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CV 00-1392 #1

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON AT SEATTLE

PRECOR INCORPORATED, a Delaware Corporation,

Plaintiff,

v

BRUNSWICK CORPORATION, a Delaware corporation, and LIFE FITNESS a division thereof,

Defendant

C00-1392P

Civil Action No

COMPLAINT FOR UNFAIR COMPETITION AND DECLARATORY JUDGMENT OF PATENT INVALIDITY AND NONINFRINGEMENT

Jury Trial Demanded

Plaintiff Precor Incorporated ("Precor") hereby alleges the following against Defendant Brunswick Corporation

PARTIES AND JURISDICTION

1 Plaintiff Plaintiff is a Delaware corporation with its principal place of business at 20001 North Creek Parkway, Bothell, Washington Precor is actively engaged in the manufacture, distribution and sale of exercise equipment including various treadmills in the Western District of Washington

ORIGINAL

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2 Defendant Upon information and belief, Life Fitness is a division of Brunswick Corporation, a Delaware corporation with its principal place of business at Franklin Park, Illinois Life Fitness/Brunswick conducts extensive business within this judicial district, including the distribution and sale of exercise treadmills

3 Jurisdiction and Venue *Inter alia*, this is an action for unfair competition and for declaratory judgment of patent invalidity and non-infringement of U S Patent No 6,095,951 ("the '951 patent") assigned to Brunswick Corporation This Court has subject matter jurisdiction pursuant to 28 U S C § § 1338, 1331, 1367, 2201 and 2202, and 15 U S C § 1121 Venue is proper in this district under 28 U S C § § 1391(c) and 1400(b)

BACKGROUND

4 Related Litigation This matter arises out of the same set of facts which is the subject of litigation between the same parties involving the identical exercise equipment in this judicial district under U S District Cause No C94-1586C On September 23, 1999 this Court therein entered a Stipulation and Order of Dismissal, dismissing with prejudice Brunswick/Life Fitness' claims against Precor for unfair competition, patent mismarking, and infringement of related U S Patent Nos 5,599,259 and 5,752,897 and Claims 38-39 of U S Patent No 5,382,207 (respectively "the '259, '897, and '207 patents") See Exhibit A hereto On January 30, 2000, following a jury trial and related proceedings, the Honorable Edward Rafeedie entered an order confirming the jury's verdict invalidating Life Fitness' '207 patent, finding Life Fitness guilty of unfair competition and assessing prejudgment interest and attorneys fees in favor of Precor under 35 U S C § 285 See Exhibit B hereto On April 19, 2000 the Court entered a further Order assessing attorneys' fees against Life Fitness in the amount of $4,044,140 40 See Exhibit C hereto Life Fitness has appealed the Courts' Order to the U S Court of Appeals for the Federal Circuit

5 Life Fitness' Announcement of Notice of Allowed Claims re the '951 Patent On October 21, 1999, shortly after the jury began its deliberations in U S District Cause

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No C94-1586C, Robert Hood, Life Fitness' Senior Vice President, approached William W. Potts, Chief Executive Officer of Precor In the well of the Court, Hood handed Potts an envelope enclosing the USPTO's Notice of Allowability, attached hereto as Exhibit D Hood advised Potts that one or more of Precor's current treadmill offerings would infringe the patent which would shortly issue, as evidenced by the Notice of Allowability However, Hood noted that, because of the inordinate expense and inconvenience of the previous litigation, both parties should not institute litigation regarding the expected patent without each company's careful consideration of the other's respective position and a full opportunity to explore out-of-court settlement options Hood was particularly adamant that the past litigation had been unwise in that it harmed both parties in the eyes of the public in general and the exercise industry in particular Hood expressly assured Potts Life Fitness would not institute litigation regarding the newly allowed claims without providing advance notice and an opportunity to fully consider and address the matter privately

6 Life Fitness' '951 Patent On August 1, 2000, United States Patent No 6,095,951, entitled "Exercise Treadmill" issued to Brunswick ("the '951 patent") A true and correct copy of the '951 patent is attached hereto as Exhibit E On August 1, 2000, the same date the patent issued, contrary to its earlier agreement and wholly without advance notice to Precor, Brunswick/Life Fitness instituted suit against Precor in the U S District Court for the District of Delaware under U S District Court Cause No 00-691 for infringement of the '951 patent See Exhibit F hereto Brunswick/Life Fitness' transparent attempt in so filing was to inconvenience Precor, which has no regular office or employees situated in Delaware, and to deprive the U S District Court for the Western District of Washington of due consideration of the matter, which would be particularly appropriate, given this Court's previous rulings regarding the family of patents out of which the '951 patent arises

7 Scope of '951 patent The disclosure and claims of the '951 patent closely parallel the disclosure and claims of the '207, '259, and/or '897 patents, previously asserted by Life Fitness

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against Precor in the related litigation referenced under paragraph 4 above, the bulk of which claims were dismissed on summary judgment, dismissed with prejudice in the Court's September 23, 1999 Order, or previously declared invalid as a matter of law by this Court on January 30, 2000 Any differences between previous claims contained in the '207, '259 and '897 patents and claims of the '951 patent consist solely of the addition of elements disclosed in the specifications of the earlier Life Fitness' patents or otherwise well known in the prior art, which facts are well known to Brunswick/Life Fitness. Brunswick/Life Fitness therefore could have no reasonable or good faith belief in the validity of the claims of the '951 patent

8 Multiple Patenting of Same Invention The disclosure of the '951 patent was drafted by Brunswick/Life Fitness patent attorneys Michael B McMurry and Kathleen A Ryan, and purportedly originate in an invention conceived and reduced to practice in 1987 Yet this invention is fully disclosed in the '207, '259 and '897 patents, also prosecuted by Mr McMurry and Ms Ryan A patent must give public notice of the scope of the claimed invention and to allow one to legitimately design around or otherwise avoid infringement of the patent It is therefore grossly unfair and inequitable to allow Brunswick/Life Fitness to obtain new patent claims covering subject matter which has previously been disclosed but not claimed in multiple earlier patents, particularly under the circumstances at issue herein

9 Invalidity of '951 Patent Upon information and belief, the claims of the '951 patent are invalid and unenforceable against Precor In particular, and without limitation, Precor alleges the following alternative and cumulative grounds of invalidity

a The patentees did not invent the subject matter patented, nor did they make any invention or discovery, either novel, original, or otherwise, within the meaning of United States Code, Title 35

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b The alleged invention was made by another in this country before the patentees' alleged invention, and such other person had not abandoned, suppressed, or concealed it

c New matter was introduced into the disclosure and claims during the prosecution of the application for said patent

d The patent does not particularly point out and distinctly claim the part, improvement, method, steps, or combination which the patentee claims as their invention, as required by Title 35, United States Code

e The specification does not contain a written description of the invention and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it pertains, or with which it is most nearly connected, to make, construct, compound and/or use the same, and the description does not adequately explain the principle or the best mode in which the patentees contemplated applying that principle so as to distinguish it from other inventions, as required by Title 35, United States Code

f The claims, and each of them, of the patent are excessively vague and indefinite and do not distinctly point out and define the invention

g The claims, and each of them, are not directed to patentable combinations, but are directed to mere aggregations of parts or steps, means, or elements which were matters of common knowledge in the art to which said patent relates before the alleged invention and more than one year prior to the date of the application for the patent

h The claims consist wholly of elements previously determined unpatentable in the litigation described under paragraph 4 above and/or additional elements disclosed but not claimed in the previously issued '207, '259 and '897 patents, and therefore

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constitute matters of common knowledge in the art which were dedicated to the public

i The structures disclosed in the patent are inoperative and incapable of accomplishing the intended result, and are not useful within the meaning and requirements of Title 35, United States Code

j In light of the prior art at the time the alleged invention was made, the subject matter as claimed in the patent would have been obvious to one skilled in the art to which the alleged invention relates and does not constitute a patentable invention

k The alleged invention or discovery was disclosed in a United States patent to another, the application for which was filed before the alleged invention by the patentee of the patent in suit

l More than one year prior to the filing of the original application which matured into the patent in suit, the alleged invention was patented or described in printed publications in this or foreign countries, or was in public use or on sale in this country

m Before the alleged invention or discovery by the patentees, the alleged invention was known or used by others than the alleged inventors and was on sale in this country and was patented or described in printed publications in this or foreign countries

n If there be any invention in the subject matter of the patent in suit, which is denied, the patent nevertheless was not obtained in a manner consistent with the provisions of Title 35, United States Code

o The claims of the patent in suit are functional, indefinite, and broader than the alleged invention as set forth in the specification of the patent in suit

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p The assertion of the claims of the '951 patent is barred by this Court's prior January 30, 2000 Order under applicable doctrines of res judicata or collateral estoppel

10 Non-infringement of '951 Patent No Precor treadmill is within the scope of any valid claim of the '951 patent.

CAUSES OF ACTION

11 Unfair Competition; Bad Faith Litigation Conduct Life Fitness and Precor are competitors in the exercise industry, offering similar products, including treadmills as described above for both the commercial and consumer markets Brunswick/Life Fitness' actions in prosecuting the '951 patent and assertion of infringement claims against Precor in Delaware are part of a continuing pattern of intentional conduct constituting unfair competition *Inter alia,* Brunswick/Life Fitness has prosecuted and obtained multiple patents on the same unpatentable subject matter, which patent(s) Life Fitness knows or should have known to be invalid, and which are asserted against Precor for improper purposes, and to force acquiescence to Life Fitness' illegal demands Brunswick/Life Fitness' actions caused Precor to bear inordinate expense and inconvenience in defending against claims arising from the earlier asserted '207, '259 and '897 patents, and the assertion of the '951 patent in Delaware is a continuation of Brunswick/Life Fitness' improper use of the legal process

12 Declaratory Judgment A justiciable controversy exists between the parties concerning the validity, infringement and enforceability of the '951 patent

PRAYER FOR RELIEF

Wherefore, Precor requests the following relief against the Defendant

1 Declaratory Judgment A declaratory judgment that the Precor treadmills do not infringe the '951 patent, that the '951 patent is invalid and unenforceable, and that the previous verdict and orders of this Court under U S District Court Cause No C94-1586C are *res judicata* or

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collateral estoppel of Brunswick's claims for infringement of the '951 patent in the above-described Delaware action,

2. Injunction For preliminary and permanent injunctions preventing Brunswick/Life Fitness from proceeding further with its recently filed Delaware action and enjoining Brunswick/Life Fitness' continuing unfair competition,

3 Punitive Damages For punitive and exemplary damages under RCW 19 86,

4 Attorneys' Fees For an award of Precor's actual attorneys' fees and costs pursuant to 35 U S C § 285 and RCW 19 86, and

5 Other Relief For such other and further relief as the Court deems just and proper

JURY DEMAND

Precor demands a jury trial on all issues triable by a jury

Dated this 17th day of August, 2000.

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Honorable Edward Rafeedie

CC: TO JUDGE JK

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BY DEPUTY

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON AT SEATTLE

PRECOR INCORPORATED, a Delaware Corporation, Plaintiff v LIFE FITNESS, a division of BRUNSWICK CORPORATION, a Delaware corporation successor in interest to LIFE FITNESS, a New York partnership, THE LIFE FITNESS COMPANIES L P , (fka LF HOLDINGS L P) a Delaware limited partnership, LF HMG INC , a Delaware corporation, and MANCUSO/EQUITY PARTNERSHIP NO 2 L P , a Delaware limited partnership, Defendants	Civil Action No C94-1586C STIPULATION AND ORDER OF DISMISSAL

STIPULATION

The parties hereto, through their attorneys of record, hereby stipulate and agree as follows

1 The caption to this case should be amended as indicated above,

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2 Life Fitness has asserted causes of action against Precor's current treadmill Models 9 17, 9 21 and 9 25 for infringement of U S Patent Nos 5,599,259 (the '259 patent) and for infringement of the 5 752,897 (the '897 patent) by those and other Precor models Life Fitness has never asserted any cause of action against Precor's current Models 9 17, 9 21 and 9 25 for infringement of U S Patent No 5,382,207 (the '207 patent).

3 Precor's current treadmill Models 917, 9 21 and 9 25 are constructed as depicted in the engineering drawings attached hereto as Exhibits A-1 to A-3,

4 On September 1, 1999, Life Fitness told Precor through its draft Pre-Trial Order that it would pursue at trial only its claims of infringement of claim 37 of the '207 patent against the listed treadmill models Life Fitness wrote that it had "determined that it will not pursue at trial any of the other claims pleaded in its November 21, 1994 Answer and Counterclaims or in its May 22, 1998 Complaint" These other claims include claims that had been pleaded for unfair competition, for patent mismarking, and for infringement of the '259 and 897 patents against Precor's past and current treadmill models

5 Life Fitness' position was expressly confirmed in the Pre-Trial Order the parties submitted to the Court on September 7, 1999,

6 Precor wishes further to document Life Fitness' decision to limit its claims to infringement of claim 37 of the '207 patent As such, Life Fitness reiterates its decision to dismiss with prejudice the following claims and causes of action

(a) all claims of infringement under the '259 and '897 patents against all past and present Precor treadmills

(b) all causes of action for unfair competition and patent mismarking as previously pled in paragraphs 21-27 of its November 21, 1994 Answer and Counterclaim and paragraphs 17-26 of its May 22 1998 Complaint (later consolidated herein), and

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(c) all claims for infringement of dependent Claims 38 and 39 of the '207 patent

7 As a result of Life Fitness' decision, Precor's claims for non-infringement, invalidity and unenforceability of the '259 and '897 patents are rendered moot, and Precor therefore withdraws those claims without prejudice

Dated this 13th day of September, 1999

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Attorneys for Plaintiff
Precor Incorporated

ORDER OF DISMISSAL

THIS MATTER having come on pursuant to stipulation, and good cause being shown, the Court hereby ORDERS as follows

1 The caption to this case shall be amended as indicated above,

2 All of Life Fitness' previously pleaded claims at issue in this case under U S Patent No 5,599,259, U S Patent No 5,752,897 and all previously pleaded assertions of infringement at issue in this case under Claims 38 and 39 of U S Patent No 5 382,207 are dismissed with prejudice,

3 All of Life Fitness' previously pleaded claims of infringement at issue in this case against the current Precor Models 917, 9 21, and 9 25 treadmills, illustrated in the attached Exhibits A-1 to A-3, are dismissed with prejudice,

4 All of Life Fitness' previously pleaded claims for unfair competition and patent mismarking are dismissed with prejudice, and

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5 Precor's claims for non-infringement, invalidity and unenforceability of the '259 and '897 patents are dismissed without prejudice

6 This Order is expressly entered without prejudice to Precor's continuing claims for damages, attorneys' fees and costs relating to the Life Fitness' claims dismissed in this Order, or to Precor's right to defend against any future assertion of infringement of the '207, '259 and '897 patents on the basis that they are, *inter alia*, invalid, unenforceable or barred by laches or estoppel

Dated this 9 day of 23, 1999

United States District Court Judge

PRESENTED BY:

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JOHNSON & KINDNESS PLLC

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APPROVED FOR ENTRY
NOTICE OF PRESENTATION WAIVED

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EXHIBIT A-1

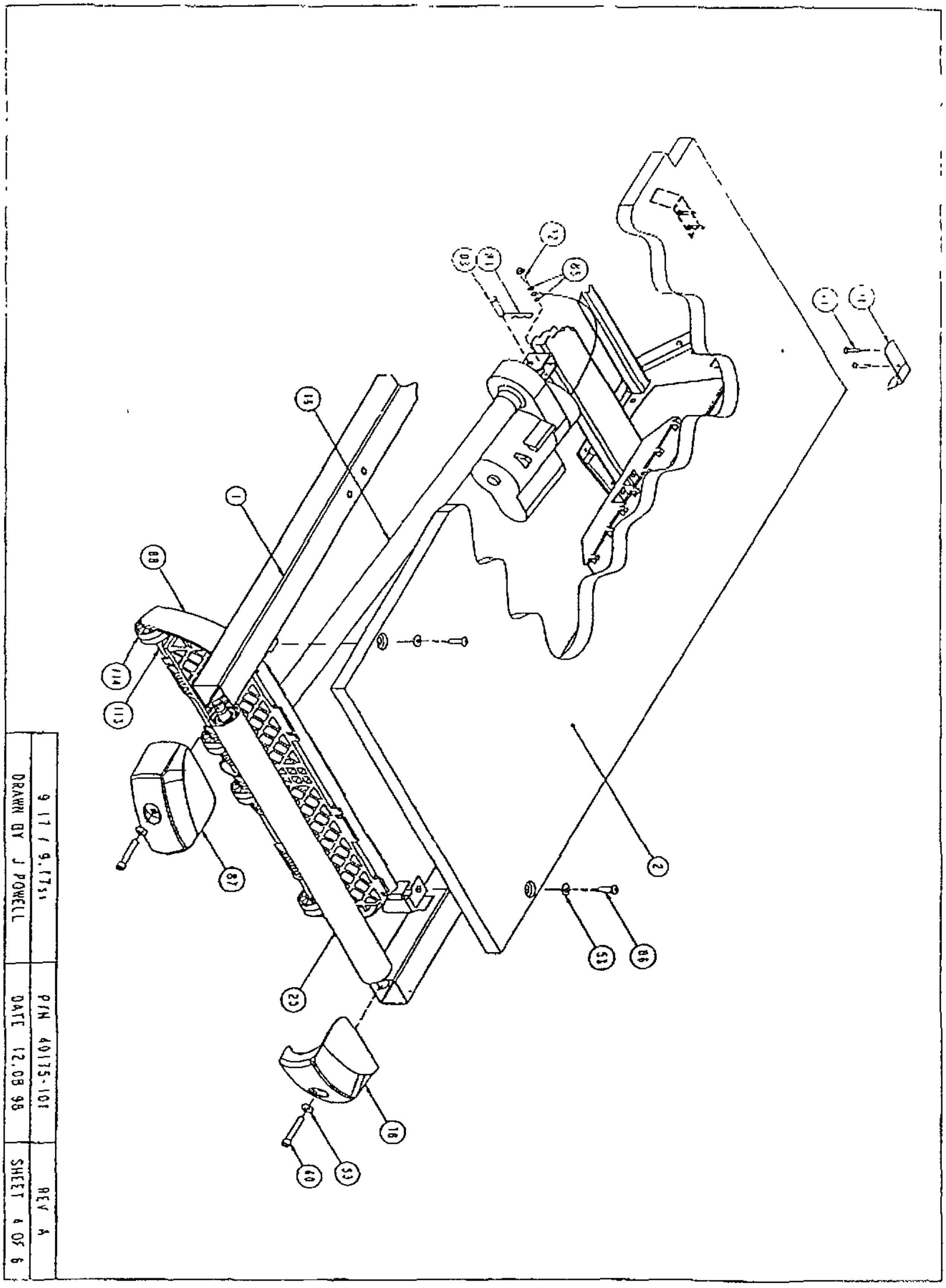

EXHIBIT A-1

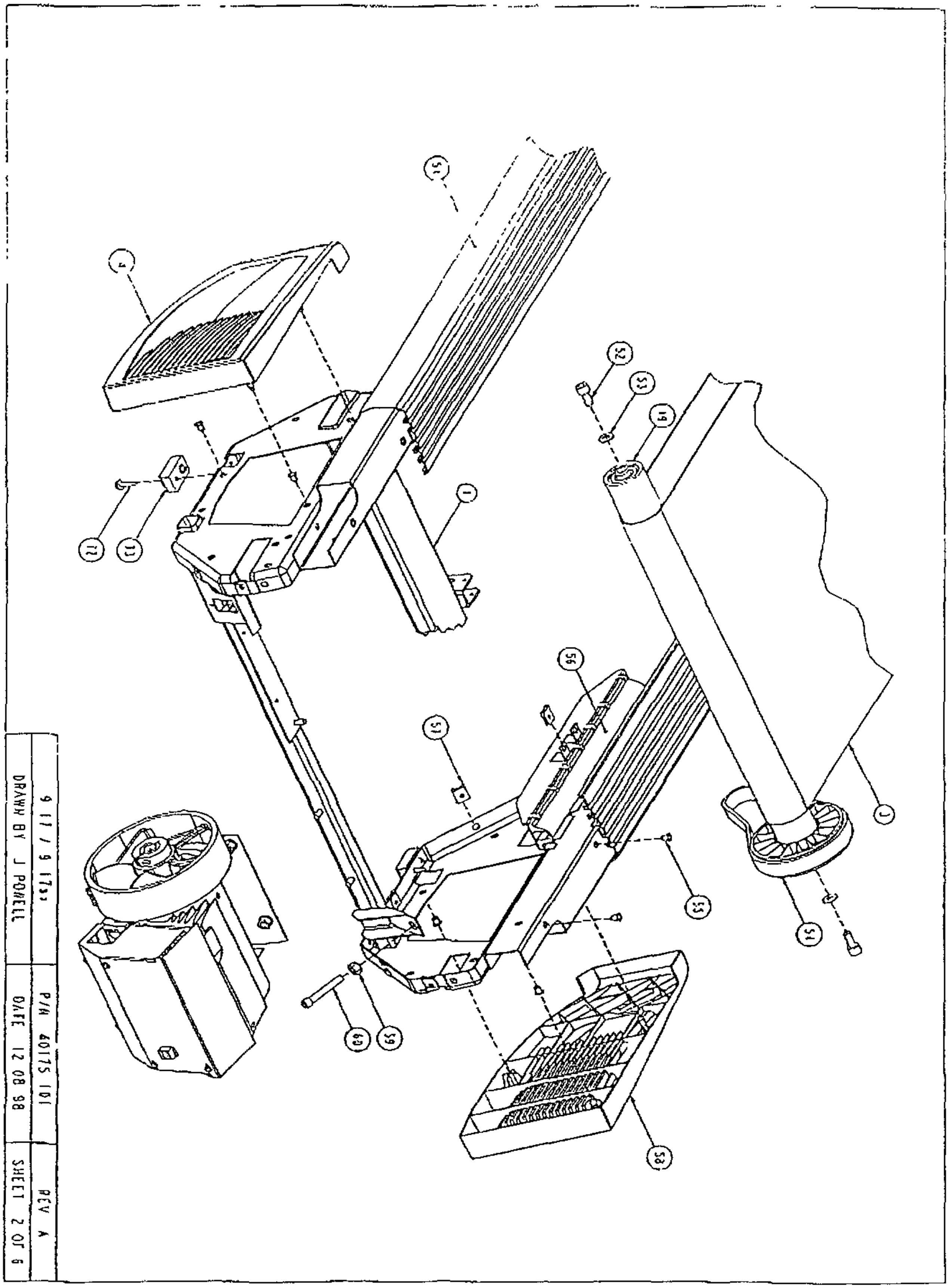
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EXHIBIT A-2

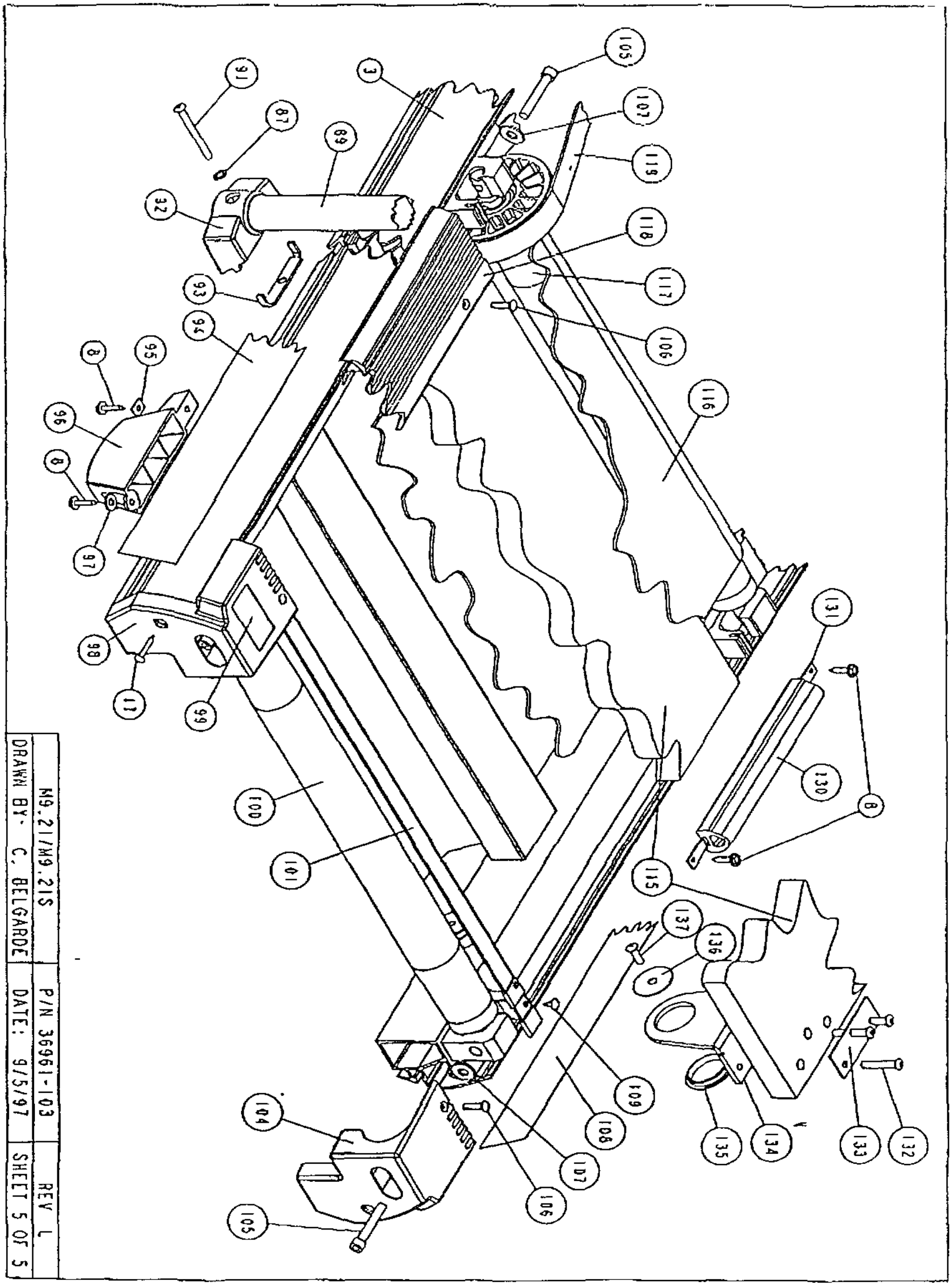
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EXHIBIT A-2

