

**UNITED STATES DISTRICT COURT  
MIDDLE DISTRICT OF FLORIDA  
ORLANDO DIVISION**

**AUTOMATED PACKAGING  
TECHNOLOGIES, LLC,**

Plaintiff,

vs.

**CASE NO. 6:01-cv-494-Orl-28-DAB**

**TAMA PLASTIC INDUSTRY,  
a partnership, and  
TAMANET (U.S.A.), INC.,  
a Delaware corporation**

**JURY TRIAL DEMANDED**

Defendants.

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MIDDLE DISTRICT OF FLORIDA  
ORLANDO, FLORIDA

FILED

**AMENDED COMPLAINT**

Plaintiff, AUTOMATED PACKAGING TECHNOLOGIES, LLC ("AUTOMATED") hereby sues Defendants, TAMA PLASTIC INDUSTRY, a partnership organized according to the laws of the State of Israel ("TAMA"), and TAMANET (U.S.A.), INC. ("TAMANET"), a Delaware corporation, and alleges:

**PARTIES AND JURISDICTION**

1. This is a civil action for a declaratory judgment and permanent injunctive relief relating to United States Patent 5,256,353 ("the '353 Patent").
2. Plaintiff AUTOMATED is, and at all times material to this action has been, a limited liability company formed and organized under the laws of the State of Florida, having its principal offices in Seminole County, Florida.
3. Defendant TAMA is, on information and belief, a partnership organized according to the laws of the State of Israel. Defendant has executive offices in Israel at

SCANNED

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Kibbutzmishmar Ha'emek, 19236 Israel, together with U.S. offices in various locations under the auspices of TAMANET (U.S.A.), INC.

4. Defendant TAMANET (U.S.A.), INC., is on information and belief, a corporation formed and organized under the laws of the State of Delaware whose principal place of business is located in Fullerton, California (hereinafter called "TAMANET").

5. TAMANET is the exclusive United States agent for Defendant TAMA, and takes orders for TAMA products, arranges for their import into the United States, and distributes such products to purchasers throughout the United States.

6. Plaintiff alleges, on information and belief, that TAMA controls the activities and affairs of TAMANET.

7. TAMANET distributes TAMA products on behalf of both Defendants to customers in Florida and in the Middle District of Florida, and attends trade shows within the Middle District of Florida to promote TAMA products in competition with Plaintiff.

8. TAMANET purports to be the only United States representative of TAMA licensed to sell products made in accordance with the '353 Patent.

9. TAMANET distributes TAMA products allegedly made in accordance with the '353 Patent throughout the United States, including the State of Florida.

10. For reasons more particularly stated hereinafter, Defendants purposely direct their activities at residents of Florida, and this Complaint arises out of and relates to those activities, namely threats of patent infringement, and the commission of tortious conduct within the State of Florida.

11. Venue is proper in this District pursuant to 28 U.S.C. §§1391(b) and (d) and 1400(b).

**DEFENDANTS' THREATS OF PATENT INFRINGEMENT**

12. Defendant TAMA is the owner by assignment of the '353 Patent entitled "Method of making elastic plastic netting made of oriented strands." A true and correct copy of the '353 Patent is attached hereto as Exhibit "A".

13. Plaintiff AUTOMATED is a licensed United States distributor of certain products manufactured by Karatzis, S.A., a corporation organized under the laws of Greece, whose offices are located in Crete, Greece. A copy of certain non-confidential portions of Plaintiff's distribution agreement is attached hereto as Exhibit "B", the remaining portions being redacted to protect its confidentiality.

14. On information and belief, Karatzis manufactures products in Greece. These products include a pallet netwrap generally described in the advertising literature attached hereto as Exhibit "C" and referred to hereinafter as the "pallet netwrap."

15. The claims of the '353 Patent are all drawn to a method of making a knitted thermoplastic netting having longitudinal ribbons with an orientation of 1:4 to 1:5. During the prosecution history of this patent, the applicant, in order to overcome a rejection by the examiner, specifically limited the fabrication method for both longitudinal and lateral ribbons to the use of linear low density polyethylene ("LLDDPE"). The applicant further argued the merits of its invention over the prior art by asserting the superiority of LLDPE over high density polyethylene ("HDPE") materials for netting products.

16. The Karatzis pallet netwrap does not meet the limitations of the '353 Patent method claims. Instead, the Karatzis netwrap has lateral ribbons of HDPE, which are precisely the type of ribbons distinguished in the Patent Office by TAMA in order to obtain the issuance of the '353 Patent.

17. The Karatzis pallet netwrap accordingly does not infringe any valid claim of the '353 Patent and Defendant, as the owner of the patent, is estopped from asserting infringement against such a product.

18. Notwithstanding the fact that the Karatzis pallet netwrap does not infringe the '353 Patent, Defendant, has repeatedly threatened Karatzis with infringement of the '353 Patent should Karatzis sell the product in the United States.

19. On or about February 15, 2001, TAMA, through its New York counsel, Morgan & Finnegan, LLP, forwarded the letter attached hereto as Exhibit "D", wherein Defendant threatened to sue Karatzis and "several of its distributors" for infringement of Claim 1 of the '353 Patent. This letter was forwarded to a law firm in the Middle District of Florida.

20. On or about March 13, 2001, TAMA caused to be forwarded to the same law firm in Orlando, Florida a "courtesy copy" of a Summons and Complaint filed by Defendant against Karatzis, S.A. and "several of its distributors in the United States", as is shown in the attached Exhibit "E".

21. Plaintiff AUTOMATED is not a party in the aforementioned litigation in California.

22. Plaintiff AUTOMATED is, however, the only presently authorized master distributor in the United States of Karatzis manufactured products, including the Karatzis pallet netwrapping.

23. Plaintiff is selling in the Middle District of Florida the Karatzis-branded netwrap accused of infringement of the '353 Patent by Defendant TAMA.

24. As a result of the threats and accusations of infringement by TAMA, Plaintiff AUTOMATED has a reasonable apprehension of suit for patent infringement by Defendant. Plaintiff further has reasonable apprehension that Plaintiff's customers will likewise be threatened or sued with infringement of the '353 Patent.

25. The threats of infringement by TAMA have chilled the marketplace for Karatzis manufactured products, and this chilling of the market will cause Plaintiff AUTOMATED to lose sales, revenue and profitability and has placed Plaintiff in doubt as to its right to sell the Karatzis-manufactured pallet netwrap.

26. Plaintiff AUTOMATED is offering and will continue to offer, pending a ruling by the Court, the Karatzis manufactured pallet netwrap in competition with Defendants in the Middle District of Florida.

27. In addition, Defendant TAMANET has actively accused Plaintiff of infringement of the '353 Patent and has widely disseminated accusations of infringement to Plaintiff's customers in the Middle District of Florida.

28. As one example of the above-mentioned threats, at a trade show in Tampa, Florida, on or about March 17, 2001, representatives of TAMANET, in the presence of a representative of Plaintiff, and in the presence of prospective customers of Plaintiff, most of whom were representatives of large Florida-based citrus customers, stated in substance that Karatzis had "stolen" TAMA's patent and that they (TAMA and TAMANET) were taking Karatzis to court. These and similar statements were made to the prospective customers of Plaintiff in order to discourage the customers from purchasing Karatzis manufactured product marketed from Plaintiff.

29. Plaintiff alleges, on information and belief, that TAMANET has continued to repeat similar comments to customers and others in Florida for the purpose of interfering with Plaintiff's ability to offer Karatzis manufactured products in competition with Defendants in the Middle District of Florida and elsewhere.

30. All conditions precedent to the filing of this action have occurred or have been waived or excused by law.

**COUNT I**  
**CLAIM FOR DECLARATORY JUDGMENT OF PATENT NONINFRINGEMENT**

31. This Count I is a claim against TAMA and TAMANET under the Declaratory Judgment Act for a judgment declaring that Plaintiff AUTOMATED's products, manufactured by Karatzis, do not infringe any valid claim of the '353 Patent.

32. Plaintiff incorporates and realleges the allegations of Paragraphs 1 through 30, above.

33. Plaintiff has a reasonable apprehension of suit for infringement of the '353 Patent.

34. Plaintiff's products do not infringe the '353 Patent and Defendant is estopped from asserting a claim of infringement against such products in light of the express representations made to the United States Patent Office to obtain issuance of the patent.

35. There is an actual and continuing controversy between the parties over the issue of infringement. Without the intervention of the Court, Plaintiff will suffer from accusations of infringement and doubt as to the validity of the claims thereof.

WHEREFORE, Plaintiff hereby prays for the following relief against Defendant:

(a) A declaratory judgment in accordance with 28 U.S.C. §2201(a) declaring that the '353 Patent is not infringed; and

(b) A permanent injunction against Defendant from all future threats or attempts to enforce the '353 Patent against Plaintiff or its customers.

**COUNT II**  
**CLAIM FOR DECLARATORY JUDGMENT OF PATENT INVALIDITY**

36. This Count II is a claim against TAMA under the Declaratory Judgment Act for a judgment declaring that the '353 Patent is invalid.

37. Plaintiff incorporates and realleges the allegations of Paragraphs 1 through 30, above.

38. Plaintiff has a reasonable apprehension of suit for infringement of the '353 Patent.

39. Plaintiff alleges, on information and belief, that the '353 Patent is invalid under the provisions of 35 U.S.C. §§102(a), 102(b), 102(g) or 35 U.S.C. §103.

40. There is an actual and continuing controversy between the parties over the validity of the '353 Patent that requires the intervention of this Court. Without such intervention, Plaintiff will continue to suffer from accusations of infringement concerning its primary product line and doubts as to the validity of the '353 Patent.

WHEREFORE, Plaintiff hereby prays for the following relief against Defendants:

(a) A declaratory judgment in accordance with 28 U.S.C. §2201(a) declaring that the '353 Patent is invalid;

(b) A permanent injunction against Defendants on all future conduct threatening or attempting to enforce the '353 Patent against Plaintiff; and

(c) Such other injunctive and ancillary relief as may be appropriate under the circumstances, pursuant to 28 U.S.C. §2202.

**COUNT III**  
**TORTIOUS INTERFERENCE WITH PROSPECTIVE BUSINESS ADVANTAGES**

41. This Count III is a claim for damages and injunctive relief against Defendants TAMA and TAMANET under the common law of the State of Florida.

42. Plaintiff incorporates and realleges the allegations of Paragraphs 1 through 40, above.

43. At all times material to this action, Plaintiff was an authorized United States reseller of Karatzis manufactured products, including the Karatzis pallet netwrapping.

44. Plaintiff was representing the Karatzis line of manufactured products at the United Show in Tampa, Florida during the period March 17 through March 19, 2001.

45. TAMANET was also present at the trade show representing itself and Defendant TAMA. During the trade show, Defendant TAMANET was promoting and offering for sale TAMA products on behalf of both Defendants.

46. During the aforementioned trade show, Plaintiff was engaged in discussions with prospective citrus customers in Florida who are large potential users of pallet netting such as the Karatzis manufactured pallet netwrap.

47. While Plaintiff was presenting the benefits of purchasing Karatzis products, Defendant TAMANET, on behalf of itself and Defendant TAMA, through representatives acting on behalf of both Defendants, stated, in the presence of Plaintiff and to Plaintiff's prospective customers that Karatzis – referring not only to Karatzis the company but to



Plaintiff – had “stolen our patent” and that “we are taking them to court” and similar words to the effect that Plaintiff had “stolen” the ‘353 Patent.

48. These conversations occurred in Tampa, Florida on or about March 17, 2001, and in the presence of specific prospective customers of Plaintiff.

49. Thereafter, Defendant TAMANET distributed, on behalf of itself and Defendant TAMA, press releases to reflect that the Karatzis manufactured products infringe the ‘353 Patent, and forwarded in commerce such press releases to known customers or prospective customers of Plaintiff. An authentic representation of such press release is attached hereto as Exhibit “F”.

50. Defendants are continuing at the present time, and will continue to do so unless enjoined by this Court, to repeat the aforementioned statements of and concerning Plaintiff and the Karatzis product line Plaintiff represents.

51. Plaintiff enjoyed a business relationship with the customers at the trade show to whom the above-mentioned statements were made, and enjoys a business relationship with the prospective customers to whom the press releases and similar representations by Defendants were made and are continuing to be made.

52. Defendants well know that Plaintiff has such a business relationship with the customers, and Defendants sought deliberately, knowingly and intentionally to interfere with such relationship by making statements such as those outlined above and by repeating accusations of infringement of the ‘353 Patent like those made in the press releases forwarded to Plaintiff’s customers.

53. At all times material to this action, Defendants knew that the aforementioned statements of and concerning the Karatzis pallet netting were false in that the Karatzis products offered for sale by Plaintiff do not infringe any valid claim of the '353 Patent.

54. Defendants acted knowingly, willfully, and in bad faith, and with the intent to interfere with the business relationships of Plaintiff.

55. Plaintiff has sustained damage in the form of lost sales and profits as a result of the interference of Defendants.

56. Plaintiff will continue to suffer lost business as the result of the Defendants' continuing representations that Plaintiff and Karatzis have "stolen" the patent and are infringing the patent.

57. As a direct and proximate result of the aforementioned conduct, Plaintiff will suffer and will continue to suffer irreparable injury unless this Court enjoins Defendants from continued acts of interference.

