IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

SRAM CORPORATION,	)	
	)	
Plaintiff,	)	Civil Action No.
	)	
v.	)	JURY TRIAL DEMANDED
	)	
LONG YIH INDUSTRY CO. a/k/a DNP, INC.,	)	
	)	
Defendant.	)	

02C 4142

MAGISTRATE JUDGE NOLAN

COMPLAINT

COMES NOW Plaintiff SRAM Corporation ("SRAM") and for its Complaint against Defendant Long Yih Industry Co. a/k/a DNP, Inc. ("DNP"), states as follows:

PARTIES, JURISDICTION AND VENUE

1. SRAM is a corporation incorporated in the State of Illinois with its principal place of business in Chicago, Illinois.

2. DNP is a foreign corporation incorporated in the Republic of China having its principal place of business at 8 Fl.-3, No. 80, Kuang Fu Road, Sec. 2, San Chung City, Taipei Hsien, Taiwan.

3. DNP, through intermediaries, has for a time past and still is purposefully selling, shipping, and/or offering for sale, whether alone or as part of an end product, bicycle twist shifting devices known by the product or trade name "VeloShift" or other private brand names, such as "TD One" (hereinafter "the DNP devices") to customers in the United States that are placed on bicycles sold in the State of Illinois and, more specifically, in this judicial district in competition with SRAM's products.

4. This action arises under the Patent Laws of the United States, United States Code, Title 35. The Court has jurisdiction over the subject matter of this action pursuant to United States Code, Title 28, Sections 1331, 1332 and 1338.

5. Venue is proper in this district under United States Code, Title 28, Sections 1391(d) and 1400(b).

COUNT I – INFRINGEMENT OF U.S. PATENT NO. 6,199,447 B1

6. SRAM realleges paragraphs 1-5 above, inclusive, which are incorporated by reference.

7. The United States Patent and Trademark Office ("PTO"), on March 13, 2001, duly and lawfully granted United States Patent No. 6,199,447 B1 ("the '447 patent"), entitled "BULBOUS GRIP FOR ROTATABLE BICYCLE GEAR SHIFTER." (A copy of the '447 patent is attached hereto as Exhibit A).

8. Thereafter, the '447 patent was assigned to SRAM and SRAM is the owner of all right, title and interest in and to the '447 patent since the assignment.

9. On information and belief, DNP, through intermediaries, has for a time past and still is purposefully shipping, selling, and/or offering for sale, or aiding and abetting and contributing such activities, in the United States and in this judicial district, the DNP devices that infringe one or more claims of the '447 patent. DNP has done so without license or authority from SRAM.

10. DNP has notice of the '447 patent and has infringed and is continuing to infringe the '447 patent by shipping, selling, and/or offering for sale in the United States and in this judicial district the DNP devices, by actively inducing others to infringe the '447 patent, and/or by contributing to the infringement of the '447 patent, all without license or authority from SRAM.

11. DNP's infringement of the '447 patent has damaged and will continue to damage SRAM, including but not limited to lost profits from lost sales, lost income from competition from infringing products, loss of opportunity of sales, and loss of reputation in the marketplace due to inferior shift actuator products.

12. DNP's infringement of the '447 patent has caused and will continue to cause SRAM irreparable harm for which there is no adequate remedy at law.

REQUEST FOR RELIEF

WHEREFORE, SRAM respectfully requests that the Court enter a judgment:

A. Declaring that DNP infringed, induced and/or contributed to the infringement of the '447 patent;

B. Permanently enjoining DNP, its subsidiaries, agents, officers, employees, directors, licensees, servants, successors, assigns, and all others acting in privity or in concert with them, from infringing, actively inducing infringement or contributing to infringement of the '447 patent;

C. Awarding SRAM damages adequate to compensate for DNP's infringing activities, together with interest;

D. Awarding SRAM treble damages pursuant to 35 U.S.C. § 284, and other applicable law, by reason of the willful, wanton, and deliberate nature of DNP's continued infringement;

E. Awarding SRAM its attorneys' fees and costs of suit, pursuant to 35 U.S.C. § 285, and other applicable law;

F. Awarding SRAM such other and further relief as the Court may deem just and proper.

COUNT II – INFRINGEMENT OF U.S. PATENT NO. 5,823,058

13. SRAM realleges paragraphs 1-12 above, inclusive, which are incorporated by reference.

14. The United States Patent and Trademark Office, on October 20, 1998, duly and lawfully granted United States Patent No. 5,823,058 ("the '058 patent"), entitled "TWIST GRIP SHIFTER FOR BICYCLES AND A BICYCLE HAVING A TWIST GRIP SHIFTER." (A copy of the '058 patent is attached hereto as Exhibit B).

15. Thereafter, the '058 patent was assigned to SRAM and SRAM is the owner of all right, title and interest in and to the '058 patent since the assignment.

16. On information and belief, DNP, through intermediaries, has for a time past and still is purposefully shipping, selling and/or offering for sale, or aiding and abetting and contributing to such activities, in the United States and in this judicial district, the DNP devices

that infringe one or more claims of the '058 patent. DNP has done so without license or authority from SRAM.

17. DNP has notice of the '058 patent and has infringed and is continuing to infringe the '058 patent by shipping, selling and/or offering for sale in the United States and in this judicial district bicycles that contain the DNP devices, by actively inducing others to infringe the '058 patent, and/or by contributing to the infringement of the '058 patent, all without license or authority from SRAM.

18. DNP's infringement of the '058 patent has damaged and will continue to damage SRAM, including but not limited to lost profits from lost sales, lost income from competition from infringing products, loss of opportunity of sales, and loss of reputation in the marketplace due to inferior shift actuator products.

19. DNP's infringement of the '058 patent has caused and will continue to cause SRAM irreparable harm for which there is no adequate remedy at law.

REQUEST FOR RELIEF

WHEREFORE, SRAM respectfully requests that the Court enter a judgment:

G. Declaring that DNP infringed, induced and/or contributed to the infringement of the '058 patent;

H. Permanently enjoining DNP, its subsidiaries, agents, officers, employees, directors, licensees, servants, successors, assigns, and all others acting in privity or in concert with them, from infringing, actively inducing infringement or contributing to infringement of the '058 patent;

I. Awarding SRAM damages adequate to compensate for DNP's infringing activities, together with interest;

J. Awarding SRAM treble damages pursuant to 35 U.S.C. § 284, and other applicable law, by reason of the willful, wanton, and deliberate nature of DNP's continued infringement;

K. Awarding SRAM its attorneys' fees and costs of suit, pursuant to 35 U.S.C. § 285, and other applicable law;

L. Awarding SRAM such other and further relief as the Court may deem just and proper.

JURY DEMAND

Plaintiff SRAM demands a trial by jury as to all claims and all issues properly triable thereby.

Dated: June 10, 2002

Respectfully submitted,

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US006199447B1

(12) **United States Patent**
Lump et al.

(10) **Patent No.: US 6,199,447 B1**
(45) **Date of Patent: Mar. 13, 2001**

COPY

(54) **BULBOUS GRIP FOR ROTATABLE BICYCLE GEAR SHIFTER**

(75) Inventors: **Brian L. Lump**, Downers Grove; **David J. Zimberoff**, Chicago; **Patrick J. Brady**, Chicago; **Michael W. Larson**, Chicago, all of IL (US)

(73) Assignee: **SRAM Corporation**, Chicago, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/980,113**

(22) Filed: **Nov. 26, 1997**

Related U.S. Application Data

(63) Continuation-in-part of application No. 08/730,352, filed on Oct. 15, 1996, now abandoned, which is a continuation of application No. 08/330,285, filed on Oct. 27, 1994, now Pat. No. 5,564,316, which is a continuation-in-part of application No. 08/287,721, filed on Aug. 9, 1994, now Pat. No. 5,584,213, which is a continuation-in-part of application No. 08/207,249, filed on Mar. 7, 1994, now Pat. No. 5,476,019.

(51) **Int. Cl.**[7] **B62K 23/04**; B62K 21/26

(52) **U.S. Cl.** **74/551.9**; 74/489

(58) **Field of Search** ..... 74/551.9, 489, 74/488, 551.8, 551.1, 558, 558.5; D8/303, 300, 83; 16/111 R, 110 R, DIG. 12

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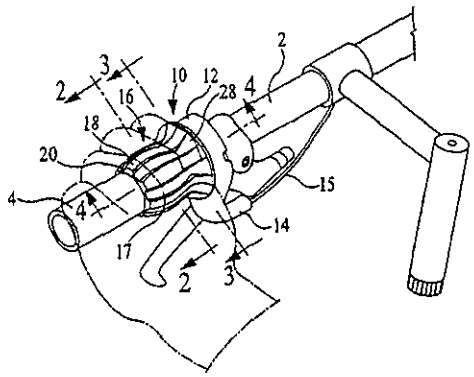
SRAM Corporation Drawings, Apr. 22, 1992 Representation of handgrip designs that were available to the public more than one year prior to the filing of this application.

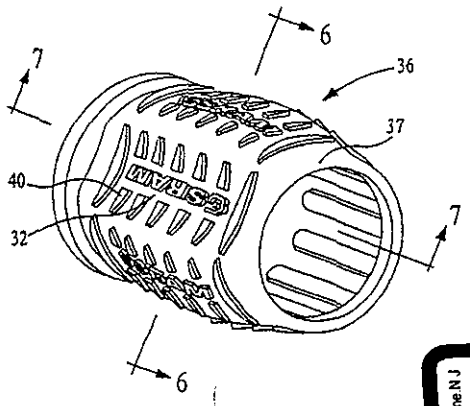
Primary Examiner—Mary Ann Green
(74) *Attorney, Agent, or Firm*—Piper Marbury Rudnick & Wolfe; Jefferson Perkins

(57) **ABSTRACT**

A bulbous rotatable gripping surface for a derailleur-type bicycle gear shifting system is formed of a resilient material with axially extending and angularly alternating ridges and base regions. The bulbous shape extending along the handlebar axis provides an increased diameter that naturally conforms to the longer middle finger of a rider's hand relative to the shorter adjoining index and ring fingers, to aid in the transmission of torque. The ridges and base regions are angularly spaced such that they fit naturally into the crooks of the rider's hand. The ridges, likewise, provide a larger diameter to aid in the transmission of torque and to protrude above any mud which may have collected thereon. To further enhance the torque transmission capabilities of the grip, the gripping surface is provided with a pattern of nubs.