EXHIBIT A-3

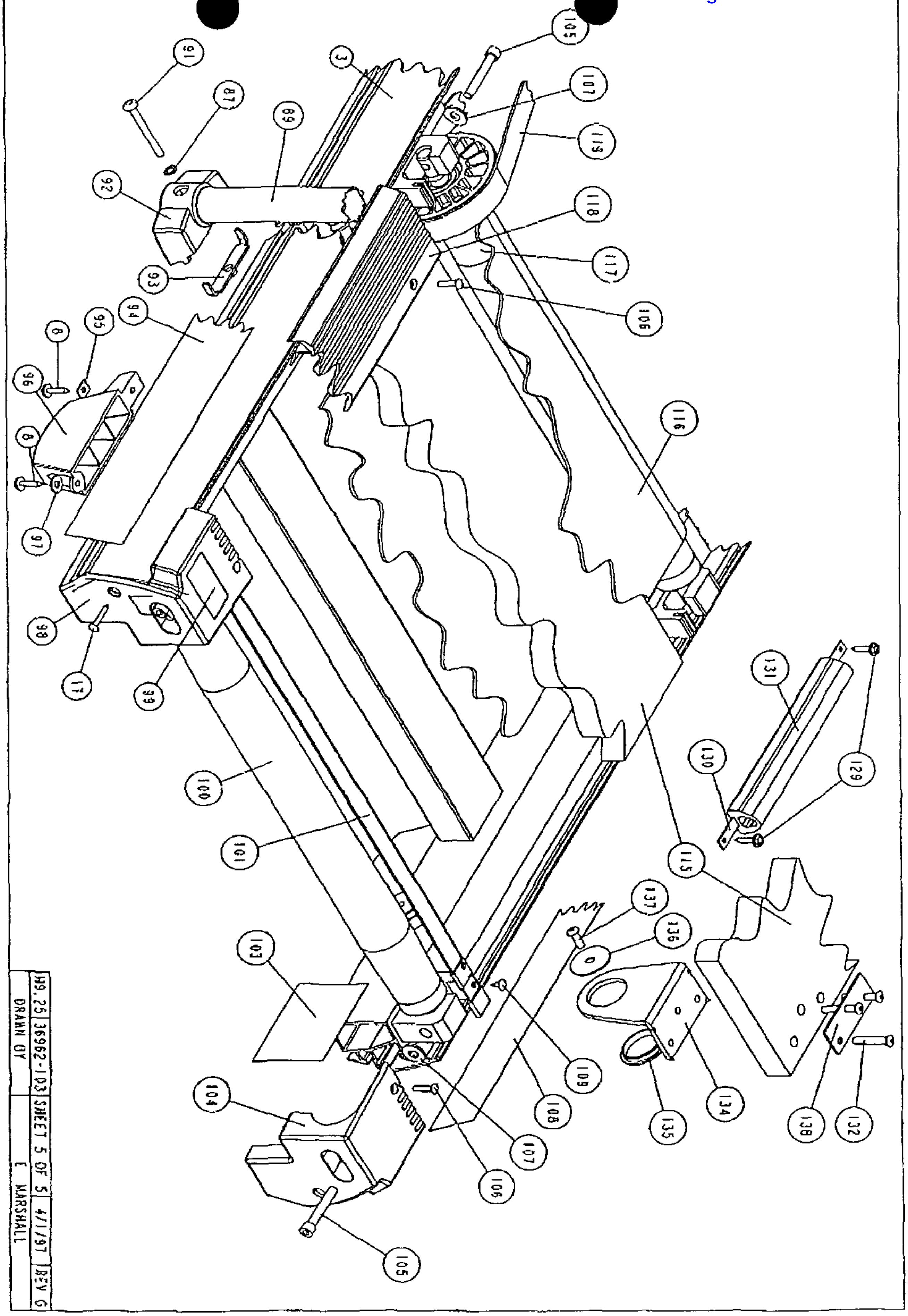
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EXHIBIT A-3

B

UNITED STATES DISTRICT COURT

WESTERN DISTRICT OF WASHINGTON

AT SEATTLE

PRECOR INCORPORATED, a Delaware Corporation, Plaintiff, v. LIFE FITNESS, a New York partnership; LF HOLDINGS, L.P., a Delaware Corporation; and MANCUSO/EQUITY PARTNERSHIP NO.2, L.P., a Delaware Limited parternship, Defendants.	Case No. C94-1586C ORDER GRANTING-IN-PART AND DENYING-IN-PART PRECOR'S OMNIBUS MOTION FOR POST-TRIAL RELIEF

The Court has read and considered the papers filed in connection with plaintiff Precor, Inc.'s ("Precor") Omnibus Motion For Post-Trial Relief, and deeming the matter fit for resolution without the need for oral argument, now hereby reaches the following CONCLUSIONS:

[1] Precor seeks an injunction "prohibiting Life Fitness' further unfair competition," pursuant to the jury's finding that Life Fitness engaged in unfair competition prior to the issuance of Life Fitness' "Skowronski" patent in 1995. Before that patent issued, Life Fitness admittedly told its treadmill dealers and others in the treadmill industry that it had a valid patent on the

"FlexDeck" technology and that Precor infringed that patent. However, no evidence was introduced at trial concerning acts by Life Fitness *after* the Skowonski patent issued in 1995 that would constitute unfair competition. The Court has no authority to issue an injunction to prevent behavior that was not considered by the jury at trial, so Precor must address any new acts of unfair competition by new legal action. Accordingly, the Court DENIES Precor's request for an injunction preventing Life Fitness' further unfair competition.

[2] Precor also seeks an injunction "prohibiting infringement of the Birrell design patent," pursuant to the jury's finding that Life Fitness wilfully infringed Precor's "Birrell" patent. The Court has discretion to issue an injunction to prevent further infringement of a patent under 35 U.S.C. § 283, and this discretion is generally used in favor of the patent owner unless there is good reason for doing otherwise. See, e.g., W.L. Gore & Assocs., Inc. v. Garlock, Inc., 842 F.2d 1275, 1281 (Fed. Cir. 1988). The Court may not, however, enjoin products that have not been found by the jury to infringe Precor's patent, and therefore any injunction must be specifically tailored to comport with the jury's findings. See, e.g., Square Liner 360, Inc. v. Chisum, 691 F.2d 362, 378 (8th Cir. 1982).

[3] The jury in this case considered evidence of three specific Life Fitness treadmill models, namely models 3500, 4000 and 4500, and found that those models infringe the Birrell design patent. Life Fitness now alleges that those models have "undergone a 'face lift,'" and argues that any injunction would therefore be inappropriate. To the extent that Life Fitness' products have been cosmetically changed from the models considered by the jury, the Court agrees that an injunction against the revised models is not an appropriate remedy at this time. However, Precor is entitled to an injunction on the specific Life Fitness models found by the jury to infringe. The Court THEREFORE ENJOINS the further use, sale, offer for sale or manufacture by Life Fitness of the specific embodiments of the models 3500, 4000 and 4500 treadmills found by the jury to infringe the Birrell design patent.

[4] Precor further seeks judgment by the Court that Claim 37 of Life Fitness' Skowronski patent is (a) invalid as a matter of law, and (b) not infringed by Precor. The jury

made a factual finding that Claim 37 of the Skowronski patent is not entitled to a priority date earlier than April 17, 1991. The parties stipulated at trial that should the jury make this finding, Claim 37 would be invalid as a matter of law. On the record before it, the Court finds that the jury's verdict on Claim 37 was supported by sufficient evidence, and thus the Court adopts the jury's finding and finds that Claim 37 is INVALID AS A MATTER OF LAW. The Court further finds that Precor does not infringe Claim 37 as a matter of law.

[5] Precor also seeks an award of increased damages, pursuant to 35 U.S.C. § 284, based on the jury's finding that Life Fitness willfully infringed the Birrell patent. Precor elected at trial to recover Life Fitness' total profits under 35 U.S.C. § 289, not "damages" under 35 U.S.C. § 284, which statute provides for recovery of damages which the Court may increase "up to three times." The Federal Circuit has authoritatively determined that 35 U.S.C. § 289 does not authorize the Court to award an increase in a patentee's total profits. See Braun, Inc. v. Dynamics Corp. Of America, 975 F.2d 815, 824 (Fed. Cir. 1992). Indeed, Braun reversed an award of treble § 289 profits that was premised on a § 284 enhancement analysis, holding that "the district court clearly exceeded its statutory authority" in increasing the total profit awarded the patentee. Because Precor elected at trial to recover lost profits under § 289, the Court finds that Precor is not entitled to § 284 enhanced damages under Braun, and therefore the Court DENIES Precor's Motion For Increased Damages.

[6] Precor also seeks an accounting of additional damages for infringement of the Birrell patent after September 30, 1999, and for a judgment for such damages. As the parties dispute the manner in which profit figures are derived, the Court ORDERS Life Fitness to provide full accounting information to Precor on or before February 14, 2000, as to its gross profits for sales of Life Fitness' models 3500, 4000 and 4500 treadmills occurring on and after October 1, 1999. Upon receiving this information Precor may submit its claim for damages relating to these sales, whereupon Life Fitness shall have 2 weeks in which to file its response, if any, with the Court.

[7] Precor further seeks an award of prejudgment interest, pursuant to 35 U.S.C. § 284, on the damages found by the jury. The Court has substantial discretion in awarding prejudgment

interest, but notes that prejudgment interest is typically awarded absent justification for withholding it. See, e.g., General Motors Corp. v. Devex Corp., 103 S.Ct. 2058 (1983). Upon the record before it, including the jury's finding of willful infringement, the Court finds that an award of prejudgment interest is appropriate in this case. The issue before the Court, however, is the appropriate manner in which to calculate that award. Life Fitness argues, and the Court agrees, that Precor's request for an interest rate of 17.6%, apparently based on Precor's borrowing rate, is inappropriately speculative and unsupported. Having reviewed both the testimony of Life Fitness witness Julie Davis and the record before it, the Court finds that the appropriate prejudgment interest rate is the prime rate of interest, compounded quarterly. The Court therefore GRANTS Precor's motion, and HEREBY ORDERS Life Fitness to pay prejudgment interest to Precor on the jury's award of $5,250,000 at the prime rate of interest, compounded quarterly.

[8] Finally, Precor seeks an award of attorneys fees and costs pursuant to 35 U.S.C. § 285 and Washington state's Unfair Business Practices Act ("UPBA"), RCW 19.86.010 *et seq.* 35 U.S.C. § 285 permits the Court to award "reasonable attorney fees to the prevailing party" in "exceptional cases." Washington's UPBA, on the other hand, permits the Court to use its discretion in awarding reasonable attorney's fees spent successfully prosecuting a violation under the Act. See, e.g., State v. Black, 676 P.2d 963, 971 (Wash. 1984).

[9] The jury found in favor of Precor both on its infringement claim, awarding Precor $5,250,000, and on its unfair competition claims, awarding no damages. The jury further found in favor of Precor on Life Fitness' counterclaim for infringement, finding that Life Fitness' [illegible] only entitled to a filing date which renders Claim 37 invalid. Thus, the Court notes as a preliminary matter that Precor is clearly the "prevailing party" on the claims at issue in this litigation for purposes of both § 285 and the UPBA. The remaining issue for the Court to decide, therefore, is whether this is an "exceptional" case within the meaning of § 285. The jury's finding of willful infringement, though strong evidence that this is an exceptional case, is not dispositive on that point. See, e.g., Delta-X Corp. v. Baker Hughes Production Tools,

Inc., 984 F.2d 410, 413-14 (Fed. Cir. 1993). The Court also considers other factors, including whether Life Fitness acted in bad faith, in determining whether an award of attorneys' fees is appropriate under § 285. See id.

[10] The Court has before it a substantial record indicating that this is an exceptional case within the meaning of 35 U.S.C. § 285. Strong evidence was presented at trial indicating a deliberate attempt by Life Fitness to copy Precor's Birrell patent design, including Life Fitness' internal documents that contained several notations stating that Life Fitness should "match Precor." Also, the Court believes that Life Fitness' overwhelming trial tactics are evidence of its intent to damage Precor, its direct competitor in the treadmill industry. For example, Life Fitness originally accused Precor of infringing 39 claims of the '207 Skowronski patent. See Declaration of F. Ross Boundy, at 10:10-16. Thirty-six of the 39 claims were resolved on summary judgment, many without evidentiary opposition from Life Fitness. See id. Life Fitness argued strenuously, however, that factual issues precluded summary judgment on infringement claims on its '259 and '897 patents, claims that had arguably extended the life of this litigation by over two years. Then, at or shortly before the pretrial conference, Life Fitness dropped its '259 and '897 infringement claims, subsequently arguing that Precor should not be permitted to introduce evidence relating to those claims at trial.

[11] The Court notes that Life Fitness' trial strategy not only greatly increased Precor's costs in bringing its infringement claim to trial, but also substantially lengthened the time during which Life Fitness was able to infringe Precor's design patent. Precor filed suit against Life Fitness for infringement of the Burrell patent in late 1994. Life Fitness continued to produce infringing [illegible] until approximately two weeks before the start of trial, at which point Life Fitness introduced a new, non-infringing design. The Court believes that these facts further suggest that Life Fitness acted in bad faith in prolonging this litigation, as Life Fitness continued to use the infringing design for nearly five years after Precor filed suit, for over a year after the Patent Office re-examined the Birrell patent, and only stopped using the infringing design on the verge of trial.

[12] These examples demonstrate, in the Court's opinion, that Life Fitness engaged in a pattern of unnecessary pleading and delay which substantially increased both the time and expense required to bring this matter to trial. Though Precor was certainly not without fault in adding to the over-litigation of this case, based on the jury's finding of willful infringement and the record before it, the Court finds that Life Fitness' conduct rises to the level of bad faith necessary to consider this an "exceptional case" within the meaning of 35 U.S.C. § 285. Based on the same analysis, the Court finds that it has the discretion to award Precor attorneys' fees under Washington state law. See, e.g., Black, 676 P.2d at 971. Accordingly, the Court will award Precor its reasonable attorney's fees both for prevailing on the patent claims at issue in this litigation and for successfully prosecuting its claims for unfair competition in violation of the UPBA.

[13] Precor seeks $5,367,463.86 in attorneys' fees, and has submitted *in camera* documentation to support the reasonableness of those fees. Life Fitness argues, and the Court agrees, that Life Fitness should have an opportunity to review Precor's attorneys' fee documentation and respond, if appropriate, before the Court issues its final judgment as to those fees. Accordingly, the Court ORDERS Precor to file and serve on or before February 14, 2000, explanation and justification of those fees it believes to be payable by Life Fitness pursuant to this Order. Life Fitness shall file and serve its response, if any, on or before February 28, 2000, and Precor shall file its reply, if any, on or before March 6, 2000. Finally, the Court has

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considered Precor's arguments for prejudgment interest on any Court ordered attorneys' fees, and HEREBY DENIES Precor's request for such interest as being both speculative and excessive.

IT IS SO ORDERED.

IT IS FURTHER ORDERED that the Clerk of the Court shall serve, by United States mail or by telefax, copies of this Order on counsel for the parties in this matter.

Dated: 1/30/00

EDWARD RAFEEDIE
Senior United States District Judge

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Entered 4/19/00

UNITED STATES DISTRICT COURT

WESTERN DISTRICT OF WASHINGTON

AT SEATTLE

PRECOR INCORPORATED, a Delaware Corporation, Plaintiff, v LIFE FITNESS, a division of BRUNSWICK CORPORATION, a Delaware corporation, successor in interest to LIFE FITNESS, a New York partnership, THE LIFE FITNESS COMPANIES L P., (fka LF HOLDINGS, L.P.), a Delaware limited partnership; LF HMG INC., a Delaware Corporation, and MANCUSO/EQUITY PARTNERSHIP NO 2, L.P , a Delaware Limited partnership, Defendants	Case No C94-1586C ORDER RE PRECOR'S MOTION FOR ATTORNEYS' FEES AND COSTS AND RELATED PLEADINGS

The Court has read and considered the papers filed in connection with plaintiff Precor, Inc.'s [hereinafter "Precor"] Motion for Attorneys' Fees and Costs, and hereby reaches the following CONCLUSIONS

[1] On January 30, 2000, the Court granted Precor's Motion for Attorneys' Fees and ordered Precor to serve defendant Life Fitness with documentation supporting Precor's request

for $5,367,463.86 The parties were further ordered to brief the reasonableness of Precor's claimed fees. Precor responded to the Court's order by requesting an award of $6,484,166.17 in attorneys' fees, plus enhancements, without adequate explanation or justification for its new calculations [1] Life Fitness filed a Response arguing, *inter alia*, that the "lodestar" factors applicable in determining attorneys' fees awards support a reduction of Precor's claimed fees by 20% [2]

[2] The amount of an award of attorneys' fees in a civil case is determined by a "lodestar" method See Blanchard v. Bergeron, 109 S.Ct. 939, 945 (1989). Using this method, the amount of the fee is estimated by multiplying the number of hours reasonably expended on the litigation by a reasonable hourly rate. See Pennsylvania v. Delaware Valley Citizens' Council for Clean Air, 106 S.Ct 3088, 3097 (1986) However, "[t]here remain other considerations that may lead the district court to adjust the fee upward or downward." Hensley v. Eckerhart, 103 S.Ct 1933, 1940 (1983) Those considerations include the twelve factors set forth in Johnson v. Georgia Highway Express, Inc., 488 F 2d 714, 717-719 (5th Cir 1974) See, e.g., Stryker Corp. v. Intermedics Orthopedics, Inc., 898 F Supp. 116, 120-21 (E D.N Y 1995), aff'd , 96 F.3d 1409 (Fed Cir. 1996). These factors are (1) the time and labor required, (2) the novelty and difficulty of the questions, (3) the skill requisite to perform the legal service properly, (4) the preclusion of other employment by the attorney, (5) the customary fee, (6) whether the fee is fixed or

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[1] The Court agrees that Precor is entitled to recover the costs of preparing its attorneys' fee request. However, Precor also has the obligation of clearly articulating for the Court what those fees are and why they are reasonable, instead of merely submitting pages of billing schedules in the hopes that the Court will unearth the related fees. Precor's memorandum on the subject does no more than make the bare assertion that Precor is entitled to such fees. See Precor's Memorandum Regarding Reasonableness of Attorneys' Fees, at 10.5-17.

[2] The Court HEREBY GRANTS Defendant's unopposed Motion for Leave to File Response Memorandum in Excess of Twelve Pages, and GRANTS Defendants' unopposed Motion for Leave to File Surreply in Response The Court has considered these pleadings in deciding Precor's Motion for Attorneys' Fees The Court has also considered Precor's objections to the Seifert and Manbeck declarations submitted by Life Fitness, and hereby overrules said objections.

contingent, (7) time limitations, (8) the amount involved and the results obtained, (9) the experience, reputation, and ability of the attorneys, (10) the "undesirability" of the case, (11) the nature and length of the professional relationship with the client, and (12) awards in similar cases See, e.g., Georgia Highway Express, 488 F.2d at 717-719

[3] Of the original $5,367,463.86 requested by Precor, $4,500,822.78 represented attorneys' fees, and $1,593,815 96 represented disbursements. Of the $4,500,822 78 in attorneys' fees, the parties apparently agree on all but two points. First, Life Fitness argues that $118,323 38 should be removed as being factually unsupported by the documentation submitted by Precor The Court agrees [3] Second, Life Fitness argues that the lodestar factors support a reduction of the remaining $4,382,499 40 by 20%.[4] Here the Court does not agree. This was a complex case, spanning more than five years of litigation The questions presented, though not novel, were not insubstantial The legal issues required attorneys with relatively specialized and technical skills to prosecute competently. Moreover, the stakes were high the results justified the cost and effort set forth In short, several of the Georgia Highway Express factors are present in this case Though the Court does not find that these factors support the 20% increase in the attorneys' fees sought by Precor, they do not support a reduction of those fees either.

[4] The remaining $1,593,815.96 of Precor's original fee request constitutes "disbursements " Of this sum, $727,174.88 represents expert fees The Court has already ruled that Precor is not entitled to expert fees beyond those awarded by the Clerk, and chooses not to disturb that decision now. Of the remaining $866,641.08 in disbursements, Life Fitness objects to Precor's request for $159,000 for litigation support and $51,000 for trial models The Clerk reviewed these requests when he ruled on Precor's Bill of Costs, and made what the Court

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[3] Indeed, Precor apparently does not contest that the original documentation supporting its Motion for Attorneys' Fees did not justify this $118,323 38

[4] Conversely, Precor seeks an up to 20% enhancement under the same factors Though several of the Georgia Highway Express factors are at least minimally present here, the Court believes that the facts do not support any enhancement in this case

believes to be the appropriate decision by denying them. Life Fitness further objects to $25,034.74 spent by Precor on mediation proceedings, and on $37,169.37 paid to French attorneys. The Court believes that these costs are reasonable in light of the nature of this litigation, and should be upheld Finally, Life Fitness objects to $1,454.00 for messenger services and freight expenses. The Court also believes these costs to be reasonable

[5] Addressing the new fees and costs raised by Precor in its Memorandum Regarding the Reasonableness of its Attorneys' Fees and Costs, the Court believes that such fees and costs are largely inappropriate The purpose of the Court's January 20 Order was to give Life Fitness fair notice of the fees with which it might be charged, not to permit Precor to find new theories under which those fees could be enhanced Furthermore, as stated, the Court does not believe that the <u>Georgia Highway Express</u> factors support the "at least 20%" enhancement sought by Precor [5] As to Precor's other requests, the Court finds that Precor is entitled to $1,000 as damages under 35 U S.C. § 289, consisting of Life Fitness' total profits for the sale of infringing treadmill units sold on or after October 1, 1999. Finally, the Court is posed with Precor's general assertion that it is entitled to attorneys' fees expended in litigating the issue of attorneys' fees The Court agrees that Precor is entitled to recover reasonable fees spent in connection with this issue. However, having reviewed Precor's documentation of attorneys' fees and costs related to the instant motion, the Court believes that such award must be limited to $5,000.

[6] In conclusion, the Court finds that Precor is entitled to attorneys' fees in the total amount of $5,044,140 40 This amount consists of $4,382,499.40 in originally sought attorneys' fees, plus $5,000 in new attorneys' fees, plus $656,641 04 in disbursements (consisting of Precor's original request, minus expert witness fees, minus $210,000 for litigation support and models) Precor is also entitled to an additional $1,000 in damages under 35 U.S C. § 289, consisting of Life Fitness' total profits for the sale of infringing treadmill units sold on or after

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[5] The Court has considered Precor's attorney's assertions that they understated their fees by 5%, and nonetheless finds that no enhancement is appropriate

October 1, 1999. Finally, pursuant to 35 U S.C. § 290, the Court HEREBY ORDERS that the Clerk of the Court give notice to the Commissioner of the United States Patent and Trademark Office that Claim 37 of U S. Patent No. 5,382,207, issued on January 17, 1995, has been determined to be invalid.

IT IS SO ORDERED.

IT IS FURTHER ORDERED that the Clerk of the Court shall serve, by United States mail or by telefax, copies of this Order on counsel for the parties in this matter

Dated·

EDWARD RAFEEDIE
Senior United States District Judge

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Notice of Allowability	Application No 09/073,400	Applicant(s) Skowronski et al	
	Examiner Glenn Richman	Group Art Unit 3764	

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course

Received by Bill Potts 10/21/99 at 2nd of closing argument. 12:15pm

☒ This communication is responsive to *8/30/99*

☒ The allowed claim(s) is/are *138-166*

☐ The drawings filed on ________ are acceptable

☐ Acknowledgement is made of a claim for foreign priority under 35 U S C § 119(a)-(d)

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received

☐ received in Application No (Series Code/Serial Number) ________

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a))

**Certified copies not received* ________

☐ Acknowledgement is made of a claim for domestic priority under 35 U S C. § 119(e)

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" of this Office action Failure to timely comply will result in ABANDONMENT of this application Extensions of time may be obtained under the provisions of 37 CFR 1 136(a)

☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient A SUBSTITUTE OATH OR DECLARATION IS REQUIRED

☒ Applicant MUST submit NEW FORMAL DRAWINGS

☐ because the originally filed drawings were declared by applicant to be informal

☒ including changes required by the Notice of Draftsperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No *3*

☐ including changes required by the proposed drawing correction filed on ________, which has been approved by the examiner.

☐ including changes required by the attached Examiner's Amendment/Comment

Identifying indicia such as the application number (see 37 CFR 1 84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal lettter addressed to the Official Draftsperson

☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL

Any response to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER) If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s) ________

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

☐ Interview Summary, PTO-413

☐ Examiner's Amendment/Comment

☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

☐ Examiner's Statement of Reasons for Allowance

GLENN RICHMAN
PATENT EXAMINER
ART UNIT 3764

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner of Patents and Trademarks, Washington, D C 20231, on 8/26/99.
Michael B. McMurry
Michael B. McMurry 8/26/99
Signature Date

PATENT
Attorney Docket
No LF-20840

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Richard C Skowronski et al

Serial Number 09/073,400

Filed May 7, 1998

For EXERCISE TREADMILL

Group Art Unit 3733

Examiner Glenn Richman

Honorable Commissioner of Patents
and Trademarks
Washington, D C 20231

AMENDMENT A

Sir

This paper is responsive to the Office Action mailed on March 3, 1999 having a shortened statutory period for response set to expire June 29, 1999

Please amend the application as follows

In the Claims

Please cancel all claims in the application including original Claims 1-29 and Claims added in the Preliminary Amendment filed with the application109-137

Please add the following new claims

138 (New) An exercise treadmill, comprising

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure, rotational means including a motor for rotating one of said pulleys,

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising,

a deck member secured beneath at least a portion of said exercise surface, and

speed control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface,

an inclination mechanism secured to said frame structure effective to permit selective inclination of said deck member by the user, and

a deck support structure including a plurality of laterally spaced resilient support members interposed between said frame structure and said deck member wherein each of said resilient support members are mounted on stationary portions of said frame structure so as to prevent longitudinal movement of said resilient support members and wherein said resilient support members support said deck member on said frame structure so as to permit at least a portion of said deck member to move downwardly with respect to said frame in response to the impact force of the user's feet on said exercise surface thereby resulting in lower impact loads on the user's feet

139 (New) The exercise treadmill of Claim 138 wherein at least one of said resilient support members is mounted proximate to the front of said frame structure proximate to the front end of said deck member

140 (New) The exercise treadmill of Claim 139 wherein at least a portion of said resilient support members are composed of an elastomeric material and abut said deck member and wherein said portion of said resilient support members are configured to provide said portion of said resilient support members with a variable spring rate

141 (New) The exercise treadmill of Claim 140 wherein said resilient support members additionally serve to limit said downward deflection

142 (New) The exercise treadmill of Claim 138 wherein said support members are composed of an elastomeric material

143 (New) The exercise treadmill of Claim 142 wherein a portion of said resilient support members are configured with a cross section having an aperture wherein said portion of support members have a variable spring rate resulting from said apertures

144 (New) The exercise treadmill of Claim 138 wherein said deck support structure additionally permits at least a limited longitudinal movement of the front end of said deck member

145 (New) The exercise treadmill of Claim 144 wherein said deck support structure includes a member pivotally connected to said frame and operatively associated with said deck to permit said limited longitudinal movement of the front end of said deck member

146 (New) The exercise treadmill of Claim 138 wherein said deck member includes a member composed substantially of wood and wherein at least one of said resilient support members abuts said deck member

147 (New) The exercise treadmill of Claim 146 wherein said deck member has a thickness of at least 5/8 inches

148 (New) The exercise treadmill of Claim 147 wherein at least one of said resilient support members is secured to said frame structure and abuts said deck member proximate to the front end of said deck member and is effective to permit both said downward movement of said deck member and at least limited longitudinal movement of said front end of said deck member

149 (New) The exercise treadmill of Claim 148 wherein said resilient support members additionally serve to limit said downward deflection

150 An exercise treadmill, comprising

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure,

means including a motor for rotating one of said pulleys,

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising,

a deck including a wood member secured beneath substantially the entire length of said exercise surface,

an inclination mechanism secured to said frame structure effective to permit selective inclination of said deck by the user,

speed control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface, and

a deck support structure including a plurality of elastomeric support members wherein at least a portion of said support members are configured with an aperture providing said support members with a variable spring rate and wherein said support members are interposed and secured between said frame structure and said deck and located so as to provide support for at least a portion of said deck on said frame structure effective to both support said portion of said deck on said frame structure and to permit said portion of said deck to move downwardly with respect to said frame structure by compressing in response to the impact force of the user's feet on said exercise surface thereby resulting in lower impact loads on the user's feet

151 (New) The exercise treadmill of Claim 150 wherein said elastomeric support members additionally limit said downward movement of said deck.