58. Plaintiff accordingly has no adequate remedy at law and will continue to suffer unjustified interference with its business relationships with customers in Florida and elsewhere unless this Court enjoins further improper conduct by Defendants.

WHEREFORE, Plaintiff hereby prays for the following relief against Defendants:

- (a) A preliminary and thereafter permanent injunction against improper interference with the respective business relationships between Plaintiff and its customers;
- (b) Compensatory damages for lost profits Plaintiff would have made, but for the acts of interference;
- (c) Such other damages as are authorized by law; and
- (d) Costs of this action.

**COUNT IV**  
**TRADE DISPARAGEMENT IN VIOLATION**  
**OF SECTION 43(a) OF THE LANHAM ACT**

59. This Count IV is a claim against Defendants TAMA and TAMANET under Section 43(a) of the Lanham Act, 15 U.S.C. §1125(a)(1)(B).

60. Plaintiff incorporates and realleges the allegations of Paragraphs 1 through 40, above.

61. At all times material to this action, Plaintiff was an authorized United States reseller of Karatzis manufactured products, including the Karatzis pallet netwrapping.

62. Defendants TAMA and TAMANET are direct competitors of Plaintiff in the same geographic and product markets.

63. Beginning at least in March 2001 and continuing to the present time, in the Middle District of Florida and elsewhere, Defendants TAMA and TAMANET have, in connection with commercial advertising or promotion, misrepresented the nature, characteristics and qualities of Plaintiff's goods, services and commercial activities in connection with the marketing and sale of Defendants' goods and services in interstate commerce.

64. The pattern of misrepresentation has included representing to Plaintiff's customers at the United Show in Tampa, Florida, during the period March 17 through March 19, 2001, that Karatzis – referring not only to Karatzis, the company, but to Plaintiff, as the seller of Karatzis manufactured products – had “stolen our patent” and that the Karatzis products infringed the ‘353 Patent.

65. Thereafter Defendants caused to be distributed in commerce to customers in the Middle District of Florida and elsewhere, including customers of Plaintiff, press

releases falsely charging that the Karatzis manufactured products sold by Plaintiff infringe the '353 Patent.

66. Plaintiff alleges, on information and belief, that Defendants are continuing at the present time to falsely represent in connection with the advertising and promotion of their own products, that Plaintiff's products infringe the '353 Patent and that Plaintiff and Karatzis have "stolen" the TAMA '353 Patent.

67. These and similar false representations of alleged fact and promotions have reduced the marketability of Plaintiff's products and have caused Plaintiff to lose sales to customers.

68. The aforementioned misrepresentations of alleged fact of and concerning Plaintiff's products are false and were known by Defendants to be false at the time such statements were made in that Defendants well knew that Plaintiff's products did not infringe any valid claim of the '353 Patent, and Plaintiff has not "stolen" Defendants' patent.

69. Defendants published the above-mentioned false representations about Plaintiff's products, goods and services with actual knowledge of the falsity of such statements or in reckless disregard of the truth.

70. Defendants acted in bad faith and with the specific intent to harm Plaintiff and to reduce the marketability of Plaintiff's products.

71. As a direct and proximate result of the aforementioned false advertising and false representations with respect to Plaintiff's goods, services and commercial activities, Plaintiff has suffered monetary loss, including the loss of profits from the sale of the falsely accused Karatzis pallet netwrapping. Plaintiff's lost profits include the loss of profits

Plaintiff would have garnered for sale to citrus related customers in Florida, as a direct result of the false representations of and concerning Plaintiff's products.

72. Defendants will continue their campaign of false advertising and false representations concerning Plaintiff's products unless this Court enjoins them from disseminating further false representations of alleged material fact.

WHEREFORE, Plaintiff hereby prays for the following relief against Defendants:

(a) Compensatory damages for lost profits Plaintiff would have made but for the improper conduct of Defendants;

(b) A permanent injunction against further false representations or false commercial advertising of or concerning Plaintiff's goods, services, or activities;

(c) Attorneys' fees and damages in accordance with 15 U.S.C. §1117;

(d) Costs of this action; and

(e) Such further relief as the Court deems appropriate under the circumstances.

**COUNT V**  
**TRADE LIBEL**

73. This Count V is a claim against Defendants TAMA and TAMANET for trade libel under the common law of the State of Florida.

74. Plaintiff incorporates and realleges the allegations of Paragraphs 1 through 30 and 63 through 72, above.

75. Beginning at least in March 2001 and continuing to the present time Defendants, in the Middle District of Florida and elsewhere, have falsely disparaged

Plaintiff's products and made false and defamatory statements of and concerning Plaintiff's products, goods and services.

76. Defendants' publication of false and disparaging statements of and concerning Plaintiff's goods and services includes, but is not limited to:

(a) Statements to the effect that Plaintiff and Karatzis have "stolen" Defendants' patent;

(b) Statements to the effect that the Karatzis product line promoted in Florida by Plaintiff infringes the '353 Patent; and

(c) Statements to the effect that Plaintiff's customers should not purchase Plaintiff's products because these products infringed the '353 Patent and Karatzis, the manufacturer, "stole" TAMA's patent.

77. Defendants, in addition, published in commerce, in Florida and elsewhere, the press release in the form attached hereto as Exhibit "F" and have forwarded such press release to specific known customers of Plaintiff.

78. The above-mentioned disparaging statements of and concerning Plaintiff's products, goods and services are false and were known to be false at the time the statements were made, and that Defendants well knew that Plaintiff had not "stolen" the '353 Patent, that the Karatzis manufactured products sold by Plaintiff do not infringe the '353 Patent, and that Plaintiff's customers would not be purchasing an infringing product as a result.

79. Defendants acted in bad faith and with the specific intent to harm Plaintiff and to detract from the marketability of Plaintiff's products, goods and services, and to divert sales from Plaintiff to Defendants.

80. As a direct and proximate result of the disparaging statements made by Defendants, Plaintiff has lost profits which Plaintiff would have garnered from customers but for the false, defamatory and disparaging statements of Defendants.

81. Defendants will continue to repeat the aforementioned disparaging and defamatory statements of and concerning Plaintiff and Plaintiff's products unless the Court joins further acts of disparagement.

WHEREFORE, Plaintiff prays for the following relief against Defendants:

- (a) Compensatory damages for lost profits Plaintiff would have made but for the improper conduct of Defendants;
- (b) Such other damages as are authorized by law; and
- (c) Costs of this action.

**DEMAND FOR JURY TRIAL**

Plaintiff hereby demands trial by jury on all issues so triable.

DATED this 9<sup>th</sup> day of May, 2001.

Respectfully submitted,

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**EXHIBIT "A"**



**United States Patent** [19]

**Leiber et al.**

[11] **Patent Number:** 5,256,353

[45] **Date of Patent:** Oct. 26, 1993

[54] **METHOD OF MAKING ELASTIC PLASTIC NETTING MADE OF ORIENTED STRANDS**

[75] **Inventors:** Yuval Leiber, Meqido; Ya'Acov Agavof; Yonatan Arnon, both of Ha'emek, all of Israel

[73] **Assignee:** Tama Plastic Industry, Kibbutz Mishmar Ha'emek, Israel

[21] **Appl. No.:** 813,140

[22] **Filed:** Dec. 23, 1991

**Related U.S. Application Data**

[62] **Division of Ser. No. 444,057, Nov. 30, 1989, Pat. No. 5,104,714.**

[51] **Int. Cl.<sup>5</sup>** ..... B28B 11/16

[52] **U.S. Cl.** ..... 264/103; 264/146; 264/210.1; 264/DIG. 47

[58] **Field of Search** ..... 264/103, 146, 147, 288.4, 264/290.2, 210.1, DIG. 47

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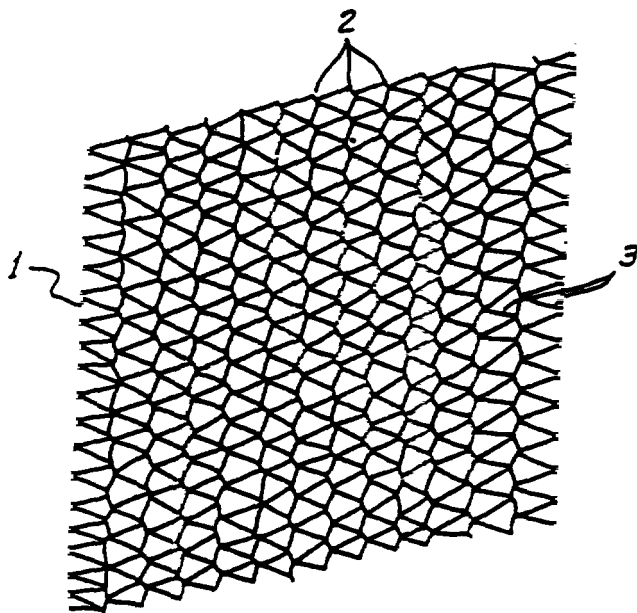
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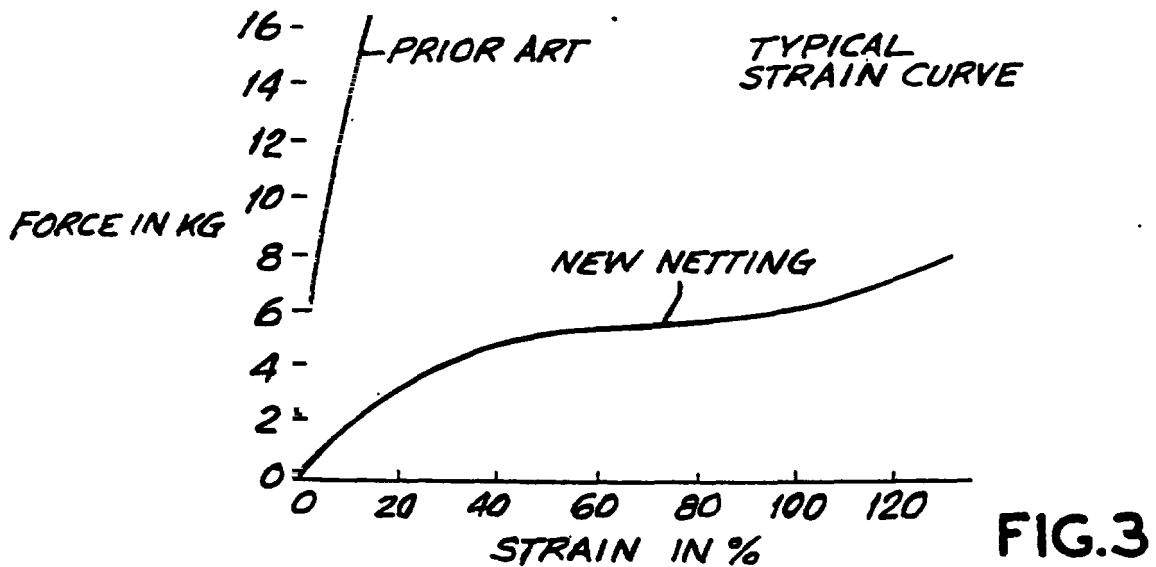
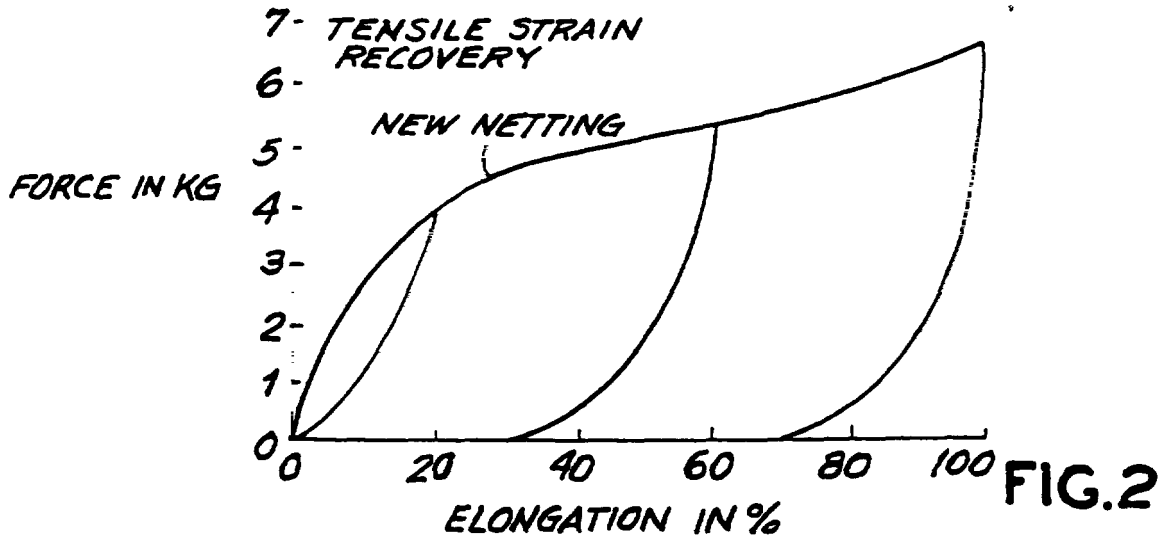
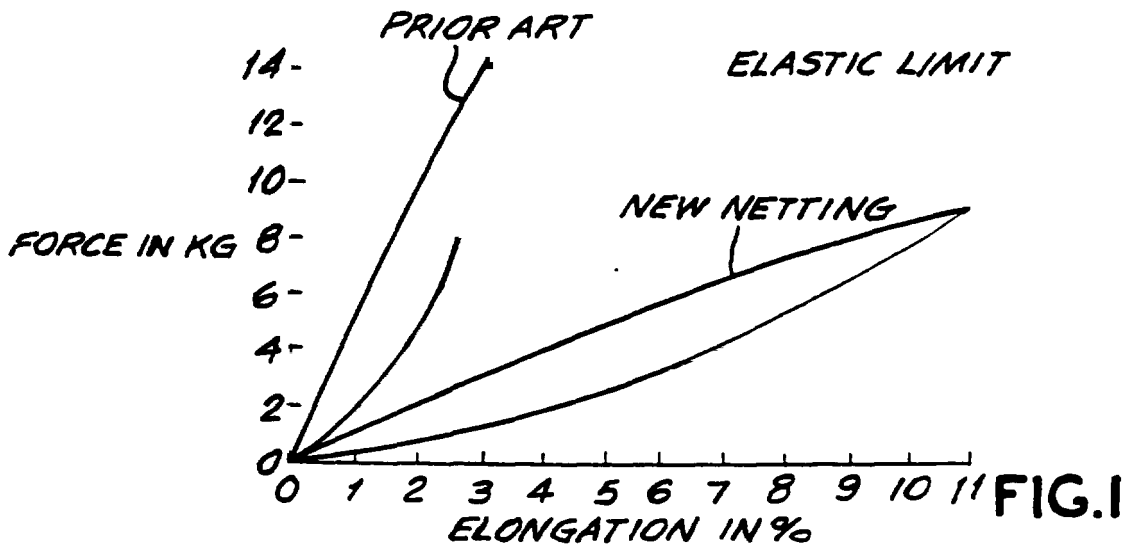
*Primary Examiner*—Jay H. Woo  
*Assistant Examiner*—Robert B. Davis  
*Attorney, Agent, or Firm*—Morgan & Finnegan