14 Claims, 4 Drawing Sheets





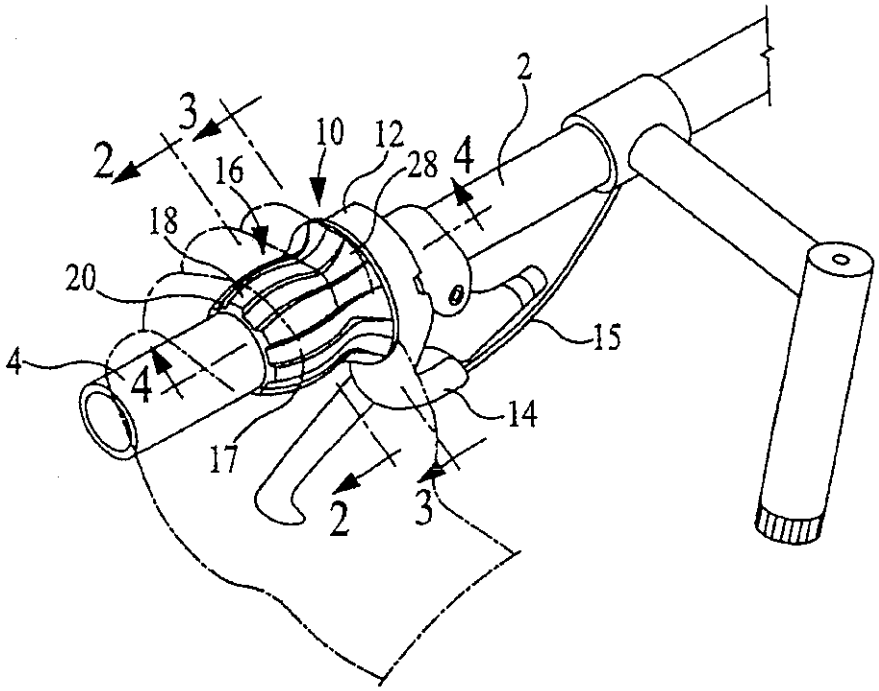


FIG. 1

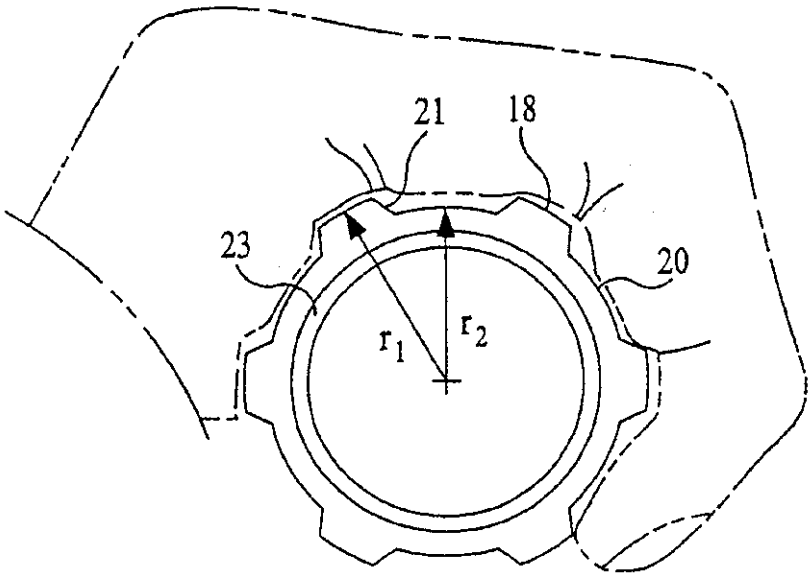


FIG. 2

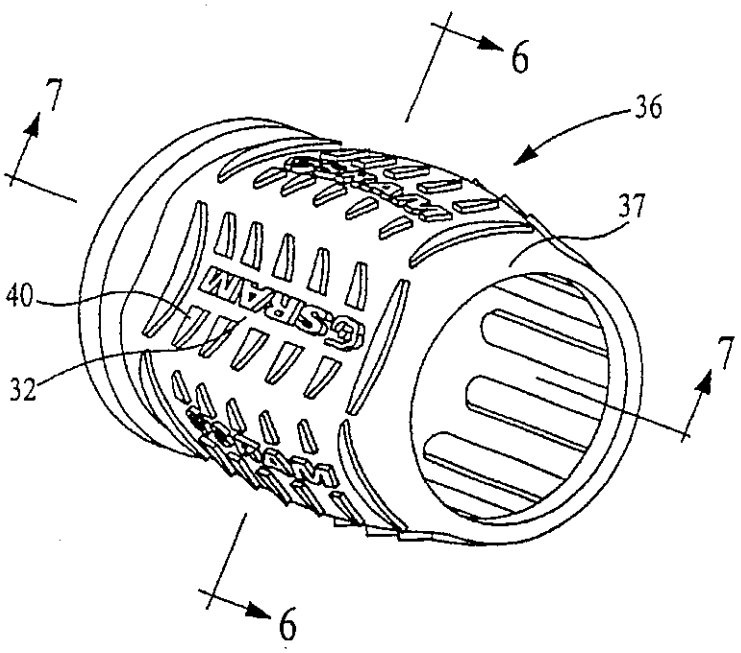


FIG. 5

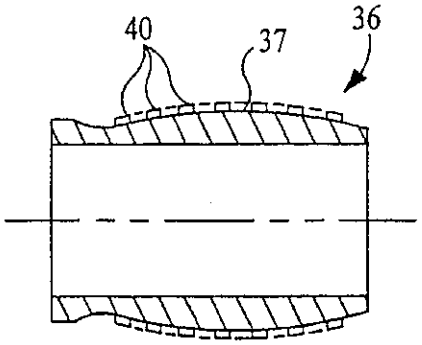


FIG. 7

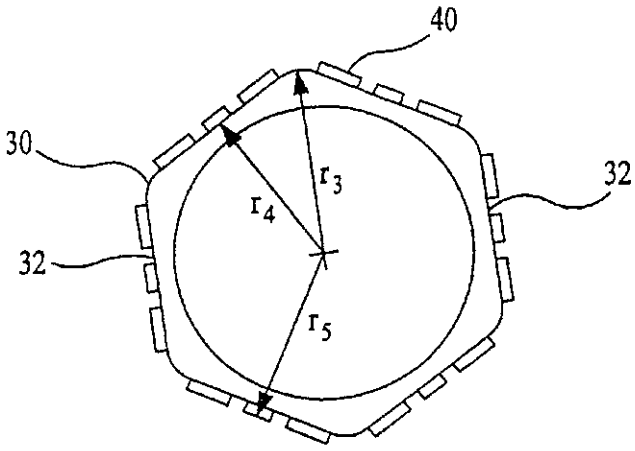


FIG. 6

BULBOUS GRIP FOR ROTATABLE BICYCLE GEAR SHIFTER

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a continuation-in-part of application Ser. No. 08/730,352 filed Oct. 15, 1996, abandoned, which in turn is a continuation of application Ser. No. 08/330,285 filed Oct. 27, 1994, now U.S. Pat. No. 5,564,316 issued Oct. 15, 1996, which in turn is a continuation-in-part of application Ser. No. 08/287,721 filed Aug. 9, 1994, now U.S. Pat. No. 5,584,213 issued on Dec. 17, 1996, which in turn is a continuation-in-part of application Ser. No. 08/207,249 filed Mar. 7, 1994, now U.S. Pat. No. 5,476,019 issued on Dec. 19, 1995. The above patents and the pending application are fully incorporated by reference herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to rotatable grips for actuating a derailleur-type bicycle gear shifting system. More particularly, it relates to handlebar-mounted rotatable grips designed to ergonomically fit the joints and lands of a rider's hand.

2. Description of Related Art

Hand-rotatable bicycle gear shifters have been developed as replacements for older lever-actuated shifters, especially for use in conjunction with off-road or "mountain" bicycles. Hand-rotatable shift actuators are disclosed, for example, In U.S. Pat. No. 4,900,291 issued Feb. 13, 1990; U.S. Pat. No. 4,938,733 issued Jul. 3, 1990; U.S. Pat. No. 5,102,372 issued Apr. 7, 1992; and U.S. Pat. No. 5,476,019 issued Dec. 19, 1995. All of these patents are assigned to the assignee of this application. In each of the foregoing patents, a bicycle derailleur is actuated by a rotatable grip which is located on the handlebar of the bicycle inboard of a customary stationary handgrip. Prior to this invention, the gripping surface of rotatable grips sold by the assignee of this application was typically formed of foam rubber or neoprene and had a smooth outer surface, as shown in FIGS. **33** and **40** of U.S. Pat. No. 5,102,372 and FIGS. **21** and **40** of U.S. Pat. No. 5,197,927 reference above.

The assignee has experimented with hand-rotatable grips with axially extending ribs where the grips were formed of a hard plastic material such as ABS; these grips were less than optimal in that they presented harsh sharp edges to the operator's hand. These edges were uncomfortable to the rider, presenting an especially acute problem during jarring off-road bicycle riding over uneven surfaces and obstacles. Also, these prior rotatable grips of the assignee tended to become slippery when fouled by mud and the like, reducing the amount of torque capable of being applied by the rider and requiring the rider to exert a greater gripping force on the shifters. A need therefore exists for improved grips with optimum torque-transmission and anti-fouling features which are adapted to be incorporated into a hand-rotatable gear shifter.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a gripping surface on a handlebar-mounted rotatable grip for actuation of a derailleur-type bicycle gear shift system which more readily and comfortably transmits torque from the rider's hand to the shifter. It is a further object of this invention to provide a gripping surface for a rotatable grip which will allow the rider to effectively transmit torque to the shifter in the presence of mud and debris while providing a comfortable surface for the rider to grip.

According to one aspect of the invention, a grip for a hand-rotatable bicycle gear shifter is provided with an outer gripping surface in the form of a bulb in a direction parallel to the shifter axis with axially extending ridges angularly spaced by elongated base regions about the grip circumference. The ridges are displaced radially outwardly relative to the adjoining base regions. The bulbous shape at the general outer surface of the grip along the shifter axis provides a larger gripping diameter that accommodates the extended length of a rider's middle finger relative to the shorter adjoining index and ring fingers. Both the bulbous shape along the shifter axis and the angularly alternating ridges and base regions define the outer surface of the grip in order to maximize the surface area contacting the rider's hand. The axially extending ridges are of a width and are spaced such that the thumb and at least the index finger and the portion of the palm therebetween readily engage at least 2 or more of the ridges to further enhance torque transmission to the shifter. Additionally, the larger diameter ridges and bulb shape enable the rider to shift with greater mechanical advantage, thereby reducing the torque transmission and gripping or clasping forces that the rider must exert on the shifter.

In a further embodiment of this invention, a rotatable grip is provided with axially extending ribs on the bulbous general outer surface. The axially extending ribs are also of a width and are spaced such that the thumb and at least the index finger and the portion of the palm therebetween readily engage at least 2 or more of the ridges to further enhance torque transmission to the shifter. The ribs are angularly spaced by grooves about the grip circumference, the ribs defining sidewalls formed at a substantial angle to the outer surface of the bulbous grip. A primary function of the ribs is to ensure that a grippable surface protrudes above any mud and debris that may collect on the grip. An additional primary function of the ribs is to improve torque transmission by providing a larger diameter operating surface with more deformable and engageable edges.

In further embodiments of this invention, the ribs, ridges and base regions of the preferred embodiments described herein are provided with radially extending nubs which provide enhanced torque transmission by presenting smaller surface areas which are deflected by engagement with the thumb and at least the index finger and the portion of the palm therebetween. Preferably, a profile of these nubs in an axial section is also bulbous, and the distance between the profile of the general outer surface and that of the nubs is substantially constant.

BRIEF DESCRIPTION OF THE DRAWINGS

Other aspects of the invention and their advantages will be discerned from the following detailed description, in which like characters denote like parts, and in which:

FIG. **1** is an isometric view of a portion of a bicycle handlebar on which is mounted a hand-rotatable gear shifter incorporating a bulbous grip according to the invention;

FIG. **2** is a sectional view taken substantially along line 2—2 of FIG. 1;

FIG. **3** is a sectional view taken substantially along line 3—3 of FIG. 1;

FIG. **4** is an axial sectional view taken substantially along line 4—4 of FIG. 1;

FIG. **5** is an isometric view of a rotatable bulbous grip according to another embodiment of the invention;

The right radial distance between the profile of the surface 37 and the profile of the nubs 40 remains substantially constant, therefore, the deformability and cushioning of the nubs 40 remains substantially constant for the fingers and portion of the palm clasping grip 36.

While FIG. 7 is a section taken through two opposed base regions 32, and demonstrates the bulbous profile thereof, an axial section taken through two opposed ridges 30 would likewise yield a bulbous or prolately convex profile. Preferably, the bulbousness of the ridges 30 matches the bulbousness of the base regions 32 so that the crook-engaging features of the grip 36 will be present on all fingers designed to be received by the grip 36.

According to the preferred embodiments of the invention, the prolately bulbous or convex shape of rotatable grips 16 and 36, as taken in a section extending axially along the handlebar axis, provides a larger diameter that naturally conforms to the longer middle finger of a rider's hand relative to the shorter adjoining index and ring fingers. Additionally, a reduced diameter valley region, along line 3—3 of FIG. 4, created between the crown 26 of the bulb, along line 2—2 of FIG. 4, and the flange 28 adjacent the housing 12, naturally cradles and supports the rider's index finger on three sides, thereby further enhancing the torque transmitting characteristics of the shifter. The larger diameter of the bulb relative to the valley region, and the larger diameter of the ribs 18 and ridges 30, enable the rider to shift with greater mechanical advantage, thereby reducing the required shifting force by the rider. Regardless of whether the grip outer surfaces 17 and 37 are characterized by spaced ridges and base regions or ribs and grooves, the bulbous shape along the handlebar axis and the pattern of radially protruding rib or ridge features about the grip circumference provide the rider with a significantly improved ergonomic gripping surface that more naturally conforms to the rider's hand. This in turn allows the rider to exert less gripping force on and impart a greater shifting torque to the shifter 16, thereby reducing hand fatigue.