152 (New) The exercise treadmill of Claim 150 wherein said deck support structure additionally permits at least limited longitudinal movement of a first end of said deck member with respect to said frame structure when said deck is moved downwardly

153 (New) The exercise treadmill of Claim 150 wherein said elastomeric support members are composed of an elastomeric material having a hardness in the range of shore 30A to 55A

154 (New) The exercise treadmill of Claim 150 wherein said aperture is generally elliptical in configuration

155 (New) The exercise treadmill of Claim 150 wherein said elastomeric support members have a compressed height in the range of 0.5 to 2 inches.

156 (New) The exercise treadmill of Claim 150 wherein said elastomeric support members cooperate with said deck member to permit said deck to move downwardly such that the amount of incremental movement of said deck member decreases as the impact force of the user's feet on said exercise surface increases

157 (New) The exercise treadmill of Claim 150 wherein said elastomeric support members are secured between said deck member and said frame structure by a plurality of fastening members

158 (New) An exercise treadmill, comprising

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure;

means including a for rotating one of said pulleys,

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising,

a deck member secured beneath substantially the entire length of said exercise surface,

speed control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface,

an inclination mechanism secured to said frame structure effective to permit selective inclination of said deck member by the user, and

a deck support structure including at least one set of two elastomeric support members having a variable spring constant secured to said frame structure and abutting said deck so as to both provide support for said deck and to permit said deck to move downwardly with respect to said frame structure resulting from compression of said elastomeric support members in response to the impact force of the user's feet on said exercise surface thereby resulting in lower impact loads on the user's feet.

159 (New) The exercise treadmill of Claim 158 wherein said set of elastomeric support members are configured with a cross section having an aperture wherein said variable spring rate substantially results from said apertures.

160 The exercise treadmill of Claim 158 wherein said set of elastomeric support members cooperate with said deck member to permit said deck to move downwardly such that the amount of incremental deflection of said deck member decreases as the impact force of the user's feet on said exercise surface increases

161 (New) The exercise treadmill of Claim 158 wherein said deck member includes a member composed substantially of wood and wherein said set of elastomeric support members abuts said deck member

162 (New) The exercise treadmill of Claim 158 wherein said elastomeric support

members have a compressed height in the range of 0 5 to 2 0 inches

163 (New) The exercise treadmill of Claim 158 wherein said elastomeric support members have a uncompressed height in the range of 1 5 to 3 0 inches

164 (New) An exercise treadmill, comprising

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure;

rotational means including a motor for rotating one of said pulleys;

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising,

a deck member secured beneath at least a portion of said exercise surface,

control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface,

an inclination mechanism secured to said frame structure effective to permit inclination of said deck member, and

display means, located on said panel, for displaying a dynamic hill display; and

inclination control means operatively connected to said control means and responsive to said display means for causing said lifting means to incline said movable surface to correspond to said dynamic hill display

165 (New) The exercise treadmill of Claim 164 wherein said display means includes means for permitting a user to program said dynamic hill display.

166 (New) The exercise treadmill of Claim 165 wherein said display means includes means for randomly generating said dynamic hill display

REMARKS

In the Office Action dated March 29, 1999, the Examiner rejected under 35 U S C §112 Claims 109-137 as being indefinite because the Preliminary Amendment canceled Claims 73, 75-91, 93-106 and 108 did not exist in the application when the original Claims 1-29 were 1-29 In order to clarify which claims are in the application, this amendment cancels all of the claims in the application and substitutes new Claims 138-166 If it is unclear as to which claims are in the application or if the new claims should be renumbered, it is respectfully requested that the Examiner call the undersigned attorney to clarify the situation so that the claims can be substantively examined

With respect to new Claims 138-166, it is believed that there should be no double patenting issues with respect to prior issued U S Patent Nos 5,382,207, 5,484,362, 5,599,259 or 5,752,897 which are assigned to the assignee of this application Specifically, Claims 138-166 contain limitations directed to an inclination mechanism that secured to said frame structure effective to permit inclination of the deck None of the claims in the above prior issued patents includes this claimed feature

Accompanying the Preliminary Amendment was an Information Disclosure Statement identifying the references considered in the above mentioned prior issued U S Patents In addition, another Information Disclosure Statement accompanies this amendment providing information relating to possible prior art in the form of a treadmill that might have been made or sold by Icon Health and Fitness prior to June 19, 1988 This treadmill had its deck supported by a plurality of wooden blocks spaced along the deck where a thin sheet of rubber, approximately 1/8" thick, was interposed between the deck and the blocks A fastener was used to secure the deck to the blocks such that the rubber sheet was under compression However, because of the thinness of the rubber and the fact that the rubber was in compression, there would be very little or no additional compression in response to the foot impact of a user and as a result rubber would have no effect in permitting the deck to deflect or move downwardly as claimed in Claims 138-163 Thus, even if the Icon treadmill is considered to be prior art to this application, it would not anticipate or make obvious the claimed subject matter

It is, therefore, respectfully requested that Claims 138-166 be examined, the information in the Information Disclosure Statement be considered and that the application issue to Letters Patent with Claims 138-166 forming a part thereof

Respectfully submitted,

Michael B McMurry
Registration Number 26,954

Dated August 26, 1999

Michael B McMurry
1210 Astor Street
Chicago, Illinois 60610
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US006095951A

United States Patent [19]

[11] Patent Number: 6,095,951

[45] Date of Patent: Aug. 1, 2000

Skowronski et al.

[54] EXERCISE TREADMILL

[75] Inventors: Richard E. Skowronski, Elk Grove Village; Kenneth F. Lantz, Oak Park; Tomas F. Leon, deceased, late of Chicago, all of Ill., by José A. Leon, executor; Donald James Alexander, Milwaukee, Wis.; George Kolomayets, Chicago, Ill.; Vincent C. Adams, Buffalo Grove, Ill.; Eugene B. Szymczak, Glen Ellyn, Ill.; Edward W. Minnich, Palatine, Ill.; Wade K. Totzke, Algonquin, Ill.

[73] Assignee: Brunswick Corporation, Lake Forest, Ill.

[21] Appl. No.: 09/073,400

[22] Filed: May 7, 1998

Related U.S. Application Data

[60] Continuation of application No. 08/574,366, Dec. 18, 1995, Pat. No. 5,752,897, which is a division of application No. 08/254,030, Jun. 3, 1994, Pat. No. 5,484,362, which is a continuation-in-part of application No. 07/686,906, Apr. 17, 1991, Pat. No. 5,382,207, which is a continuation-in-part of application No. 07/452,885, Dec. 19, 1989, abandoned, which is a continuation in-part of application No. 07/368,450, Jun. 19, 1989, abandoned.

[51] Int. Cl.^{7} A63B 22/02

[52] U.S. Cl. 482/54; 482/51

[58] Field of Search 482/51, 54

[56] References Cited

U.S. PATENT DOCUMENTS

2,315,485	4/1943	Jones, III
2,399,915	5/1946	Drake
2,847,114	8/1958	Orr
2,914,957	12/1959	Johnson

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

B-56877/90	9/1993	Australia .
196-887	10/1986	European Pat. Off. .
1432392	2/1966	France
2616132	12/1988	France
2 623 410	5/1989	France .
38 39 391 A1	6/1989	Germany
191377	8/1987	Switzerland
546523	10/1974	U.S.S.R. .
1256755	9/1986	U.S.S.R. .
1248617	7/1987	U.S.S.R.
1321430	10/1987	U.S.S.R.
1347953	10/1987	U.S.S.R.
2 152 825	8/1985	United Kingdom
2184361	6/1987	United Kingdom .
2 212 729	8/1989	United Kingdom
WO 81/01960	7/1981	WIPO
WO 89/07473	8/1989	WIPO .
WO 92/11905	7/1992	WIPO

OTHER PUBLICATIONS

Tapis De Marche—instructions De Service, TMS, Nov. 1987.

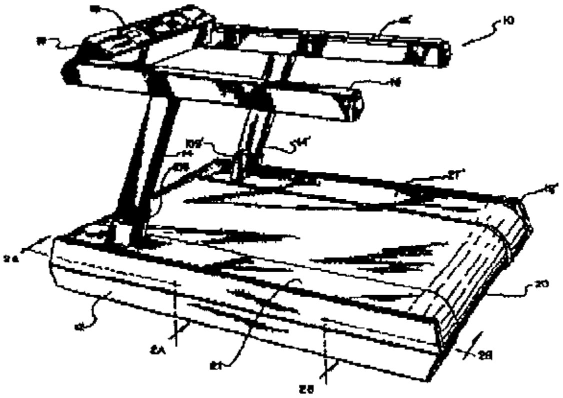
Paulstra hutchinson, catalogue general, Apr. 1986.

Primary Examiner—Glenn E. Richman
Attorney, Agent, or Firm—Michael B. McMurry; Kathleen A. Ryan

[57] ABSTRACT

To improve tracking, an exercise treadmill is provided with a frame including molded plastic pulleys, having an integral gear belt sprocket, an endless belt extending around the pulleys and a motor operatively connected to the rear pulley to drive the belt. The pulleys are molded out of plastic and have a diameter of approximately nine inches. A mold and method for producing large diameter treadmill pulleys having an integrally molded sprocket are also disclosed. A deck underneath the running surface of the belt is supported by resilient members. A positive lateral belt tracking mechanism is used to correct the lateral position of the belt. A belt position sensor mechanism is used in combination with a front pulley pivoting mechanism to maintain the belt in the desired lateral position on the pulleys. The exercise treadmill also includes a lift mechanism with an internally threaded sleeve engaged to vertically aligned nonrotating screws. A user display of foot impact force on the belt is also provided.

29 Claims, 20 Drawing Sheets



U S PATENT DOCUMENTS

3,319,767	5/1967	Breternitz et al
3,408,067	10/1968	Armstrong
3,627,313	12/1971	Schonfeld .
3,689,066	9/1972	Hagen
3,703,284	11/1972	Hesen
3,711,812	1/1973	Cherry
3,824,067	7/1974	Voshel
3,994,261	11/1976	Wedell et al
4,087,088	5/1978	Kelso .
4,095,371	6/1978	Knippel
4,334,676	6/1982	Schonenberger
4,344,616	8/1982	Ogden
4,350,336	9/1982	Hanford .
4,358,105	11/1982	Sweeney, Jr.
4,364,556	12/1982	Otte
4,445,683	5/1984	Ogden .
4,502,679	3/1985	De Lorenzo
4,544,152	10/1985	Taitel .
4,614,337	9/1986	Schonenberger
4,616,822	10/1986	Trulaske et al
4,635,927	1/1987	Shu
4,635,928	1/1987	Ogden et al. .
4,643,418	2/1987	Bart
4,659,074	4/1987	Taitel et al.
4,660,247	4/1987	Frohbieter et al
4,664,371	5/1987	Viander
4,687,195	8/1987	Potts
4,693,363	9/1987	Kuehnert
4,696,357	9/1987	Beehler et al
4,749,181	6/1988	Pittaway et al
4,766,996	8/1988	Gibson .
4,786,049	11/1988	Lautenschlager
4,819,583	4/1989	Guerra .
4,842,266	6/1989	Sweeney, Sr. et al.
4,844,449	7/1989	Truslaske .
4,860,634	8/1989	Horn
4,927,138	5/1990	Ferrari .
4,928,959	5/1990	Bassett et al
4,938,475	7/1990	Sargeant et al
4,959,040	9/1990	Gardner et al
4,974,831	12/1990	Dunham
4,981,136	1/1991	Chance .
4,984,810	1/1991	Stearns et al .
5,007,528	4/1991	Hideharu
5,072,928	12/1991	Stearns et al
5,081,991	1/1992	Chance
5,279,528	1/1994	Dalebout et al
5,318,487	6/1994	Golen et al
5,336,144	8/1994	Rodden .
5,336,145	8/1994	Keiser
5,441,468	8/1995	Deckers et al
5,454,772	10/1995	Rodden .
5,476,430	12/1995	Lee et al. .

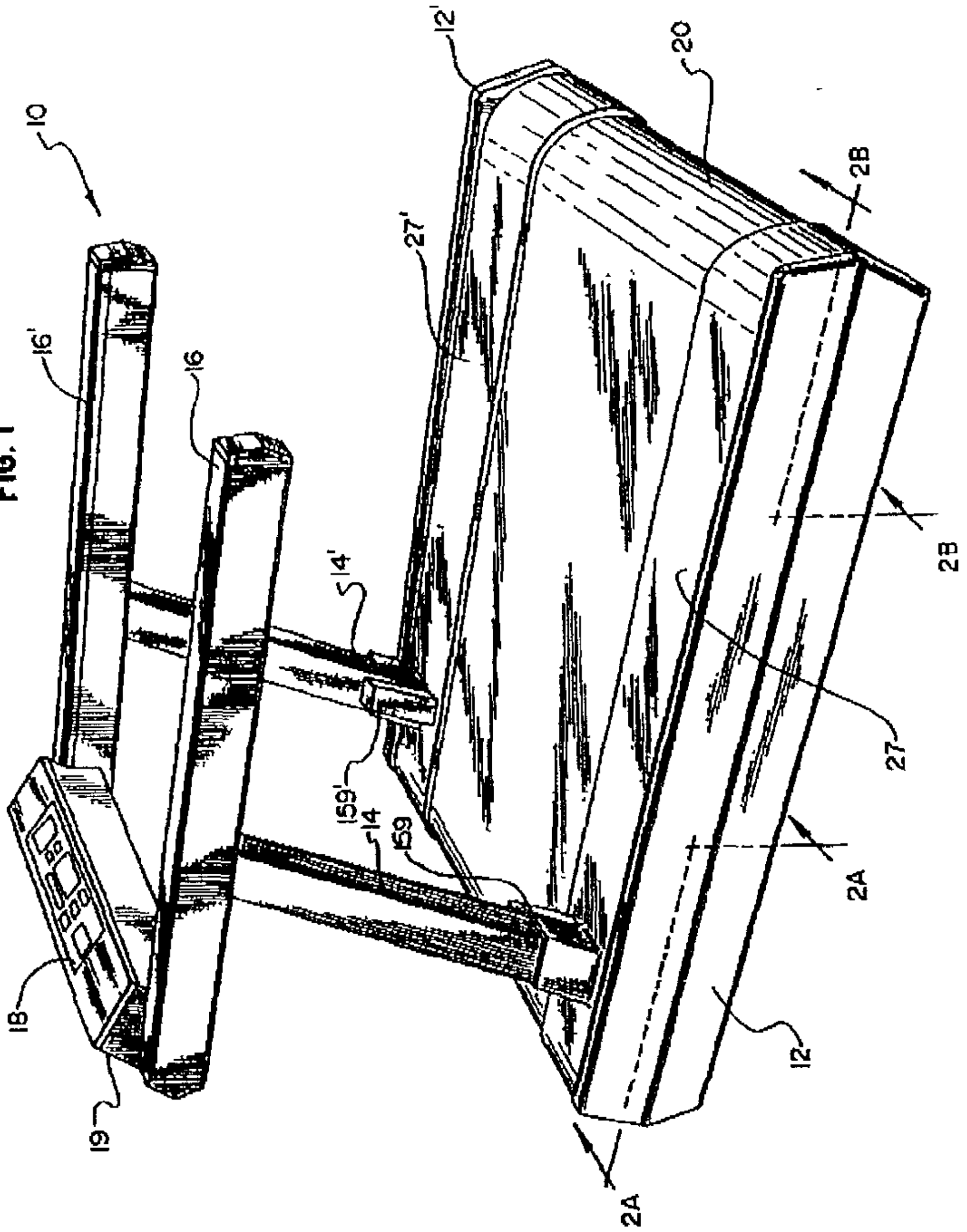
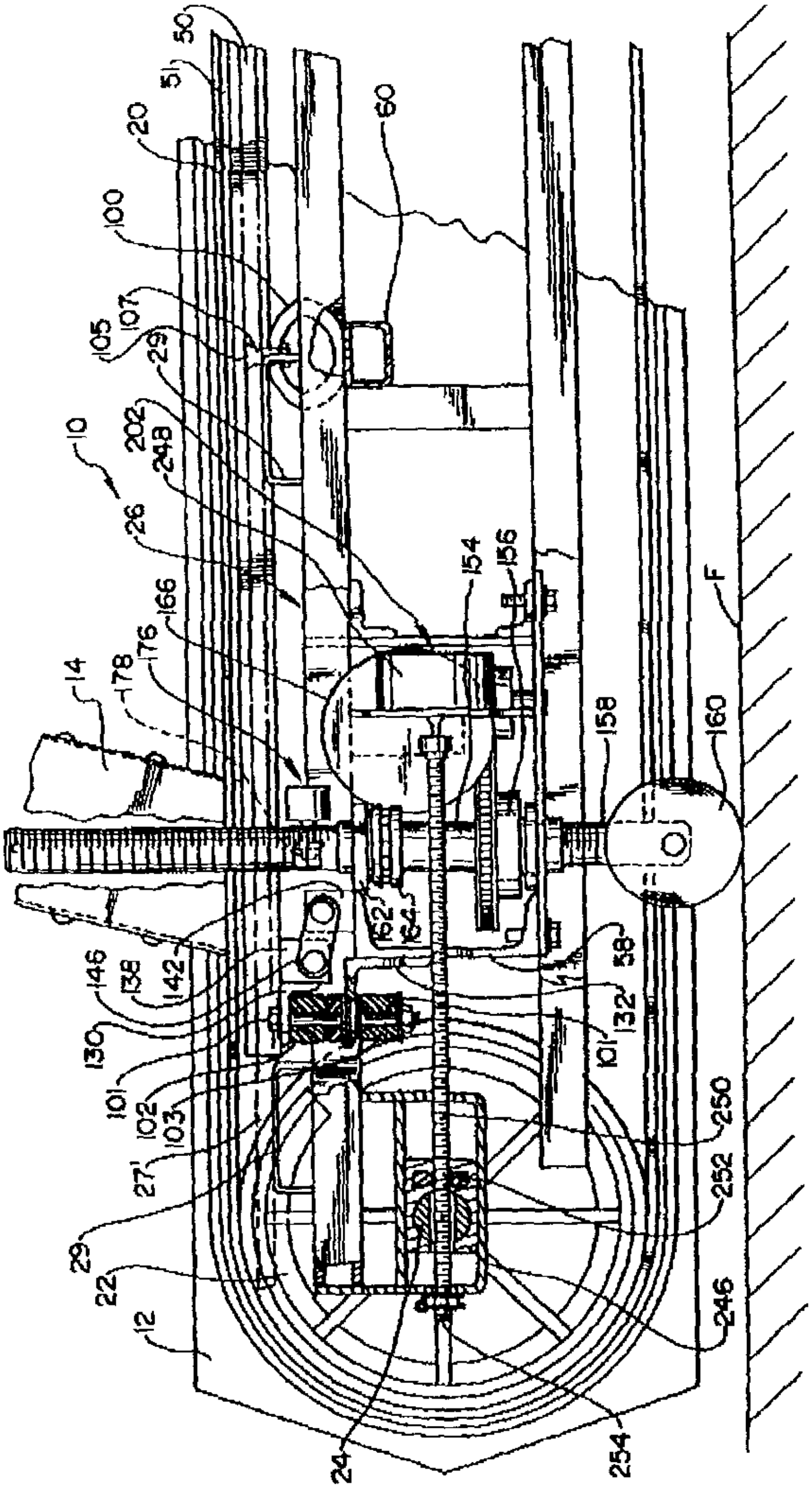


FIG. 1

FIG. 2A



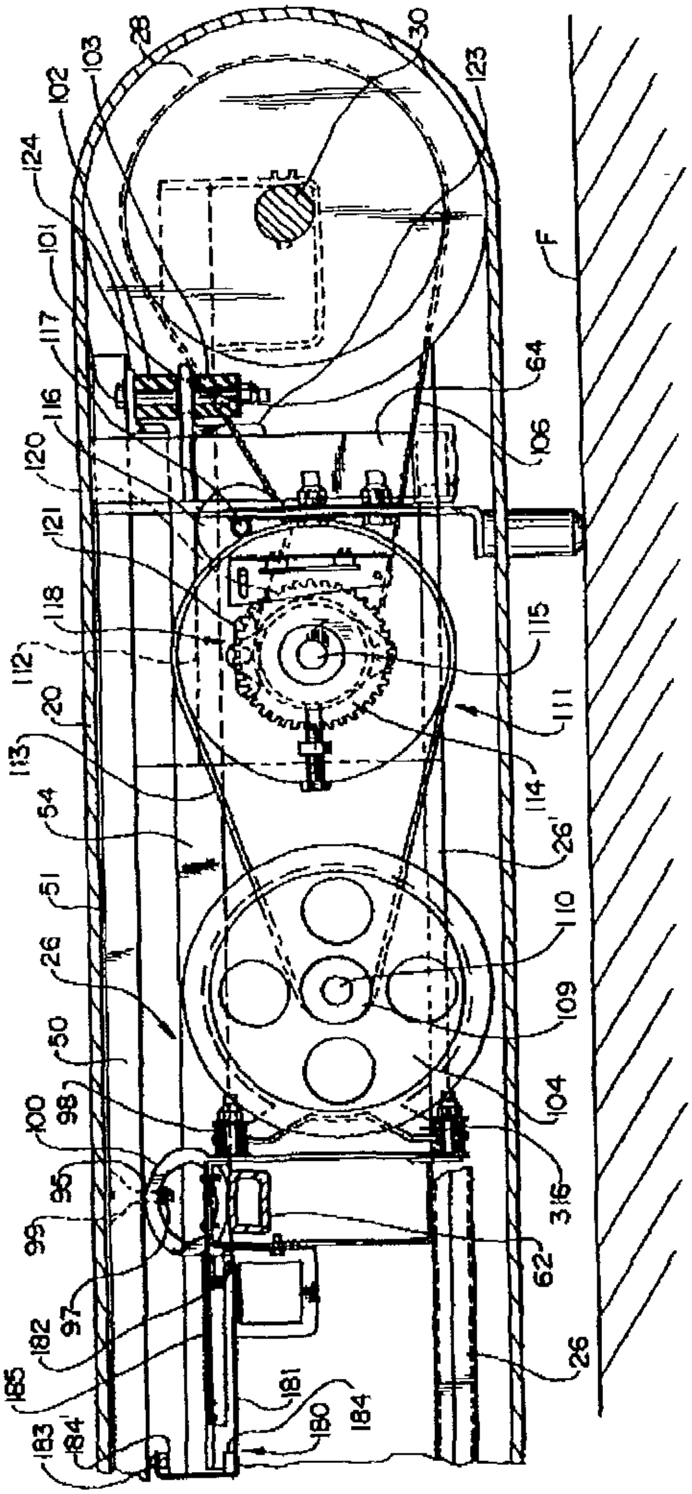
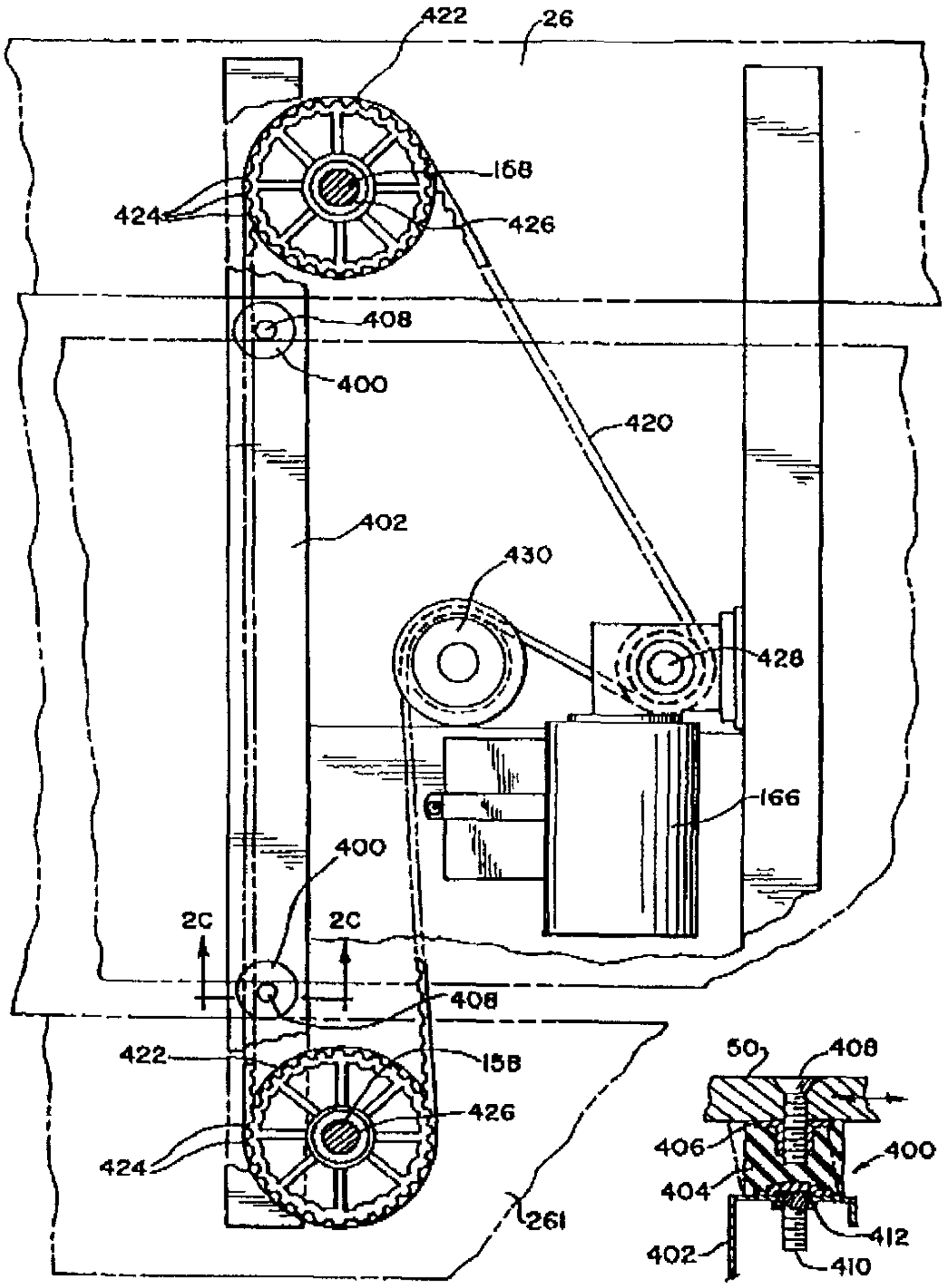


FIG. 2B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168
424
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408
400
420
402
430
428
166
400
2C
2C
408
422
158
426
424
261