[57] **ABSTRACT**

A method of making an elastic wrapper netting wherein linear low density polyethylene ribbons are knitted into a Raschel net. The ribbons of the knitted wrapper netting have an orientation of about 1:4.25 in the longitudinal direction.

6 Claims, 3 Drawing Sheets





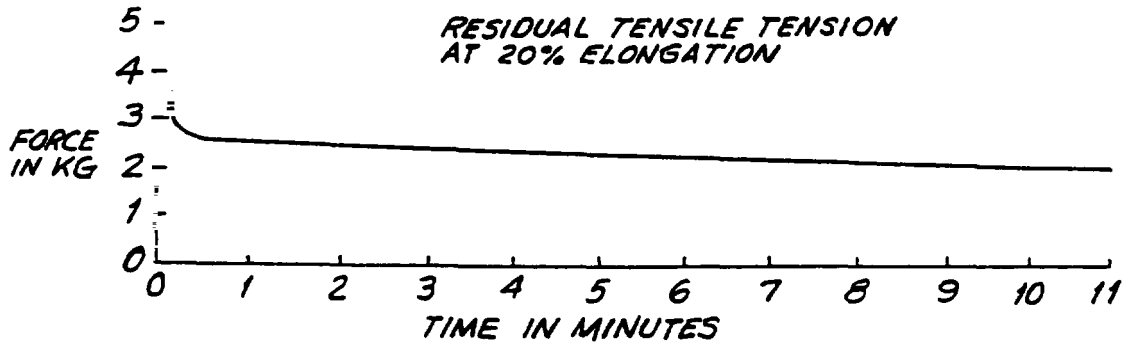


FIG.4A

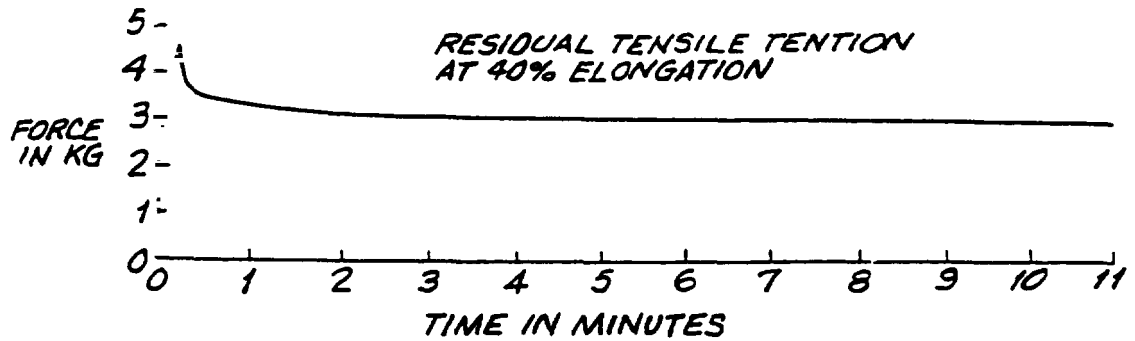


FIG.4B

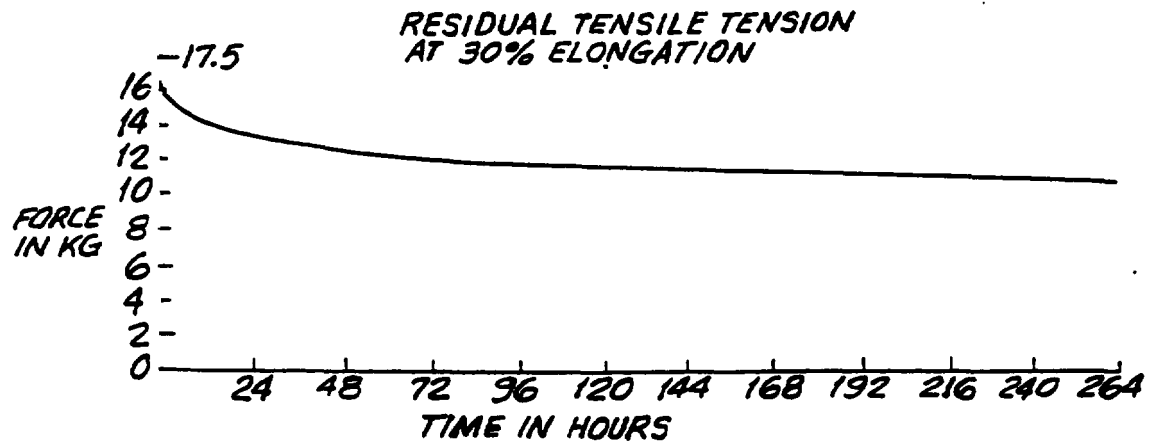


FIG.5

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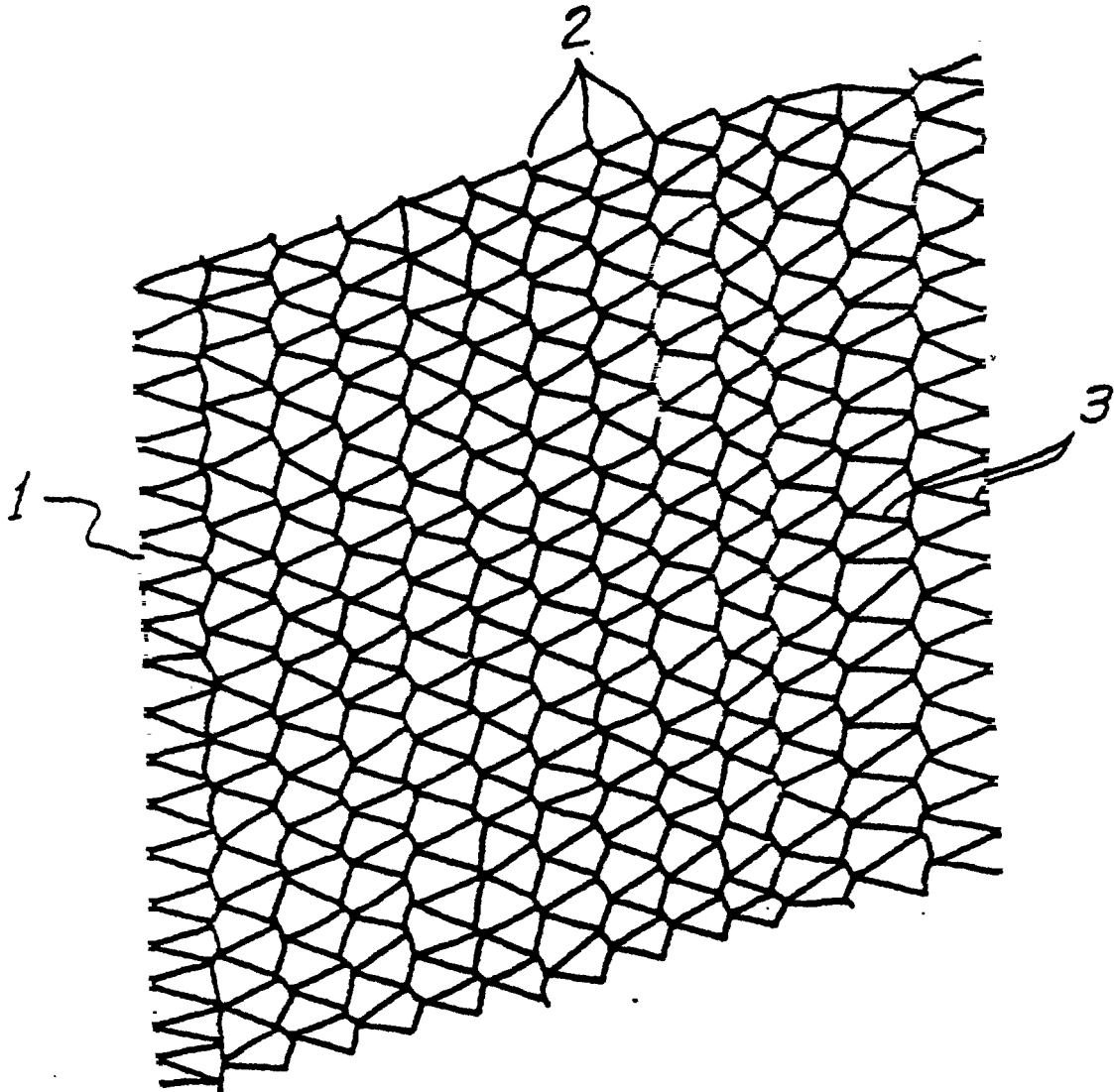


FIG. 6

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5,256,353

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## METHOD OF MAKING ELASTIC PLASTIC NETTING MADE OF ORIENTED STRANDS

This is a divisional application of co-pending application Ser. No. 07/444,057 filed Nov. 30, 1989, now U.S. Pat. No. 5,104,714.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to plastic knitted netting and its use in wrapping loads on pallets and in wrapping agricultural loads such as cylindrical bales of hay. Further, this invention relates to a method of making thermoplastic ribbons used to knit the netting so as to achieve the surprising result of excellent elasticity, elongation and residual elasticity.

#### 2. Description of Related Art

Wrapping pallet loads and agricultural loads with plastic film and with plastic netting to hold and stabilize the loads has become a widespread practice. The plastic netting which has heretofore been used has been either extruded netting or knitted netting, such as Raschel netting. Some manufacturers of extruded netting have discovered that it is desirable to manufacture a netting having a high degree of stretch before tensile failure and having a high degree of elasticity. In the past, users of netting who have wanted high strength in their netting have had to use extruded netting. Extruded netting has had greater strength than knitted netting due to the much greater amount of material (i.e., greater cross-sectional area) contained in each strand of netting. With the recent awareness that extruded netting could also be made elastic as well as strong, there has been more interest in the use of extruded netting than in the past.

Knitted plastic netting is made of very thin ribbons of thermoplastic material in order to allow it to be knitted; and because of the thinness of the ribbons, knitted netting has not been considered as useful as extruded netting for heavy loads where tensile strength is important. Because of this perception, manufacturers of knitted netting have always attempted to make their netting as strong as possible while still using thin ribbons of thermoplastic in order to keep cost and weight as low as possible.

Whether one is using extruded netting or knitted netting, it is desirable to have a netting which is both strong and elastic. Strength is obviously an important physical characteristic in order to avoid having the netting break and causing the load to spill. Elasticity in a netting is a desirable characteristic because it provides continued tension to the load after wrapping and after the load may have experienced settling and a reduction in volume. A load wrapped by a netting having insufficient elasticity will become loose and unstable. Even with loads which will not settle or reduce in volume, it is undesirable to use a non-elastic netting because tightening the netting sufficiently to hold the load can sometimes damage the contents. Whereas, use of an elastic netting can provide sufficient load-holding tension without damage to the contents.

Although extruded netting is advantageous to use in some applications, it has many undesirable characteristics when compared to knitted netting. One, much less extruded netting can be wound on the same diameter spool compared to a spool of knitted netting. This disadvantage is important when one realizes how frequently rolls have to be changed on a pallet wrapping machine

or how much storage space is needed to store the necessary inventory of netting. The same amount of knitted netting of this invention takes one-third the space of some conventional extruded netting.

Also, extruded netting creates great disposal problems. Because of the integral joining of the strands in extruded netting, the structure is very inflexible and is very difficult, if not impossible, to compact into a small space; and when it is done, the netting tends to spring open. The knitted netting of this invention is very easy to dispose of and can be easily gathered into a small volume for disposal.