In summary, novel grips for hand-rotatable bicycle gear shifter have been disclosed and illustrated which provide bulbous surfaces for good retention of torque transmission under adverse environmental conditions, and which optimize the transmission of torque by being ergonomically fitted to a rider's hand. While preferred embodiments and their advantages have been described in the above detailed description, the invention is not limited thereto but only by the scope and spirit of the appended claims.

What is claimed:

1. A hand-rotatable shift actuator adapted to be coaxially mounted over a bicycle handlebar inboard of a stationary handgrip, said shift actuator comprising:

a rotating member adapted to be rotated with respect to the handlebar to actuate a control cable of a bicycle gear shifting system and having an axis and an exterior; and

a resilient grip mounted on the exterior of said rotating member and having an outer surface defining a bulbous shape in a direction parallel to the axis, the outer surface having an inboard position and an outboard position adjacent this inboard position, the bulbous grip outer surface is adapted to be engaged by an index finger of a user at the inboard position, the inboard position on said grip having a grip outer surface diameter that is smaller than a grip outer surface diameter at the outboard position on said grip, the outboard position adapted to be engaged by a middle finger of the user, the outboard grip position being closer to an end of the handlebar than the inboard grip position.

2. The shift actuator of claim 1, wherein the grip outer surface further defines:

a plurality of elongated ridges formed substantially in parallel with the axis; and

a plurality of elongated base regions angularly spacing apart adjacent ones of said elongated ridges, an outer surface of each of said ridges being radially outwardly displaced from an adjacent base region, an angular extent of said ridges and base regions being preselected such that said grip is adapted to be engaged by a thumb, at least an index finger, and a palm therebetween of a hand of a rider in such a way that the ridges engage only the crooks of the rider's hand formed by the thumb, finger and palm therebetween.

3. The shift actuator of claim 2, wherein said grip has no more than six of said ridges.

4. The shift actuator of claim 2, wherein the grip outer surface is provided with nubs in the elongated base regions, each of said nubs having a radially outward surface area, the surface areas of said nubs adapted to be deflected by engagement by the thumb and one or more fingers and the portion of the palm therebetween of the rider.

5. The shift actuator of claim 2, wherein the outer surface of said ridges is provided with nubs, each of said nubs having a radially outward surface area, the surface areas of said nubs adapted to be deflected by engagement by the thumb and one or more fingers and the portion of the palm therebetween of the rider.

6. The shift actuator of claim 5, wherein the grip outer surface is provided with nubs in the elongated base regions, each of said nubs having a radially outward surface area, the surface areas of said nubs adapted to be deflected by engagement by the thumb and one or more fingers and the portion of the palm therebetween of the rider.

7. The shift actuator of claim 1, further comprising a plurality of elongated ribs formed substantially in parallel with the axis on the grip outer surface, a plurality of grooves angularly spacing apart adjacent ones of said ribs, each of said grooves having a base surface, an outer surface of each of said ribs being radially outwardly displaced from the base surface of an adjacent one of said grooves by a sidewall having a predetermined height, an angular extent of said grooves and said height selected such that said grip is adapted to be engaged by a thumb, at least an index finger, and a palm therebetween of a hand of a rider in such a way that said ribs engage only the crooks of a rider's hand formed by said thumb, finger and palm therebetween.

8. The shift actuator of claim 7, where said grip has no more than six of said ribs.

9. The shift actuator of claim 7, wherein the outer surface of said ribs is provided with nubs, each of said nubs having a radially outward surface area, the surface areas of said nubs adapted to be deflected by engagement by the thumb and one or more fingers and the portion of the palm therebetween of the rider.

10. A hand-rotatable shift actuator adapted to be coaxially mounted over a bicycle handlebar, said shift actuator comprising:

a rotating member adapted to be rotated with respect to the handlebar to actuate a control cable of a bicycle gear shilling system and having an axis and a cylindrical exterior; and

a resilient grip mounted on the cylindrical exterior of said rotating member and having an outer surface defining a bulbous shape in a direction parallel to the axis, the

US005823058A

United States Patent [19]

Arbeiter

[11] Patent Number: 5,823,058

[45] Date of Patent: Oct. 20, 1998

[54] **TWIST-GRIP SHIFTER FOR BICYCLES AND A BICYCLE HAVING A TWIST-GRIP SHIFTER**

[75] Inventor: Markus Arbeiter, Würzburg, Germany

[73] Assignee: Mannesmann Sachs AG, Schweinfurt, Germany

[21] Appl. No.: 610,651

[22] Filed: Mar. 4, 1996

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 566,284, Dec. 1, 1995, Pat. No. 5,666,859, which is a continuation-in-part of Ser. No. 563,996, Nov. 29, 1995, Pat. No. 5,588,925.

[60] Provisional application No. 60/004,006, Sep. 20, 1995.

[30] Foreign Application Priority Data

Dec. 2, 1994 [DE] Germany 44 42 953.3
Dec. 2, 1994 [DE] Germany 44 42 952.5

[51] Int. Cl.[6] B62K 23/04; B62M 25/04

[52] U.S. Cl. 74/489; 74/473.13; 74/506

[58] Field of Search 74/489, 506, 473.13, 74/473.14

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9412207	2/1995	Germany .
29502403	6/1995	Germany .
0180484	8/1962	Sweden .
9318960	9/1993	WIPO .
9318961	9/1993	WIPO .
9319977	10/1993	WIPO .

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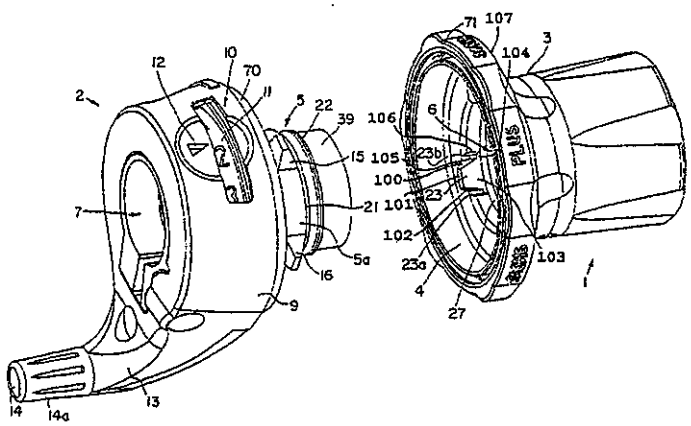
Primary Examiner—Allan D. Herrmann
Attorney, Agent, or Firm—Nils H. Ljungman and Associates

[57] ABSTRACT

A twist-grip shifter for bicycles having a twist grip or grip part which is actuated by the rider's hand to change the gears of the bicycle, and a cable winding mechanism or coil wind-up mechanism. The twist grip and the cable winding mechanism of the twist-grip shifter can be connected to one another by providing claws or projections on a tubular extension of the cable winding mechanism, and by providing corresponding recesses inside the twist grip, in which recesses the claws can be engaged. One of the claws and one of the recesses can be configured differently from the other claws and recesses, in order to simplify the assembly of the two parts with respect to one another.