FIG. 3D

50
408
406
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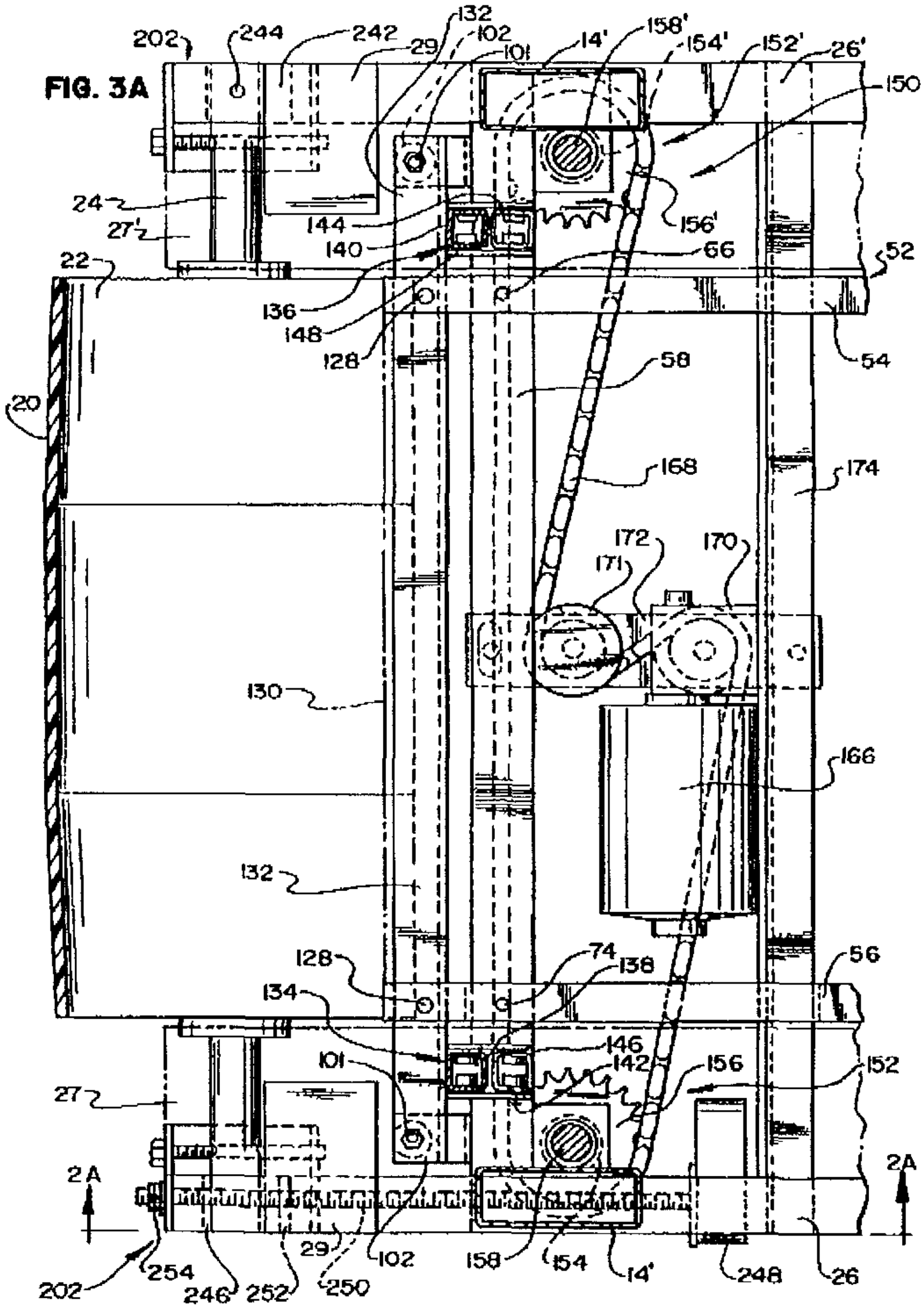
404
412
402
410

FIG. 2C

FIG. 3A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244
242
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132
102
101
14'
158'
154'
152'
26'
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24
27'
144
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156'
66
52
22
136
148
128
54
58
20
168
174
172
171
170
130
166
132
128
74
138
56
134
146
142
156
101
152
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2A
2A
202
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246
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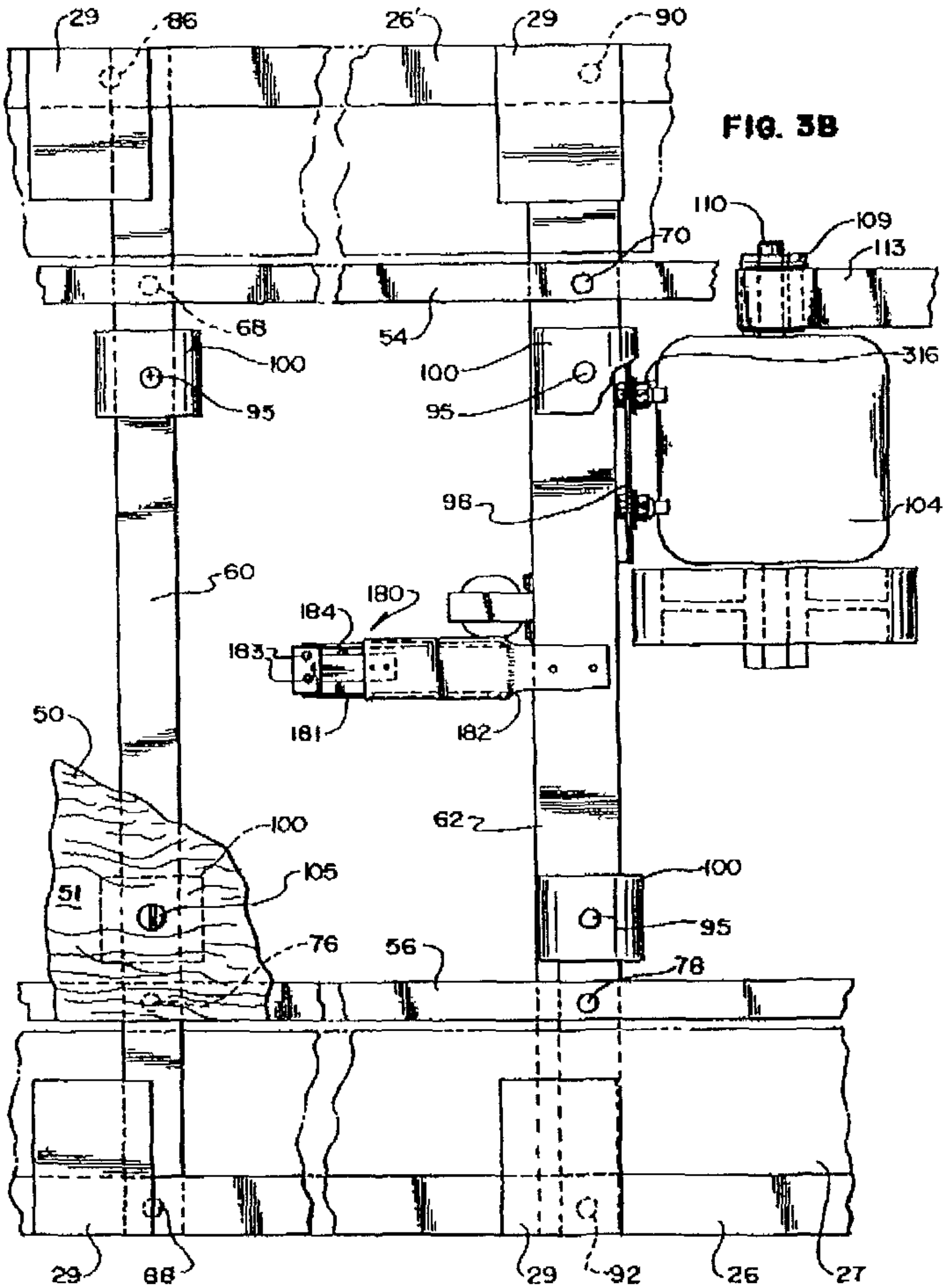
29
250
102
158
154
14'
248
26

FIG. 3B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26'
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109
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316
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184
183
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78
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92
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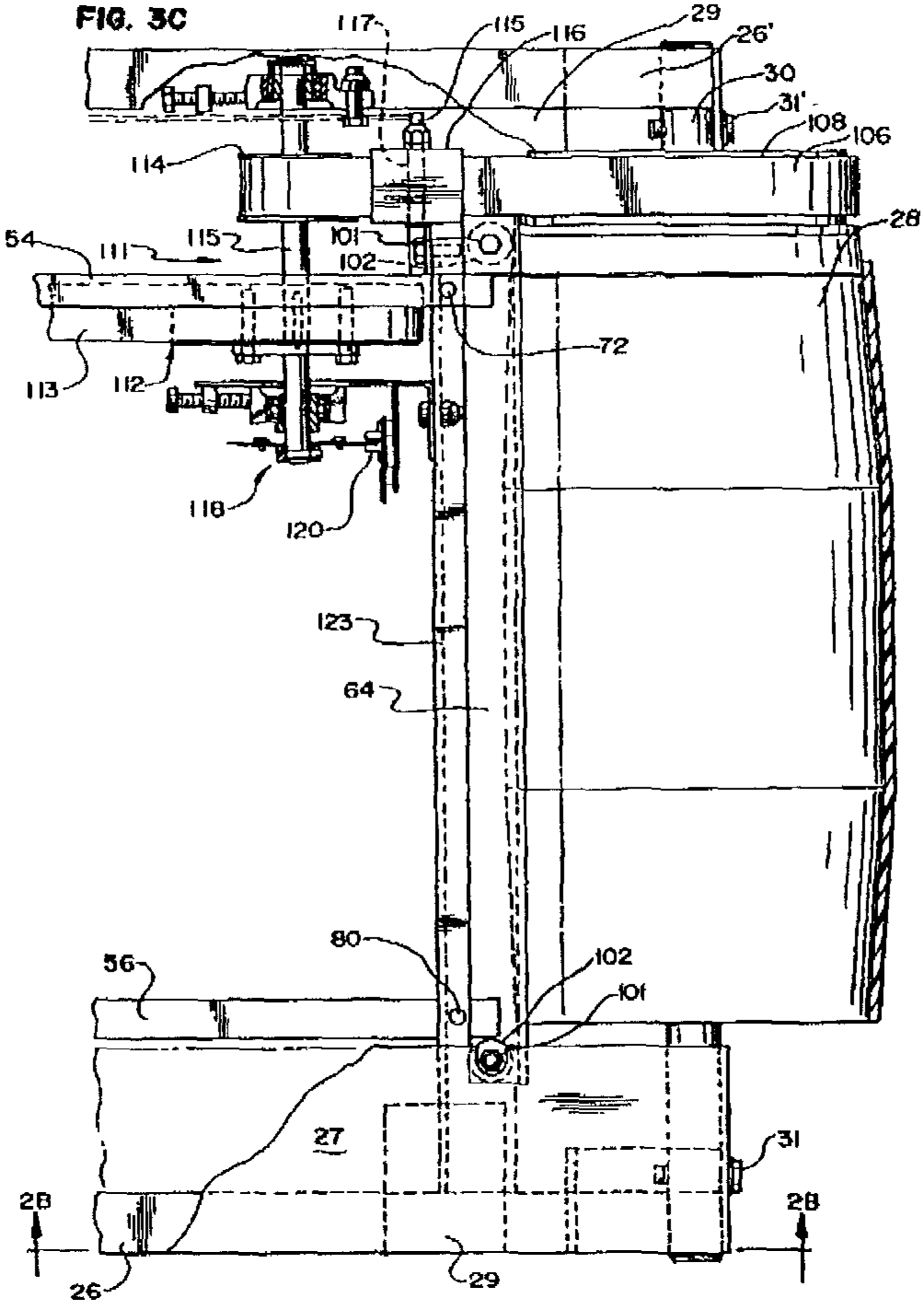
FIG. 3C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116
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26'
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31'
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106
114
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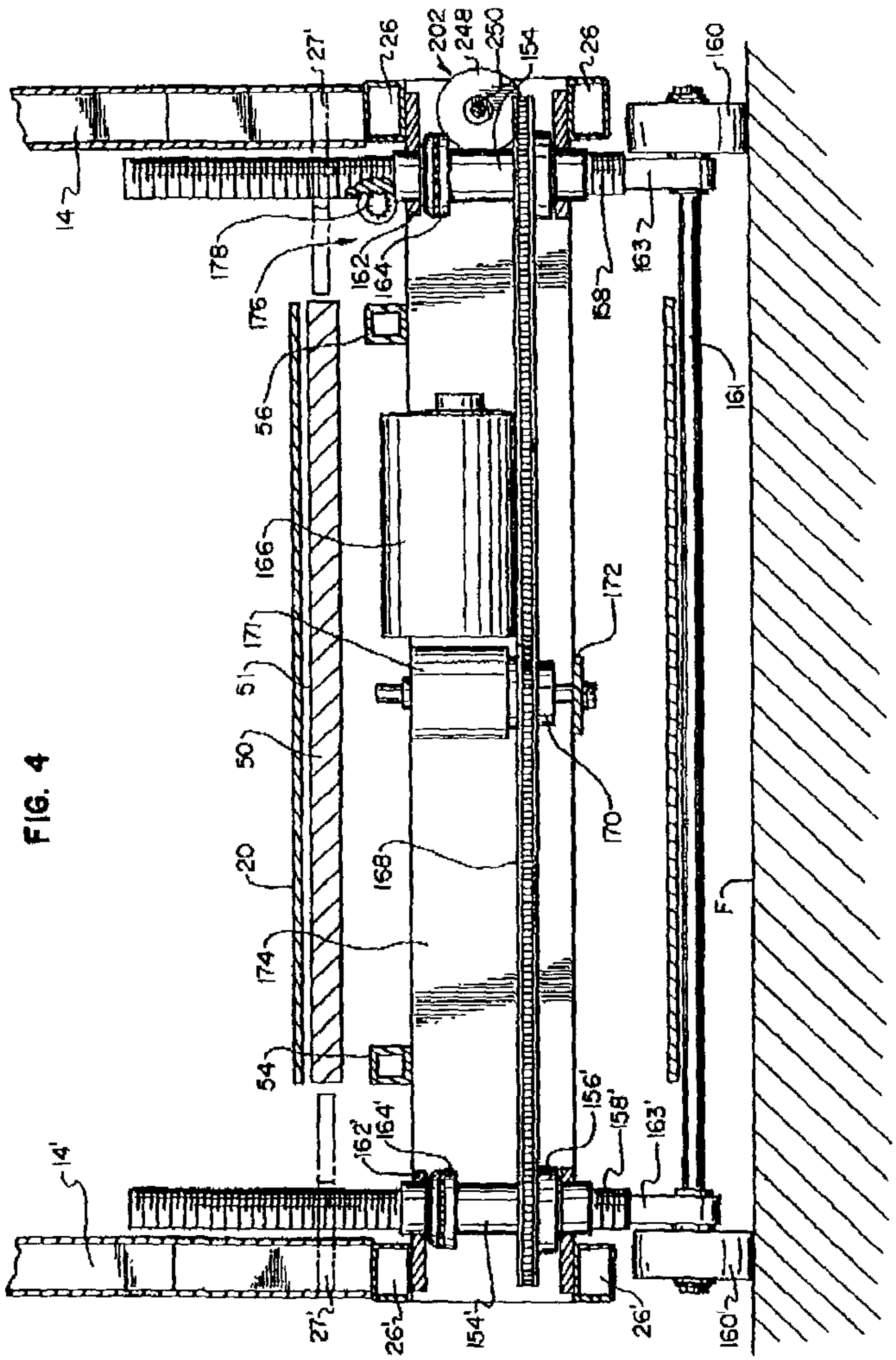
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27'
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172
170
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168
174
F
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164'
156'
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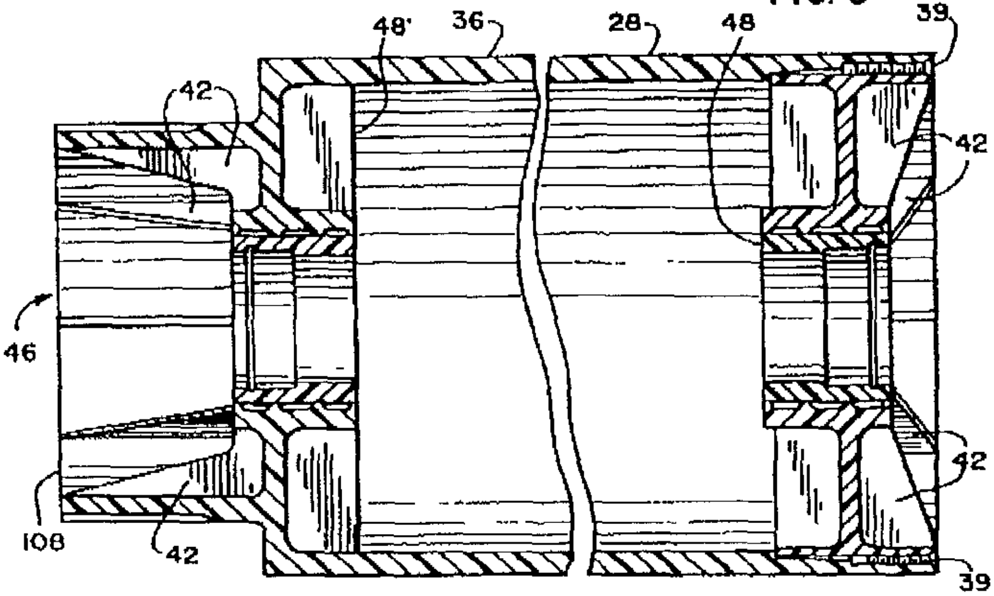
163'
27'
26'
154'
26'
160'

FIG. 4

FIG. 5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42
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42
108
42
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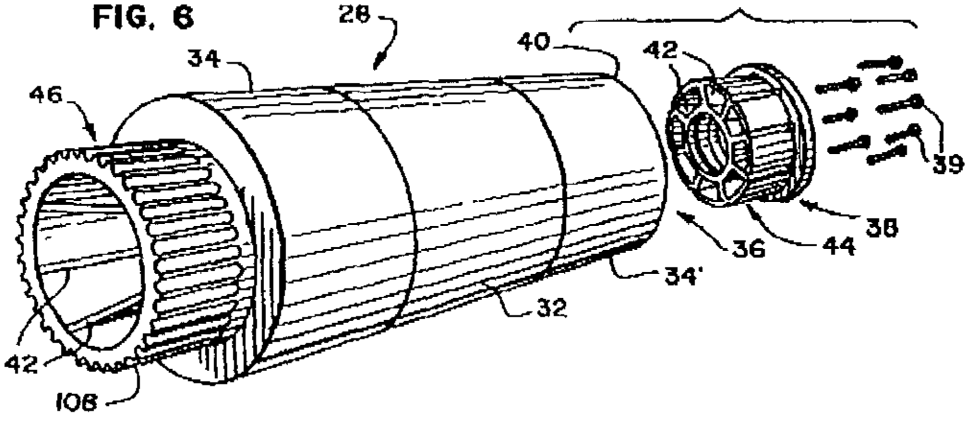
FIG. 6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34'
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108

FIG. 7

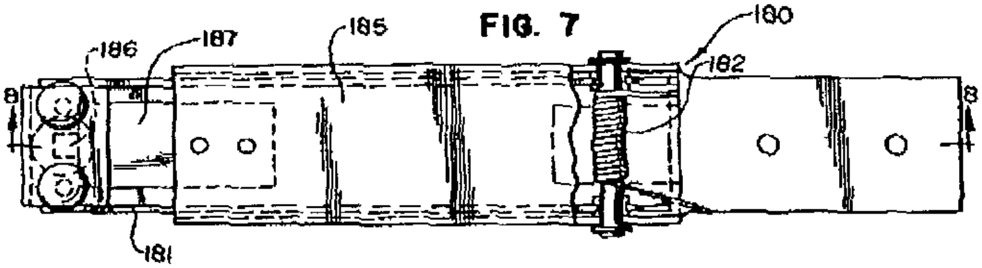


FIG. 8

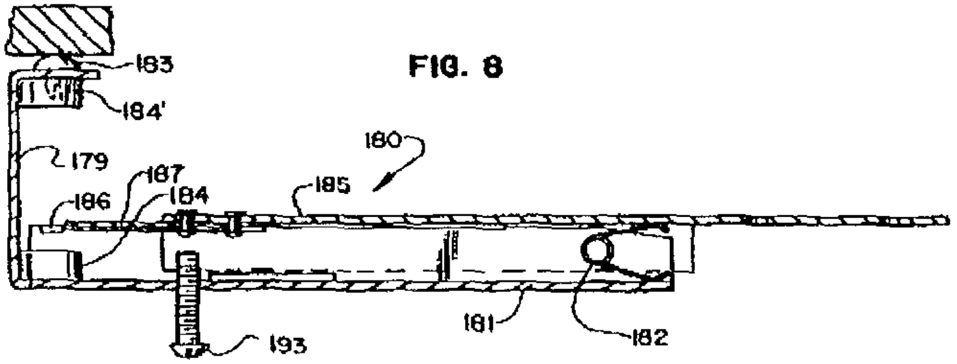


FIG. 9

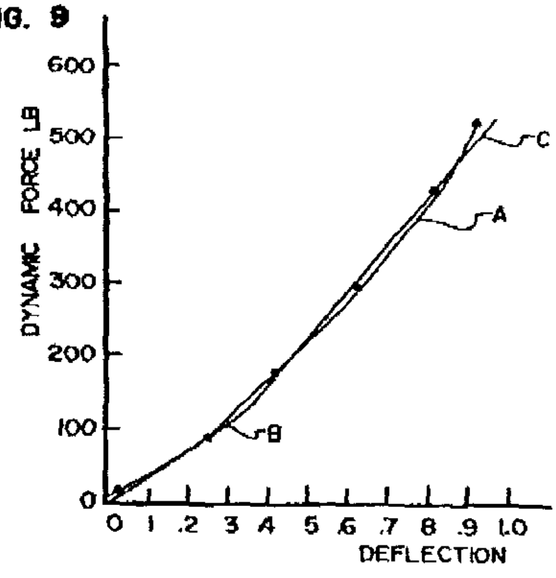


FIG. 10

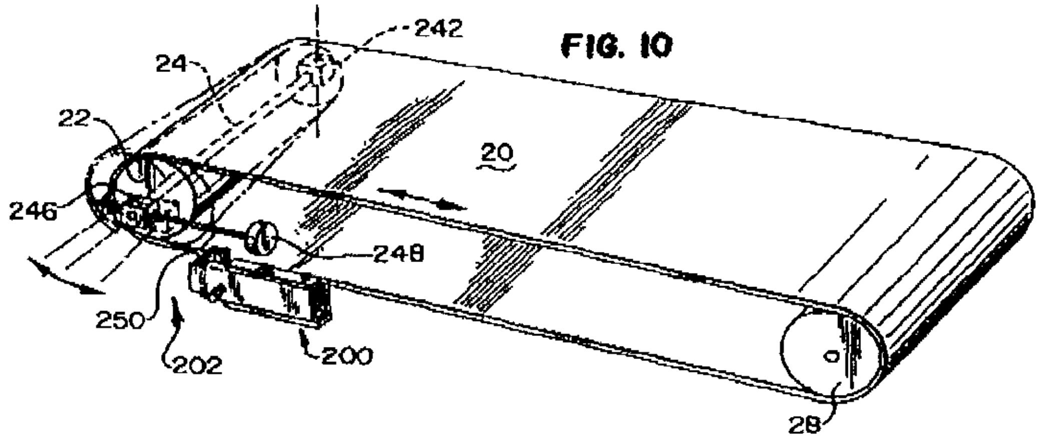


FIG. 11

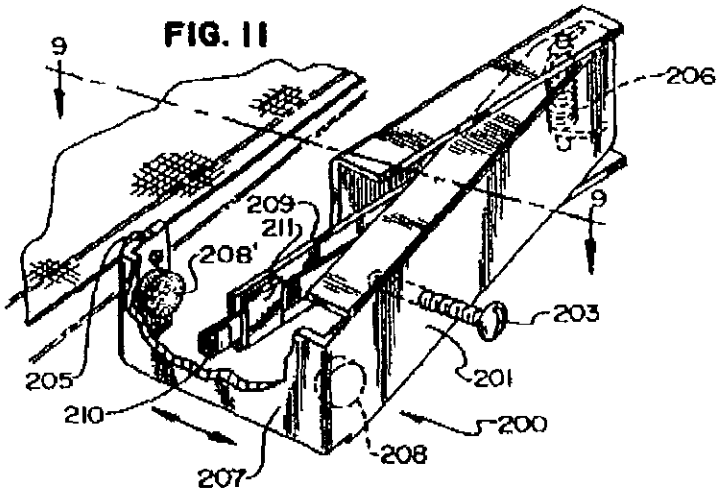


FIG. 12

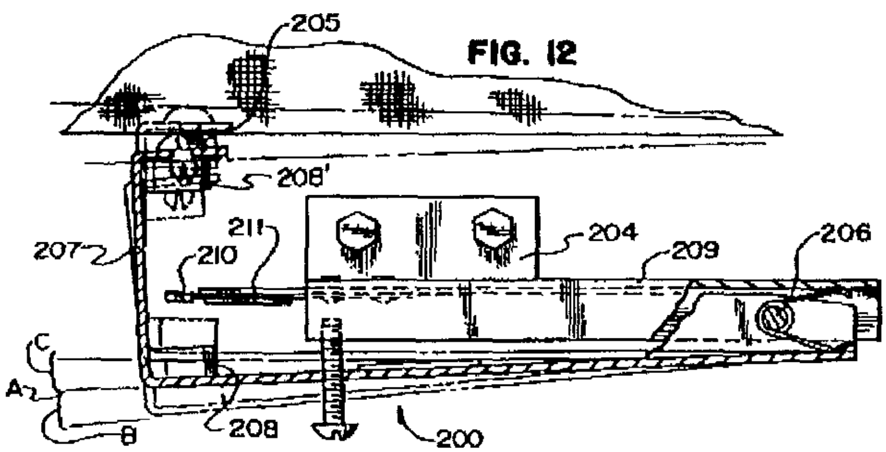


FIG. 12A

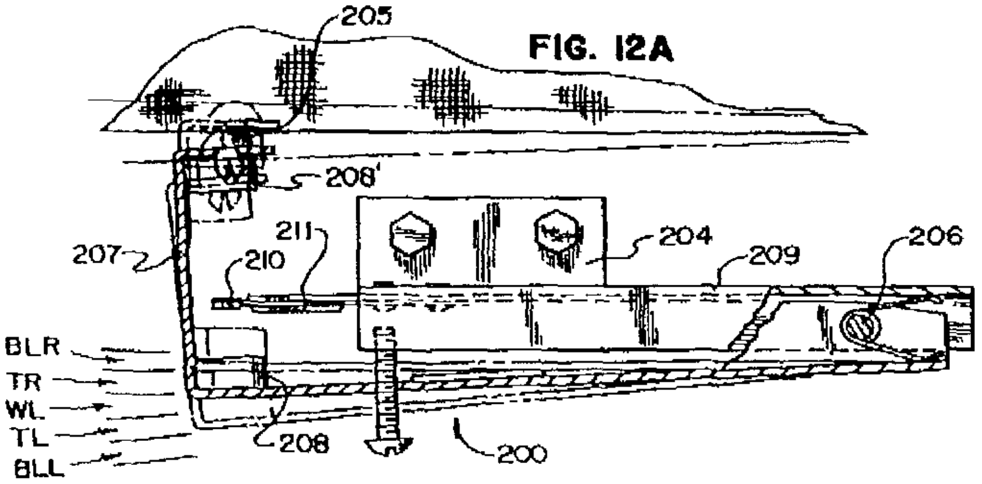


FIG. 12B

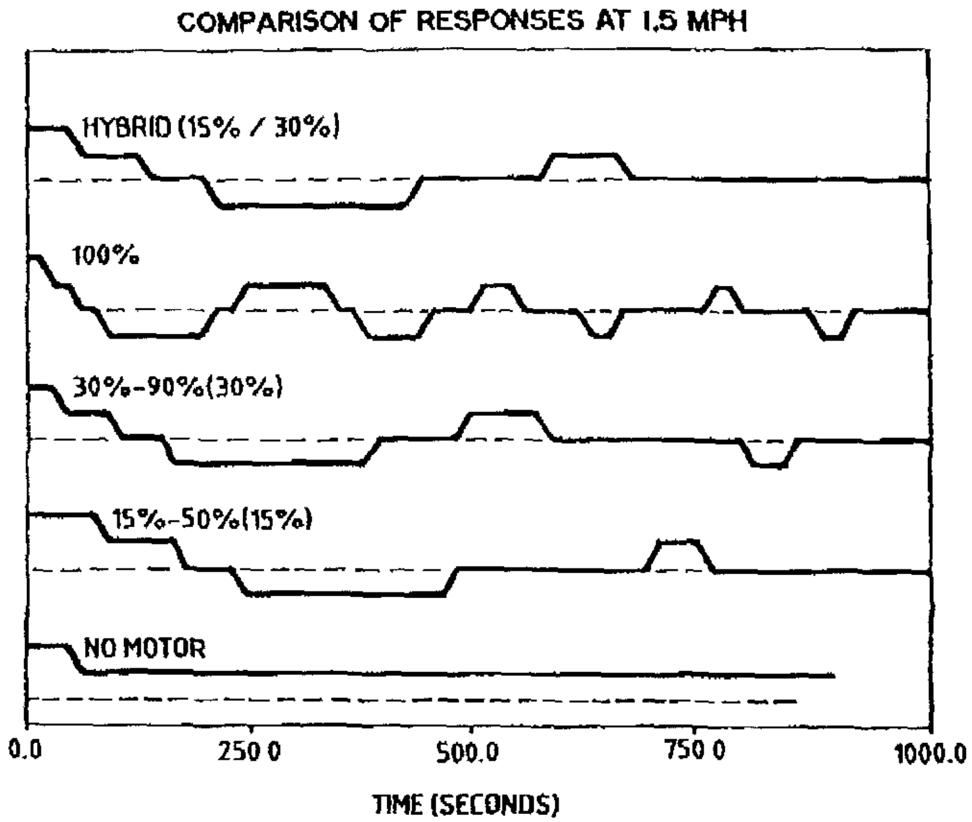

COMPARISON OF RESPONSES AT 1.5 MPH
HYBRID (15% / 30%)
100%
30%-90%(30%)
15%-50%(15%)
NO MOTOR
0.0
250 0
500.0
750 0
1000.0
TIME (SECONDS)