It would be very desirable to combine the benefits of extruded netting and knitted netting in one netting product; however, in the past there has never been a way to combine the features of strength, stretchability and elasticity in one netting. This has been because the techniques used to strengthen a thermoplastic ribbon were the very techniques used to make a ribbon inelastic, and the techniques used to make a thermoplastic ribbon elastic resulted in a weaker ribbon.

### SUMMARY OF THE INVENTION

This invention is directed to knitted plastic netting possessing an elongation (i.e., stretching) of more than about 60% before breaking, an elastic limit of more than about 6%, and will retain at least about 15% of its original length when stretched more than 40%. Further, in use, the netting of this invention is preferably stretched about 30-50% when wrapped around its load. This invention is particularly directed to a method of creating such a netting.

It has been discovered that the desired properties of the knitted netting of this invention is achieved by producing a substantially unoriented primary film consisting essentially of a thermoplastic, such as a polyolefin, slitting the primary film into ribbons, then orienting the ribbons by an amount to maximize the tensile energy at break or to at least about 80% of such maximum value, and then knitting such ribbons into a netting having longitudinal and lateral ribbons. It has been found that practicing this invention can optimize the relationship between the strength, elasticity, and stretchability. In particular, the preferred knitted netting of this invention will have an elongation at break of more than about 60%, an elastic limit of more than about 6%, and elasticity of more than about 15% when elongated more than 40%.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a force-elongation graph comparing the elastic limit of a prior art knitted netting not made by the method of this invention with a knitted netting made by the preferred embodiment of this invention.

FIG. 2 is a force-elongation graph showing the tensile strain recovery for a knitted netting made by the preferred embodiment of this invention after various amounts of elongation.

FIG. 3 is a graph which compares the force-elongation characteristics of a prior art knitted netting with a knitted netting made according to this invention.

FIG. 4A is a graph which illustrates the residual tensile tension characteristics of the preferred knitted netting of this invention after 20% elongation up to 11 minutes.

FIG. 4B is a graph which illustrates the residual tensile tension characteristics of the preferred knitted net-

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ting of this invention after 40% elongation up to 11 minutes.

FIG. 5 contains a graph which shows the residual tensile tension characteristics of the preferred knitted netting of this invention up to 264 hours.

FIG. 6 shows a sample of the preferred netting of this invention.

#### DETAILED DESCRIPTION OF THE INVENTION AND BEST MODE

In the preferred mode of this invention, the primary thermoplastic film is made by a conventional blown-film technique utilizing small thermoplastic pellets. Although, other methods of making the primary film can be used, such as the chill roll slot cast extrusion method or the water-quenched slot cast extrusion method, the blown film method is preferred. The netting may be formed of any thermoplastic material which can be formed into knittable ribbons. The thermoplastic material may be single polyolefin or a blend of polyolefins. The presently preferred material is linear low density polyethylene (LLDPE) which has been copolymerized with the alpha olefin, octene, and having a specific weight of about 0.92 g/cc.

It is well-known that when making primary film, increased orientation is achieved by pulling the end of the film out faster than it enters, wherein the ratio of the output velocity to the input velocity is the orientation value. It has been discovered that the desirable netting of this invention is obtained by using primary film that is substantially unoriented in any direction. Particularly, the film should have an orientation in the lateral direction of about 1.0, and an orientation in the longitudinal direction of between about 1.0-1.2. The preferable method of producing a primary film which is substantially unoriented in both directions is by producing the film with a blow-up ratio of 1:1 to 1:1.2. It is preferred that the thickness of the primary film which is used to make the longitudinal ribbons to be knitted into the netting be between about 0.08 mm to 0.10 mm, and preferably about 0.09 mm; and that the primary film which is to be used to make the lateral ribbons have a thickness of between about 0.04 mm and 0.06 mm, and preferably about 0.05 mm.

After the primary film is made, it is then passed to a machine for slitting the film into ribbons. The ribbons which are to be used as the longitudinal ribbons in the knitted netting, as well as the ribbons which are to be used as the lateral ribbons in the knitted netting are preferably slit into the same width of between about 2.4 mm and 2.6 mm and preferably about 2.5 mm. After the slitting process the ribbons are then stretched and oriented in the longitudinal direction to a value of between about 1:4 and 1:5, and preferably about 1:4.25. This orientation produces a longitudinal ribbon having a thickness of between about 0.04 mm and 0.05 mm, and preferably about 0.044 mm, and a lateral ribbon having a thickness of between about 0.02 mm and 0.03 mm, and preferably about 0.024 mm. After orientation, both the longitudinal and the lateral ribbons have a width of between 1.2 mm and 1.3 mm, and preferably about 1.23 mm. The denier of the preferred longitudinal ribbons is between about 430 and 460, and preferably about 448, and the denier of the preferred lateral ribbons is between 240 and 250, and preferably about 244. The denier of a ribbon is a unit of weight and is defined as the weight in grams of 9000 meters of the ribbon. The

next step in the process is to oil the ribbons and to knit them using a Raschel machine into a knitted netting.

It has been determined that by using a primary film which was substantially unoriented during its manufacture and by properly orienting the ribbons after cutting the film into ribbons, the desired characteristics for elongation at break, elastic limit, and elasticity can be achieved. The desired properties are achieved by having a high "tensile energy to break" value, preferably more than 80% of the maximum possible value, and more preferably maximizing the "tensile energy to break" (TEB). The TEB is defined in ASTM D 882-83 as the area under the stress-strain curve to the break point. However, because netting having an elongation at break value of more than 130% are generally of no commercial value, it is preferred to measure and maximize the TEB up to 130% elongation. If netting having a greater elongation at break is commercially useful, for example, 150% or more, then the TEB should be measured and maximized up to this greater value.

Although it has been determined that in the preferred embodiment using the preferred thermoplastic material, the preferred ribbon orientation is about 1:4.25, when other materials are used, the proper ribbon orientation will need to be determined by preparing stress-strain curves for the netting made from the material at various ribbon orientations and then determining which orientation maximizes the TEB value. This ribbon orientation will provide a knitted netting having the most desired balance of strength (i.e., stress at break), elongation at break, elastic limit, stretchability (i.e., strain at break), and elasticity. Although it is preferable to select this proper orientation for both the longitudinal and lateral ribbons, the invention could be practiced by orienting only the longitudinal ribbons pursuant to this invention and orienting the lateral ribbons by any of the prior art methods not in accordance with this invention. This new netting has been compared to a prior art netting which is made from high density polyethylene. This comparison is best seen in Table I on the following page and in FIGS. 1-3.

TABLE I

|  | LONGITUDINAL RIBBONS OF PRIOR ART NETTING | LONGITUDINAL RIBBONS OF NEW NETTING |
|--|---|-------------------------------------|
| Ratio Of Tape Orientation              | 1:7.2                                     | 1:4.25                              |
| Width Of Tape Prior To Orientation     | 5.08 M.M.                                 | 2.5 M.M.                            |
| Width Of Tape After Orientation        | 1.89 M.M.                                 | 1.23 M.M.                           |
| Thickness Of Tape Prior To Orientation | 0.080 M.M.                                | 0.09 M.M.                           |
| Thickness Of Tape After Orientation    | 0.030 M.M.                                | 0.044 M.M.                          |
| Denier Of Tape After Orientation       | 483 DEN.                                  | 448 DEN.                            |
|  | LATERAL RIBBONS OF PRIOR ART NETTING      | LATERAL RIBBONS OF NEW NETTING      |
| Ratio Of Tape Orientation              | 1:6.8                                     | 1:4.25                              |
| Width Of Tape Prior To Orientation     | 2.54 M.M.                                 | 2.5 M.M.                            |
| Width Of Tape After Orientation        | 0.97 M.M.                                 | 1.23 M.M.                           |
| Thickness Of Tape Prior To Orientation | 0.07 M.M.                                 | 0.05 M.M.                           |
| Thickness Of Tape After Orientation    | 0.027 M.M.                                | 0.024 M.M.                          |
| Denier Of Tape After                   | 223 DEN.                                  | 244 DEN                             |

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TABLE 1-continued

| Orientation<br>MATERIAL                                    | LDPE                 | LLDPE                |
|--|----------------------|----------------------|
| Specific Weight  | 0.947 GR/CC          | 0.92 GR/CC           |
| Weight Per Square<br>Square Meter Of                       | 10 GR/M <sup>2</sup> | 10 GR/M <sup>2</sup> |
| Netting  |                      |                      |
| Recommended Elongation Under Normal Palletizing Conditions | 3-4%                 | 30-50%               |
| Elastic Limit  | 3%                   | 10%                  |
| Elasticity   | 4%                   | 30%                  |

FIG. 1 represents the relationship between the elongation of the respective netting and the applied load. The upper portion of the curves represents elongation as the load is increased, and the bottom portion represents the elongation as the load is released. It is seen that the new netting material is more elastic than the old netting, both in the sense of being more easily elongated and in having a higher elastic limit. The elastic limit is defined as that percentage of elongation experienced by the ribbon after which the ribbon can return to its original length. If the ribbon is stretched beyond the elastic limit, the ribbon undergoes irreversible deformation, meaning that when the load is released, the ribbon does not return to its original length.

Referring now to FIG. 3, this graph bears the important force—elongation curves for the new netting and the prior art netting. It is seen that the prior art netting is not nearly as stretchable as the new netting. It is seen that the new netting can undergo elongation of 130% of its original length, whereas the prior art netting can only undergo elongation of about 15%. It can be visualized by looking at the two curves in FIG. 3 that the tensile energy at break (TEB) for the new netting is much greater than that for the prior art netting. Calculating the TEB for each netting results in the new netting having a TEB value of about 58.75 Mjoules/m<sup>3</sup> (mega joules per cubic meter), while the TEB value of the prior art netting is about 26.11 Mjoules/M<sup>3</sup>.

Another benefit of the new netting can be seen by viewing FIG. 2, which shows the hysteresis of the new netting after undergoing elongation of 20%, 60%, and 100%. It is seen that after 20% elongation, the netting nearly returns to its original length, whereas, after elongations of 60% and 100%, the netting returns to 30% elongation and 70% elongation, respectively based on its original length. This characteristic of the new netting provides residual stress and continued tension on a load regardless of how much the netting is stretched during the wrapping process.

Turning now to FIG. 4, the residual tensile tension for the new netting after elongations of 20% and 40% is plotted versus time, and it is apparent that the new netting maintains its tension for a long time, as shown in FIG. 5.

#### EXAMPLE

Thermoplastic pellets consisting essentially of linear low density polyethylene (LLDPE) are extruded by the blow-film method into one primary film having a thickness of about 0.9 mm. This film will be used to make the longitudinal ribbons. The same thermoplastic is extruded into a film having a thickness of about 0.05 mm to be used to make the lateral ribbons. The LLDPE is made by Dow Chemical Company and is sold under the name DOWLEX 2045 E (General Purposes). The film

is produced under conditions such that it undergoes no orientation in either the longitudinal or lateral direction.

Once the primary film is made, it is fed into an I.S.O. machine for slitting into ribbons and stretching in order to produce the properly oriented ribbons. The I.S.O. machine is manufactured by I.S.O., a company located at Rosenfeld, West Germany. The film for both the longitudinal ribbons and the lateral ribbons are fed into the I.S.O. machine at a temperature of 100-110 degrees C. The longitudinal ribbons are first slit to a width of 2.5 mm and then oriented to a value of 1:4.25. The width and thickness of the longitudinal ribbons after orientation are 1.23 mm and 0.044 mm, respectively. The lateral ribbons are first slit to a width of 2.54 mm and then oriented to a value of 1:4.25. The width and thickness of the lateral ribbons after orientation are 1.23 mm and 0.024 mm, respectively.

The denier of the longitudinal ribbon prior to orientation is 1900, and after orientation of 1:4.25 is 448. The denier of the lateral ribbon prior to orientation is 1040 and after orientation of 1:4.25 is 244. The longitudinal ribbons and the lateral ribbons are then placed on their respective grooves for knitting on the Raschel knitting machines. The Raschel knitting machine then produces a knitted netting which is rolled up onto a spool for future use. The netting has a width of up to 500 cm and the weight of the netting is about 10 grams/square meter.

The completed netting is shown in FIG. 6 wherein a section of netting 1 is comprised of longitudinal ribbons 2 and lateral ribbons 3.

This netting stretches 130% when stretched at the rate of 100% per minute before breaking, has an elastic limit of 10%, and has a tensile strain recovery of 30% after elongation of between 40% to 130%. A 50 cm width of this netting will break at 40 Kg.

This knitted netting is utilized with a conventional pallet wrapping machine and the load is wrapped by stretching the netting around the load so that it elongates 20%-40% and is wrapped in a spiral or parallel fashion by a wrapping machine intended for this purpose or by hand. Because of the characteristics of this netting, round bales of hay can be wrapped by only one and one-third circumferences around the load.

Although the invention has been described in its preferred embodiment, it will be apparent to those skilled in the art that the procedures and techniques of this invention can be applied to other materials to achieve the desired results of this invention. Accordingly, the scope of this invention is defined by the scope of the following claims.