18 Claims, 16 Drawing Sheets



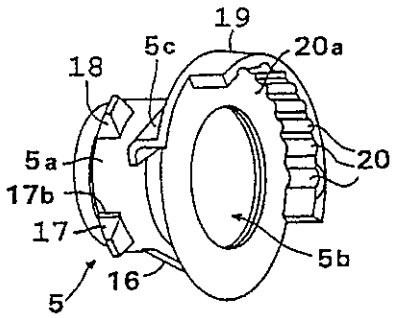


FIG. 2

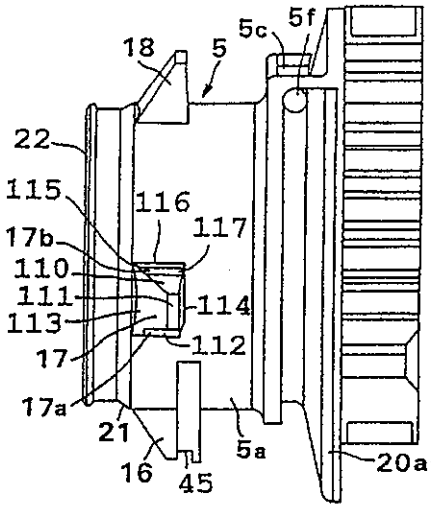


FIG. 3

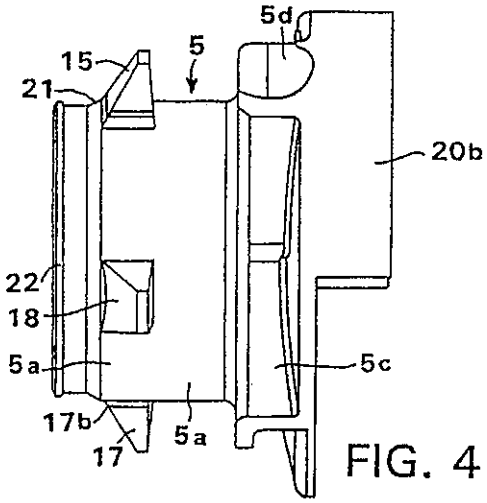


FIG. 4

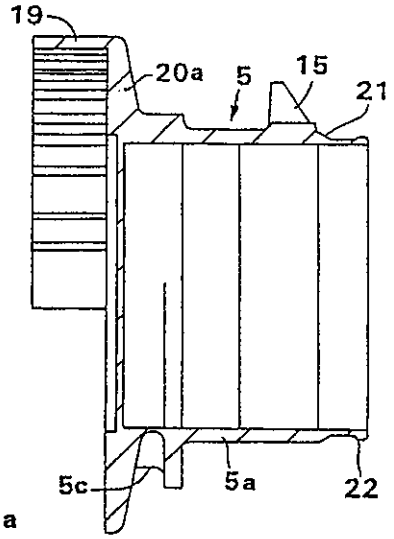


FIG. 5

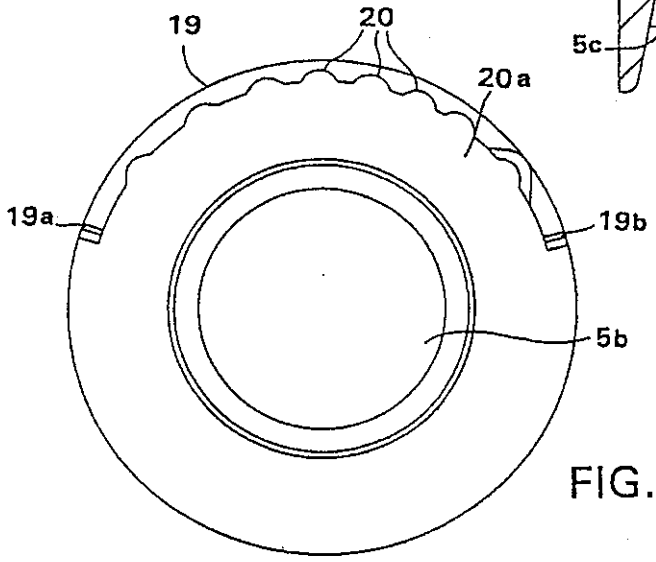


FIG. 6

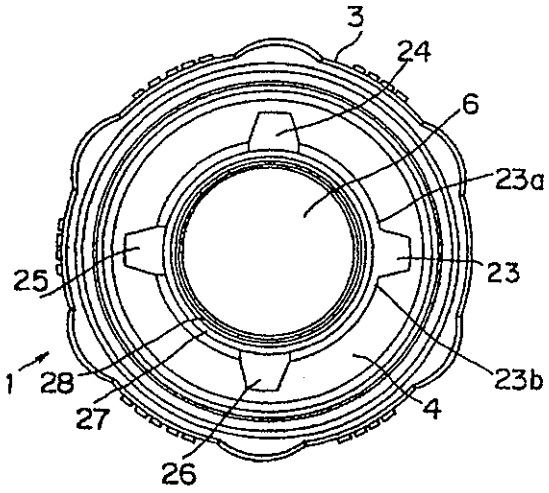


FIG. 9

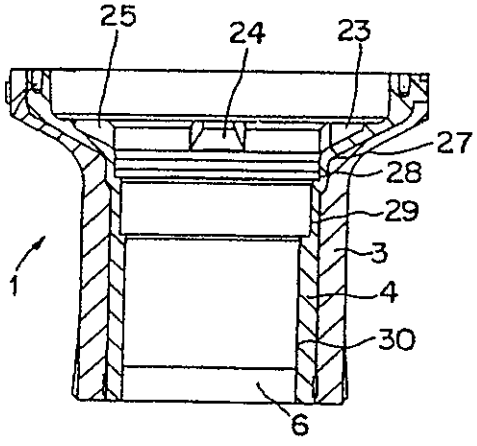


FIG. 10

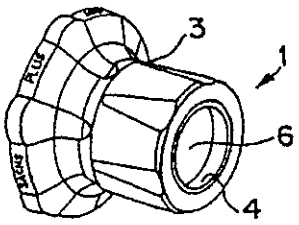


FIG. 11

FIG. 13A

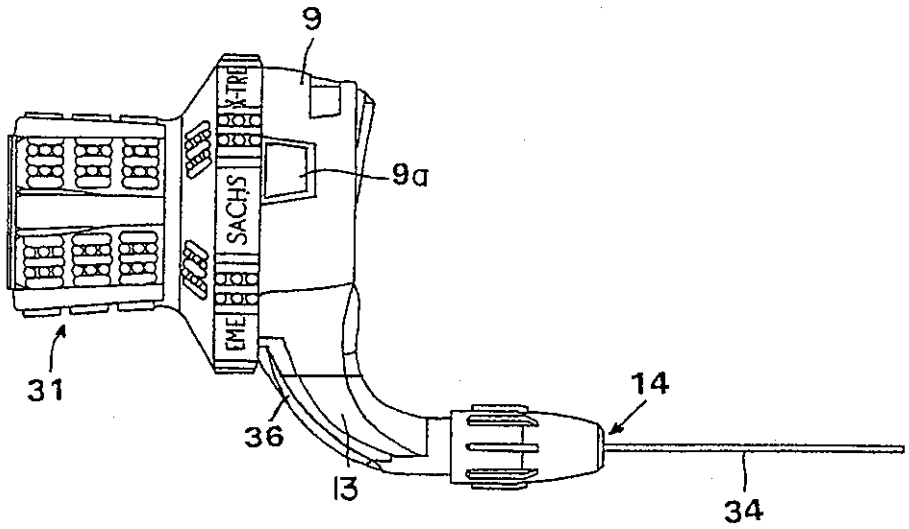
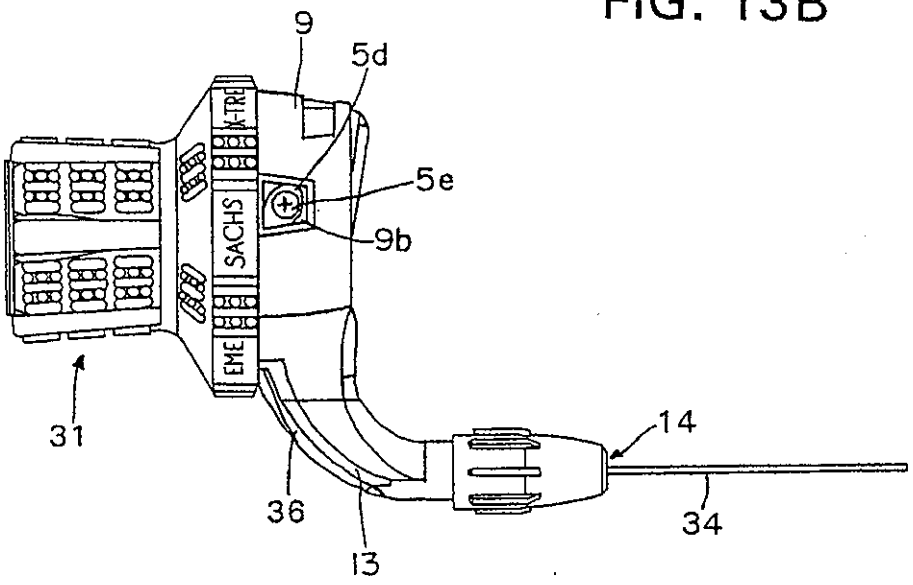