FIG. 12C

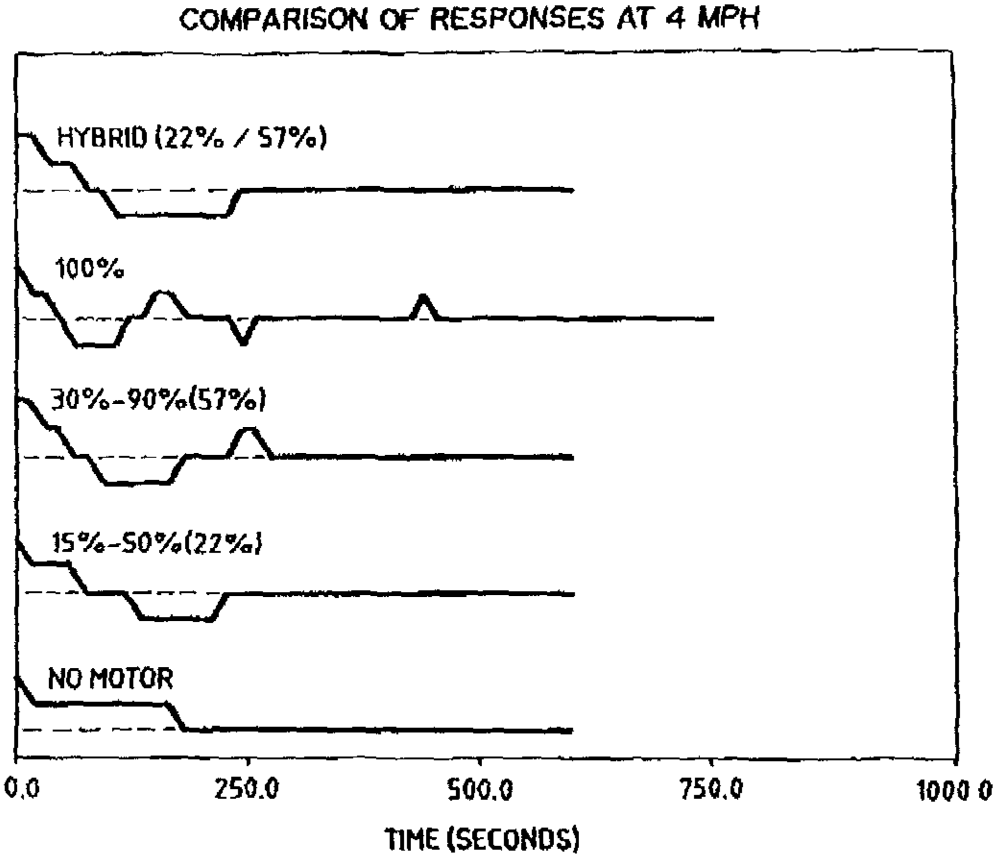

COMPARISON OF RESPONSES AT 4 MPH
HYBRID (22% / 57%)
100%
30%-90%(57%)
15%-50%(22%)
NO MOTOR
0.0
250.0
500.0
750.0
1000 0
TIME (SECONDS)

FIG. 12D

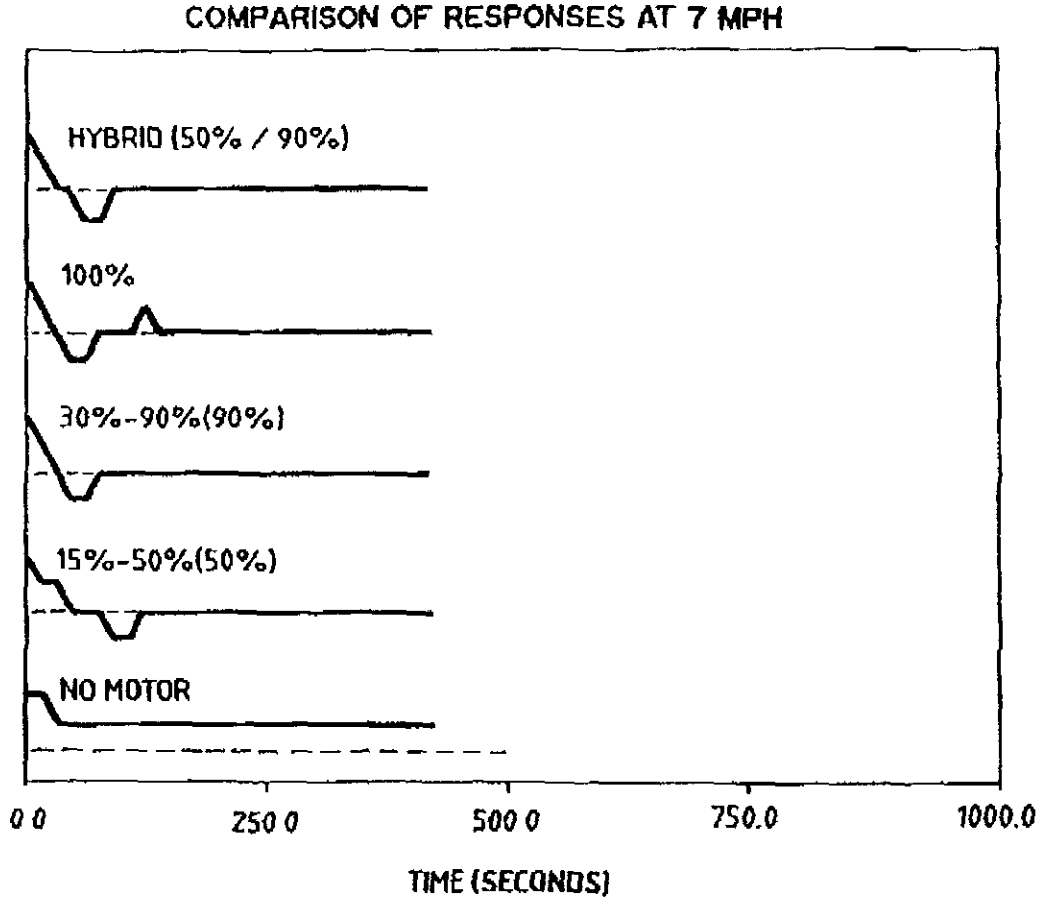

COMPARISON OF RESPONSES AT 7 MPH
HYBRID (50% / 90%)
100%
30%-90%(90%)
15%-50%(50%)
NO MOTOR
0 0
250 0
500 0
750.0
1000.0
TIME (SECONDS)

FIG. 13

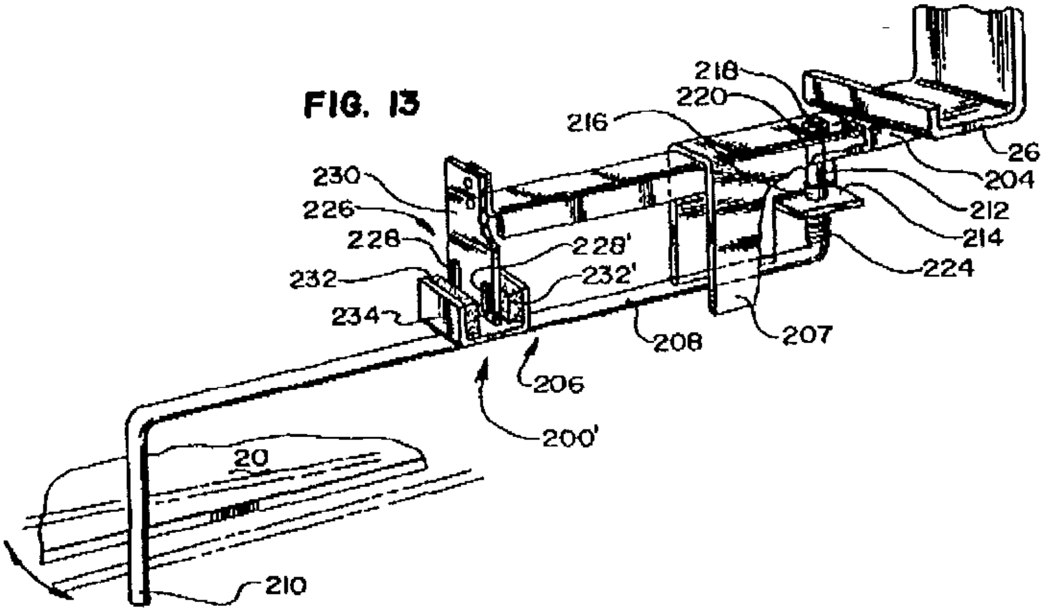


FIG. 14

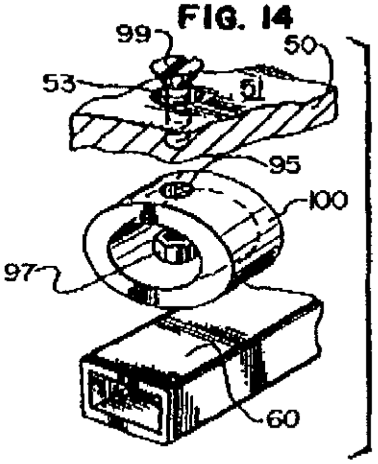
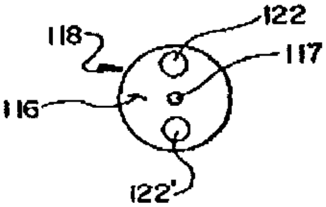


FIG. 15



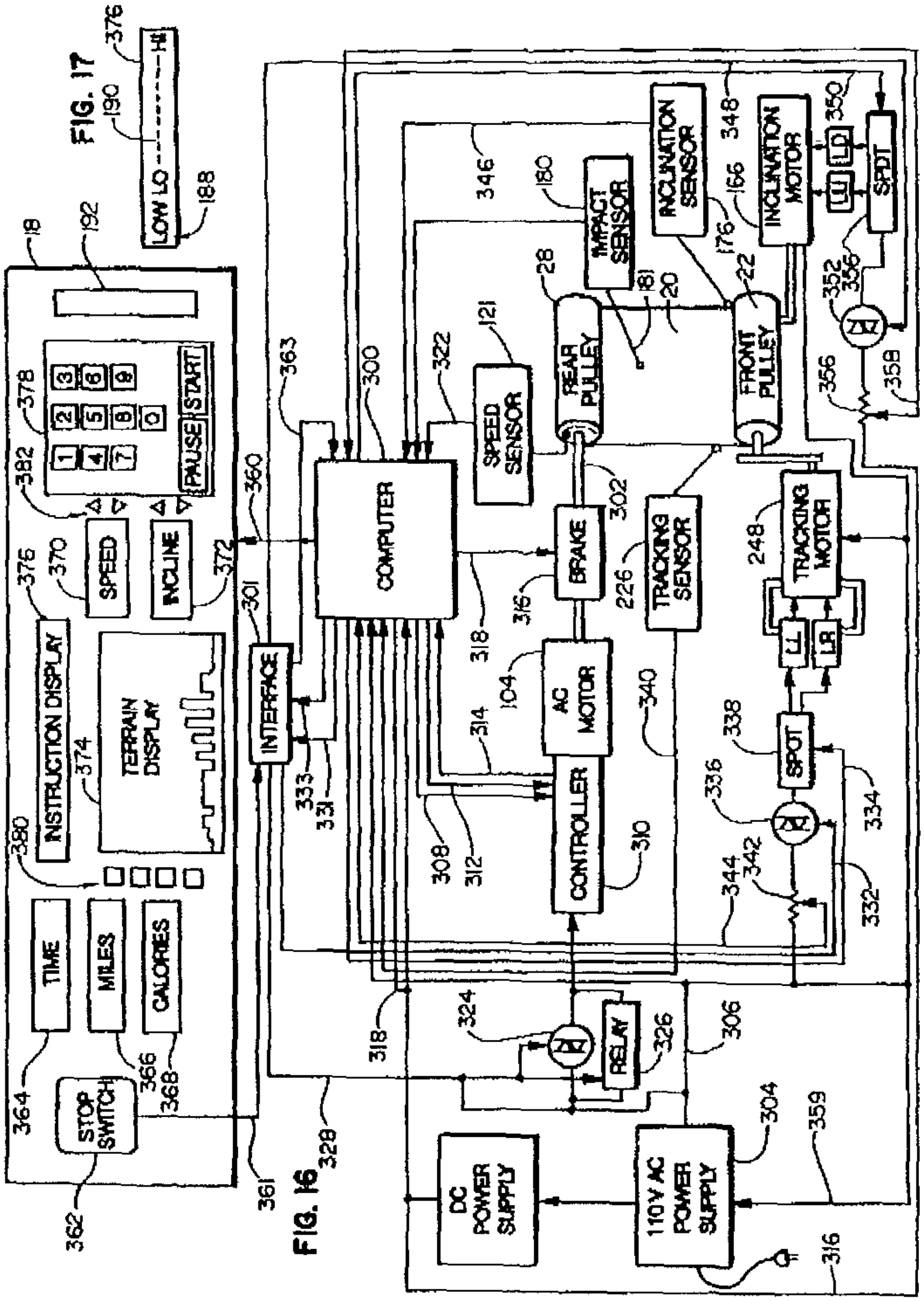
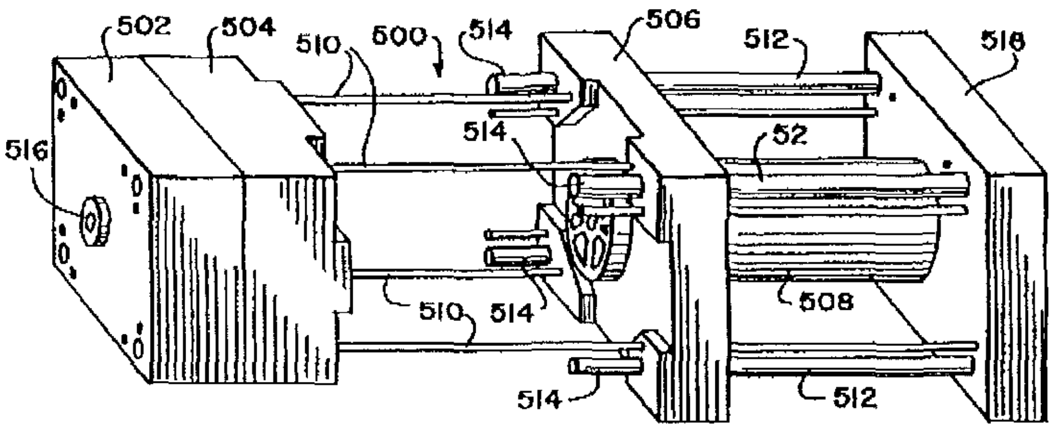

LOW LO
HI
INSTRUCTION DISPLAY
TERRAIN DISPLAY
SPEED
INCLINE
PAUSE
START
TIME
MILES
CALORIES
STOP SWITCH
INTERFACE
COMPUTER
SPEED SENSOR
REAR PULLEY
FRONT PULLEY
IMPACT SENSOR
INCLINATION SENSOR
INCLINATION MOTOR
SPDT
BRAKE
AC MOTOR
CONTROLLER
TRACKING SENSOR
TRACKING MOTOR
RELAY
DC POWER SUPPLY
110V AC POWER SUPPLY

FIG. 17

FIG. 16

FIG. 18



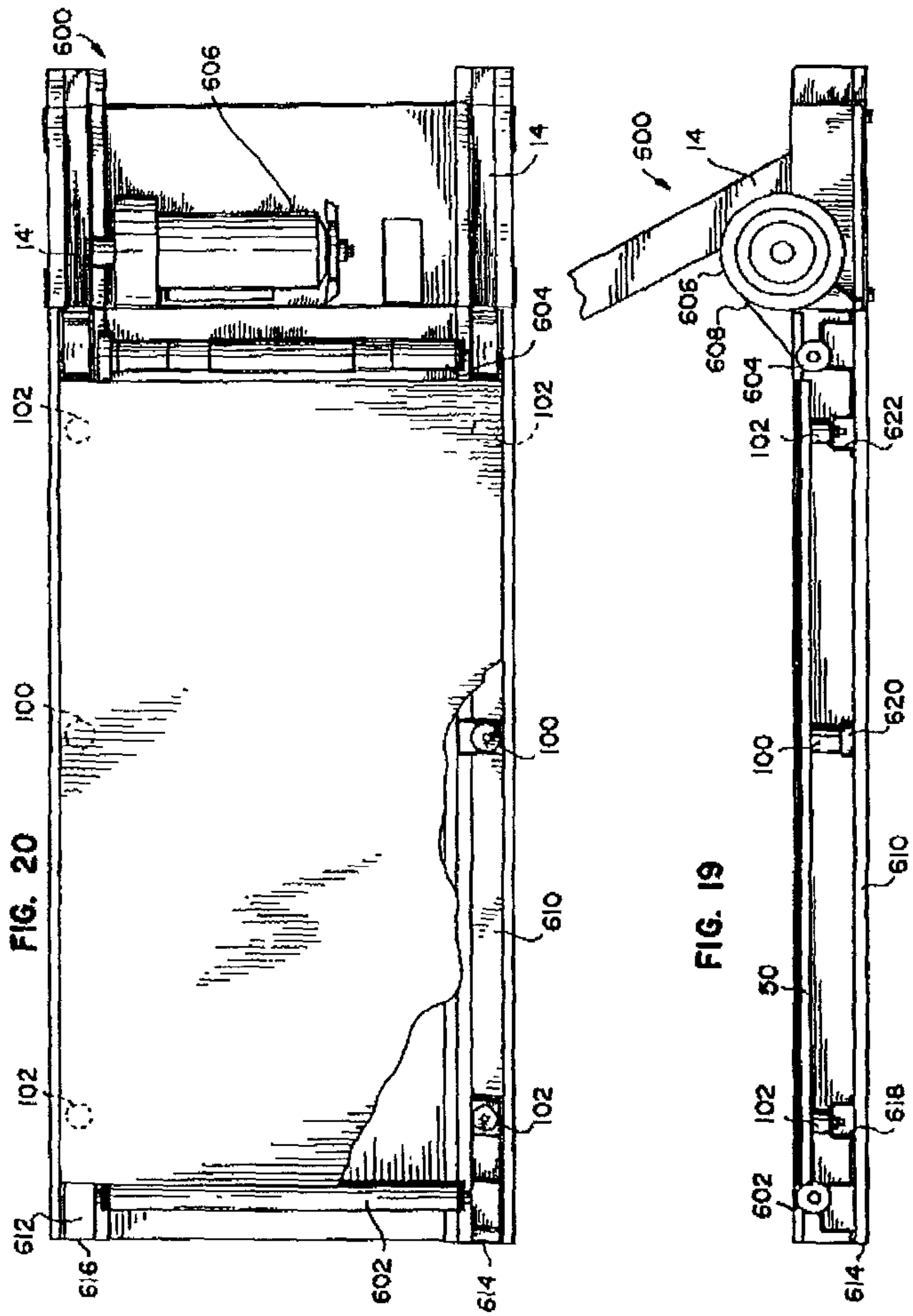

600
606
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FIG. 20

FIG. 19

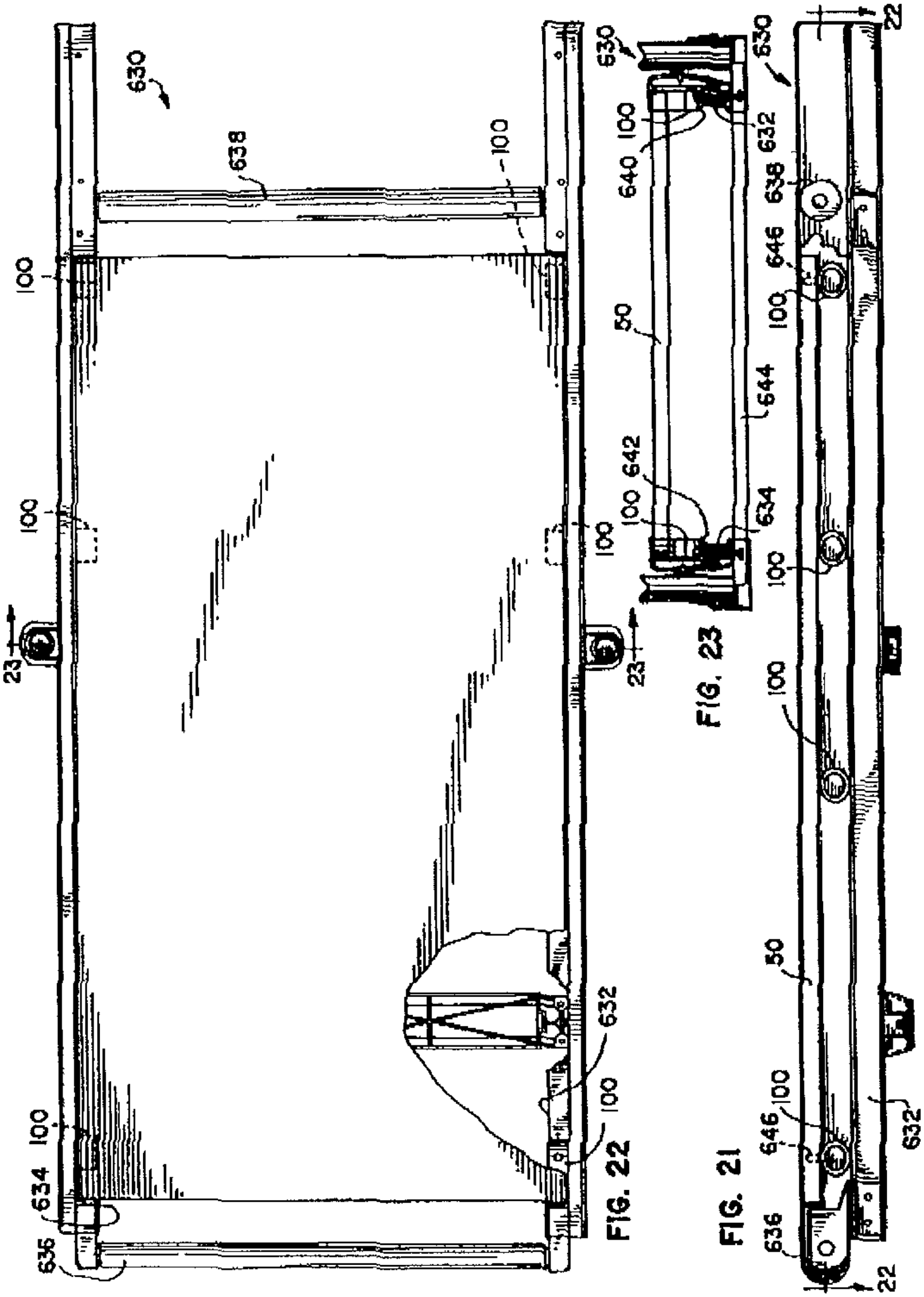
630
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FIG. 21
FIG. 22
FIG. 23

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Images

(1 of 1)

United States Patent	6,095,951
Skowronski , et al.	August 1, 2000

Exercise treadmill

Abstract

To improve tracking, an exercise treadmill is provided with a frame including molded plastic pulleys, having an integral gear belt sprocket, an endless belt extending around the pulleys and a motor operatively connected to the rear pulley to drive the belt. The pulleys are molded out of plastic and have a diameter of approximately nine inches A mold and method for producing large diameter treadmill pulleys having an integrally molded sprocket are also disclosed A deck underneath the running surface of the belt is supported by resilient members A positive lateral belt tracking mechanism is used to correct the lateral position of the belt A belt position sensor mechanism is used in combination with a front pulley pivoting mechanism to maintain the belt in the desired lateral position on the pulleys The exercise treadmill also includes a lift mechanism with an internally threaded sleeve engaged to vertically aligned nonrotating screws. A user display of foot impact force on the belt is also provided

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Assignee: **Brunswick Corporation** (Lake Forest, IL)

Appl No: **073400**

Filed: **May 7, 1998**

U.S. Class:	**482/54**; 482/51
Intern'l Class:	A63B 022/02
Field of Search:	482/51,54

References Cited [Referenced By]

U.S. Patent Documents

2315485	Apr , 1943	Jones, III
2399915	May., 1946	Drake
2847114	Aug , 1958	Orr
2914957	Dec , 1959	Johnson
3319767	May , 1967	Breternitz et al
3408067	Oct , 1968	Armstrong
3627313	Dec , 1971	Schonfeld
3689066	Sep , 1972	Hagen
3703284	Nov , 1972	Hesen
3711812	Jan , 1973	Cherry.
3824067	Jul , 1974	Voshel
3994261	Nov , 1976	Wedell et al
4087088	May., 1978	Kelso
4095371	Jun , 1978	Knippel
4334676	Jun , 1982	Schonenberger.
4344616	Aug , 1982	Ogden
4350336	Sep , 1982	Hanford
4358105	Nov , 1982	Sweeney, Jr..
4364556	Dec., 1982	Otte
4445683	May , 1984	Ogden.
4502679	Mar , 1985	De Lorenzo
4544152	Oct., 1985	Taitel
4614337	Sep , 1986	Schonenberger.
4616822	Oct , 1986	Trulaske et al
4635927	Jan., 1987	Shu
4635928	Jan , 1987	Ogden et al.
4643418	Feb., 1987	Bart
4659074	Apr., 1987	Taitel et al .
4660247	Apr., 1987	Frohbieter et al.
4664371	May , 1987	Viander.
4687195	Aug , 1987	Potts
4693363	Sep , 1987	Kuehnert
4696357	Sep , 1987	Beehler et al.
4749181	Jun , 1988	Pittaway et al.
4766996	Aug , 1988	Gibson

4786049	Nov , 1988	Lautenschlager
4819583	Apr , 1989	Guerra
4842266	Jun , 1989	Sweeney, Sr et al
4844449	Jul , 1989	Truslaske
4860634	Aug , 1989	Hein
4927138	May , 1990	Ferrari
4928959	May , 1990	Bassett et al
4938475	Jul , 1990	Sargeant et al
4959040	Sep , 1990	Gardner et al
4974831	Dec , 1990	Dunham
4981136	Jan , 1991	Chance
4984810	Jan , 1991	Stearns et al
5007528	Apr , 1991	Hideharu.
5072928	Dec , 1991	Stearns et al.
5081991	Jan , 1992	Chance
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5318487	Jun , 1994	Golen et al
5336144	Aug , 1994	Rodden.
5336145	Aug , 1994	Keiser.
5441468	Aug , 1995	Deckers et al
5454772	Oct , 1995	Rodden
5476430	Dec., 1995	Lee et al

Foreign Patent Documents

B-56877/90	Sep , 1993	AU.
196-887	Oct , 1986	EP
1432392	Feb , 1966	FR.
2616132	Dec., 1988	FR.
2 623 410	May., 1989	FR.
38 39 391 A1	Jun , 1989	DE
191377	Aug , 1987	CH
546523	Oct , 1974	SU
1256755	Sep., 1986	SU
1248617	Jul., 1987	SU
1321430	Oct , 1987	SU
1347953	Oct , 1987	SU

2 152 825	Aug , 1985	GB
2184361	Jun , 1987	GB
2 212 729	Aug., 1989	GB
WO 81/01960	Jul , 1981	WO
WO 89/07473	Aug , 1989	WO
WO 92/11905	Jul , 1992	WO

Other References

Tapis De March--instructions De Service, TMS, Nov 1987
Paulstra hutchinson, catalogue general, Apr. 1986

Primary Examiner Richman, Glenn E
Attorney, Agent or Firm: McMurry; Michael B , Ryan, Kathleen A.