What is claimed is:

1. A method of making a knitted thermoplastic netting having longitudinal ribbons and lateral ribbons, comprising the steps of:
  - producing a substantially unoriented primary film consisting essentially of linear low density polyethylene;
  - slitting the substantially unoriented primary film into longitudinal ribbons;
  - orienting by stretching the longitudinal ribbons to have a ratio of stretched oriented length to original substantially unoriented length of about 1:4 to 1:5; and
  - knitting said oriented longitudinal ribbons and the lateral ribbons into a knitted net;
 wherein said knitted net has an elastic limit of more than about 6%, an elongation at break of more than

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about 60%, and an elasticity of more than about 15% when stretched more than 40%.

2. The method according to claim 1, further comprising the step of orienting by stretching the longitudinal ribbons to produce a tensile energy at break (TEB) of about 80% of the maximum TEB possible for said ribbons measured up to an elongation of 130%.

3. The method according to claim 1, further comprising the steps of:  
orienting by stretching said longitudinal ribbons to a width of between about 1.2 mm and 1.3 mm, a thickness of between about 0.04 mm and 0.05 mm, and a denier of between about 430 and 460; and orienting by stretching the lateral ribbons to have a width of between about 1.2 mm and 1.3 mm, a

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thickness of between about 0.2 mm and 0.03 mm, and a denier of between about 240 and 250.

4. The method according to claim 3, further comprising the step of orientating said longitudinal ribbons to a ratio of about 1:4.25.

5. The method according to claim 1, further comprising the step of orienting by stretching the lateral ribbons to have a ratio of stretched oriented length to original substantially unoriented length in excess of 1:4.

6. The method according to claim 1, further comprising the step of orienting by stretching the lateral ribbons to have a ratio of stretched oriented length to original substantially unoriented length of about 1:4 to 1:5.

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**EXHIBIT "B"**

## ΣΥΜΒΑΣΗ ΑΠΟΚΛΕΙΣΤΙΚΗΣ ΑΝΤΙΠΡΟΣΩΠΕΙΑΣ ΠΩΛΗΣΕΩΝ

Η ΣΥΜΒΑΣΗ ΑΥΤΗ συντάχθηκε στις 3 Απριλίου 2001 μεταξύ της ΚΑΡΑΤΖΗ , Βιομηχανικές & Ξενοδοχειακές Επιχ/σεις Ανώνυμη Εταιρεία, που εδρεύει στον Δήμο Ν. Καζαντζίκη Μονοφατσίου Ηρακλείου Κρήτης, με ΑΦΜ 094113381, νομίμως εκπροσωπούμενη από τον Γενικό Διευθυντή της κ. Κωνσταντίνο Αρχοντάκη και του Αντιπροσώπου AUTOMATED PACKAGING TECHNOLOGIES LLC, εταιρεία περιορισμένης ευθύνης, που εδρεύει στην 4217 Sunny Brook Way, #205, Winter Springs, FL 32708, ΗΠΑ, με ΑΦΜ 59-3710635, νομίμως εκπροσωπούμενη από τον πρόεδρό της κ. Στέφανο Στάμο.

ΛΑΜΒΑΝΟΝΤΑΣ ΥΠΟΨΗ ότι, η Καράτζη είναι η εταιρία που παράγει τα αγαθά που περιγράφονται εν γένει στο Παράρτημα Α (τα Αγαθά) και

ΛΑΜΒΑΝΟΝΤΑΣ ΥΠΟΨΗ ότι, η Καράτζη επιθυμεί να διατηρήσει τις υπηρεσίες του Αντιπροσώπου για εμπορευματοποίηση των αγαθών σε όλη την Βόρεια Αμερική, και

ΛΑΜΒΑΝΟΝΤΑΣ ΥΠΟΨΗ ότι, ο ίδιος ο Αντιπρόσωπος, αλλά και μέσω εκμέρους αντιπροσώπων του διατίθεται να αντιπροσωπεύσει τον Καράτζη σε ό,τι αφορά την εμπορευματοποίηση των Αγαθών.

ΔΙΑ ΤΑΥΤΑ, λαμβάνοντας υπόψη τις υποχρεώσεις και τις συμφωνίες όπως αυτές εκτίθενται στο παρόν έγγραφο, τα συμβαλλόμενα μέρη, προαίθετα να δεσμευτούν νομικά δια του παρόντος εγγράφου, υπόσχονται και συμφωνούν να τηρήσουν τα ακόλουθα :

### 1. ΠΡΟΝΟΜΙΑ ΑΝΤΙΠΡΟΣΩΠΕΙΑΣ

- A. Η Καράτζη Α.Ε. δια του παρόντος εγγράφου παρέχει στον Αντιπρόσωπο, κατά την διάρκεια του παρόντος Συμφωνητικού, το αποκλειστικό δικαίωμα να αντιπροσωπεύσει την Καράτζη Α.Ε. σε όλη την Βόρεια Αμερική, συμπεριλαμβανομένου του Καναδά, των Ηνωμένων Πολιτειών, και του Μεξικού (η Περιφέρεια) σε ό,τι αφορά στην εμπορευματοποίηση των Αγαθών. Ο Αντιπρόσωπος θα επιφυλάσσει το δικαίωμα διορισμού εκμέρους αντιπροσώπων (Υποαντιπρόσωποι) σε χώρες εκτός των Ηνωμένων Πολιτειών δεδομένου ότι η Καράτζη Α.Ε. θα ενημερώνεται δέοντως για τους Υποαντιπροσώπους αυτούς. Όσα συμφωνητικά υπογραφούν μέσω των Υποαντιπροσώπων θα πρέπει να είναι σύμφωνα προς τον τύπο συμφωνητικού όπως αυτός έχει προεγκριθεί από την Καράτζη Α.Ε., και θα διέπονται από το παρόν Συμφωνητικό.
- B. Υπό αυτούς τους όρους, ο Αντιπρόσωπος και οι Υποαντιπρόσωποι του εξουσιοδοτούνται να παρουσιάζουν, διαπραγματεύονται και να συνάπτουν εμπορικές συναλλαγές σχετικά με τα Αγαθά με τρίτους κινώντας χρήση του τύπου συμφωνητικού όπως αυτό έχει εγκριθεί από την Καράτζη Α.Ε. και σύμφωνα με τους όρους και τις συμφωνίες που έχουν προεγκριθεί από την τελευταία.
- Γ. Όλα τα συμφωνητικά με τρίτους θα συνάπτονται εξ' ονόματος της και θα φέρουν την σφραγίδα Καράτζη Α.Ε., παρότι ο Αντιπρόσωπος και οι Υποαντιπρόσωποι θα είναι συμβαλλόμενα μέρη σε όλα αυτά τα συμφωνητικά ως αντιπρόσωποι της Καράτζη Α.Ε. . Όλες οι πληρωμές από τρίτους θα καταβάλλονται στην Καράτζη Α.Ε.

### 2. ΔΙΑΡΚΕΙΑ ΣΥΜΦΩΝΗΤΙΚΟΥ

- A. Το παρόν Συμφωνητικό και οι διατάξεις του, εκτός αν προβλέπεται άλλως, θα τεθούν σε πλήρη ισχύ και θα ισχύουν από την ημερομηνία εκτέλεσης της σύμβασως και από τα δύο συμβαλλόμενα μέρη και θα παραταθεί για πέντε (5) έτη κατόπιν αυτής της διάρκειας των πέντε ετών, μπορεί να παραταθεί για δυο έτη, με γραπτή συναίνεση των συμβαλλομένων.

### 3. ΚΑΘΗΚΟΝΤΑ ΚΑΙ ΥΠΟΧΡΕΩΣΕΙΣ ΤΩΝ ΣΥΜΒΑΛΛΟΜΕΝΩΝ ΜΕΡΩΝ

- A. Σύμφωνα με τους όρους που καθορίζονται στο παρόν, ο Αντιπρόσωπος θα καταβάλλει τις δέουσες προσπάθειες καθ' όλη τη διάρκεια του Συμφωνητικού προκειμένου να βρίσκεται και να συνάπτει επιχειρηματικές συνεργασίες με τρίτους, σε συνεργασία με τους Υποαντιπροσώπους του οι οποίοι θα είναι προς όφελος της Καράτζη Α.Ε. σχετικά με τα Αγαθά και στη συνέχεια να τις διατηρεί καθ' όλη την προβλεπόμενη διάρκεια ισχύος. Εντός των καθηκόντων του Αντιπροσώπου όπως αυτά

8. Όλες οι διαφορές που αφορούν το παρόν Συμφωνητικό θα επιλύονται ενώπιον των δικαστικών αρχών της πόλης του Ηρακλείου Κρήτης, Ελλάδα και όλα τα μέρη συναινούν στη δικαιοδοσία των δικαστηρίων αυτών, συμφωνούν να αποδέχονται την ταχυδρομική κοινοποίηση της διαδικασίας, και δια τον παρόντος αποποιούνται οποιαδήποτε δικαιοδοσία ή δικαιοσύνη που θα είχαν σε άλλη περίπτωση.

#### 11. ΔΕΣΜΕΥΤΙΚΗ ΣΥΜΦΩΝΙΑ ΓΙΑ ΔΙΑΔΟΧΟΥΣ

Οι διατάξεις του παρόντος θα είναι δεσμευτικές και θα ισχύουν για τα συμβαλλόμενα μέρη, τους κληρονόμους, μεταβιβαστές και διαδόχους τους.

#### 12. ΑΠΟΠΟΙΗΣΗ

Καμία αποποίηση ευθύνης οποιαδήποτε από τα δύο μέρη για αθέτηση όρων δεν θα θεωρηθεί ως αποποίηση ευθύνης για προηγούμενη ή επακόλουθη αθέτηση παρομοίων διατάξεων της συμβάσεως αυτής.

#### 13. ΚΑΤΑΜΕΡΙΣΜΟΣ ΕΥΘΥΝΩΝ

Εάν οποιοσδήποτε όρος, ρήτρα ή διάταξη του παρόντος θεωρηθεί άκυρος ή ανεφάρμοστος από αρμόδιο δικαστήριο, αυτή η ακύρωση δεν θα επηρεάσει την ισχύ ή εφαρμογή οποιαδήποτε άλλου όρου, ρήτρας ή διάταξης και κάθε μη ισχύων όρος, ρήτρα ή διάταξη θα θεωρηθεί αναγκαίο να αφαιρεθεί από το παρόν.

#### 14. ΑΝΕΞΑΡΤΗΤΟΣ ΣΥΝΕΡΓΑΤΗΣ

Ο Αντιπρόσωπος θα θεωρείται ανεξάρτητος συνεργάτης και κανένα από τα περιεχόμενα του παρόντος δεν θα καθιστά την συνεργασία αυτή εξαρτημένη εργασιακή σχέση, ομόρρυθμη εκμετάλλευση ή προσωπική εταιρία. Ο αντιπρόσωπος θα είναι αποκλειστικά υπεύθυνος και θα διαφυλάσσει την Καράτζη Α.Ε. από οποιοδήποτε και όλες τις αξιώσεις φόρων, αμοιβών ή κόστους συμπεριλαμβανομένων αλλά μη περιοριζόμενων των φορολογικών κρατήσεων, φόρου εισοδήματος, FICA, και αποζημίωσης εργατικού δυναμικού.

#### 15. ΔΥΝΑΤΟΤΗΤΑ ΕΚΧΩΡΗΣΗΣ

Το παρόν Συμφωνητικό, τα δικαιώματα και οι υποχρεώσεις που προκύπτουν από αυτό αφορούν προσωπικά τον Αντιπρόσωπο και δεν θα εκχωρούνται με οποιαδήποτε ενέργεια του Αντιπροσώπου ή εκτέλεση του νόμου παρά μόνο εάν αυτή σχετίζεται με μεταβίβαση ουσιαστικά όλων των παγίων του Αντιπροσώπου ή κατόπιν συναίνεσης της Καράτζη Α.Ε. .

#### 16. ΑΚΕΡΑΙΟΤΗΤΑ

Το παρόν Συμφωνητικό συνιστά την πλήρη συμφωνία των μερών, ακυρώνει και καθιστά ανίσχυρα όλα τα προηγούμενα συμφωνητικά μεταξύ τους και προβλέπεται ως τελική έκφραση της συμφωνίας τους. Οποιαδήποτε τροποποίηση ή βελτίωση στα προηγούμενα και ειδικά σε ό,τι αφορά το παρόν Συμφωνητικό θα γίνεται γραπτώς με την υπογραφή των μερών. Το παρόν Συμφωνητικό θα υπερισχύει οποιασδήποτε άλλων εγγράφων που ενδεχομένως έρχονται σε σύγκρουση με αυτήν.

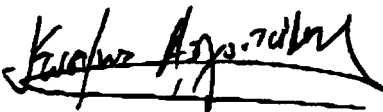
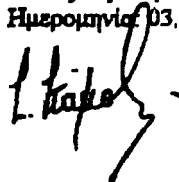
ΠΡΟΣ ΠΙΣΤΩΣΗ ΤΩΝ ΑΝΩΤΕΡΩ, τα συμβαλλόμενα μέρη, αποβλέποντας στην νόμιμη δέσμευσή τους δια του παρόντος, έχουν το κάθε ένα υπογράψει και σφραγίσει το παρόν την αναγραφόμενη ημέρα.