FIG. 13B



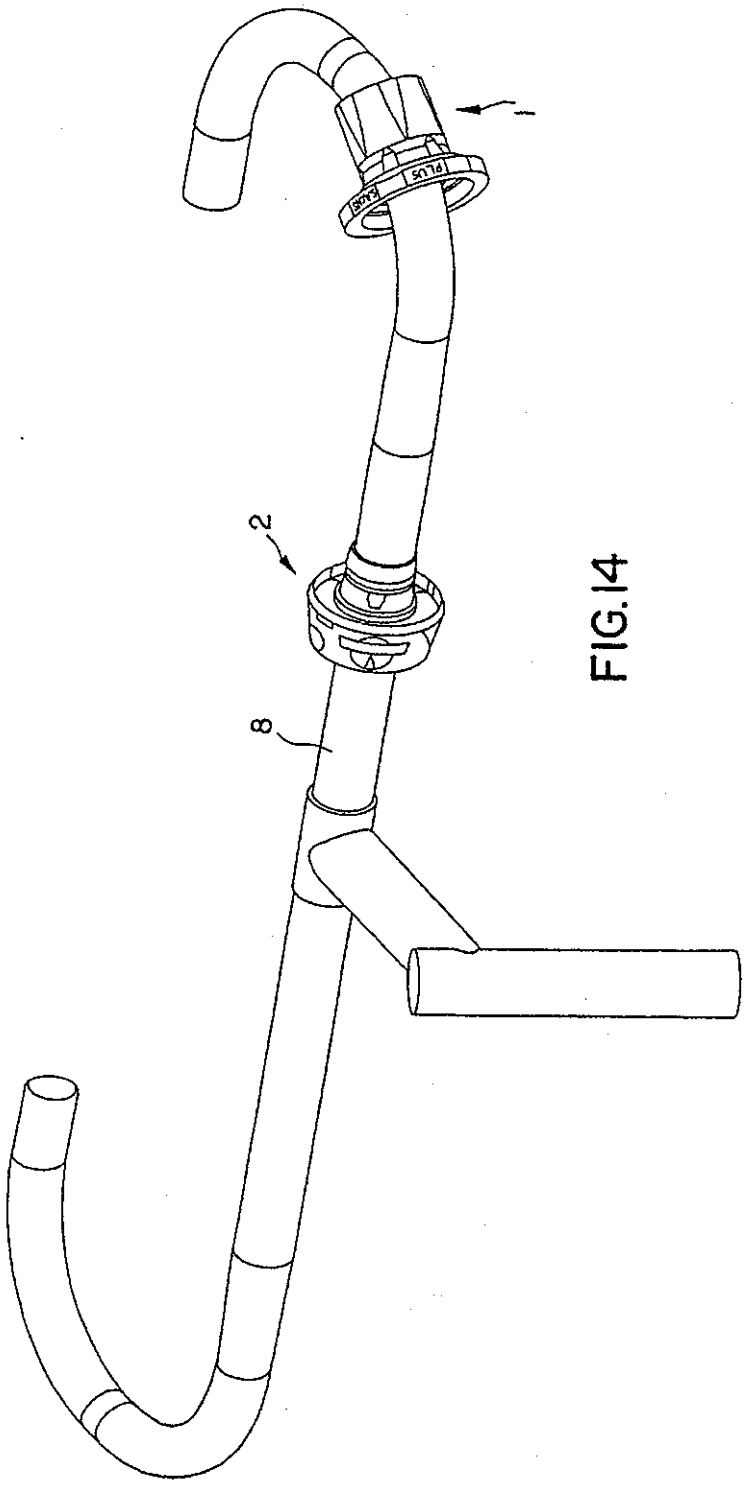


FIG.14

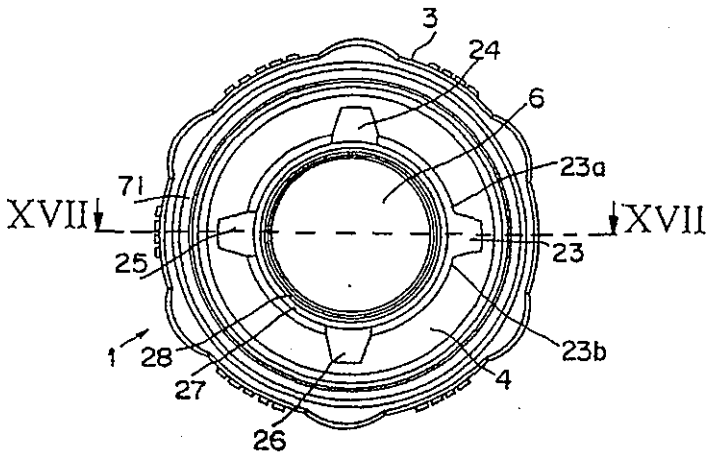


FIG. 16

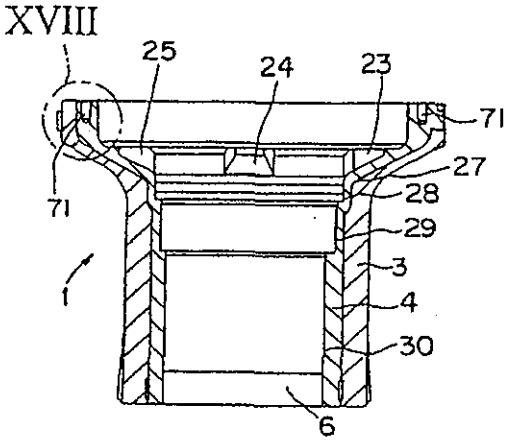


FIG. 17

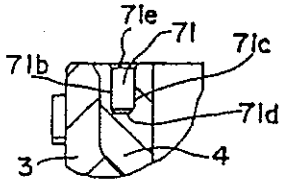


FIG. 18

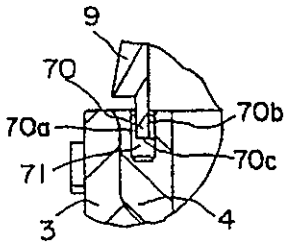


FIG. 18A

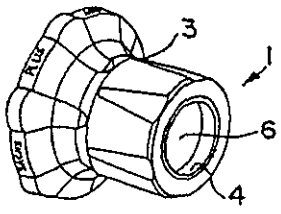


FIG. 19

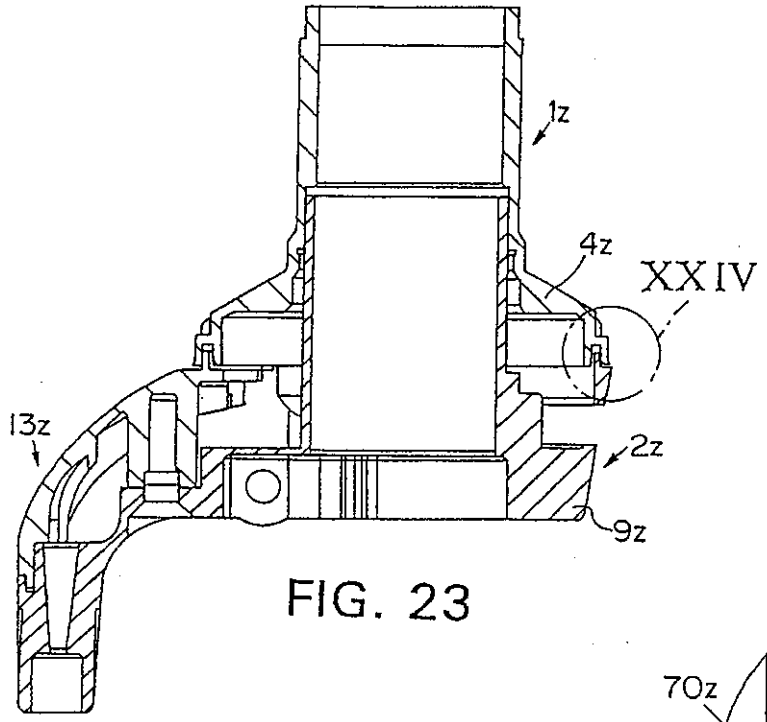


FIG. 23

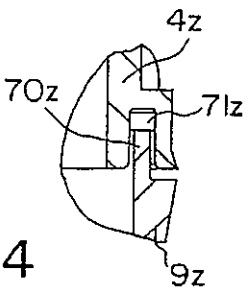


FIG. 24

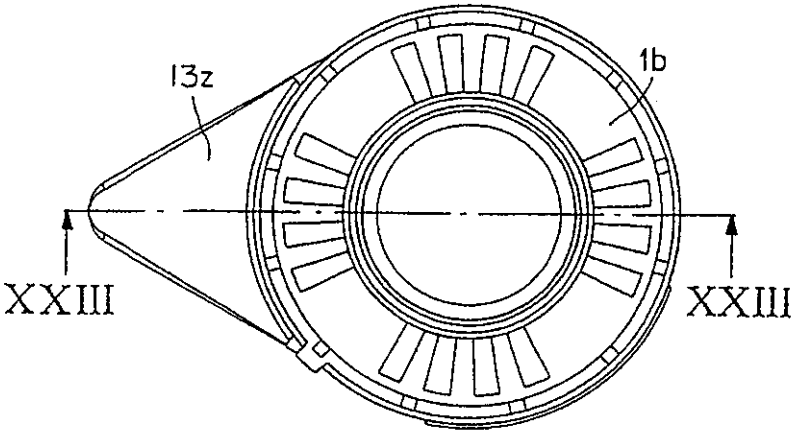


FIG. 25

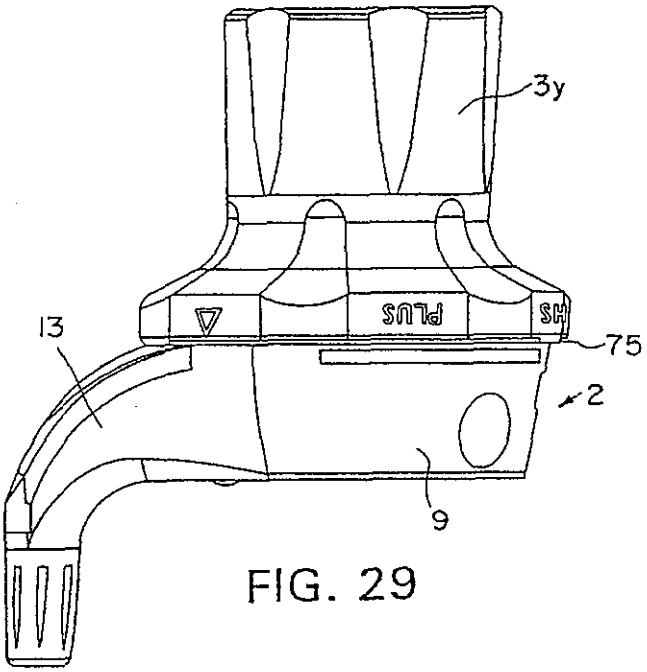


FIG. 29

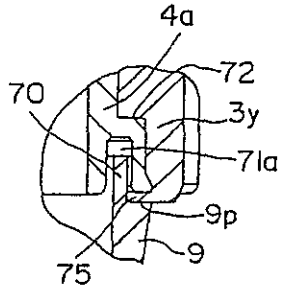


FIG. 30

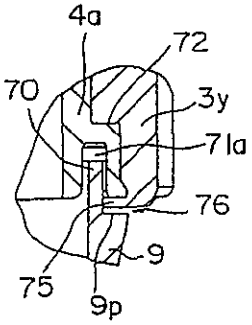


FIG. 30A

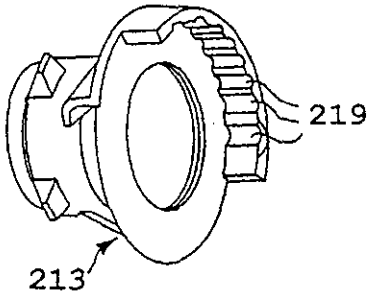


FIG. 31

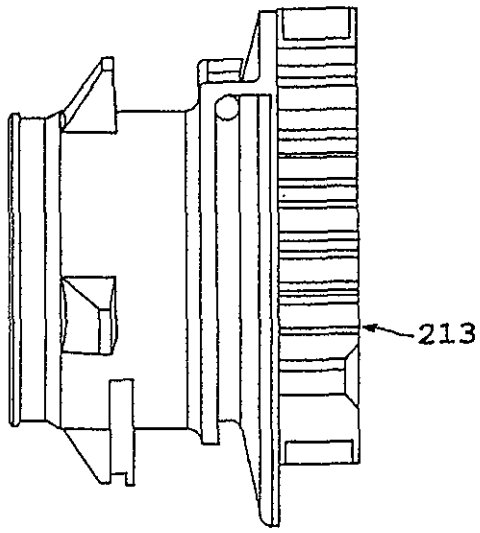


FIG. 32

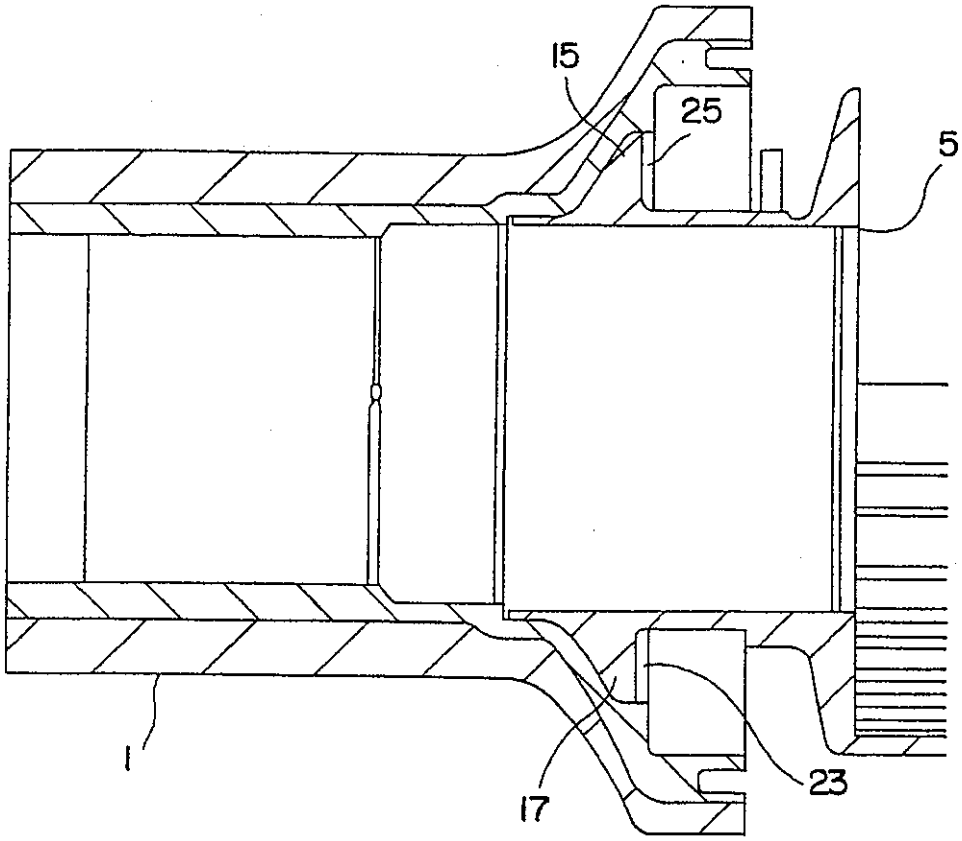


FIG. 36

configured differently than the other three recesses, in order to essentially guarantee a correct assembly of the two parts with respect to one another. Thus, an essentially simple and reliable connection can be achieved between the grip part of a twist-grip shifter and the cable winding mechanism of a twist-grip shifter, which connection can be configured such that an incorrect installation of the two parts with respect to one another can be avoided.

One aspect of the invention resides broadly in a bicycle, the bicycle comprising: a frame; at least two wheels, the at least two wheels comprising at least a front wheel and a rear wheel; the at least two wheels being disposed on the frame; apparatus for propelling at least one of the front wheel and the rear wheel; the apparatus for propelling comprising: a chain; at least two sprockets to engage the chain; at least two pedals, the at least two pedals being connected to one of the at least two sprockets; a seat, the seat being disposed on the frame; a handlebar for steering the bicycle; a bicycle gearing system, the bicycle gearing system comprising: apparatus for shifting gearing associated with the rear wheel of the bicycle; shift actuator apparatus rotatably mounted on the handlebar, generally coaxially with the handlebar; at least one control cable having a first end and a second end; the first end of the at least one control cable being operatively associated with the shift actuator apparatus; the second end of the at least one control cable being operatively associated with the apparatus for shifting gearing; the shift actuator apparatus comprising: a first part for being rotated in a first direction and a second direction; the first part being operatively connected to the apparatus for shifting gearing; the first part comprising a rotatable grip part; a second part, the second part comprising apparatus for actuating the first end of the at least one control cable; apparatus for connecting the first part and the second part to one another, and for rotating the first part and the second part along with one another; a housing, at least a portion of the second part being disposed within the housing.

Another aspect of the invention resides broadly in a handlebar mountable bicycle gear shifter, the gear shifter comprising: shift actuator apparatus rotatably mounted on a handlebar, generally coaxially with the handlebar; at least one control cable having a first end and a second end; the first end of the at least one control cable being operatively associated with the shift actuator apparatus; the second end of the at least one control cable for being operatively associated with gearing; the shift actuator apparatus comprising: a first part for being rotated in a first direction and a second direction; the first part being operatively connected to the gearing; the first part comprising a rotatable grip part; a second part, the second part comprising apparatus for actuating the first end of the at least one control cable; apparatus for connecting the first part and the second part to one another, and for rotating the first part and the second part along with one another; a housing, at least a portion of the second part being disposed within the housing.

The above discussed embodiments of the present invention will be described further hereinbelow with reference to the accompanying figures. When the word "invention" is used in this specification, the word "invention" includes "inventions", that is, the plural of "invention". By stating "invention", the Applicants do not in any way admit that the present application does not include more than one patentably and non-obviously distinct invention, and maintains that this application may include more than one patentably and non-obviously distinct invention. The Applicants hereby assert that the disclosure of this application may include more than one invention, and, in the event that there is more than one invention, that these inventions may be patentable and non-obvious one with respect to the other.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is described in greater detail below with reference to the accompanying drawings, in which:

FIG. 1 shows an exploded view of a twist grip and a cable winding mechanism of a twist-grip shifter;

FIG. 2 shows a perspective view of the tubular extension of the cable winding mechanism;

FIG. 3 shows a side view of the tubular extension of the cable winding mechanism;

FIG. 4 shows an additional side view of the tubular extension of the cable winding mechanism, rotated by about 45° with respect to the view shown in FIG. 3;

FIG. 5 shows a cross-section of the tubular extension of the cable winding mechanism;

FIG. 6 shows an end view of the tubular extension of the cable winding mechanism;

FIG. 7 shows an additional side view of the tubular extension of the cable winding mechanism, rotated by about 45° from the view shown in FIG. 4;

FIG. 8 shows an additional end view of the tubular extension of the cable winding mechanism, opposite of the end view shown in FIG. 6;

FIG. 9 shows an end view of the twist grip of the twist-grip shifter shown in FIG. 1;

FIG. 10 shows a cross-section of the twist grip shown in FIG. 1;

FIG. 11 shows an additional perspective view of the twist grip shown in FIG. 1;

FIG. 12 shows an exploded view of a complete twist-grip shifter;

FIG. 13 shows the twist-grip shifter of FIG. 12 fully assembled;

FIG. 13A also shows the twist-grip shifter of FIG. 12 fully assembled, but shows the opposite side of the twist-grip shifter than that shown in FIG. 13;

FIG. 13B shows substantially the same view as shown in FIG. 13A, but with the cover panel removed;

FIG. 13C shows the interior of the cable winding portion;

FIG. 13D shows a frontal view of the guide;

FIG. 13E shows the interior of the cover for the arm or cable inlet segment;

FIG. 14 shows the twist grip shifter of FIG. 1 being assembled on a handlebar of a bicycle;

FIG. 15 shows one example of a bicycle and bicycle transmission incorporating the present invention;

FIG. 16 shows an end view of the twist grip of the twist-grip shifter shown in FIG. 1;

FIG. 17 shows a cross-section of the twist grip shown in FIG. 1;

FIG. 18 shows an enlarged view of the groove of the twist grip shown in FIG. 17;

FIG. 18A shows essentially the same view as FIG. 18, but shows the collar;

FIG. 19 shows an additional perspective view of the twist grip shown in FIG. 1;

FIG. 20 shows a side view of the cable winding portion and a twist grip connected to one another;

FIG. 21 shows a cross-section of the seal between the cable winding portion and the twist grip of FIG. 20;

which stepped portions 17*a* and 17*b* can preferably be located at the base of claw 17 (i.e. where claw 17 joins tubular extension 5*a*), and on both sides 17*c* and 17*d* of claw 17 (as best shown in FIG. 8). Of course other configurations of claw 17 would be within the scope of the present invention, and stepped portions 17*a* and 17*b* are presented as one example of a method for configuring claw 17 differently from the other claws 15, 16 and 18. As illustrated in FIG. 3, claw 17 can have a first side 110, a second side 112, a third side 111, a front side 113, a back side 114 and a base portion 115. In addition, the stepped portion 17*b* can have a first surface 116 and a second surface 117.