Parent Case Text

This application is a continuation of U S Ser No 08/574,366, filed Dec. 18, 1995, now U S Pat No. 5,752,897, which is a division of application Ser No. 08/254,030, filed Jun. 3, 1994, now U S Pat No 5,484,362, which is a continuation-in-part of U S Ser No 07/686,906, filed Apr. 17, 1991, now U S. Pat No 5,382,207, which is a continuation-in-part of U S Ser No 07/452,885, filed Dec 19, 1989, now abandoned, which is a continuation-in-part of U.S Ser No 07/368,450, filed Jun. 19, 1989, now abandoned

Claims

1 An exercise treadmill, comprising:

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure,

rotational means including a motor for rotating one of said pulleys;

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising,

a deck member secured beneath at least a portion of said exercise surface, and

speed control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface,

an inclination mechanism secured to said frame structure effective to permit selective inclination of said deck member by the user, and

a deck support structure including a plurality of laterally spaced resilient support members interposed between said frame structure and said deck member wherein each of said resilient support members are mounted on stationary portions of said frame structure so as to prevent longitudinal movement of said resilient support members and wherein said resilient support members support said deck member on said frame structure so as to permit at least a portion of said deck member to move downwardly with respect to said frame in response to the impact force of the user's feet on said exercise surface thereby resulting in lower impact loads on the user's feet

2. The exercise treadmill of claim 1 wherein at least one of said resilient support members is mounted proximate to the front of said frame structure proximate to the front end of said deck member

3 The exercise treadmill of claim 2 wherein at least a portion of said resilient support members are composed of an elastomeric material and abut said deck member and wherein said portion of said resilient support members are configured to provide said portion of said resilient support members with a variable spring rate

4 The exercise treadmill of claim 3 wherein said resilient support members additionally serve to limit said downward deflection.

5. The exercise treadmill of claim 1 wherein said support members are composed of an elastomeric material.

6 The exercise treadmill of claim 5 wherein a portion of said resilient support members are configured with a cross section having an aperture wherein said portion of support members have a variable spring rate resulting from said apertures.

7. The exercise treadmill of claim 1 wherein said deck support structure additionally permits at least a limited longitudinal movement of the front end of said deck member.

8. The exercise treadmill of claim 7 wherein said deck support structure includes a member pivotally connected to said frame and operatively associated with said deck to permit said limited longitudinal movement of the front end of said deck member

9. The exercise treadmill of claim 1 wherein said deck member includes a member composed substantially of wood and wherein at least one of said resilient support members abuts said deck member.

10. The exercise treadmill of claim 9 wherein said deck member has a thickness of at least 5/8 inches.

11. The exercise treadmill of claim 10 wherein at least one of said resilient support members is secured to said frame structure and abuts said deck member proximate to the front end of said deck member and is effective to permit both said downward movement of said deck member and at least limited longitudinal movement of said front end of said deck member.

12. The exercise treadmill of claim 11 wherein said resilient support members additionally serve to limit said downward deflection

13. An exercise treadmill, comprising.

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure,

means including a motor for rotating one of said pulleys,

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising,

a deck including a wood member secured beneath substantially the entire length of said exercise surface,

an inclination mechanism secured to said frame structure effective to permit selective inclination of said deck by the user,

speed control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface; and

a deck support structure including a plurality of elastomeric support members wherein at least a portion of said support members are configured with an aperture providing said support members with a variable spring rate and wherein said support members are interposed and secured between said frame structure and said deck and located so as to provide support for at least a portion of said deck on said frame structure effective to both support said portion of said deck on said frame structure and to permit said portion of said deck to move downwardly with respect to said frame structure by compressing in response to the impact force of the user's feet on said exercise surface thereby resulting in lower impact loads on the user's feet

14 The exercise treadmill of claim 13 wherein said elastomeric support members additionally limit said downward movement of said deck

15. The exercise treadmill of claim 13 wherein said deck support structure additionally permits at least limited longitudinal movement of a first end of said deck member with respect to said frame structure when said deck is moved downwardly.

16 The exercise treadmill of claim 13 wherein said elastomeric support members are composed of an elastomeric material having a hardness in the range of shore 30 A to 55 A.

17. The exercise treadmill of claim 13 wherein said aperture is generally elliptical in configuration

18. The exercise treadmill of claim 13 wherein said elastomeric support members have a compressed height in the range of 0.5 to 2 inches.

19. The exercise treadmill of claim 13 wherein said elastomeric support members cooperate with said deck member to permit said deck to move downwardly such that the amount of incremental movement of said deck member decreases as the impact force of the user's feet on said exercise surface increases

20 The exercise treadmill of claim 13 wherein said elastomeric support members are secured between said deck member and said frame structure by a plurality of fastening members

21 An exercise treadmill, comprising

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure,

means including a for rotating one of said pulleys;

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising,

a deck member secured beneath substantially the entire length of said exercise surface;

speed control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface;

an inclination mechanism secured to said frame structure effective to permit selective inclination of said deck member by the user, and

a deck support structure including at least one set of two elastomeric support members having a variable spring constant secured to said frame structure and abutting said deck so as to both provide support for said deck and to permit said deck to move downwardly with respect to said frame structure resulting from compression of said elastomeric support members in response to the impact force of the user's feet on said exercise surface thereby resulting in lower impact loads on the user's feet

22. The exercise treadmill of claim 21 wherein said set of elastomeric support members are configured with a cross section having an aperture wherein said variable spring rate substantially results from said apertures

23. The exercise treadmill of claim 21 wherein said set of elastomeric support members cooperate with said deck member to permit said deck to move downwardly such that the amount of incremental deflection of said deck member decreases as the impact force of the user's feet on said exercise surface increases

24. The exercise treadmill of claim 21 wherein said deck member includes a member composed substantially of wood and wherein said set of elastomeric support members abuts said deck member.

25. The exercise treadmill of claim 21 wherein said elastomeric support members have a compressed height in the range of 0 5 to 2 0 inches

26 The exercise treadmill of claim 21 wherein said elastomeric support members have a uncompressed height in the range of 1.5 to 3.0 inches

27 An exercise treadmill, comprising:

a frame structure including two rotatable pulleys, said pulleys being positioned substantially parallel to each other, and a pair of spaced apart longitudinal frame members for providing longitudinal structural support for said frame structure;

rotational means including a motor for rotating one of said pulleys;

an endless, moveable surface being rotated when one of said pulleys is rotated, and providing an exercise surface on which a user can walk or run while exercising;

a deck member secured beneath at least a portion of said exercise surface,

control means including a control panel secured to said frame structure and operatively connected to said motor for permitting a user to control the speed of said endless movable surface,

an inclination mechanism secured to said frame structure effective to permit inclination of said deck member; and

display means, located on said panel, for displaying a dynamic hill display, and

inclination control means operatively connected to said control means and responsive to said display means for causing said lifting means to incline said movable surface to correspond to said dynamic hill display

28 The exercise treadmill of claim 27 wherein said display means includes means for permitting a user to program said dynamic hill display.

29. The exercise treadmill of claim 28 wherein said display means includes means for randomly generating said dynamic hill display

Description

FIELD OF THE INVENTION

The invention generally relates to exercise equipment and in particular to exercise treadmills.

BACKGROUND OF THE INVENTION

Exercise treadmills are widely used for various purposes. Exercise treadmills are, for example, used for performing walking or running aerobic-type exercise while the user remains in a relatively stationary position, further, exercise treadmills are used for diagnostic and therapeutic purposes For all of these purposes, the person on the exercise treadmill normally performs an exercise routine at a relatively steady and continuous level of physical activity Examples of such treadmills are illustrated in U S. Pat. Nos 4,635,928, 4,659,074, 4,664,371, 4,334,676, 4,635,927, 4,643,418, 4,749,181, 4,614,337 and 3,711,812

Exercise treadmills typically have an endless running surface which is extended between and movable around two substantially parallel pulleys at each end of the treadmill The running surface may be comprised of a belt of a rubber-like material, or alternatively, the running surface may be comprised of a number of slats positioned substantially parallel to one another attached to one or more bands which are extended around the pulleys In either case, the belt or band is relatively thin The belt is normally driven by a motor rotating the front pulley The speed of the motor is adjustable by the user so that the level of exercise can be adjusted to simulate running or walking as desired

The belt is typically supported along at least its upper length between the pulleys by one of several well-known designs in order to support the weight of the user. For example, rollers may be positioned directly below the belt to support the weight of the user. Another approach is to provide a deck or support surface beneath the belt, such as a wood panel, in order to provide the required support Here a low-friction sheet or laminate is usually provided on the deck surface to reduce the friction between the deck surface and the belt Because the belt engages the deck surface, friction between the belt and the deck arises and the belt is therefore subject to wear Further, most of the decks are rigid resulting in high impact loads as the user's feet contact the belt and the deck This is often perceived by users as being uncomfortable and further can result in unnecessary damage to joints as compared to running on a softer surface

Because the typical treadmill has a very stiff, hard running surface and can become uncomfortable for extended periods or running, some manufacturers have applied a resilient coating to the running surface, such as rubber or carpeting, to reduce foot impact. Unfortunately, these surfaces for the most part have not provided the desired level of comfort because the running surface tends to retain its inherent stiffness Attempts to solve this problem by using a thicker belt to provide a more shock absorbent running surface have not been successful for the reasons given in U.S Pat. No. 4,614,337. Specifically, the thickness of the belt has to be limited in order to limit the belt drive power to reasonable levels In other words, the thicker the belt, the more power that is required to drive the pulley. To keep motor size cost effective, it has been necessary to keep the belt relatively thin As discussed below, the power of the motor required to drive a pulley is also related to the size of the pulleys

Pulleys used in current exercise treadmills typically are made of steel or aluminum and as such are relatively expensive to make and are relatively heavy. Therefore, because of tooling, manufacturing and material costs, the diameter of the pulleys are normally no larger than three to four inches

Additionally, the diameter of the pulley directly affects the power required to rotate the pulley as does the thickness of the belt. If the diameter of the pulleys is relatively small, the thickness of the belt must be kept relatively thin As the diameter of the pulley is increased, the belt may be made thicker for the same amount of power available to drive the pulleys. As discussed above, the thicker the belt, the more shock the belt will absorb

A further disadvantage of smaller pulleys results from the fact that the reduced surface area of the pulley contacting the belt requires increased tension in the belt in order to transfer torque from the treadmill motor to the belt. In some cases, this increased tension can result in decreased belt life.

The pulleys used in current exercise treadmills are typically of a "convex" or of a "cambered" design and as such have a substantially inwardly sloping profile with a portion of the pulley having a larger diameter, or crown, at the center. The convex-type pulley has a rounded crown at its center portion and the cambered-type pulley has a cylindrical center section between conical ends. The purpose of using these two types of pulleys is to maintain "tracking" of the felt because the belt is less likely to slide from side to side on the pulley during rotation if the pulley has a crown. Unfortunately, belts on convex- or camber-type pulleys also tend to be sensitive to improper adjustment and side loading, which can occur when the user is not running on the center of the belt

Another source of belt wear on existing exercise treadmills results from driving the front belt pulley instead of the rear belt pulley In a front drive arrangement, the belt has a tendency to develop a slack portion on the upper or running surface of the belt. This tends to increase belt wear. Because existing treadmills have relatively small diameter belt pulleys, it has not been practical to locate the drive motor such that the rear belt pulley can be driven by the motor

Because most pulleys use the convex- or camber-type configuration as a belt guide, the belts are still sensitive to improper adjustment and side loading A system whereby a more positive, lateral "tracking" or guidance of the belt is achieved during rotation is therefore desirable.

Many current exercise treadmills also have the ability to provide a variable incline to the treadmill Normally, the entire apparatus is inclined, not just the running surface There are a number of exercise treadmills having manual or power driven inclination systems to take advantage of the fact that the exercise effort, or aerobic effect, can be varied greatly with small changes in inclination For example, a seven percent grade doubles the aerobic or cardiovascular effort compared to level walking or running exercise

Current inclination or lift mechanisms typically comprise a toothed post in a rack-and-pinion arrangement or a threaded post on which a sprocket attached to the treadmill frame is rotated upwards to lift the treadmill In both arrangements, the post must be at a height equivalent to the height of travel of the treadmill frame to accommodate the travel of the pinion or sprocket The length of the post tends to compromise the aesthetics of the treadmill because the post has to extend beyond the plane of the running surface to provide the desired inclination of the running surface Therefore, a lift mechanism with a large extension rotation which would fit primarily within the treadmill enclosure is desirable

The treadmill user's stride also effects the user's body because the resultant force on the user's body increases as the stride increases If the user is running relatively hard, especially over an extended period of time, physical damage to the user's feet and legs can occur The larger the resultant force the greater the likelihood of physical damage If a user's stride results in a force (measured in pounds) which is about equal to or greater than twice the user's body weight, the force can be considered excessive Therefore, a sensor which could measure the force or impact on the treadmill by a user is desirable.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide an exercise treadmill having a shock absorbent running surface by providing resilient members to support a deck located under a belt.

It is also an object of the invention to provide molded plastic belt pulleys having a large diameter including a drive gear portion integrally molded into one of the pulleys

It is a further object of the invention to provide an exercise treadmill in which the belt is driven by the rear belt pulley.

It is a further object of the invention to provide a more positive lateral "tracking" or guidance mechanism for the belt.

It is another object to provide a lift mechanism to incline the treadmill running surface that fits primarily within a treadmill enclosure and intermediate the front and rear pulleys

It is yet another object of the invention to provide a treadmill capable of sensing the impact of the user's body on the treadmill and capable of providing that information to the user

It is still another object of the invention to provide a treadmill in which treadmill belt tension can be reduced without sacrificing reliable operation

In particular, an exercise treadmill is provided in which a belt is supported for a portion of its length between a pair of pulleys and a deck supported by resilient members in combination with a resilient belt The thickness of the belt is preferably approximately 0 20 inches Further, the deck is fixed to resilient members at several points, permitting the deck to partially float on the deck frame when stepped upon, resulting in even lower impact loads on the user feet and legs

The belt pulley construction can be, alternatively, straight cylindrical, convex, or a cylindrical center section and conical ends (cambered) The belt pulleys also have a relatively large diameter, preferably approximately nine inches The pulleys are of a molded plastic construction and a drive sprocket portion can be molded as part of the pulley. Possible plastic materials from which the pulleys can be molded include glass-filled polypropylene, polystyrene, polycarbonate, polyurethane and polyester In some embodiments, bearing seat assemblies can be molded-in to the pulley when it is originally manufactured, thereby eliminating the need for inserting and fastening bearing seats into molded pulleys.

The use of large diameter pulleys is facilitated through the use of a plastic construction, rather than a steel construction The large diameter of the pulleys permits the use of thicker belts which can be made to be more shock-absorbing than currently used belts User comfort is therefore further enhanced. The larger pulleys also reduce the belt tension required for satisfactory belt drive.

A belt position sensor mechanism provides for positive lateral tracking of the belt. As a result, the belt is prevented from laterally sliding too far to one side of the pulley so that it contacts a frame or other portions of the structure, resulting in a reduction of wear or damage to the belt. This arrangement is also less sensitive to improper adjustment and side loading.

The sensor mechanism includes an arm which is spring biased to one edge of the lower surface of the belt, preferably near the front belt pulley. As the belt moves to one side or the other on the front pulley, the arm moves in the same direction as the lateral movement of the belt In one of two designs, a Hall effect sensor connected to the arm electrically measures the lateral movement of the belt, and the electrical signals are transmitted to a microprocessor If correction of the belt position is required, the microprocessor will activate a front pulley pivoting mechanism to pivot one end of the front pulley in a longitudinal direction, either towards the front or towards the rear of the treadmill. Because the belt will tend to move towards the lateral (transverse) direction in which the belt tension is lower, the front pulley will be pivoted towards the front of the treadmill to move the belt to the right, and towards the rear of the treadmill to move the belt to the left The front pulley pivoting mechanism uses a pivot block for holding one end of the pulley axle and a guide block for the other end of the front axle that selectively moves along a longitudinal path from front to rear to create the pivot. In some embodiments, the pivot mechanism drive motor duty cycle is varied as a function of belt position and speed to optimize belt position corrections

Also, a lift mechanism for the exercise treadmill is provided which includes an internally threaded sprocket assembly which, when driven, forces a non-rotating screw, threaded to the sprocket assembly against the floor thereby inclining the unit A lift mechanism with a large extension ration which can fit primarily within a side enclosure of the treadmill is therefore made possible. In another embodiment, molded sprockets are driven on the screw by a toothed belt, thereby eliminating the need for chain oiling and providing quieter operation than that produced by a chain drive system.

An impact sensor mechanism is also provided to measure the relative force created on the deck by the treadmill user. The impact sensor mechanism includes an arm, having a pair of magnets, which is spring biased against the lower surface of the deck As the deck flexes downward when the user's feet impact the deck, the impact sensor arm is also deflected downward A Hall effect sensor secured to the frame between the magnets electrically measures the downward deflection of the deck, and the electrical signals are transmitted to a microprocessor The downward deflection of the deck is a function of the foot impact force and is related to the compressibility of the resilient support members supporting the deck The microprocessor calculates the impact force by comparing the measured deflection to empirical values Also, a relative force value is calculated, based on an inputted value for the user's body weight

A mold for producing a large diameter pulley having an integral sprocket is also disclosed In some embodiments, the mold accepts a bearing insert or seat assembly prior to insertion of the plastic pulley material to yield a pulley with a molded-in bearing seat assembly A method for producing these pulleys is also disclosed

BRIEF DESCRIPTION OF THE DRAWINGS

FIG 1 is a perspective view of an assembled exercise treadmill,

FIGS 2A and 2B provide sectioned side views along the lines 2A--2A and 2B--2B, respectively of FIGS 1, 3A and 3C illustrating the internal assembly of the exercise treadmill;

FIG. 2C illustrates an alternative structure for securing the deck to the frame to be used in place of the linkage assembly shown in FIG 2A;

FIGS 3A-3B and 3C provide sectioned top views of FIG. 1 from front to back, illustrating the internal lift assembly of the exercise treadmill and the spacing of spring post assemblies,

FIG. 3D illustrates an alternative embodiment of the internal lift assembly which uses a toothed drive belt,

FIG. 4 is a sectioned front view of the exercise treadmill of FIG 1, illustrating the internal lift assembly of FIG 3A;

FIG. 5 is a partial sectioned longitudinal view illustrating an assembled cambered-type rear belt pulley;

FIG. 6 is an exploded, perspective view of the rear belt pulley of FIG. 5,

FIG. 7 is a top view of an impact sensor for use with the treadmill of FIG. 1;

FIG. 8 is a side view of the impact sensor of FIG 7,

FIG. 9 is a graph of dynamic force versus downward deflection of the deck;

FIG. 10 is a perspective view illustrating the placement of a belt sensing mechanism and a front pulley pivoting mechanism,

FIG. 11 is a perspective view of the belt sensing mechanism of FIG. 10;

FIG 12 is a top view of the pivoting movement of the sensor arm of the belt sensing mechanism in FIG 11;

FIG 12A is a top view of the pivoting of the sensor arm of FIG 12 showing the preferred sensing regions

FIGS. 12B-12D are graphs of belt tracking performance at 1.5, 4 and 7 miles per hour using different belt tracking motor control regimes,

FIG 13 is a perspective view of an alternative embodiment for the belt sensing mechanism,

FIG 14 is a exploded, perspective view of one of the resilient member assemblies shown in FIGS. 2A and 2B,

FIG. 15 is a right side view of the idler pulley, illustrating the speed sensor magnets;

FIG. 16 is a functional block diagram illustrating the integrated control scheme,

FIG 17 is a diagram illustrating the impact force display,

FIG 18 is a perspective view of a mold useful for forming large diameter treadmill pulleys having integral toothed sprockets,

FIG 19 is a sectioned side view of a second embodiment of a treadmill;

FIG 20 is a sectioned top view of the treadmill of FIG. 19;

FIG 21 is a sectioned side view of a third embodiment of a treadmill;

FIG. 22 is a sectioned top view of the treadmill of FIG. 21 taken along lines 22A--22A of FIG. 21, and

FIG. 23 is a sectioned front view of the treadmill of FIGS. 21 and 22 taken along lines 23A--23A of FIG 22.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 provides a perspective view of an assembled exercise treadmill 10. The treadmill 10 has a lower frame portions 12 and 12' housing the internal mechanical components of the treadmill 10, as discussed below. Projecting upwardly from frame 12 and 12' are a pair of railing posts 14 and 14' As illustrated in FIG. 1, railing posts 14 and 14' are slightly tilted from perpendicular relative to lower frame 12 and 12', primarily for aesthetic purposes. Secured to the tops of railing posts 14 and 14' are a pair of side rails 16 and 16', respectively Side rails 16 and 16' provide the treadmill user with a means of support either during the entire exercise period or for an initial period until the user has assimilated himself to the speed of the treadmill Extending between and attached to the side rails 16 and 16' is a front rail 17 and a control panel 18 mounted on crossmember 19 Front rail 17 provides yet another means of support for the treadmill user Control panel 18 includes electronic controls and information displays which are typically provided on exercise treadmills for purposes such as adjusting the speed of treadmill 10 and for operating a lift mechanism for inclining the entire exercise treadmill 10, as will be discussed later in connection with FIG 16

In normal operation, the user will step onto a belt 20, positioning himself between the side rails 16 and 16'. As belt 20 begins to move, the user will start a walking motion towards the front of the treadmill 10 Alternatively, the treadmill 10 may be set up to automatically begin to move at a speed according to a value entered from control panel 18 The pace of the walking motion may be increased into a brisk walk or run, depending upon the speed of the belt 20 The speed of belt 20 can be controlled by the adjustment of the controls on panel 18 along with the adjustment of the inclination of the treadmill 10, as will be discussed in connection with FIG. 16

A drive assembly for the belt 20 is generally illustrated in the Figures, and more particularly in FIGS. 2B, 3B and 3C. A front belt pulley 22 is rotatably mounted on a first axle 24 A second, rear belt pulley 28 is rotatably supported on a second axle 30 which is in turn secured to the frame portions 26 and 26' within the frame portions 12 and 12' by fasteners 31 and 31', respectively. Step surfaces 27 and 27' run longitudinally from front to rear of treadmill 10. Surfaces 27 and 27' provide a surface upon which a treadmill user can step onto before, during or after the belt 20 begins to move. Step surfaces 27 and 27' are supported on either frame 26 or 26' by a plurality of support members 29. The rear belt pulley 28 is positioned substantially parallel to the front pulley 22. The belt 20 is looped around pulleys 22 and 28 for movement therearound, to form an upper run or length and a lower run or length of the belt

The front pulley 22 and rear belt pulley 28 can be of any type of construction, for example, of either a straight cylindrical-type construction, a convex-type construction, or a cylindrical center section and conical ends-type construction (cambered pulley) Convex-type pulleys are especially useful since belts have the natural tendency to stay centered on such a "crowned" pulley. Because convex-type pulleys involve relatively high production costs, cambered-type pulleys can be used instead, with the transitions from the conical sections to the cylindrical section being rounded off in order to approximate a convex shape

The need for a specific type of pulley, such as a crowned pulley, can be mitigated by the use of a positive lateral belt tracking and positioning mechanism as discussed below For example, although straight cylindrical pulleys have the poorest belt guidance characteristics of the three types of pulleys already discussed, straight cylindrical-type pulleys can be used in combination with a positive lateral belt tracking mechanism which can correct the lateral position of the belt The use of a positive lateral tracking arrangement prevents the belt 20 from travelling too far to one side of either pulley 22 or 28 so that belt 20 does not contact either frame portion 26 or 26'. Also, as discussed above, induced stresses and sensitivity to improper adjustment are decreased through the use of this arrangement.

Preferably, the pulleys 22 and 28 are of the same relatively large diameter and in the range of seven to ten inches. The preferred pulleys have a twenty inch longitudinal surface and include a six inch long crowned center portion having a diameter of 9.14 inches which includes a rise of 0.07 inches from the ends of the pulley that have a diameter of 9 00 inches.

The relatively large diameter of pulleys 22 and 28 provides significant performance advantages One advantage is that the large diameter pulleys permit the use of a relatively thicker belt 20, which can provide more shock absorbency than most currently used belts. The thickness of the preferred belt 20 is about 0 20 inches or more

A second significant performance advantage of large diameter pulleys stems from the large drive pulley to belt contact area. This large contact area provides enhanced "gripping" of the belt by the pulley, which in turn permits the use of lower belt tension than is required by treadmills having smaller diameter pulleys This, in turn, reduces or eliminates tension-related belt failure known to occur in treadmills having smaller diameter pulleys For the preferred nine inch diameter pulley embodiment having a drive pulley to belt contact area of 250 square inches, belt tensions of 50 lbs per inch of lateral belt width or less are sufficient to provide reliable belt operation with a Siegling belt, Model No E 812 U0/U4

Another advantage to larger diameter pulleys is increased belt life It has been determined that stresses induced in the belt due to bending are decreased with larger diameter pulleys

Pulleys 22 and 28 are also preferably of a molded plastic construction Suitable materials from which pulleys 22 and 28 can be molded include glass-filled polypropylene, polystyrene, polycarbonate, polyurethane and polyester Economical manufacture of the pulleys 22 and 28 having such a relatively large diameter is facilitated through the use of this plastic material. The preferred method of manufacturing pulley 28 is discussed later in conjunction with FIG 18.