#### ΚΑΡΑΤΖΗ Α.Ε.

Κωνσταντίνος Αρχοντάκης  
Τίτλος: Γενικός Διευθυντής  
Ημερομηνία: 03.04.2001

#### AUTOMATED PACKAGING TECHNOLOGIES LLC

Στέφανος Στάμος  
Τίτλος: Πρόεδρος  
Ημερομηνία: 03.04.2001

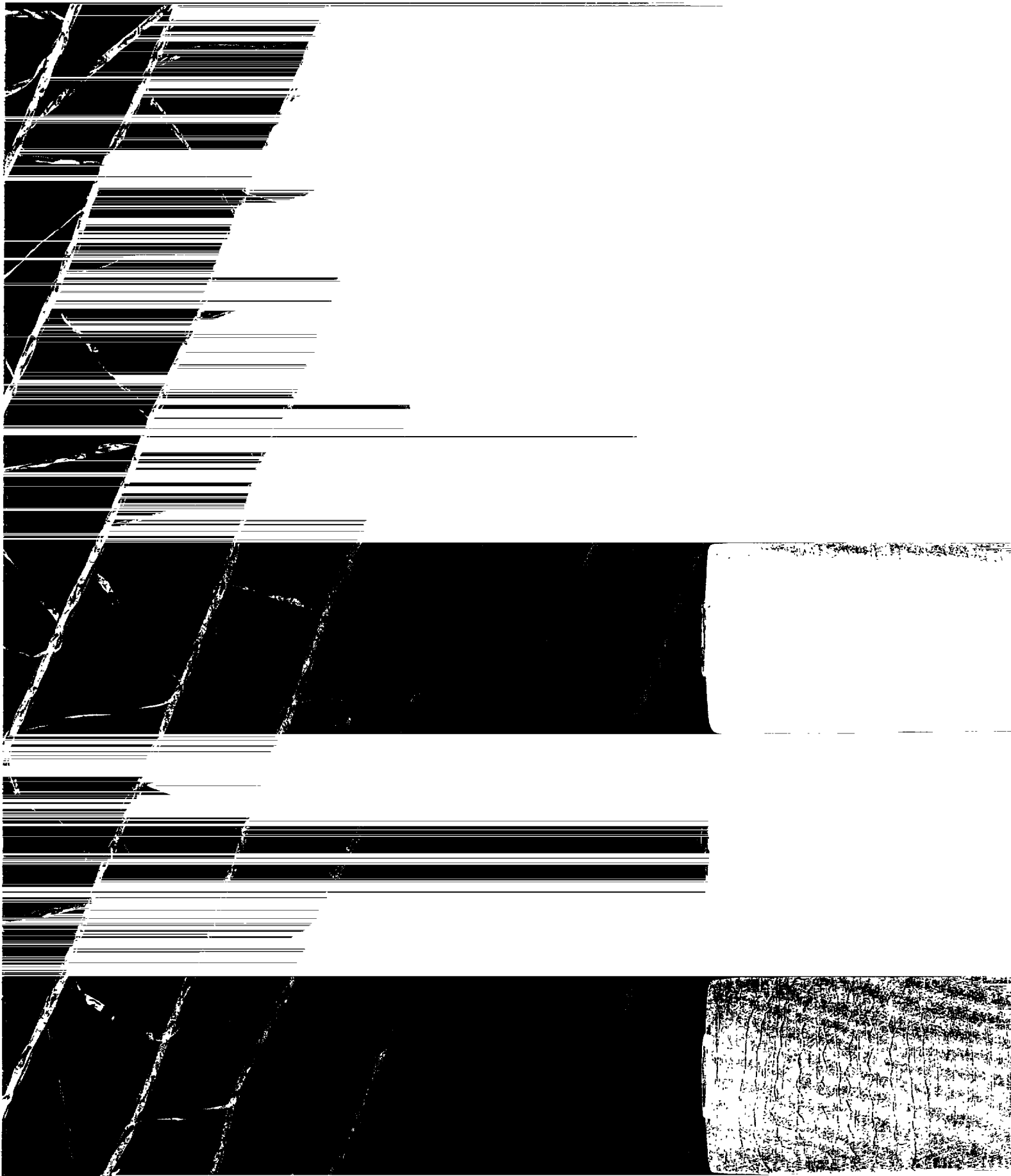



**The balance of the Exclusive Sales Agreement has been redacted for purposes of confidentiality.**

**EXHIBIT "C"**

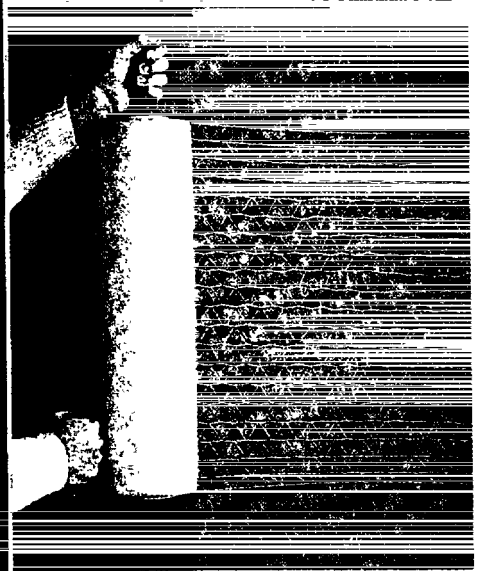


# PALLET NETWORK



# Normal pallet netting

- inexpensive
- easy to handle
- simple to dispose
- fully protective



available in

- jumbo rolls
- machine rolls
- hand rolls



# Stretch pallet netwrap

## Pallet net with Built-in memory

- Due to it's Built-in memory practically no overlap is required.

This means savings up to 20% compared to a normal pallet netting.

- Excellent three dimension tension: when applied on the

**available in**

- machine rolls
- hand rolls

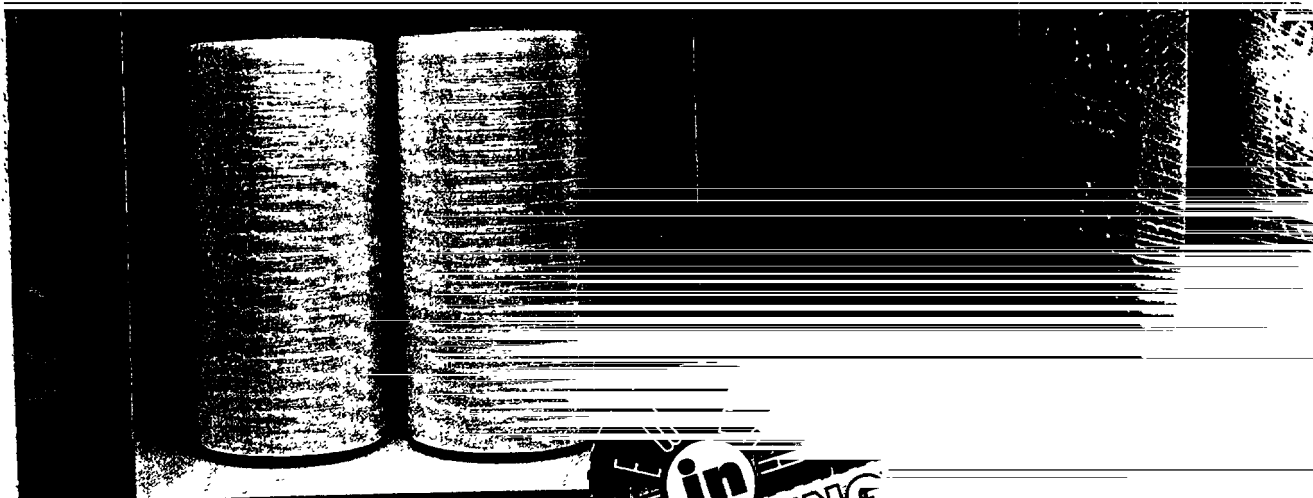
top layer provides the right pressure on the top layer of the pallet to

- Ideal for hand application

- Provides air circulation and is recommended for packaging of produce units

- Ensures no condensation and no misting when used for the packaging of

- Ideal for the packaging of hot foods and frozen pizzas



**in  
PACKAGING**

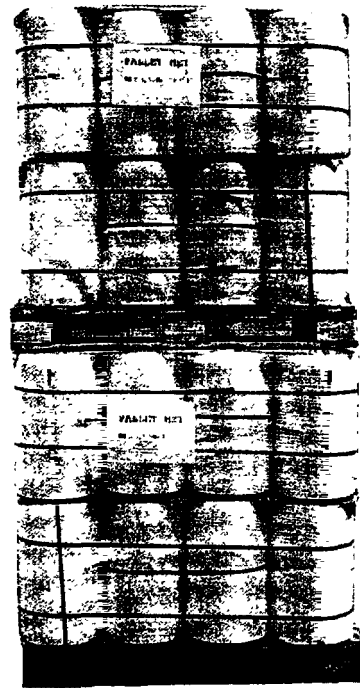


**PALLET NETWRAP**

| PRODUCTS                  | METERS/ROLL | TENSILE STRENGTH Kgs | grs/m   | CORE DIA- METER mm | CORE WIDTH cm | NET WIDTH cm | NUMBER OF WRAPS |
|---------------------------|-------------|----------------------|---------|--------------------|---------------|--------------|-----------------|
| PALLET NETWRAP NORMAL     | 7.000       | 60-70                | 3.3-3.5 | 76                 | 51.5          | 50           | 21              |
| PALLET NETWRAP NORMAL     | 3.500       | 60-70                | 3.3-3.5 | 76                 | 51.5          | 50           | 21              |
| PALLET NETWRAP NORMAL     | 1.000       | 60-70                | 3.3-3.5 | 50                 | 51.5          | 50           | 21              |
| PALLET NETWRAP NORMAL     | 500         | 60-70                | 3.3-3.5 | 50                 | 51.5          | 50           | 21              |
| PALLET NETWRAP REINFORCED | 3.500       | 80-90                | 3.8-4.0 | 76                 | 51.5          | 50           | 21              |

**STRETCH PALLET NETWRAP**

| STRETCH PALLET NETWRAP | METERS/ROLL | TENSILE STRENGTH Kgs | CORE DIAMETER mm | CORE WIDTH cm | NET WIDTH cm | NUMBER OF WRAPS |
|------------------------|-------------|----------------------|------------------|---------------|--------------|-----------------|
| STRETCH PALLET NETWRAP | 4.500       | 35                   | 76               | 51.50         | 50           | 21              |
| STRETCH PALLET NETWRAP | 750         | 35                   | 50               | 51.50         | 50           | 21              |



NETS INDUSTRY  
**hellasnet**

**EXHIBIT "D"**

# MORGAN & FINNEGAN, L.L.P.

A Registered Limited Liability Partnership

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www.morganfinnegan.com

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FACSIMILE: (202) 857-7929

WRITER'S DIRECT DIAL NUMBER:

(212) 415-8503

February 15, 2001

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\*NOT ADMITTED IN NEW YORK  
†ADMITTED IN WASHINGTON, D.C.

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Allen, Dyer, Doppelt, Milbrath  
& Gilchrist, P.A.  
1401 Citrus Center  
255 South Orange Avenue  
Post Office Box 3791  
Orlando, Florida 32802-3791

Re: U.S. Patent No. 5,256,353 of Tama Plastic Industry  
Our File No. 1874-4016; Your Ref.: 24223

Dear Mr. Estevez:

This will acknowledge your letter of February 8. As I have made clear previously, we disagree with your position. The claim language is very clear. The specification, e.g. in column 4, is very clear. The invention resides in the use of oriented longitudinal LLDPE ribbons. According to your statements, your client's product uses exactly that. Nothing in the patent prosecution estops Tama Plastic Industry from applying claim 1 of the '353 patent, as written, to your client's product.

We are currently arranging for the testing of a sample of your client's product recently obtained from a distributor. We expect the testing to be completed within the next several

RECEIVED  
FEB 20 2001  
A.D.D.M.&G.

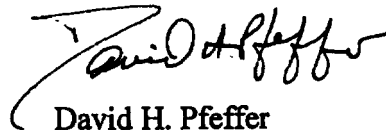
MORGAN & FINNEGAN, L.L.P.

Henry Estevez, Esq.  
February 15, 2001  
Page 2

weeks. Following receipt of the test results, we have every expectation that your client and several of its distributors will be sued for infringement of claim 1 of the '353 patent.

If in advance of litigation, you would like to discuss a settlement of Tama Plastic Industry's infringement claim against your client and several of its distributors, including a graceful exit by your client from sales of the infringing product in the U.S. market, please let me know.

Very truly yours,

A handwritten signature in black ink, appearing to read "David H. Pfeffer", written in a cursive style.

David H. Pfeffer

DHP:mjp

**EXHIBIT "E"**

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March 13, 2001

*SDM*  
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VIA FACSIMILE  
CONFIRMATION BY FIRST CLASS MAIL

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& Gilchrist, P.A.  
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255 South Orange Avenue  
Post Office Box 3791  
Orlando, Florida 32802-3791

**CONFIRMATION**

RECEIVED  
MAR 20 2001  
A.D.D.M.&G.

Re: Tama Plastic Industries v. M. & A. Karatzis S.A.,  
Civ. Action No. 01-2332 NM (CW)

Dear Mr. Estevez:

Enclosed is a courtesy copy of a Summons and Complaint by Tama Plastic Industry naming as defendants your client, M. & A. Karatzis S.A., and several of its distributors in the United States. The complaint was filed by our local counsel in the U.S. District Court for the Central District of California on Friday, March 9, 2001.

MORGAN & FINNEGAN, L.L.P.