Twist grip 1, as shown in FIGS. 1 and 9–11, can, along the same lines, have four recesses 23, 24, 25 and 26 located in interior portion 4, in which recesses claws 15, 16, 17 and 18 of tubular extension 5*a* can be engaged. In FIG. 1 only one recess 23 can be seen, due to the particular orientation of the twist grip 1, but see FIG. 9. The recess 23 shown in FIG. 1 can preferably be configured to engage only with claw 17 of the tubular extension 5*a*, so that an incorrect installation of tubular extension 5*a* inside the twist grip 1 can be avoided. Thus, recess 23 can have stepped portions 23*a* and 23*b* for respectively engaging with stepped portions 17*a* and 17*b* of claw 17. The recess 23 can include a first side 100, a second side 102, a third side 101, a back side 103 and a base portion 104. The stepped portion 23*b* can also include a first surface 106 and a second surface 105.

With regard to the above, a specific orientation of the twist grip 1 with respect to the cable winding portion 2 may be desirable if the twist grip 1 has a marking on the exterior portion 3 at its largest diameter, such as an arrow for example, which marking can be used to point to the current gear in gear display 11 located on housing 9 of the cable winding portion 2. In this case, the claw and recess which are to have the different configuration than that of the other claws and recesses should be selected so the location of the "special" claw and recess coordinate with the location of the gear display 11 on the housing 9. In other words, the location of the "special" claw and recess should be chosen so that the range of rotation of the twist grip 1 coordinates with the location of the gear display 11 on the cable winding portion 2. In this situation, the indicator 12 shown in FIG. 1 which is located on the housing 9 essentially would not be necessary, since a marking or gear indicator would instead be located on the exterior portion 3 of the twist grip 1. Thus, once the twist grip 1 is connected to the cable winding portion 2, the marking on the twist grip 1 can be utilized to indicate the current gear of the bicycle transmission by pointing to a gear number shown in the gear display 11.

In addition, it should be understood that a greater or lesser number of claws 15, 16, 17, and 18 and recesses 23, 24, 25 and 26 would be within the scope of the present invention, provided that the number of claws is sufficient for transmitting the torque applied by the rider's hand or fingers to the cable winding mechanism 5.

In accordance with one embodiment of the present invention, the claws 15, 16, 17 and 18 can preferably be located at about 90° intervals from one another along tubular extension 5*a*. Similarly, recesses 23, 24, 25 and 26 can also be located at about 90° intervals from one another inside interior portion 4. Of course, it should be understood that the above-mentioned angular orientations of the claws 15, 16, 17, and 18 and recesses 23, 24, 25 and 26 with respect to one another are only one example of one type of configuration in accordance with the present invention, and that other configurations and/or orientations of the claws 15, 16, 17 and 18 and recesses 23, 24, 25 and 26 would be within the scope of the present invention.

The tubular extension 5*a* of the cable winding mechanism 5 can also preferably have an angled or sloped circular portion 21 located near claws 15, 16, 17, and 18, and a bead or flange 22 (see FIGS. 1, 3, 4, 5 and 7) located next to angled portion 21. Angled portion 21 can engage with a corresponding angled portion 27 (see FIG. 1) located in the interior portion 4 of the twist grip 1, and the bead 22 can likewise engage with a groove 28 located inwardly of angled portion 27 (see FIGS. 9 and 10). Thus, once the cable winding mechanism 5 has been inserted into the twist grip 1, and the claws 15, 16, 17 and 18 are engaged in a corresponding recess 23, 24, 25 and 26, bead 22 can be engaged in groove 28, and angled portion 21 can fit against angled portion 27. Once inserted into the twist grip 1, the tubular extension 5*a* will then be non-rotationally connected to the twist grip 1, such that when the twist grip 1 is turned by the rider, the interior portion or twist part 4 rotates, and thus rotates the tubular extension 5*a*, and, since the shifting cable is connected to the cable winding mechanism 5 by means of the guide 5*c* discussed hereinabove, the shifting cable can be moved along with the tubular extension 5*a* in order to change the gears of the bicycle by means of a hub transmission or derailleur transmission (see FIG. 15).

In other words, and in accordance with one embodiment of the present invention, one end of the control or shifting cable can preferably be fastened to the hub or derailleur transmission of the bicycle. This end of the cable can be biased by a spring or similar device in the bicycle transmission. The other end of the cable can be connected to the cable winding mechanism 5 by means of orifice 5*f* and guide 5*c* as discussed above. Thus, when for example, the rider upshifts (i.e. shifts from a lower gear to a higher gear), the cable is essentially released from the previous gear position, and can essentially be "unwound" from the tubular extension 5*a* of the cable winding mechanism 5. This motion of the cable can be assisted by the spring in the transmission which pulls on the cable. For this movement, i.e. upshifting, relatively little force is typically needed on the twist grip 1, so the portion of the twist grip 1 with the smaller diameter can preferably be used by the rider. Oppositely, when the rider downshifts (i.e. shifts from a higher gear to a lower gear), the cable is "wound" around the tubular extension 5*a* of the cable winding mechanism 5, against the force of the transmission spring. For this movement, i.e. downshifting, a larger force is typically needed on the twist grip 1, so the portion of the twist grip 1 having the larger diameter can be used by the rider in this situation for a more effective transmission of torque.

As best seen in FIG. 10, the interior portion 4 of the twist grip 1 can also have two stepped portions 29 and 30, located inwardly from groove 28. Stepped portion 29 can preferably have a smaller diameter than does the groove 28, and a larger diameter than stepped portion 30.

FIG. 12 shows an additional exploded view of a complete twist-grip shifter, which twist-grip shifter has a different twist grip 31 than the twist grip 1 discussed above, and also has a different cable connection or cap 34*a* than the cap 14*a* shown in FIG. 1. FIG. 13 shows the twist-grip shifter of FIG. 12 fully assembled. The twist grip 31 shown in FIGS. 12 and 13 has a different exterior surface 32 than that of exterior portion or grip part 3 of twist grip 1, otherwise, the twist-grip shifter shown in FIGS. 12 and 13 is essentially identical to the twist-grip shifter discussed hereinabove. The description presented herebelow can be considered to be one possible method of assembling the twist-grip shifter of the present invention.

The twist-grip shifter shown in FIGS. 12 and 13 can preferably have a bracket 33 which can be inserted inside

is of the traditional drop bar type, although it is to be understood that the present invention is equally applicable to virtually any type of bicycle handlebar.

A down fork 62 consisting of left and right seat stays extends downwardly and rearwardly from the upper portion of seat tube 54, and a bottom fork 63 consisting of left and right chain stays extends rearwardly from bottom bracket 55. The left sides of down fork 62 and bottom fork 63 are connected at their rear ends, and similarly the right sides of down fork 62 and bottom fork 63 are connected at their rear ends, and these rear connections support rear wheel dropouts which define the axis 64 of rear wheel 65.

A seat stem 66 is engaged in the upper end of seat tube 54, and is releasably secured by a seat clamp 67. The pedal crank, generally designated 68, is rotatably journalled in bottom bracket 55, and includes right and left crank arms 69. A chain wheel cluster designated 170 is rigidly supported on pedal crank 68, and constitutes the sprocket cluster of the front derailleur assembly. Most commonly, the chain wheel cluster will embody two chain wheels, although it is also common to have chain wheel clusters with three chain wheels. An endless drive chain 171 transmits power from the chain wheel cluster 170 to a multiple freewheel 172 that is operatively connected to the rear wheel hub mechanism in a conventional manner.

A front derailleur mechanism designated 173 cooperates with chain wheel cluster 170 to shift chain 171 laterally between two chain wheels of cluster 170, down-shifting from the smaller chain wheel to the larger chainwheel, or up-shifting from the larger chain wheel to the smaller chain wheel. A rear derailleur mechanism designated 174 is pivotally connected to the frame proximate the right side portions of down fork 62 and bottom fork 63 for shifting chain 171 laterally from sprocket to sprocket of the multiple freewheel 172. A front control cable (not shown) operatively connects a front twist-grip shifter (not shown) in accordance with the present invention to the front derailleur mechanism 173 such that the front twist-grip shifter cooperates with and controls the shifting of the front derailleur mechanism 173. Similarly, a rear control cable 175 operatively connects a rear twist-grip shifter, including twist grip 1 and cable winding portion portion 2 in accordance with the present invention, to the rear derailleur mechanism 174 such that the rear twist-grip shifter cooperates with and controls the shifting of the rear derailleur mechanism 174.

Referring back to FIG. 1, the disclosure now turns to an additional feature of the present invention relating to a seal between the cable winding portion 2 and the twist grip or grip part 1. As mentioned above, FIG. 1 shows the twist grip or grip part 1 and the cable winding portion 2 disassembled from one another, which is useful here for illustrating the seal between the two parts.

Since it is highly desirable to prevent dirt and debris from entering the interior of the twist-grip shifter, a seal can preferably be provided adjacent the connection of the cable winding portion 2 and the twist grip 1. In accordance with the embodiment shown in FIG. 1, the seal can be a contactless or frictionless seal that includes a collar, tongue or flange 70 disposed about the connecting end of the cable winding portion 2, and a groove 71 formed in the connecting end of the interior portion 4 of the frusto-conical part 107 of the twist grip 1. The collar 70 can be integral with the housing 9, or can be separate component and attached to the housing 9.

The collar 70 of the cable winding mechanism 2 can preferably be positioned with respect to the groove 71 so that when the cable winding portion 2 and the twist grip 1 are fastened to one another, as discussed in detail herebelow, the collar 70 essentially does not contact the walls of the groove 71. When fully assembled, the twist grip 1 can rotate along with the cable winding mechanism 5, which cable winding mechanism 5 is located inside the cable winding portion 2, and the collar 70 and housing 9 of the cable winding portion 2 can remain essentially stationary with respect to the twist grip 1 and the cable winding mechanism 5. Thus, the groove 71 can rotate with respect to the collar 70.

FIGS. 16, 17, 18, 18A and 19 show additional views of the twist grip 1 shown in FIG. 1. Specifically, FIG. 16 shows an end view of the twist grip 1, wherein essentially the entire interior portion 4 can be seen. FIG. 17 shows a cross-section of the twist grip 1 in FIG. 16, FIG. 18 shows an enlarged view of the groove 71 shown in FIG. 17, FIG. 18A shows a view similar to FIG. 18 (but also shows the collar 70), and FIG. 19 shows an additional perspective view of the twist grip 1. FIGS. 16, 17 and 19 are essentially the same views shown in FIGS. 9, 10 and 11, but show additional components.

FIGS. 18 and 18A respectively show enlarged views of the groove 71 and the collar 70 disposed within the groove 71. The groove 71 can preferably have two essentially parallel side walls 71*b* and 71*c*, a bottom wall 71*d*, and a flared or angled end portion 71*e*. Collar 70 likewise can have a generally rectangular cross-section, with two essentially parallel side walls 70*a* and 70*b*, and a bottom wall 70*c*. As can be seen in FIG. 18A, the seal between the cable winding portion 2 and the twist grip 1 can be contactless, or virtually contactless, since the collar 70 preferably does not come into contact with the walls 71*b*, 71*c*, and 71*d* of groove 71.