A two-piece embodiment of the rear pulley 28 is illustrated in FIGS 5 and 6 Specifically, rear pulley 28 includes a cylindrical body 36 and a second portion or end cap 38 Body 36 includes an integrally molded toothed sprocket 108 at one end. Depending on the desired pulley construction, body 36 is either straight cylindrical, convex or have a cylindrical center section with conical ends Preferably, as illustrated, body 36 has a cylindrical center section 32 with conical ends 34 and 34', generally known as a cambered-type pulley. A number of angularly spaced support elements indicated by reference numeral 42 are integrally molded within the end cap 38 and sprocket 108 to provide structural rigidity. A portion 44 of the molded cap 38 extends into the end 40 of cambered body 36 The molded cap 38 is secured to the cambered body 36 by any one of a variety of known securing means including the press fit arrangement shown in FIGS 5 and 6 In addition to the press fit arrangement, eight flat head screws 39 can be used to secure cambered body 36 and cap 38 together Molded cap 38 and the other, integral end 46 of the cambered body 36 each include a bearing seat assembly 48 and 48' (FIG 5), respectively, for attachment to the second axle 30 The use of molded-in bearing seats allows easy insertion of bearing rings (not shown) after the pulley has been molded. Bearing seats 48 and 48' are preferably molded into pulleys 22 and 28 when pulleys 22 and 28 are originally manufactured. Front pulley 22 can be molded by a similar process, but, of course, does not include an integral sprocket

As a user steps on the belt 20 during normal operation of the treadmill 10, the belt 20 will tend to flex or bend under the weight of the user. The belt 20 is supported for a portion of its length between the pulleys 22 and 28 by a deck 50, as shown in FIGS 2A and 2B Deck 50 can be made of any suitable material, preferably maple hardwood or a suitable composite material, and provides a support surface located such that the belt 20 will flex or bend downwardly until it contacts the top surface 51 of deck 50. The thickness of deck 50 also partially determines the downward flex of the deck 50. For example, a deck thickness of 5/8ths inches provides more of a flex than a deck thickness of 3/4ths inches Generally, the downward flex of deck 50 increases with decreasing deck thickness. The thickness of deck 50 is therefore chosen to provide a desired flex

To reduce friction between the underside of the upper run of belt 20 and the top surface 51 of deck 50, a low friction laminate or other coating can be applied to either the top surface 51 of the deck 50 or the underside of belt 20, or both Preferably, a coating of suitable wax is applied to the underside of belt 20

FIGS. 2A, 2B, 3A, 3B, 3C and 4 illustrate the preferred arrangement for supporting the deck 50.

Specifically, deck 50 is secured to a lightweight steel deck support structure, indicated generally at 52 The deck support structure 52 includes a pair of laterally spaced longitudinal support members 54 and 56 that in turn are each secured to a set of parallel crossbars 58, 60, 62 and 64. Crossbars 58, 60, 62 and 64 extend transversely from one side of the treadmill 10 to the other Longitudinal member 54 is attached to each of crossbars 58, 60. 62 and 64 with pins or rivets 66, 68, 70 and 72, respectively, longitudinal member 56 is attached to each of crossbars 58, 60, 62 and 64 with pins or rivets 74, 76, 78 and 80 respectively In turn, crossbar 60 is attached to frame portions 26 and 26' with fasteners 86 and 88. Respectively, and crossbar 62 is attached to frame portions 26 and 26' with fasteners 90 and 92, respectively Further, crossbars 58, 60, 62 and 64 can be constructed, either by a choice of appropriate material or thickness, to provide additional flex to deck 50

Deck 50 is also supported by an array of resilient members 100 mounted on crossbars 60 and 62 and at each end by a set of resilient members 102 mounted to crossbars 58 and 64 Through the use of the resilient members 100 and 102, the deck 50 is permitted to flex when stepped upon, resulting in lower impact loads on the user's feet As shown in FIGS 3B, two of the resilient members 100 are positioned on each of the crossbars 60 and 62.

As further shown in FIGS 3A and 3C, each end of deck 50 is secured to two of the resilient members 102. Resilient members 102 provide a downward flex as a load resulting from the impact of a treadmill user's feet on deck 50 Resilient members 102 become compressed as the load is placed on deck 50, with potential energy in the direction opposite the direction of compression being stored in the compressed resilient members 102 Although downward flex of the ends of deck 50 is desired, too much downward flex is undesirable because as the user strides on the treadmill 10, the load is alternatively placed on and taken off of deck 50. As the load is taken off of deck 50, the potential energy stored in the resilient members 102 forces the deck upwards

To partially control downward flex, resilient members 103 are aligned with and placed underneath resilient members 102 as shown in FIG. 2A. Resilient members 103 tend to bias the deck 50 upwards and to limit downward flex of deck 50, creating a smoother surface for the treadmill user Further, resilient members 103 may be assembled in a partially compressed position which assists in biasing the deck 50 upwards Resilient members 103 are preferably of the same construction as resilient members 102.

The resilient members 100 and 102 can be secured to crossbars 58, 60, 62 and 64 by one of a variety of methods. The members 100 are preferably secured to the deck 50 by a flat head, countersunk bolt 105 extending vertically through the top surface 51 of deck 50 and through the bore 95 on the upper portion of the members 100, as illustrated in FIGS. 2A, 2B and 14. A nut 97 on bolt 99 secures members 100 to deck 50 In this embodiment, the lower portion of each member 100 is not connected to the crossbars 60 and 62, thereby permitting the deck 50 to be free-floating relative to the crossbars 60 and 62 The resilient members 102 and 103 connected to the crossbars 58 and 64 can be made of the same material as resilient members 100 and may have a different configuration than members 100, preferably a generally cylindrical or post configuration, with a fastener receiving bore (not shown) substantially aligned along their centerlines for receiving fastener 101 Alternatively, in place of members 100, 102 and 103, springs such as leaf or coil springs or tension bars can be used to perform this support function for deck 50.

Although four resilient members 100 are shown in FIG 3B, more or less of the members 100 can be provided As a general rule, the resiliency of flex of the deck 50 can be reduced by providing more resilient members 100 to support the deck 50 For example, if three sets of two resilient members 100 are provided instead of two sets of two resilient members 100 or by adding another crossbar with two additional resilient members, deck 50 would have slightly less flex during normal operation of the treadmill 10

The resilient members 100, 102 and 103 can be made from any suitable material, including polystyrene, polycarbonate, polyurethane, polyester, or mixtures thereof, and are preferably made of polyphenylene oxide TECSPAK RTM bumpers, made of EFDYN, a division of Autoquip Corporation of Guthrie, Okla , and made of an EFDYN proprietary material including polyurethand and DuPont HYTREL RTM (polyester elastomers) have been especially useful as resilient members 100, although any other suitable material may be used. In the preferred embodiment, the resilient members 100 have a free, uncompressed height in the range of 1 50 to 3 inches and the hardness of the material is preferably in the range of shore 30 A to shore 55 A and most preferably shore 47 A, the resilient members 100 also have a compressed height in the range of 0.5 to 2 inches As illustrated in the FIGS 3B and 14, the members 100 have a generally elliptically shaped configuration, preferably having an un compressed diameter in the range of about 1.5 to 3.0 inches.

The elliptical shape of the resilient members 100 has another advantage in that it results in a more comfortable running surface due to its variable spring constant k or modulus of the spring. Most resilient materials as well as conventional springs such as coil springs have a constant value of k which means that the distance the material or spring will compress is a linear function of increased force applied to the spring. This is usually represented by the formula F=kx where F is the compressive force applied to the spring and x represents the distance the spring will compress. For example, if a force F of 80 pounds is applied to a conventional spring the spring might compress a distance a of 0 50 inches and if the force F is doubled to 160 pounds the spring will compress a distance of 1 00 inch. However, because of its elliptical shape, the spring constant k of the resilient member 100 is variable, that is, it increases as a function of the compression distance x In this case, the incremental distance x that the resilient member 100 will compress will decrease with increasing force F because the spring constant k will increase with the increasing compression distance x. In the example discussed above, the compression distance x of the elliptical support member 100 under the second force F of 180 pounds would be 0.875 inches instead of 1 00 inches for the coil spring having a constant k. By using springs or resilient members such as resilient member 100 having a variable k or rate of compression to support the deck 50, the deck 50 will have a variable rate of deflection resulting in a significantly more comfortable running surface. The variable rate of deflection of the deck 50 achieves this object by permitting the deck 50 to flex downwardly a first distance, for example 0.5 inches, absorbing the initial energy of a foot striking the deck 50 Then because of the increase in the spring constant of the resilient support members 100, the deck 50 will proportionately deflect less under the remaining force of the foot striking the deck 50 thereby providing a firmer and more comfortable footing for the user. Thus, the above described deck support arrangement which provides for a variable rate of deflection can provide an optimum running surface where the initial energy of the user s steps are absorbed while at the same time providing a surface that neither feels mushy nor has a trampoline effect This deck support arrangement has the further advantage of being able to comfortably accomodate users having different weights because the deck 50 will deflect about the same amount for lighter weight users as it will for heaver users giving each approximately the same feel.

It should be noted that the resilient members 100 having a variable spring constant are located in the middle of the deck 50 where the majority of the user's foot impact force will generally occur. The cylindrical resilient members 102, which have a substantially constant spring constant k, are located at the ends of the deck 50 where the effect of the user's foot impact force is minimized and consequently will not affect to a significant degree the feel of the running surface of the treadmill 10.

Deck 50 is also preferably assembled into position to be convex or crowned in the longitudinal direction (not shown) Specifically, the front and rear ends of deck 50 are assembled to be lower than the middle portion Deck 50 is rigidly attached into place first at either the front end or the rear end of the treadmill Deck 50 is then warped into place and attached to the other end of the treadmill, to have a crown in the middle of deck 50 Deck 50 is provided with a length slightly greater than the distance between the front and rear attachments of deck 50 to crossbars 58 and 64, respectively, so that it can be so assembled. Deck 50 is provided with a crown to provide an additional measure of upward deflection of deck 50 when a load is placed on deck 50 since the load from the feet of the treadmill user is typically placed on the middle portion of the deck 50 Further, the crowning of deck 50 increases its fatigue life because the overall deflection of the deck from the centerline is reduced

As can be seen from FIGS 2B, 3B and 3C, the rear belt pulley 28 is rotated by a motor 104 during normal operation of the treadmill 10 Motor 104 is mounted to plate 98 by conventional means, plate 98 being mounted to crossbar 62 The rear pulley 28 is rotated by the motor 104 using a toothed drive belt 106 engaged with a complementary toothed sprocket 108 integrally molded on the outer end of body 36. The motor 104 is preferably a variable speed A C. induction motor having an electrical speed controller. Motor 104 has a toothed sprocket 109 secured to the motor shaft 110. A speed reducing transmission or drive indicated generally at 111 is used to connect pulley 28 to motor 104. By using the speed reducing transmission 111, it is possible to use a smaller, less expensive motor 104. The motor 104 is connected to a reduction pulley 112 by drive belt 113 A toothed sprocket 114 is attached to the same shaft and bearing assembly 115 as gear 112 and engages toothed drive belt 106.

Although the pulley drive arrangement including motor 104 and the speed reducing transmission 111 is shown as being engaged to the rear pulley 28, a similar arrangement can alternatively be used to drive the front belt pulley 22. As discussed below, the speed at which rear pulley 28 is rotated is controlled by microprocessor 300 through motor 104, by varying the voltage and frequency to the electric controller of motor 104. The speed is adjustable from controls on panel 18. With this arrangement, it is therefore possible to vary the belt 20 speed at various times during the exercise routine, such as to perform a predetermined exercise profile.

An idler pulley 116 is also placed intermediate transmission 111 and rear pulley 28 along the upper length of drive belt 106. Idler pulley 116 is supported on axle bracket assembly 117, secured to crossbar 64. Idler pulley 116 eliminates slack from drive belt 106 and allows for better traction between drive belt 106 and rear pulley 28 since a greater circumference of rear pulley 28 is contacted with drive belt 106.

Further, a speed sensor 118, illustrated in FIGS 2B and 3C, is operatively connected to shaft 115 of transmission 111. Sprocket 119 is similarly notched around its circumference, and is mounted for rotation with shaft 115. The circumference of sprocket 119 is aligned to move through optical reader 120, which measures the number of notches 121 which pass thereby A pulse for each passing of notch 121 is registered, and a signal is sent to the computer 300. The speed of belt 20 is therefore calculated by the microprocessor from the measurement of the number of pulses per given time period

An alternative embodiment for speed sensor 118', partially illustrated in FIG 15, is provided on idler pulley 116 to indirectly measure the speed of the treadmill belt (and consequently the speed of the treadmill user) An end of idler pulley 116 has two magnets 122 and 122' mounted thereon. The magnets 122 and 122' are mounted along a line passing through the center point of that axle on which idler pulley 116 rotates and are positioned equidistant from the center point The two magnets 122 and 122' are mounted so that during a point of the rotation of idler pulley 116, each becomes aligned with a Hall effect sensor (not shown). Each time either magnet 122 or 122' is aligned with the Hall effect sensor, a pulse is registered from the change in magnetic flux to the Hall effect sensor and a signal is sent to the computer 300. The speed of belt 20 is therefore calculated by the microprocessor from the measurement of the number of pulses per minute. The use of two magnets 122 and 122' at opposite sides of each other on idler pulley 116 allows for more accurate measurement of the speed than if only one magnet were used Further, the use of the two magnets 122 and 122' allows for the more accurate calculation of acceleration, if desired

Another alternative embodiment for speed control not shown in the drawing would use an induction motor controller which delivers a fixed speed for a given control signal i e., treadmill computer 300 sends a given number of pulses (which equates to a pre-determined speed) to the motor controller. In turn, the motor controller will maintain this motor speed within an acceptable tolerance limit. This system is referred to as an open loop system

Although the pulley drive arrangement including motor 104 and the mechanical transmission 111 is shown as being engaged to the rear pulley 28, a similar arrangement can alternatively be used to drive the front pulley 22. However, the use of motor 104 to drive the rear pulley 28, and the mounting of motor 104 intermediate the front pulley 22 and rear pulley 28 within treadmill enclosure portions 12 and 12' accrues several novel advantages. Known designs of treadmills have not placed the drive motor intermediate the front and rear pulleys because the size of the drive motor was too large to be placed intermediate the smaller sized pulleys Previously known arrangements housed the drive motors in an appendage enclosure of generally greater height than the rest of the treadmill enclosure to accommodate the motor size. Placement of the motor 104 as illustrated eliminates the need for an appendage enclosure of greater height

Further, a slack portion on the belt 20 is eliminated by a rear pulley drive arrangement compared to a front pulley drive arrangement Specifically, with a front pulley drive arrangement, a slack portion would tend to develop on the upper or running length of the belt since the front pulley was pulling the bottom surface of the belt towards the front of the treadmill. The slack portion would tend to increase wear of the belt With the rear pulley drive arrangement, the same effect of the pulley is seen but with the slack portion appearing on the bottom length of the belt and the upper length at the belt being relatively taut. The treadmill user is therefore not stepping on a relatively slack section of belt 20, which increases fatigue life and increases smooth operation of treadmill 10.

Returning to the description of the support mechanism for deck 50 as shown in FIGS 2A-B, the back portion of deck 50 is attached to crossbar 64 with an angle iron 123. Angle iron 123 is secured to crossbar 64, and is also attached between resilient members 102 and 103 by fasteners 101. Second angle iron 124 extends between resilient members 102 supporting the back portions of deck 50, and is positioned between the top of resilient members 102 and deck 50.

At the front end of deck 50, third angle iron 132 rests between the resilient members 102 and 103 and is secured to the crossbar 58. Fourth angle iron 130 extends between resilient members 102 and is also attached to resilient members 102 and 103 by fasteners 101. Fourth angle iron 130 is positioned between the top of resilient members 102 and deck 50 In turn, the fourth angle iron 130 is also attached to crossbar 58 through linkage assemblies indicated generally at 134 and 136. Further, members 54 and 56 are attached to fourth angle iron 130 by pins or rivets 128, as shown in FIG. 3A

The linkage assemblies 134 and 136 include blocks 138 and 140, respectively, that are attached to fourth angle iron 130 by any suitable means. Blocks 138 and 140 are cooperatively attached to stationary blocks 142 and 144 through a pair of links 146 and 148, respectively. Stationary blocks 142 and 144 are attached to the crossbar 56 When weight is placed on deck 50, the front portion of deck 50 will flex downward under the weight The links 146 and 148 allow the deck 50 to flex downwardly and in a forward direction Blocks 138 and 140 also move downwardly and slightly forward, while stationary blocks 142 and 144 remain stationary The purpose of the linkage assemblies 134 and 136 is to provide additional flexure and to permit forward movement of the deck 50 during operation of the treadmill.

A simpler, preferred method for allowing deck flexure and movement is illustrated in the partial cross-section of FIG 2C In FIG 2C, each linkage and block assembly just described is replaced by a single rubber or elastomeric member 400 mounted between the deck 50 and frame crossmember 402 which is affixed to the treadmill frame portions 26 and 26' (not shown). Member 400 includes an elastomeric body 404 having a generally upright cylindrical shape Member 400 also includes a threaded metal insert 406 for receiving a countersunk mounting screw 408 used to fasten deck 50 to member 400 Member 400 also includes a threaded member 410 protruding axially from the bottom of member 400 The threaded member 410 is used to secure member 400 to crossmember 402 Member 410 can be attached to the crossmember 402 by inserting it into a threaded aperture 412 in the member 402 or by inserting it through a non-threaded aperture and securing it with a nut (not shown). A suitable elastomeric member 400 is produced by the Lord Company of Erie, Pa., Part No. J-11729-177.

Member 400 is preferred because it is mechanically simpler than the linkage system already described. Additionally, member 400 permits deck movement in both the lateral and longitudinal horizontal directions while limiting vertical movement

As illustrated in the Figures generally, and in particular FIGS. 2A, 3A and 4, a lift or inclination mechanism indicated generally at 150 for the treadmill 10 is provided to permit inclination of the deck 50 Lift mechanism portions 152 and 152" are similarly constructed with like reference numerals referring to like parts In FIG 2A, lift mechanism 152 includes an internally threaded sleeve 154 welded or otherwise permanently attached to a sprocket 156 When sprocket 156 is rotated, the sleeve 154 will travel upward or downward depending on its direction of rotation on a non-rotating, threaded screw or post 158. The screw 158 is in effect forced downward against the floor F resulting in the raising of the front portion of treadmill 10 when, for example, the sprockets 156 are rotated in a first direction. As illustrated in FIG 2A, screw 158 extends upwardly through enclosure 12 Shroud 159 conceals the screw 158 from the user for safety and aesthetic reasons Shroud 159 is attached at its lower end to enclosure 12 and at its upper end and or at its sides to side post 14.

Rollers 160 and 160' can also be rotatably attached to the lower end of non-rotating screws 158 and 158', respectively As the roller 160 is forced downward against the floor F, the treadmill 10 will roll slightly to compensate for the inclination of the treadmill 10. The inclination of treadmill 10 is thereby facilitated by this slight movement of roller 160. Rollers 160 and 160' are rotatably secured together on axle assembly 161, with axle assembly 161 being secured to posts 158 and 158' by brackets 163 and 163', respectively.

Because the frame 26 is attached through a bracket 162 and bearing assembly 164 to sleeves 154, as sleeves 154 are rotated downwardly on the screw 158, the frame 26 will incline in an upward direction. The lift mechanisms 152 and 152' are located substantially opposite each other on either sides of the treadmill 10 Both lift mechanisms 152 and 152' are operatively connected to an inclination motor 166 Sprockets 156 and 156' are attached to sleeves 154 and 154' at the same height so that a chain 168 can both be operatively connected to the motor 166 by a sprocket 170. Chain 168 is formed in a serpentine arrangement on sprockets 156 and 156', motor sprocket 170 and guide sprocket 171 The motor 166 is mounted on a base plate 172, which extends between crossbar 58 and mounting plate 174 Mounting plate 174 itself extends between frame portions 26 and 26' By this arrangement, the motion upward or downward on both non-rotating screws 158 and 158' will be the same and as a result both sides of the treadmill 10 will be inclined to the same degree

Any suitable inclination can be achieved by lift mechanisms 152 and 152', preferably in the range of zero to eighteen percent As discussed below, the degree of inclination desired by the treadmill user may be controlled within the predetermined range by controls on panel 18

The degree of inclination chosen by the treadmill user is further controlled by a potentiometer 176 connected to microprocessor 300. Potentiometer 176 is attached to frame 26 Potentiometer 176 also comprises a gear 178 which is mounted to travel up or down screw 158 as treadmill 10 becomes more or less inclined, respectively The rotation of gear 178 therefore is used to calculate the degree of inclination as discussed below. Additionally, limit switches (not shown) which sense the upper and lower degrees of inclination, respectively in a known arrangement. The limit switches are mounted to screw 158 which are activatable by sleeves 154 respectively when the sleeves move into contact therewith. The limit switches are therefore a redundant inclination sensing device to potentiometer 176 Once the maximum upper or lower degree of inclination is reached as sensed by either potentiometer 176 or the limit switches, the microprocessor shuts off motor 166.

FIG. 3D illustrates a preferred embodiment of the lift mechanism just discussed. In FIG. 3D, the chain 168 of FIG. 3A has been replaced by a toothed belt 420 The toothed belt 420 drives a pair of molded pulleys 422, each of which integrally includes a plurality of teeth 424 and an internally threaded sleeve 426 Belt 420 rotates around pulleys 422, an idler pulley 430 and is driven by a drive pulley 428 Pulleys 428 and 430 are generally equivalent to sprockets 170 and 171 of FIG. 3A but are, of course, designed for operation with a toothed belt instead of a chain.

The operation of the preferred lift mechanism is similar to that already discussed in conjunction with FIG. 3A except that the mechanism is designed for a 0 to 15 percent grade range The molded pulleys and belt provide for quieter lift mechanism operation and eliminate the need for lubrication of the chain 168 shown in FIG 3A

Another method for controlling the inclination of treadmill 10 is through the use of time This method eliminates the need for potentiometer 176. In this method, lift motor 166 will raise the treadmill to the maximum height limit switch (not shown) is activated. The time it takes for lift mechanism 152 to go from high to low is divided into 15 equal parts and stored in non-volatile memory. Each division is equal to a 1% incline. This procedure is known as calibration. Once calibrated, percent elevation is controlled by treadmill computer 300 in units of motor lift time.

The embodiment of the treadmill 50 as discussed above in connection with FIGS. 1-6 is particularly useful in the health club environment where an exercise treadmill 50 can be subject to very heavy usage. However, there are situations where cost or potential usage factors can make other treadmill structures desirable To that end, another embodiment of the invention is illustrated in FIGS. 19 and 20 FIG. 19 is a sectioned side view and FIG. 20 is a sectioned top view of an exercise treadmill 600 Components of treadmill 600 that are similar to the components of treadmill 10 will be referred to using the same reference numerals The treadmill 600 includes a deck 50 located between a pair of belt pulleys 602 and 604. For simplicity the belt, which is similar to the belt 20 is not shown. A motor 606 drives the front pulley 604 via a drive belt 608 and a pair of support posts 14 and 14' are used to support a display and control panel (not shown) Support for the deck 50 is provided by a pair of cylindrical resilient members 102 at each end of the deck 50 and a pair of elliptically shaped resilient members 100 approximately midway between the pulleys 602 and 604 To simplify construction, the resilient members 100 and 102 are mounted on an upper rail 610 and 612 of a a pair of formed steel longitudinal support members 614 and 616 which form part of the frame of the treadmill 600 By mounting the resilient members 100 and 102 on the longitudinal support members 614 and 616, cross members can be eliminated As shown in FIG. 19, the resilient members 100 and 102 are secured to the lower rails 610 and 612 by sets of mounting brackets 618-622 It should also be noted that the use of the elliptically shaped resilient members 100 located between the ends of the deck 50 provides the same variable deflection rate as described above in connection with the treadmill 10 thereby contributing to the comfort of running on the treadmill 600

A third embodiment of a treadmill structure which is particularly suitable for the home market segment is illustrated in FIGS. 21-23 FIG 21 is a sectioned side view, FIG 22 is a sectioned top view and FIG 23 is a sectioned end view of a treadmill 630. Here, the treadmill frame includes a pair of longitudinal support members 632 and 634 upon which a pair of belt pulleys 636 and 638 are rotatably mounted. Again for simplicity of depiction, the belt 20 is not shown The longitudinal support members 632 and 634 are preferably composed of extruded aluminum and have a cross section as illustrated in FIG. 23 that is generally box-shaped with a top flange 640 or 642. A central channel member 644 running the length of the treadmill 630 is connected to the bottoms of the longitudinal support members 632 and 634 and provides lateral structural support for the treadmill 630 Spaced evenly along the top flanges 640 and 642 of the longitudinal support members 632 and 634 are four pairs of eight elliptically shaped resilient members 100 The resilient support members 100 provide support for a deck 50. FIG. 22 is used to illustrate the relative locations of the support members 100 and consequently are shown in releif below the deck 50 this figure The resilient support members 100 in the treadmill 630 are preferably smaller than the resilient support members 100 in the treadmill 10 having an uncompressed height of about 1.5 inches The resilient support members 100 located at each end of the deck 50 are secured to the deck 50 by a screw 646 inserted through the deck 50, as shown in FIG. 21, in order to limit the longitudinal movement of the deck 50 The middle sets of resilient members 100 are not connected to the deck 50 so as to facilitate limited longitudinal movement of the central portion of the deck 50 as it flexes downwardly under the impact of a user's feet on the belt. As with the treadmills 10 and 600, the use of elliptically shaped resilient members 100 having a variable spring constant provides for an exceptionally comfortable running surface

An impact sensing mechanism 180, illustrated in FIGS. 7 and 8, is used to provide a measurement of the relative impact force of the user's feet on deck 50. Impact sensor 180 is preferable provided at or near the midpoint of deck 50 and is mounted substantially horizontally on crossbar 62 and includes a deflection arm 181 which is resiliently biased by spring 182 against the lower surface of the deck 50. A pair of rubber or plastic elements 183 are mounted on the end of the arm 181 in contact with the lower surface of the deck 50. By this arrangement, as the deck 50 flexes downwardly when the user's feet impact the deck, the arm 181 will also be deflected downwardly. The arm 181 is configured with a &-shaped portion 179 which contains a pair of magnets 184 and 184'. As shown in FIG 8, the magnets 184 and 184' are mounted in a substantially vertical array on opposite sides of the U-shaped portion 179.