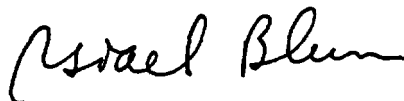
Henry Estevez, Esq.

March 13, 2001

Page 2

Please let us know by the close of business on Friday, March 16, 2001 whether as U.S. counsel for M. & A. Karatzis S.A., you are willing to accept service of the Summons and Complaint on behalf of (1) M & A Karatzis S.A; and (2) any or all of the other named defendants.

Very truly yours,

A handwritten signature in cursive script that reads "Israel Blum".

Israel Blum

Michael D. Young, Esq. (Bar No.120787)  
William E. Berner, Esq.(Bar No.169175)  
Weston, Benshoof, et al  
444 South Flower Street, 43rd Floor  
Los Angeles, CA 90071

**UNITED STATES DISTRICT COURT  
CENTRAL DISTRICT OF CALIFORNIA**

TAMA PLASTIC INDUSTRY

CASE NUMBER

PLAINTIFF(S),

CV- 01-2832 NM (awx)

v.

M. & A. Karatzis S.A., Rolling Hills  
Plastics, Inc., Pacon Paper, Inc., and  
Marcus-James Company

**SUMMONS**

DEFENDANT(S).

TO: THE ABOVE-NAMED DEFENDANT(S):

YOU ARE HEREBY SUMMONED and required to file with this court and serve upon plaintiff's attorney

Michael D. Young, whose address is:

Weston, Benshoof, Rochefort, Rubalcava & MacCuish, LLP  
444 South Flower Street  
43rd Floor  
Los Angeles, CA 90071  
Phone: (213) 623-2322 Fax: (213) 623-0824

An answer to the complaint which is herewith served upon you within 30 days after service of this summons upon you, exclusive of the day of service. If you fail to do so, judgment by default will be taken against you for the relief demanded in the complaint.

CLERK, U.S. DISTRICT COURT

DATE: March 9, 2001

By *D. Young*  
Deputy Clerk

(SEAL OF THE COURT)

ORIGINAL



Michael D. Young, Esq. (Bar No.120787)  
William E. Berner, Esq. (Bar No.169175)  
Weston, Benshoof, et al  
444 South Flower Street, 43rd Floor  
Los Angeles, CA 90071

**UNITED STATES DISTRICT COURT**  
**CENTRAL DISTRICT OF CALIFORNIA**

TAMA PLASTIC INDUSTRY

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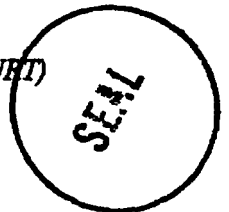
An answer to the complaint which is herewith served upon you within 30 days after service of this  
summons upon you, exclusive of the day of service. If you fail to do so, judgment by default will be taken  
against you for the relief demanded in the complaint.

CLERK, U.S. DISTRICT COURT

DATE: March 9, 2001

By DENISE LAZO  
Deputy Clerk

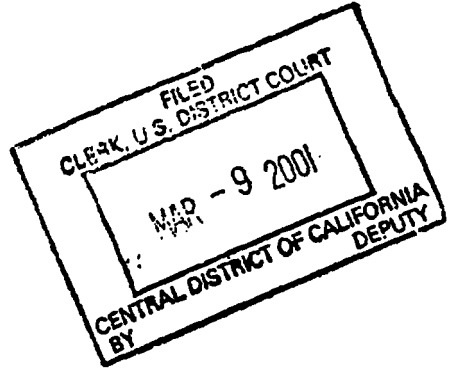
(SEAL OF THE COURT)



COPY

mdy

1 MICHAEL D. YOUNG (State Bar No. 120787)  
WILLIAM E. BERNER, JR. (State Bar No. 169175)  
2 WESTON, BENSHOOF, ROCHEFORT,  
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3 444 South Flower Street, Forty Third Floor  
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4 Telephone: (213) 623-2322  
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5 Attorneys for Plaintiff  
6 TAMA PLASTIC INDUSTRY

7  
8  
9 UNITED STATES DISTRICT COURT  
10 CENTRAL DISTRICT OF CALIFORNIA

WESTON BENSHOOF ROCHEFORT RUBALCAVA MACCUISH LLP  
444 South Flower Street, Forty Third Floor  
Los Angeles, California 90071-2901  
(213) 623-2322

11 TAMA PLASTIC INDUSTRY,  
12 Plaintiff,  
13 v.  
14 M. & A. KARATZIS S.A., ROLLING  
HILLS PLASTICS, INC., PACON PAPER,  
15 INC., and MARCUS-JAMES COMPANY.  
16 Defendants.

Case No. 01-2332 NM (CWX)

- COMPLAINT FOR:
- (I) PATENT INFRINGEMENT
  - (II) TRADEMARK INFRINGEMENT
  - (III) FALSE DESIGNATION OF ORIGIN AND UNFAIR COMPETITION
  - (IV) TRADEMARK INFRINGEMENT AND UNFAIR COMPETITION
  - (V) UNFAIR COMPETITION AND UNFAIR BUSINESS PRACTICES

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22 Plaintiff, TAMA Plastic Industry ("TAMA"), for its complaint against M. & A  
23 Karatzis, S.A. ("Karatzis"), Rolling Hills Plastics, Inc. ("Rolling Hills Plastics"), Pacon Paper  
24 Inc. ("Pacon Paper"), and Marcus-James Company ("Marcus-James"), alleges as follows:

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**Nature of Action and Jurisdiction**

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1. This is an action for patent infringement, trademark infringement, unfair competition and other related causes of action under federal, state and common law arising from defendants' unauthorized manufacture, sale, offer to sell and/or importation into the United States of knitted thermoplastic netting in violation of TAMA's patent rights, and also arising from at least defendant Marcus-James' unauthorized sale of products under TAMA's federally registered FLEX-NET mark in violation of TAMA's exclusive rights in that mark. Jurisdiction of this Court is based on 28 U.S.C. §§ 1331 and 1338 (a) and (b) (Acts of Congress relating to patents, trademarks and related actions), Sections 39 and 43(a) of the United States Trademark Act of 1946, as amended (15 U.S.C. § 1121 and 1125(a)), 28 U.S.C. § 1331 (Federal Question), 28 U.S.C. 1332(a)(1) (Federal Diversity), and 28 U.S.C. § 1367 (Supplemental Jurisdiction), as well as the principles of pendent jurisdiction. The amount in question exceeds \$75,000.

**The Parties**

2. Plaintiff TAMA is a partnership organized according to the laws of the State of Israel and has executive offices in Israel at Kibbutz Mishmar Ha'emek, 19236 Israel.

3. Upon information and belief, defendant Karatzis is a corporation organized under the laws of Greece with offices in Industrial Area, 71110 Heraklion P.O. Box 1490, Crete, Greece. Upon information and belief, defendant Karatzis is not registered to do business within any state and does not have offices in the United States.

4. Upon information and belief, defendant Rolling Hills Plastics is a corporation of the State of California, having a place of business at 3555 Lomita Blvd., Suite B Torrence, California 90505, within this judicial district.

5. Upon information and belief, defendant Pacon Paper is a corporation of the State of California, having a place of business at 4249 N. Puente Ave., Baldwin Park, California 91706, within this judicial district.

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6. Upon information and belief, defendant Marcus-James is a corporation of the State of Missouri having places of business at 1846 Yellow Rock Rd., DeSoto, Missouri 63020 and 301 East Main, DeSoto, Missouri 63020, and also is doing business within this judicial district.

Venue

7. Venue is proper in this district pursuant to 28 U.S.C. §§ 1391(b), (c) and (d) and 1400(b).

The TAMA '353 Patent

8. Plaintiff is the owner by assignment of United States Letters Patent No. 5,256,353 ("the '353 patent") entitled "METHOD OF MAKING ELASTIC PLASTIC NETTING MADE OF ORIENTED STRANDS." The '353 patent was duly and lawfully issued by the United States Patent and Trademark Office on October 26, 1993. A copy of the '353 patent is annexed as Exhibit A hereto.

9. Pursuant to 35 U.S.C. § 282, the '353 patent is presumed valid.

Use Of The FLEX-NET Mark By TAMA

10. Since May 1992, TAMA has continuously and extensively sold and promoted its knitted thermoplastic netting products throughout the United States under the FLEX-NET Mark.

11. TAMA has maintained the high quality of its FLEX-NET knitted thermoplastic netting products since May, 1992 and does not permit the use of the FLEX-NET Mark on product which does not meet TAMA's standards.

12. As a result of TAMA's efforts, the FLEX-NET knitted thermoplastic netting products are recognized by relevant consumers as designated high quality knitted thermoplastic netting originating exclusively from TAMA.

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1 13. TAMA is the owner of the United States Trademark Registration No.  
2 1,815,946 for the mark FLEX-NET for "pallet netting." This registration is valid and subsisting  
3 and in full force and effect and is prima facie proof of TAMA's exclusive right to own and use  
4 the FLEX-NET Mark pursuant to 15 U.S.C. §1057. This registration also has become  
5 incontestable pursuant to 15 U.S.C. §1065.

6  
7 **Defendants' Infringing Activities**

8 14. On information and belief, defendant Karatzis has manufactured and/or ha  
9 caused to be manufactured outside the United States knitted thermoplastic netting by a metho  
10 embodying the invention described and claimed in at least Claim 1 of the '353 patent and ha  
11 sold and offered to sell knitted thermoplastic netting made by such method to distributors whos  
12 activities include sales to consumers located within this judicial district, as well as elsewhere i  
13 the United States, without leave or license from plaintiff.

14 15. Upon information and belief, defendant Karatzis has been aware of th  
15 existence of the '353 patent for at least several years. Notwithstanding knowledge of th  
16 existence of the '353 patent, defendant Karatzis proceeded to infringe and has continued t  
17 infringe at least Claim 1 of the '353 patent by the manufacture outside of the United States an  
18 shipment into the United States of knitted thermoplastic netting product(s).

19 16. On information and belief, the acts by defendant Karatzis of manufacturin  
20 the knitted thermoplastic netting outside of the United States by such method and importin  
21 offering to sell and selling the knitted thermoplastic netting made by such method, to defendan  
22 Rolling Hills Plastics, Pacon Paper, and/or Marcus-James infringe at least Claim 1 of the '3  
23 patent under 35 U.S.C. § 271(g). The acts by the defendants Rolling Hills Plastics, Pacon Pap  
24 and Marcus-James in this district and elsewhere in the United States of importing and/or offerin  
25 to sell and/or selling the knitted thermoplastic netting made by Karatzis outside of the Unit  
26 States by such method also infringe at least Claim 1 of the '353 patent under 35 U.S.C. § 271(c)  
27 These infringing acts are without leave or license from plaintiff, and on information and beli  
28 are willful and deliberate, with knowledge of the '353 patent.

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1 17. On information and belief, defendant Rolling Hills has obtained supplies  
2 of the knitted thermoplastic netting directly from defendant Karatzis and also from defendant  
3 Marcus-James and possibly others, and has sold and offered to sell such netting to customers  
4 located in this judicial district and elsewhere in the United States.

5 18. On information and belief, defendant Marcus-James has obtained supplies  
6 of the knitted thermoplastic netting directly from defendant Karatzis and has sold and offered  
7 to sell such netting to customers throughout the United States. Further, on information and  
8 belief, defendant Marcus-James has contracted with defendant Rolling Hills to fill orders for  
9 such netting taken by defendant Rolling Hills within this judicial district.

10 19. On information and belief, defendant Pacon Paper has purchased quantities  
11 of the knitted thermoplastic netting from one or more of the defendants herein and has offered  
12 to sell used and/or resold such netting within this judicial district.

13  
14 **Defendant Marcus-James' Improper Use Of The FLEX-NET Mark**

15 20. Since August 2000, TAMA has not authorized or consented to the use of  
16 the FLEX-NET Mark by defendant Marcus-James.

17 21. Upon information and belief, defendant Marcus-James has sold and/or  
18 offered for sale in this district and elsewhere in the United States a knitted thermoplastic netting  
19 product under the FLEX-NET Mark which was not genuine FLEX-NET knitted thermoplastic  
20 netting product, in deliberate violation of TAMA's exclusive rights in the FLEX-NET Mark.

21 22. Upon information and belief, the aforesaid willful and deliberate acts of  
22 defendant Marcus-James were intended to cause, have caused and are likely to continue to cause  
23 confusion or mistake with TAMA's FLEX-NET Mark, and otherwise infringe the prior exclusive  
24 rights of TAMA in the FLEX-NET Mark. In addition, the aforesaid willful and deliberate acts  
25 of defendant Marcus-James have caused and will continue to cause, unless enjoined, irreparable  
26 damage to TAMA and to the reputation and goodwill of its valuable FLEX-NET Mark.

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1 23. TAMA has been, and will continue to be, absent injunctive relief,  
2 irreparably harmed by each and every defendants' aforementioned acts of infringement; and has  
3 further suffered monetary damages in an amount to be determined at trial.

4 24. TAMA has no adequate remedy at law.

5 25. This is an exceptional case.

6

7 **COUNT I**

8 **Patent Infringement**  
9 **Under § 271(g) Of The Patent Act**

10 26. TAMA repeats the allegations set forth in paragraphs 1 through 25.