FIGS. 20, 21 and 22 show the cable winding portion 2 and an additional embodiment of a twist-grip 1*a* wherein the twist grip 1*a* has an end portion which is configured somewhat differently than that of the twist grip 1 shown in detail in FIGS. 18 and 18A. FIG. 20 shows a side view of the cable winding portion 2 and the twist grip 1*a* connected to one another, FIG. 22 shows an end view of FIG. 20, and FIG. 21 shows a cross-section of the seal between the cable winding portion 2 and the twist grip 1*a*. Components of the twist grip 1*a* shown in FIG. 21 which are similar to components of the twist grip 1 have been given the same reference numbers plus an "a". Essentially the only difference between the end portion of the twist grip 1*a* and the end portion of the twist grip 1 is that the interior portion 4 of twist grip 1 (shown in FIGS. 18 and 18A) can preferably be rounded along its juncture with the exterior portion 3, and, in contrast, the end portion of twist grip 1*a* preferably has a stepped portion 72.

FIGS. 23, 24 and 25 show an additional embodiment of a twist-grip shifter in accordance with the present invention, wherein FIG. 23 shows a cross-section of FIG. 25, which FIG. 25 shows an end view, and FIG. 24 shows a cross-section of the seal of FIG. 23, which shows the seal formed by twist grip 1*z* and cable winding portion 2*z*. Components which are similar to the components of the twist grip 1 and cable winding portion 2 have been given the same reference numbers plus a "z". The seal shown in FIG. 24 is similar to the seal shown in FIG. 21, with the exception that the embodiment shown in FIGS. 23, 24 and 25 does not include an exterior portion such as the exterior portion 3 and 3*a* shown in FIGS. 1 and 20, respectively.

FIGS. 26, 26A, 26B, 27 and 28 show an additional embodiment similar to that shown in FIGS. 16–19, but wherein the seal is not a contactless or frictionless seal, but can be considered a lip seal or friction seal. This type of seal

present invention can be found in U.S. Pat. No. 4,427,615 entitled "Method of Making Injection Moulded Plastic Objects with Imbedded Decorative and/or Descriptive Prints".

Examples of methods for molding rubber onto a plastic molding which may be utilized in accordance with the present invention can be found in U.S. Pat. Nos. 4,896,922 to Guthe on Jan. 30, 1990, entitled "Plastic Wheel Assembly"; 4,970,103 to Wolf et al. on Nov. 13, 1990, entitled "Preformed Part Made of Plastics with Integrally Formed Rubber Elastic Parts"; 4,743,422 to Kalriss-Nielsen et al. on May 10, 1988, entitled "Method for Manufacturing a Sealing Body for a Pipe Joint"; and 5,302,336 entitled "Method for Producing Molded Hose Branches from Rubber and a Hose Produced by the Method".

An additional example of a method for making a molded article having a coating can be found in U.S. Pat. No. 4,961,894 entitled "Process for Producing Synthetic Resin Molded Articles".

Examples of injection molding machines and/or methods which can be utilized in accordance with the present invention can be found in U.S. Pat. No. 4,954,074 entitled "Injection Bladder Press", U.S. Pat. No. 5,059,113 entitled "Injection Molding Apparatus", U.S. Pat. No. 5,087,190 entitled "Multiplunger Molding Machine for Liquid Silicone Rubber", U.S. Pat. No. 4,540,359 entitled "Injection Molding Machine", U.S. Pat. No. 3,921,963 entitled "Injection Molding Machine Construction and Method of Operation", U.S. Pat. No. 3,904,078 entitled "Injection Molding Machine having a Programming Device and a Method of Operating the Machine", and U.S. Pat. No. 5,200,208 entitled "Multi-station Rubber Injection Molding Machine".

Examples of injection moldable thermoplastic materials which may be utilized in accordance with the present invention can be found in U.S. Pat. Nos. 4,902,738 to Mitsuno et al. on Feb. 20, 1990, entitled "Thermoplastic Elastomer Composition and Process for Producing Same"; 5,100,960 to Grigo et al. on Mar. 31, 1992, entitled "Thermoplastic Molding Composition of a Polysiloxane Block Copolycarbonate and a Polycarbonate Based on Certain Dihydroxydiphenylcyclo Alkanes"; 5,187,230 entitled "Rubber-modified Polymer Blends of Polycarbonate and PETG"; and 5,095,063 to Okada et al. on Mar. 10, 1992, entitled "Polypropylene Composition".

Examples of injection moldable rubber compositions which may be utilized in accordance with the present invention can be found in U.S. Pat. Nos. 5,082,886 to Jeram et al. on Jan. 21, 1992, entitled "Low Compression Set, Oil and Fuel Resistant, Liquid Injection Moldable, Silicone Rubber"; 5,010,136 to Ohmae et al. on Apr. 23, 1991, entitled "Process for Producing Impact-resistant Polyamide Resin Compositions"; and 5,145,897 to Levif et al. on Sep. 8, 1992, entitled "Rubbery Composition and Polynorbornene-based Thermoplastic Elastomer with Improved Heat Stability".

Examples of injection-compression molding machines and/or methods can be found in U.S. Pat. No. 5,059,364 entitled "Injection-Compression Molding Machine and Method of Molding by Using the Machine", U.S. Pat. No. 5,057,255 entitled "Molding Method and Molding Apparatus in an Injection-Compression Molding Machine", and U.S. Pat. No. 5,044,925 entitled "Injection-Compression Mold".

An example of a process control can be found in U.S. Pat. No. 4,146,601 entitled "Injection Mold Process Control".

Examples of hot runner or nozzle valves or shutters can be found in U.S. Pat. No. 5,078,589 entitled "Multicavity Injection Molding Apparatus having Precision Adjustment and Shut Off of Injection Flow to Individual Mold Cavities", U.S. Pat. No. 5,071,340 entitled "Cooling Arrangement for Valve Stem Gates in Hot Runner Injection Molding Machine Systems", and U.S. Pat. No. 5,067,893 entitled "Injection Molding Apparatus with Shut Off Valve Pin Actuation System".

Examples of a clamping apparatus can be found in U.S. Pat. No. 5,066,217 entitled "Clamping Apparatus for an Injection Molding Machine", U.S. Pat. No. 4,781,568 entitled "Mold Clamping Unit of Injection Molding Machine", and U.S. Pat. No. 4,545,756 entitled "Hydraulic Clamping Apparatus for an Injection Molding Machine".

Examples of a transport apparatus and gripper device can be found in U.S. Pat. No. 5,087,315 entitled "Fabric Lifting Apparatus and Method", U.S. Pat. No. 5,056,246 entitled "Device for Taking Trousers Off an Ironing Machine", U.S. Pat. No. 5,048,815 entitled "Gripper Device on Sheet-Feed Rotary Printing Machines", and U.S. Pat. No. 4,889,221 entitled "Vending Machine for Newspapers or Periodicals".

Some examples of latching shifters which may be used in accordance with the embodiments of the present invention, may be disclosed in the followin U.S. Patents: U.S. Pat. No. 5,421,219 entitled "Bicycle Speed Change System, Bicycle Speed Change Method and Bicycle Speed Change Operation Assembly" to Maeda and Bridgestone; No. 5,390,565 entitled "Bicycle Speed Change System, Bicycle Speed Change Method and Bicycle Speed Change Operation Assembly" to Maeda and Bridgestone; No. 5,315,891 entitled "Bicycle Speed Change Operation Assembly" to Maeda; and No. 5,241,877 entitled "Gear Selector" issued Sep. 7, 1993.

Some examples of latching shifters which may be used in accordance with the embodiments of the present invention, may be disclosed in the following Federal Republic of Germany Patents: No. DE 32 15 426 A1 to Fichtel & Sachs and No. DE 38 23 741 A1 to Shimano.

An additional example of latching shifters which may be used in accordance with the embodiments of the present invention, may be found in French Patent No. 2 540 818.

Some examples of twist grip shifters which may be used in accordance with the embodiments of the present invention, may be disclosed in the followin U.S. Patents: U.S. Pat. No. 3,218,879 entitled "Twist Grip Controls" to Raleigh; No. 5,134,897 entitled "Twist-grip Device for Operating the Gears of a Bicycle" to Campagnolo; No. 4,938,733 entitled "Bicycle Gear Shifting Method and Apparatus" to Sram Corporation; and No. 4,900,291 entitled "Bicycle Gear Shifting Method and Apparatus" to Sram Corporation.

Additional examples of twist grip shifters and related components which may be used in accordance with the embodiments of the present invention, may be disclosed in the following Federal Republic of Germany Patents: No. DE 32 15 427 A1 to Fichtel & Sachs and No. DE 37 27 933 A1.

The components disclosed in the various publications, disclosed or incorporated by reference herein, may be used in the embodiments of the present invention, as well as, equivalents thereof.

The appended drawings in their entirety, including all dimensions, proportions and/or shapes in at least one embodiment of the invention, are accurate and to scale and are hereby included by reference into this specification.

All, or substantially all, of the components and methods of the various embodiments may be used with at least one

a central, longitudinal axis defined perpendicular to the axis of rotation;

a first side and a second side, both of said first side and said second side of said recess extending into said interior portion and being angled towards one another and being angled towards the longitudinal axis of said recess;

a third side extending between and adjoining said first and second sides of said recess;

a back side extending between said first and second sides of said recess and adjoining said third side of said recess, said back side of said recess being angled towards the longitudinal axis of said recess;

said first, second and third sides of each of said recesses being disposed immediately adjacent said first, second and third sides of each of said projections, respectively; and

said front side of each of said projections being disposed immediately adjacent said back side of each of said recesses.

6. The bicycle according to claim 5 wherein:

said one of said projections configured to solely engage with said one of said recesses comprises:

a base portion disposed immediately adjacent and along said second tubular extension;

a first stepped portion and a second stepped portion, said first stepped portion and said second stepped portion forming said base portion;

said first stepped portion extends in a circumferential direction away from said first side of said projection;

said first stepped portion comprising:

a first surface extending generally radially away from said second tubular extension and being angled towards the longitudinal axis of said projection, said first surface being substantially parallel to said first side of said projection;

a second surface extending from said first surface and adjoining said first side of said projection, said second surface being substantially parallel to said third side of said projection;

said second stepped portion extends in a circumferential direction away from said second side of said projection;

said second stepped portion comprising:

a first surface extending generally radially away from said second tubular extension and being angled towards the longitudinal axis of said projection, said first surface of said second stepped portion being substantially parallel to said second side of said projection; and

a second surface extending from said first surface of said second stepped portion and adjoining said second side of said projection, said second surface of said second stepped portion being substantially parallel to said third side of said projection;

said one of said recesses comprises:

a base portion disposed immediately adjacent said base portion of said one of said projections;

a first stepped portion and a second stepped portion, said first stepped portion and said second stepped portion of said one of said recesses together forming said base portion of said one of said recesses;

said first stepped portion of said one of said recesses extends in a circumferential direction away from said first side of said one of said recesses;

said first stepped portion of said one of said recesses comprising:

a first surface extending generally radially away from the axis of rotation and being angled towards the longitudinal axis of said one of said recesses, said first surface of said one of said recesses being substantially parallel to said first side of said one of said recesses; and

a second surface extending from said first surface of said one of said recesses and adjoining said first side of said one of said recesses, said second surface of said one of said recesses being substantially parallel to said third side of said one of said recesses;

said second stepped portion of said one of said recesses extends in a circumferential direction away from said second side of said one of said recesses;

said second stepped portion of said one of said recesses comprising:

a first surface extending generally radially away from the axis of rotation and being angled towards the longitudinal axis of said one of said recesses, said first surface of said one of said recesses being parallel to said second side of said one of said recesses; and

a second surface extending from said first surface of said one of said recesses and adjoining said second side of said one of said recesses, said second surface of said one of said recesses being substantially parallel to said third side of said one of said recesses; and

said first stepped portion of said one of said projections being engaged within said first stepped portion of said one of said recesses, and said second stepped portion of said one of said projections being engaged with said second stepped portion of said one of said recesses.