The impact sensor 180 also includes a cantilevered sensor support member 185 that is rigidly secured to crossbar 62. Mounted on the free end of the support member 185 is a Hall effect sensor element 186 which is used to detect the position of the free end of the arm 181 relative to the stationary sensor support member 185. As shown in FIG 8, the Hall sensor element 186 is positioned substantially along the same vertical line as the magnets 184 and 184'. The Hall effect sensor element 186 is effective to detect changes in magnetic flux generated by magnets 184 and 184' and translates these changes into an electrical signal Therefore when the deck 50 (and consequently arm 181) flexes downwardly, the position of the sensor element 186 relative to magnets 184 and 184' will change and an analog electrical signal is generated by the sensor element 186 that represents the deflection of the deck 50 Also attached to the sensor support member 185 is a printed circuit board 187 that contains various electronic circuit elements which are effective to transmit a filtered version of the Hall effect sensor signal to the computer 300 where a resident analog to digital converter converts the analog signal into a digital signal that represents the deflection of the deck 50 In the preferred embodiment of the invention, this digital deflection signal is sampled every 5 milliseconds and the value is stored in the memory of the computer 300 Once, each 1 5 second period the maximum value of the digital deflection signals stored in memory is identified by the computer 300 and used to calculate the impact force

In particular, the computer 300 uses the maximum deflection value to calculate the impact force by comparing the measured deflection with corresponding force values, such as set forth in FIG. 9. FIG 9 has along its X-axis values representing the deflections of the deck 50 in inches and, along the Y-axis, corresponding impact force values in pounds These impact force values can be derived by calculating the force required to compress the resilient members 100 in combination with the force required to deflect the deck member 50 Alternatively, these force/deflection values may be determined empirically

Computation of the impact force by the computer 300 can be simplified by forming linear approximations of the curve "A" shown in FIG 9 and using linear equations to calculate the impact force for each deflection value As an example, the curve in FIG 9 can be approximated by the following linear equations for 0 0 to 0 4 inch deflections, y=400x (illustrated as line "B"); and for 0.4 to 0.9 inch deflections, y=640x-96 (illustrated as line "C")

Once the impact force value is calculated by the computer 300, normalized impact force value based on the user's weight can be calculated Specifically, before or during use of the treadmill, the user enters his weight via the control panel 18 into the memory of the computer 300. The impact force value is then divided by the user's weight by the microprocessor 300 to yield a normalized or relative impact force value.

In one embodiment of the invention, the resulting relative impact force value is displayed graphically to the user on the vacuum fluorescent display 376 of FIG 16. Two examples of the use of display 376 to display relative impact force values are illustrated in FIG. 17. In the upper example of the display 376 in FIG 17, the left hand portion indicated at 188 is used to display the word "LOW," and the right hand portion indicated at 189 is used to display the word "MED" with a 14-segment bar graph 190 generated between the illuminated words "LOW" and "MED " The greater the relative impact force value, the more segments 190 are illuminated. In the preferred embodiment, the display in FIG 17 is autoscaled by the computer 300 into two ranges so that when the relative impact force is between 0.8 and 1.75 "LOW" and "MED" are displayed, and when the relative impact force is between 1.75 and 3.0, the words "MED" and "HI" are displayed at the left hand portion 188' and at the right hand portion 189' of display 376 as shown in the lower example of FIG. 17. As the relative impact force in each range increases, the number of illuminated segments 190 are increased from left to right In this embodiment, the relative impact force is displayed on the display 376 only during the actual operation of the treadmill 10 after operating instructions have been displayed, the user has entered his weight and selected an exercise program and the speed of the belt 20 has reached 4 0 miles per hour As an alternative, the user can be provided with a graphical display of relative impact force by a vertical column of, preferably, ten LEDs 192 as shown on the panel 18 of FIG 16 The autoscaled range effect can be simulated by using tri-colored LEDs where for example green would indicate the low scale, yellow would indicate the medium scale and red would indicate the high impact scale Corresponding to the previously described vacuum fluorescent display 376, the individual LED segments in the display 192 would be illuminated from bottom to top as the relative impact force increased within each scale

Calibrating the impact sensor is accomplished in the preferred embodiment as shown in FIG. 8 by utilizing a calibration screw 193 which is threaded into the arm 181. The end of the screw 193 abuts the sensor support member 185 and calibration is accomplished by rotating the screw sufficiently to move the arm 181 downwardly in 0 125 inch increments. The digital value of the signal from the Hall effect sensor 186 is recorded in a table in the memory of the computer 300 for each 0.125 inch increment This table is then used by the computer 300 to determine from the digital deflection signals the actual deflection of the deck 50.

A belt position sensing mechanism such as 200 or 200' as shown in FIGS 10-13 can be used to provide for positive lateral tracking of the belt. As a result, the belt is prevented from laterally sliding too far to one side of the pulley so that it contacts a frame member or other portions of the structure, resulting in increased belt wear or damage to the belt. This arrangement also decreases the sensitivity of the belt to improper adjustment and side loading for which the lateral position of the belt is corrected The belt position sensing mechanism 200 or 200' senses the position of the belt and causes a front pulley pivoting mechanism indicated at 202 to move the belt back into proper position.

The belt position sensing mechanism 200 or 200' is capable of sensing whether the belt 20 has laterally moved too far to either the right or the left, or whether the belt 20 is positioned within a proper range of positions for normal operation The belt position is measured by the position of one lateral edge of the belt, the same edge being used to measure the left and right lateral movement of the belt 20 If the belt 20 has moved too far to the left so that the edge of the belt is out of the proper range, the belt is laterally moved to the right towards and into the proper range by the mechanism 202. Similarly, if the belt 20 has moved too far to the right so that the edge of the belt is out of the proper range, the belt 20 is laterally moved to the left towards and into the proper range.

The preferred embodiment of the belt position sensing mechanism 200 is illustrated in FIGS. 11-12, and can be located along an edge of the upper or lower surface of belt 20. Preferably, the belt sensing mechanism 200 or 200' is located along an edge of the lower run of belt 20, and is preferably mounted on the left, lower front portion of the belt 20

Belt position sensing mechanism 200 is mounted on a bracket 204 which is attached to the frame portion 26. Belt sensing mechanism 200 of FIG. 11 is similar in design and operation to the impact sensing mechanism 180 of FIGS 7 and 8 discussed above, Belt sensing mechanism 200 is calibrated with screw 203, as described above in connection with impact sensing mechanism 180.

The sensing mechanism 200 includes a sensor arm 201 with a rubber or plastic element 205 biased towards belt 20 by a torsion spring 206. Alternatively, a pin or coil spring (not shown) could be used in place of element 205 The pin or spring would extend vertically downward and be resiliently biased towards belt 20 With this arrangement, the element 205, and hence the arm 201, will effectively track the belt 20 as it moves from side to side The use of a coil spring in place of a rigid finger, arm or pin is to prevent damage during handling or transit of the treadmill Experience has indicated that rigid members bend when subjected to abuse, rendering the sensor 200 inoperable The coil spring deflects when loaded, and when the load is released, the spring returns to its normal position

The sensor arm 201 includes a U-shaped portion 207 containing a pair of magnets 208 and 208'. As shown in FIG 11, the magnets 208 and 208' are mounted in a substantially horizontal array at opposite ends of the U-shaped portion 207

The sensing mechanism 200 has a sensor support member 209 which is rigidly mounted to bracket 204, and which is stationary with respect to the sensor arm 201 At the free end of member 209, a Hall effect sensor 210 is positioned substantially in alignment with the magnets 208 and 208' As is conventional, sensor 210 detects changes in magnetic flux generated by the magnets 208 and 208' and translates these changes into an electrical signal. Therefore, when the belt 20 (and consequently sensor arm 201) is within the proper range, a predetermined electrical signal is generated by sensor 210 As belt 20 (and consequently sensor arm 201) moves out of the proper range, the magnetic flux changes as sensor 210 moves relative to the magnets 208 and 208', producing different electrical signals Sensor 210 is connected to microprocessor 300 via a printed circuit board 211 which serves to condition the position signals generated by the Hall effect sensor 210 As will be described below, the signals from the sensor 210 can be used by the pivoting mechanism 202 to keep the belt 20 within a desired range

As discussed above, if the belt 20 moves either to the left or right, sensor arm 201 travels with the belt 20. The movement of sensor arm 201 can be divided into three ranges, illustrated with respect to the alternative embodiment in FIG. 12 Specifically, there is a range of movement in FIG. 12, that is "proper," labelled as range "a", and no correction is necessary If sensor arm 201 moves either left, labelled as range "b", or right, labelled as range "c", out of the proper range, correction of the lateral position of the belt is necessary.

Lateral tracking of belt 20 can be improved by dividing the range of travel of sensor arm 201 into five regions as indicated on FIG. 12A. These regions correspond to belt "within limit" conditions as indicated by the region labelled WL, minor deviations of belt travel left or right as indicated by the regions labelled TL and TR, respectively, and major "beyond limit" deviations of belt travel left or right as indicated by the regions labelled BLL and BLR, respectively Positional information provided from these five sensing regions can be used in conjunction with an indication of belt speed to provide optimal belt tracking correction as a function of speed and position by varying the duty cycle of tracking motor 248 In such a control regime, the duty cycle of the motor 248 should increase with greater belt speed and greater deviation from the ideal path of travel

One example of the preferred tracking scheme linearly increases tracking motor duty cycle with increasing belt speed. For example, consider belt speeds of 1.5, 4 and 7 miles per hour. When belt speed is in the 1 5 mile per hour range, a 15 percent motor duty cycle is used to correct tracking deviations in the TL or TR regions. When tracking deviations enter the BLL or BLR regions, the duty cycle is increased to 30 percent. Four mile per hour corrections employ a 22 percent duty cycle when deviations are in the TL or TR regions and a 57 percent duty cycle when deviations are in the BLL or BLR regions. Seven mile per hour corrections employ a 50 percent duty cycle when deviations are in the TL or TR regions and a 90 percent duty cycle when deviations are in the BLL or BLR regions

In each case, the motor is turned on for one second, followed by an off period of the appropriate length to yield the required duty cycle. Within regions WL, TL and TR, the belt position is sensed every second and corrections initiated if required When the belt position is in the BLL or BLR region, sensing and correction is performed only at the end of the "off" period of each cycle. Preferably, the motor 248 remains switched off following belt movement from BLL or BLR to TL or TR to permit the belt 20 to recover from the more severe belt adjustment just performed.

The effects of a variable duty cycle tracking regime operating at 1 5, 4 and 7 miles per hour are illustrated in FIGS 12B-12D In FIGS. 12B-12D, the horizontal dashed axes represent ideal belt tracking, while the solid lines represent the belt position resulting from attempted tracking corrections made in response to an initial "beyond limits" perturbation The available motor duty cycles for tracking motor 248 are indicated in parentheses In each case, it can be seen that the optimized multiple duty cycle control region described in the preceding paragraph reaches optimal tracking as fast or faster than single duty cycle or nonoptimized multiple duty cycle control regions and that, in many cases, the optimized multiple duty cycle regime reduces control "overshoot" problems Other embodiments may employ a greater number of sensing regions and/or duty cycles to obtain even "smoother" control characteristics These multiple duty cycle control regimes are also suitable for use with the alternative embodiment of the position sensor described below.

In an alternative embodiment, illustrated in FIG 13, sensing mechanism 200' has sensor arm 215 with an elongated portion 217, a vertically downward extending leg 219 attached to one end of elongated portion 217 and a vertically upwardly extending leg 212 attached to the opposite end of elongated portion 217. Sensor arm 215 is substantially cylindrical at all portions. As seen in FIG 13, upward leg 212 is mounted for rotation on beam 213. Beam 213 is secured to the frame portion 26 Upward leg 212 extends through bushing 214, having a cylindrical sleeve 216 therethrough. Cap 218 and washer 220 are connected to the uppermost end of upward leg 212, with cap 218 partially extending into sleeve 216 A torsion spring 224 is chosen of sufficient length so that it is partially compressed between the bottom of bushing 214 and the bend between upward leg 212 and elongated portion 217 Sensor arm 215 is therefore biased towards belt 20 by torsion spring 224, and downward leg 219 contacts and is biased against belt 20 By this arrangement, when belt 20 moves to the right, downward leg 219 is still biased against belt 20, and when belt 20 moves to the left, downward leg 219 is pushed outward against the torsion spring 224

The detection of whether the sensor arm 215 has moved out of the proper range is accomplished by a dual Hall effect sensor 226. Hall effect sensor 226 is used to detect the position of sensor arm 215 by using dual sensors 228 and 228' connected to a printed circuit board 230. Printed circuit board 230 is directly mounted on the crossmember 213 and sensors 228 and 228' are attached to the lower end of board 230 Sensors 228 and 228' are positioned to be aligned substantially along the same horizontal line on board 230. Magnets 232 and 232' are held in cup 234 placed on sensor arm 215 and are positioned on opposite sides of sensors 228 and 228'. As is conventional, sensors 228 and 228' detect changes in magnetic flux around them and translate these changes into changes in electrical current Therefore, when the belt 20 (and consequently sensor arm 215) is within the proper range, a predetermined electrical signal is generated by sensors 228 and 228'. As belt 20 (and consequently sensor arm 215) moves out of the proper range, the magnetic flux changes as magnets 232 and 232' move out from between sensors 228 and 228', translating into a different generated electrical signal The printed circuit board 230 is connected to computer 300 As the lateral position of belt 20 is being corrected, the Hall effect sensor 226 is used to determine whether the belt 20 is within the proper range If the belt 20 is back within the proper range, the computer 300 takes no further action in correcting the lateral position of belt 20

If the lateral position of the belt 20 is to be corrected, the computer 300 operates front pulley pivoting mechanism 202, as discussed below. As shown in FIGS 2A, 3A, 4 and 10, front pulley pivoting mechanism 202 is used to pivot one end of front pulley 22 either towards the front, or towards the rear of treadmill 10 Specifically, one end of front axle 24 is placed into pivot block 242 which is preferably located at the right end of front axle 24, as illustrated in FIG 3A Pivot block 242 is attached to frame 26 by pivot pin 244. As front pulley 22 pivots, pivot block 244 also pivots. The opposite, left end of front axle 24 is therefore moved to pivot the front pulley 22. The left end of the front axle 24 is placed into guide block 246 As guide block 246 is made to move towards the front of treadmill 10, front pulley 22 also pivots forward, as guide pivot block 246 is made to move towards the rear of treadmill 10, front pulley 22 also pivots rearward

The pivoting of front pulley 22 is used to correct the lateral position of belt 20 in a known manner. If belt 20 is moving too far to the left, the front pulley 22 is pivoted towards the front of treadmill 10 If belt 20 is moving too far to the right, the front pulley 22 is pivoted towards the rear of treadmill 10 Since the belt 20 will tend to move towards the lateral direction where belt tension is lower, the front pulley 22 will be pivoted to create a slack on the side of the belt 20 towards which lateral movement of the belt is desired

Movement of guide block 246 is controlled by a tracking motor 248, attached to the frame portion 26 Long threaded bolt 250 is attached to motor 248 and extends longitudinally towards the front of treadmill 10. Guide block 246 is moved by rotation of bolt 250, which extends through nut 252 in guide block 246; bolt 250 is attached to guide block 246 by fastener assembly 254, depending on the rotation of bolt 250 If guide block 246 is to be moved towards the front, motor 248 rotates the bolt 250 clockwise, and if guide block 246 is to be moved towards the rear, motor 248 rotates the bolt 250 counterclockwise As discussed below, computer 300 causes motor 248 to rotate bolt 250 for a predetermined rotation to move guide block 246 for a predetermined distance, resulting in the desired pivot

As belt 20 begins to move in the desired direction, guide block 246 is moved back to its starting position, substantially transverse across treadmill 10, by rotating bolt 250 in the opposite direction

FIG. 16 is a functional block diagram illustrating the preferred embodiment of an electronic system using a computer or computer 300 to control the various functions of the treadmill 10. Preferably the computer 300 is composed of two or more interconnected Motorola 6805 or 68HC11 microprocessors. As previously described, the belt 20 is driven by the rear pulley 28 which in turn is driven through the transmission 111 by the A.C. motor 104 The speed of the motor 104, and hence the belt 20 is controlled by the computer 300 through the application of control signals from the computer 300. Single phase 110 volt A.C. power is applied to the A.C belt drive motor 104 from a conventional A.C. power source, functionally shown at 304, over an A C. power line 306 which is connected to a terminal of the A.C. power source 304. As previously indicated, the A.C. motor 104 is mechanically connected to the rear pulley 28, as functionally represented by a shaft 302, and is effectively controlled by digital signals from the computer 300 transmitted over a line 308. Specifically, line 308 is used to provide a speed signal to an A.C. motor controller 310 which in turn admits the A.C. current on the line 306 to the motor 104 In the preferred embodiment the A.C. motor 104 and controller 310 are combined in a Emerson Electric 1.5 horsepower motor-controller unit. In this embodiment, the A.C. motor controller 310 accepts digital speed signals from the computer 300 over the line 308 and alters the frequency and voltage of the A.C. current to the motor 104 in such a manner to cause the motor 104 to rotate at the desired speed. In addition, on/off motor signals can be transmitted to the controller 310 over a line 312 from the computer 300 and signals indicating the operating condition of the controller 310 are transmitted over a line 314 to the computer 308.

FIG 16 also illustrates the operation of a system for sensing the speed of the belt 20. The speed sensor 121 senses the rate of rotation of the pulley 116 shown in FIGS. 3C and 11 and provides a series of pulses to the computer over a line 322 which represents the speed of the belt 20

Control of the speed of the belt 20 by the computer 300 is provided in the preferred embodiment of the invention in the following manner. The computer 300 compares the actual speed of the belt 20 as measured by the speed sensor 118 to a desired value If the actual speed differs from the desired value the computer 300 transmits the appropriate speed signal over line 308 to the controller 310 to adjust the speed of the motor 104 to the desired value of treadmill 10 An additional feature which can be included is the mechanical brake functionally represented by a box 316 inserted in the shaft 302 The object of the brake 316 is to prevent the read pulley 28, and hence the belt 20, from moving when the motor 104 is off Control of the brake 316 is provided by a signal from the computer 300 over a line 318.

Also functionally illustrated in FIG 16 is the belt tracking mechanism which includes the sensor 226 that provides an indication of the lateral position of the belt 20 on the front pulley 28. Signals from the sensors 200 and 226 are transmitted as represented by a line 340 to the computer 300 Upon receipt of a left or right deflection signal from the tracking sensor 226, the computer 300 will transmit appropriate control signals over a pair of lines 332 and 334 through interface 301 from lines 331 and 333, respectively, to activate the tracking motor 248 which in turn causes the front pulley 28 by means of the front pulley pivoting mechanism 202 to pivot longitudinally in order to center the belt 20 on the pulley 28. A triac 336, a SPDT switch 338, a left limit switch LL and a right limit switch LR are inserted in the A C. power line 306 ahead of the tracking motor 248 The tracking sensor 226 transmits a signal over a line 340 to the computer 300 which represents the lateral deflection of the belt 20 on the pulley 28. In response, the computer 300, by means of a signal transmitted over the line 332 from the interface 301, places triac 336 in a conducting state and switches the polarity of the SPDT switch 338 such that the A.C current is applied through either the LL or LR switch to drive the tracking motor 248 in the appropriate direction to center the belt 20. Limit switches LL and LR also serve to effectively limit the amount of longitudinal travel of the axle 24 of the front pulley 28 by cutting off current to the tracking motor 248 when the predetermined limits are exceeded An indication of this condition is provided to the computer 300 by a current detecting resistor 342 which is connected to the computer 300 by a line 344

Inclination of the treadmill 10 is controlled by the computer 300 in a similar manner As previously described, the inclination sensor or potentiometer 176 detects the inclination of the treadmill and transmits an inclination signal over a line 346 to the computer 300. In response to the inclination signal on the line 346 the computer 300 applies control signals over a pair of lines 348 and 350 to control the inclination motor 166 so as to adjust the inclination of the treadmill to the angle selected either by the user or an exercise program contained in the computer 300. This is accomplished by a triac 352 and a SPDT switch inserted in the A.C. power line 306. When it is desired to increase or decrease the inclination of the treadmill 10, the triac 352 is placed in a conducting condition by a signal on line 348 and the A.C. current is transmitted through the SPDT switch in response to a signal on line 350 and then through either an upper limit switch LU or a lower limit switch LD to the A.C. inclination motor 166 The computer 300 will switch off the triac 352 when it receives a signal over the line 346 indicating that the treadmill is at the desired inclination Upper and lower limits of operation of the inclination motor 166 are provided by switches LU and LD which serve to disconnect the A.C. current on the line 306 which serve to disconnect the A.C current on the line 306 inclination motor 166 when predetermined limits are exceeded. An indication of this out of limit condition is transmitted to the computer 300 by a current detecting resistor 356 over a line 358

As illustrated in FIG 16, each of the A.C motors 104, 166 and 248 are connected to a return power line 359 which in combination with the power line 306 completes the A C. circuit with the 110 volt A C. power source 304.

Additionally connected to the computer 300 are the various elements of the control-display panel 18.

For simplicity the signals transmitted to and from the computer 300 to the control-display panel 18 are represented by a single line 360 In the preferred embodiment of the invention the panel 18 includes a large stop switch 362 which can readily be activated by a user, that is connected through the interface 301 to computer 300 by a line 361 and a line 363 This switch 362 is provided as a safety feature and activation by the user will result in the computer 300 causing the A C belt motor 104 to come to an immediate stop and can also activate the brake 316

A number of numeric displays are also included on the panel 18 including: an elapsed time display 364 which displays the elapsed time of an exercise program controlled by the computer 300, a mile display 366 which displays the simulated distance traveled by the user during the program, a calorie display 368 which can selectively display, under control of the computer 300, a computation of the current rate of user calorie expenditure or the total calories expended by the user during the program, a speed display 370 representing the current speed of the belt 28 which is transmitted to the computer 300 from the speed sensor 118 over the line 322, an incline display 373 representing the inclination of the treadmill 10 in degrees, and a terrain or a "hill" display 374 which is similar to the LED display disclosed in U S Pat No 4,358,105. In the preferred embodiment, the computer 300 operating under program control will cause the treadmill to incline so as to correspond to the hills displayed on the terrain display 374 In this manner the user is provided with a display of upcoming terrain A scrolling alpha-numeric vacuum fluorescent display 376 is also provided for displaying operating instructions to the user, or as previously described, displaying relative impact forces.

Along with the displays 364-376, the panel 18 is provided with an input key pad 378 with which the user can communicate with the computer 300 in order to operate the treadmill 10 as well as program keys indicated at 380 to select a desired exercise program such as manual operation, a predetermined exercise program or a random exercise program In the preferred embodiment, incline and speed keys indicated at 382 on panel 18 can be used to override the predetermined speeds and inclines of a user selected exercise program

FIG 18 illustrates a treadmill pulley body mold 500 useful for molding large diameter plastic pulleys such as pulleys 22 and 28. Mold 500 is shown in an "open" position for purposes of illustration. Mold 500 includes three mold members 502, 504 and 506, each of which shapes about one-third of a molded pulley such as pulley 28. In this example, pulley portions 108, 32 and 34 (see FIG 6) are molded in mold members 502 and 504, and pulley portion 34' is molded in mold member 506. A core 508 is moveable through members 502, 504 and 506 and causes the formed pulley to be formed with about a 1/3-inch wall thickness as shown in FIG 5. Members 502 and 504 are slidably moveable on pins 510 so as to mate with member 506 when mold 500 is in a "closed" position for molding

Core 508 and a core base plate 509 to which core 508 is attached are slidably moveable toward member 506 on pins 512 to insert core 508 within members 502, 504 and 506 when mold 500 is in the closed position The pin ends 514 distal from base 509 cooperatively mate with complementary apertures in member 506 (not shown) to insure the proper alignment of members 506 and 504.

Pulley 28 is formed by first loading bearing seat insert 48' into mold 500 when mold 500 is in the open position shown in FIG. 18. Members 502, 504 and 506 are then slid together and core 508 is coaxially retained within the mated mold members 502, 504 and 506 by the base portion 509. The pulley is then molded by introducing a hot structural foam and plastic mixture having a 40% glass fill into a material gate 516. The mold is allowed to cool for about 3 to 6 minutes, opened, and the molded pulley ejected Ejector pins (not shown) in the base plate 509 can be used to facilitate removal of pulley 28 from core 508. End cap 44 can be produced with molded-in bearing seat insert 48 by a similar process

UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

- plead.

BRUNSWICK CORPORATION, a Delaware corporation, Plaintiff, v PRECOR INCORPORATED, a Delaware corporation, Defendant.	C.A. No. 00 - [illegible] 1 JURY TRIAL DEMANDED

FILED AUG 1 12 25 PM '00 CLERK U.S. DISTRICT COURT DISTRICT OF DELAWARE

COMPLAINT

Plaintiff Brunswick Corporation, through its division Life Fitness, alleges as follows:

JURISDICTION AND VENUE

1. This action arises under the patent laws of the United States, including, but not limited to, 35 U.S.C. §§ 271, 281, 283, 284 and 285. Subject matter jurisdiction is therefore proper under 28 U S C §§ 1331 and 1338(a).

2. Venue is proper in this judicial district pursuant to 28 U S.C. §§ 1391(c) and 1400(b) because, among other reasons, defendant Precor Incorporated (hereinafter "Precor") is subject to personal jurisdiction in this judicial district and is deemed to reside in this judicial district for the purposes of venue.

3. Plaintiff is informed and believes, and on that basis alleges, that Precor is a corporation organized and existing under the laws of Delaware Precor conducts business on a regular basis within this judicial district Precor has purposely placed its products into the stream of commerce with the expectation that they will be purchased by

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customers, including customers in this judicial district. Upon information and belief, Precor has committed acts of patent infringement within this judicial district

THE PARTIES

4. Plaintiff Brunswick Corporation is a Delaware corporation with an exercise equipment division, Life Fitness. Life Fitness has its principal place of business in Franklin Park, Illinois Plaintiff Brunswick Corporation, including its division Life Fitness, is referred to hereinafter as "Life Fitness."

5. Upon information and belief, defendant Precor is a corporation organized and existing under the laws of Delaware

THE PATENT

6. On August 1, 2000, United States Patent No 6,095,951, entitled "Exercise Treadmill" (hereinafter "'951 Patent"), was duly and legally issued The entire right, title and interest to this patent is assigned to Life Fitness Life Fitness is now, and at all relevant times has been, the owner and possessor of all rights pertaining to this patent A true and correct copy of this patent is attached as Exhibit A

PRECOR'S PATENT INFRINGEMENT

7. Upon information and belief, Precor has infringed and is currently infringing the '951 Patent by making, using, selling and/or offering to sell treadmill products that infringe the '951 Patent

8. Upon information and belief, Precor threatens to continue and, unless enjoined and restrained by this Court, will continue to infringe the '951 Patent. As a result of Precor's infringement of the '951 Patent, Life Fitness will suffer, or has suffered, irreparable harm for which Life Fitness has no adequate remedy at law. Accordingly, Life Fitness is entitled to a permanent injunction enjoining and restraining Precor from infringing the '951 Patent.

9. As a result of Precor's infringement of the '951 Patent, Life Fitness has suffered damages in an amount to be determined at trial.

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PRAYER FOR RELIEF

Life Fitness respectfully requests the following relief:

(a) That the Court adjudge and decree that Precor has infringed the '951 Patent,

(b) That the Court enter a preliminary and/or permanent injunction against Precor's infringement of the '951 Patent;

(c) That the Court award damages to compensate Life Fitness for all harm suffered as a result of the infringement of the '951 Patent to the fullest extent under the law;

(d) That the Court award interest on such damages;

(e) Such other relief as the Court deems just and proper.

Dated: August 1, 2000

For Plaintiff,
BRUNSWICK CORPORATION

By: [signature]

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