7. The bicycle according to claim 6 wherein: said shift actuator further comprises:

an interior portion and an exterior portion, said second part being disposed within said interior portion of said shift actuator;

a sealing arrangement to seal said interior portion of said shift actuator, said sealing arrangement being disposed between said housing and said first part; and

said sealing arrangement comprising:

a groove, said groove being circular and extending about the axis of rotation;

said groove being disposed in said first part;

a tongue, said tongue being circular and extending about the axis of rotation;

said tongue being disposed to extend a substantial distance within said groove;

said tongue being disposed on said housing; and

said tongue comprising one of the following sets of characteristics a) and b):

a) said tongue extends into said groove with a clearance to form a frictionless seal between said first part and said housing; and

b) said tongue contacts a portion of said first part to form a friction seal between said housing and said first part, said friction seal comprising a lip seal.

a third side extending between and adjoining said first and second sides of said recess;

a back side extending between said first and second sides of said recess and adjoining said third side of said recess, said back side of said recess being angled towards the longitudinal axis of said recess;

said first, second and third sides of each of said recesses being disposed immediately adjacent said first, second and third sides of each of said projections, respectively; and

said front side of each of said projections being disposed immediately adjacent said back side of each of said recesses. 15. The gear shifter according to claim 14 wherein:

said one of said projections configured to solely engage with said one of said recesses comprises:

a base portion disposed immediately adjacent and along said second tubular extension;

a first stepped portion and a second stepped portion, said first stepped portion and said second stepped portion together form said base portion;

said first stepped portion extends in a circumferential direction away from said first side of said projection;

said first stepped portion comprising:

a first surface extending generally radially away from said second tubular extension and being angled towards the longitudinal axis of said projection, said first surface being substantially parallel to said first side of said projection;

a second surface extending from said first surface and adjoining said first side of said projection, said second surface being substantially parallel to said third side of said projection;

said second stepped portion extends in a circumferential direction away from said second side of said projection;

said second stepped portion comprising:

a first surface extending generally radially away from said second tubular extension and being angled towards the longitudinal axis of said projection, said first surface of said second stepped portion being substantially parallel to said second side of said projection; and

a second surface extending from said first surface of said second stepped portion and adjoining said second side of said projection, said second surface of said second stepped portion being substantially parallel to said third side of said projection. 16. The gear shifter according to claim 15 wherein:

said one of said recesses comprises:

a base portion disposed immediately adjacent said base portion of said one of said projections;

a first stepped portion and a second stepped portion, said first stepped portion and said second stepped portion of said one of said recesses together forming said base portion of said one of said recesses;

said first stepped portion of said one of said recesses extends in a circumferential direction away from said first side of said one of said recesses;

said first stepped portion of said one of said recesses comprising:

a first surface extending generally radially away from the axis of rotation and being angled towards the longitudinal axis of said one of said recesses, said first surface of said one of said recesses being substantially parallel to said first side of said one of said recesses;

a second surface extending from said first surface of said one of said recesses and adjoining said first side of said one of said recesses, said second surface of said one of said recesses being substantially parallel to said third side of said one of said recesses;

said second stepped portion of said one of said recesses extends in a circumferential direction away from said second side of said one of said recesses;

said second stepped portion of said one of said recesses comprising:

a first surface extending generally radially away from the axis of rotation and being angled towards the longitudinal axis of said one of said recesses, said first surface of said one of said recesses being substantially parallel to said second side of said one of said recesses;

a second surface extending from said first surface of said one of said recesses and adjoining said second side of said one of said recesses, said second surface of said one of said recesses being substantially parallel to said third side of said one of said recesses; and

said first stepped portion of said one of said projections being engaged within said first stepped portion of said one of said recesses, and said second stepped portion of said one of said projections being engaged with said second stepped portion of said one of said recesses. 17. The gear shifter according to claim 16 wherein:

said shift actuator further comprises:

an interior portion and an exterior portion, said second part being disposed within said interior portion of said shift actuator;

a sealing arrangement to seal said interior portion of said shift actuator, said sealing arrangement being disposed between said housing and said first part; and

said sealing arrangement comprising:

a groove, said groove being circular and extending about the axis of rotation;

said groove being disposed in said first part;

a tongue, said tongue being circular and extending about the axis of rotation;

said tongue being disposed to extend a substantial distance within said groove;

said tongue being disposed on said housing; and

said tongue comprising one of the following sets of characteristics a) and b):

a) said tongue extends in to said groove with a clearance to form a frictionless seal between said first part and said housing; and

b) said tongue contacts a portion of said first part to form a friction seal between said housing and said first part, said friction seal comprising a lip seal.18. The gear shifter according to claim 17 wherein:

said plurality of projections comprises four of said projections spaced at substantially equal distances from one another about said second tubular extension;

said plurality of recesses comprises four of said recesses spaced at substantially equal distances from one another circumferentially within said interior portion of said first part;

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,823,058
DATED : October 20, 1998
INVENTOR(S) : Markus ARBEITER

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In column 13, line 56, after 'the', delete "followin" and insert --following--.

In column 14, line 3, after 'the', delete "followin" and insert --following--.

In column 14, line 16, after 'the', delete "followin" and insert --following--.

In column 14, line 23, after 'the', delete "followin" and insert --following--.

In column 16, line 23, after 'the', delete "followin" and insert --following--.

In column 16, line 44, after "the', delete "followin" and insert --following--.

Signed and Sealed this

Seventh Day of September, 1999

Attest:

Q. TODD DICKINSON

Attesting Officer *Acting Commissioner of Patents and Trademarks*

JS 44 (Rev. 11/95) Cat #1

CIVIL COVER SHEET

The JS-44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as requ by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

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02 JUN 10 PM 2:18
CLERK
U.S. DISTRICT COURT

DOCKETED
JUN 11 2002

I. (a) PLAINTIFFS

SRAM CORPORATION

DEFENDANTS

LONG YIH INDUSTRY, CO.
a/k/a/ DNP, Inc.

(b) COUNTY OF RESIDENCE OF FIRST LISTED PLAINTIFF Cook, Illinois
(EXCEPT IN U.S. PLAINTIFF CASES)

COUNTY OF RESIDENCE OF FIRST LISTED DEFENDANT _____
(IN U.S. PLAINTIFF CASES ONLY)
NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED.

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ATTORNEYS (IF KNOWN)

02C 4142 JUDGE BUC
MAGISTRATE JUDGE NOLA

II. BASIS OF JURISDICTION (PLACE AN "X" IN ONE BOX ONLY)

- ☐ 1 U.S. Government Plaintiff
- ☒ 3 Federal Question (U.S. Government Not a Party)
- ☐ 2 U.S. Government Defendant
- ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (PLACE AN "X" IN ONE BOX FOR PLAI (For Diversity Cases Only) AND ONE BOX FOR DEFENDANT)

	PTF	DEF		PTF	D
Citizen of This State	☐ 1	☐ 1	Incorporated *or* Principal Place of Business In This State	☒ 4	☐
Citizen of Another State	☐ 2	☐ 2	Incorporated *and* Principal Place of Business In Another State	☐ 5	☐
Citizen or Subject of a Foreign Country	☐ 3	☒ 3	Foreign Nation	☐ 6	☐

IV. ORIGIN (PLACE AN "X" IN ONE BOX ONLY)

☒ 1 Original Proceeding | ☐ 2 Removed from State Court | ☐ 3 Remanded from Appellate Court | ☐ 4 Reinstated or Reopened | ☐ 5 Transferred from another district (specify) | ☐ 6 Multidistrict Litigation | ☐ 7 Appeal to Dis Judge from Magistrate Judgment

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CONTRACT
- ☐ 110 Insurance
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- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS

PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury

PERSONAL INJURY
- ☐ 362 Personal Injury – Med. Malpractice
- ☐ 365 Personal Injury – Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

CIVIL RIGHTS
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/ Accommodations
- ☐ 444 Welfare
- ☐ 440 Other Civil Rights

PRISONER PETITIONS
- ☐ 510 Motions to Vacate Sentence
- Habeas Corpus:
- ☐ 530 General
- ☐ 535 Death Penalty
- ☐ 540 Mandamus & Other
- ☐ 550 Civil Rights

FORFEITURE/PENALTY
- ☐ 610 Agriculture
- ☐ 620 Other Food & Drug
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 630 Liquor Laws
- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs.
- ☐ 660 Occupational Safety/Health
- ☐ 690 Other

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt. Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ret. Inc Security Act

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

PROPERTY RIGHTS
- ☐ 820 Copyrights
- ☒ 830 Patent
- ☐ 840 Trademark

SOCIAL SECURITY
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 IRS – Third Party 26 USC 7609

OTHER STATUTES
- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce/ICC Rates/etc
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 810 Selective Service
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 875 Customer Challenge 12 USC 3410
- ☐ 891 Agricultural Acts
- ☐ 892 Economic Stabilization Ac
- ☐ 893 Environmental Matters
- ☐ 894 Energy Allocation Act
- ☐ 895 Freedom of Information Act
- ☐ 900 Appeal of Fee Determinat Under Equal Access to Ju
- ☐ 950 Constitutionality of State Statutes
- ☐ 890 Other Statutory Actions

VI. CAUSE OF ACTION (CITE THE U.S. CIVIL STATUTE UNDER WHICH YOU ARE FILING AND WRITE BRIEF STATEMENT OF CAUSE. DO NOT CITE JURISDICTIONAL STATUTES UNLESS DIVERSITY)

Action for patent infringement under Title 35USC

VII. REQUESTED IN COMPLAINT: ☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23

DEMAND $ to be determined

CHECK YES only if demanded in complai **JURY DEMAND:** ☒ YES ☐ NO

VIII. RELATED CASE(S) IF ANY (See instructions): JUDGE _____ DOCKET NUMBER _____

DATE 6/10/02

SIGNATURE OF ATTORNEY OF RECORD Robert E. Browne (7844)

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ILLINOIS

DOCKETED

JUN 11 2002

In the Matter of SRAM CORPORATION,
Plaintiff
V.
LONG YIH INDUSTRY CO.
a/k/a DNP, INC.,
Defendant

FILED-ED4
02 JUN 10 PM 2:11
CLERK
U.S. DISTRICT COURT

Case Number: 02C 4142

JUDGE BUCKLO

MAGISTRATE JUDGE NOLAN

APPEARANCES ARE HEREBY FILED BY THE UNDERSIGNED AS ATTORNEY(S) FOR: SRAM Corporation

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FAX NUMBER		FAX NUMBER	
E-MAIL ADDRESS		E-MAIL ADDRESS	
IDENTIFICATION NUMBER (SEE ITEM 4 ON REVERSE)		IDENTIFICATION NUMBER (SEE ITEM 4 ON REVERSE)	
MEMBER OF TRIAL BAR?	YES ☐ NO ☒	MEMBER OF TRIAL BAR?	YES ☐ NO ☒
TRIAL ATTORNEY?	YES ☒ NO ☐	TRIAL ATTORNEY?	YES ☒ NO ☐
		DESIGNATED AS LOCAL COUNSEL?	YES ☐ NO ☐

(C)		(D)	
SIGNATURE		SIGNATURE	
NAME	Robert E. Browne	NAME	Mark R. Galis
FIRM	Altheimer & Gray	FIRM	Altheimer & Gray
STREET ADDRESS	10 South Wacker Drive	STREET ADDRESS	10 South Wacker Drive
CITY/STATE/ZIP	Chicago, IL 60606	CITY/STATE/ZIP	Chicago, IL 60606
TELEPHONE NUMBER	(312)715-4000	TELEPHONE NUMBER	(312)715-4800
FAX NUMBER	(312)715-4800	FAX NUMBER	(312)715-4800
E-MAIL ADDRESS		E-MAIL ADDRESS	
IDENTIFICATION NUMBER (SEE ITEM 4 ON REVERSE)		IDENTIFICATION NUMBER (SEE ITEM 4 ON REVERSE)	
MEMBER OF TRIAL BAR?	YES ☒ NO ☐	MEMBER OF TRIAL BAR?	YES ☒ NO ☐
TRIAL ATTORNEY?	YES ☐ NO ☒	TRIAL ATTORNEY?	YES ☐ NO ☒
DESIGNATED AS LOCAL COUNSEL?	YES ☒ NO ☐	DESIGNATED AS LOCAL COUNSEL?	YES ☒ NO ☐