11 27. The complained of acts herein constitute willful and deliberate infringement  
12 by defendants, and each of them, of the '353 patent in violation of 35 U.S.C. § 271 (g).

13 **COUNT II**

14 **Trademark Infringement Under The**  
15 **United States Trademark Act**  
16 **(15 U.S.C. § 1114)**

17 28. TAMA repeats the allegations set forth in paragraphs 1 through 25.

18 29. The acts of defendant Marcus-James complained of herein constitute  
19 willful, deliberate and intentional infringement of plaintiff's federally registered FLEX-NEI  
20 Mark, in violation of §32 of the United States Trademark Act (15 U.S.C. §1114).

21 **COUNT III**

22 **False Designation Of Origin And**  
23 **Unfair Competition**  
24 **Under The United States Trademark Act**  
25 **(15 U.S.C. § 1125(a))**

26 30. TAMA repeats the allegations set forth in paragraphs 1 through 25.

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1 31. The acts of defendant Marcus-James complained of herein constitute  
2 willful, deliberate and intentional unfair competition and false designations of origin and/or false  
3 representations or descriptions as to the knitted thermoplastic netting product made available by  
4 defendant Marcus-James, in violation of §43(a) of the Trademark Act (15 U.S.C. §1125(a)).

6 **COUNT IV**

7 **Trademark Infringement and Unfair Competition**  
8 **Under California Statutory Law and Common Law**  
9 **(Cal. Bus. & Prof. Code § 14335)**

10 32. TAMA repeats the allegations set forth in paragraphs 1 through 25.

11 33. The acts of defendant Marcus-James complained of herein constitute  
12 willful, deliberate and intentional trademark infringement and unfair competition for the purpose  
13 of enhancing the commercial value of, or selling or soliciting purchases of, the goods of  
14 defendant Marcus-James in violation of the California Business and Professional Code § 14335  
15 and under the common law.

16 **COUNT V**

17 **Unfair Competition and Unfair Business Practices**  
18 **Under California Law**  
19 **(Cal. Bus. & Prof. Code § 17200)**

20 34. TAMA repeats the allegations set forth in paragraphs 1 through 25.

21 35. The acts of defendant Marcus-James complained of herein constitute  
22 willful, deliberate and intentionally unfair and fraudulent business practices in violation of  
23 17200 of the California Business and Professions Code.

24 **PRAYER**

25 WHEREFORE, plaintiff respectfully requests that judgment be entered:

26 a) holding that defendants have each infringed the '353 patent and  
27 35 U.S.C. § 271(g);  
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1                   b)     enjoining defendants and each of them, and all persons and entities  
2     in privity with one or all of them, from further acts of infringement, contributory and/or inducing  
3     infringement, of the '353 patent, including importing, offering to sell and selling the knitted  
4     thermoplastic netting made by the method of the '353 patent in the United States, or contributing  
5     and/or inducing such importation, offering to sell and selling;

6                   c)     holding that defendant Marcus-James has infringed and violated  
7     plaintiff's exclusive rights in the FLEX-NET Mark in violation of federal, state and common  
8     law;

9                   d)     preliminarily and permanently enjoining and restricting defendant  
10    Marcus-James from directly or indirectly:

11                   (i)    using, in any manner, or holding itself out as having rights  
12    to use the name and mark FLEX-NET or any other name, mark or design confusingly similar  
13    to plaintiff's FLEX-NET Mark to designate, describe or refer to any knitted thermoplastic netting  
14    product it offers for sale;

15                   (ii)   selling, offering for sale, promoting, advertising, distributing,  
16    providing or offering to provide any goods in conjunction with the name or mark FLEX-NET  
17    or any other name, mark or design confusingly similar to plaintiff's FLEX-NET Mark in  
18    conjunction with knitted thermoplastic netting products, and all other goods or services  
19    pertaining to the knitted thermoplastic netting market.

20                   e)     holding that defendant Marcus-James be required to deliver to  
21    plaintiff all merchandise, packaging, labels, boxes, cartons, advertising, brochures, documents,  
22    advertising and promotional materials and other things, possessed, used or distributed by  
23    defendant Marcus-James, or on its behalf, which refer to the name or mark FLEX-NET or any  
24    other name, mark or design confusingly similar to plaintiff's FLEX-NET Mark, and all  
25    documents which refer or relate to the sale or offering for sale by defendant Marcus-James of  
26    knitted thermoplastic netting product under the FLEX-NET Mark;

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- 1 f) awarding plaintiff such monetary damages adequate to compensate
- 2 plaintiff for defendants' acts of infringement of the '353 patent, including pre-judgement interest
- 3 on these damages;
- 4 g) awarding plaintiff treble damages against defendants pursuant to 35
- 5 U.S.C. § 284 for willful infringement;
- 6 h) awarding plaintiff treble damages against defendant Marcus-James
- 7 pursuant to 15 U.S.C. § 1117;
- 8 i) declaring this case to be "exceptional" and awarding plaintiff its
- 9 reasonable attorneys' fees pursuant to 35 U.S.C. § 285, plus the costs and disbursements of this
- 10 action; and
- 11 j) awarding plaintiff such other and further relief as this Court may
- 12 deem just and proper.

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13 DATED: March 9, 2001

Respectfully submitted,

MICHAEL D. YOUNG  
 WILLIAM E. BERNER, JR.  
 WESTON, BENSHOOF, ROCHEFORT,  
 RUBALCAVA & MACCUISH LLP



MICHAEL D. YOUNG

Attorneys for Plaintiff  
 TAMA PLASTIC INDUSTRY

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**United States Patent** [19]

Leiber et al.

[11] Patent Number: 5,200,000

[45] Date of Patent: Oct. 26, 1993

[54] **METHOD OF MAKING ELASTIC PLASTIC NETTING MADE OF ORIENTED STRANDS**

[75] Inventors: Yuval Leiber, Megido; Ya'Acov Agavof; Yonatan Arnon, both of Haemek, all of Israel

[73] Assignee: Tama Plastic Industry, Kibbutz Mishmar Ha'emek, Israel

[21] Appl. No.: 813,140

[22] Filed: Dec. 23, 1991

**Related U.S. Application Data**

[62] Division of Ser. No. 444,057, Nov. 30, 1989, Pat. No. 5,104,714.

[51] Int. Cl.<sup>5</sup> ..... B28B 11/16

[52] U.S. Cl. .... 264/103; 264/146; 264/210.1; 264/DIG. 47

[58] Field of Search ..... 264/103, 146, 147, 288.4, 264/290.2, 210.1, DIG. 47

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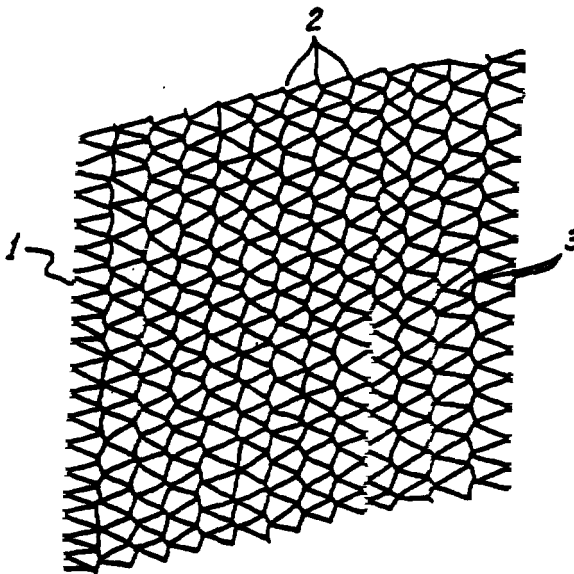
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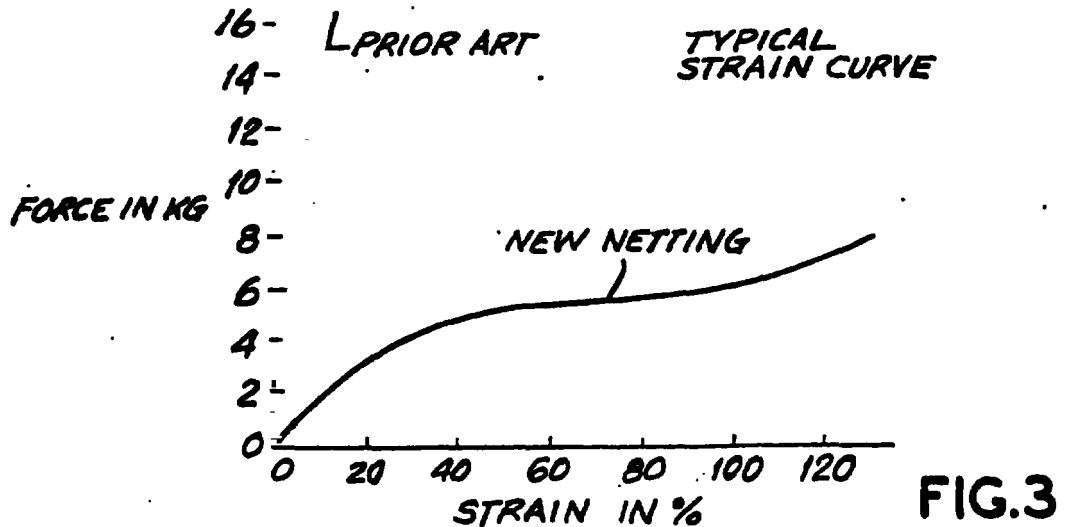
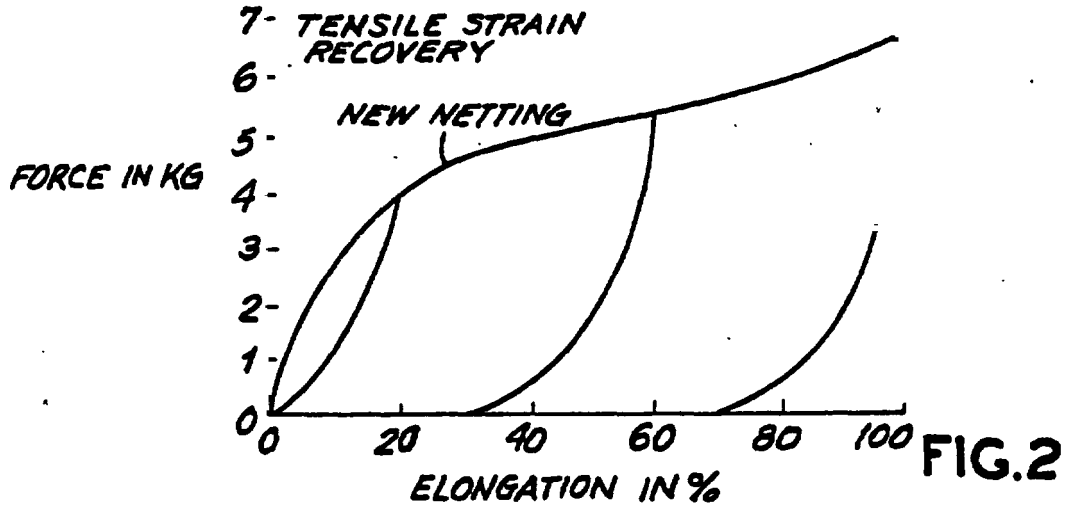
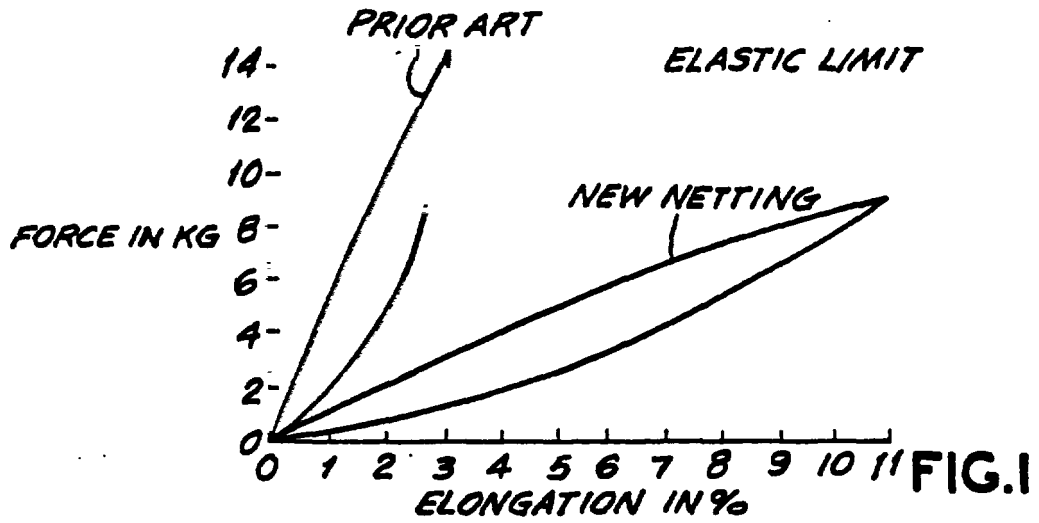
Primary Examiner—Jay H. Woo  
 Assistant Examiner—Robert B. Davis  
 Attorney, Agent, or Firm—Morgan & Finnegan

[57] **ABSTRACT**

A method of making an elastic wrapper netting wherein linear low density polyethylene ribbons are knitted into a Raschel net. The ribbons of the knitted wrapper netting have an orientation of about 1:4.25 in the longitudinal direction.

6 Claims, 3 Drawing Sheets





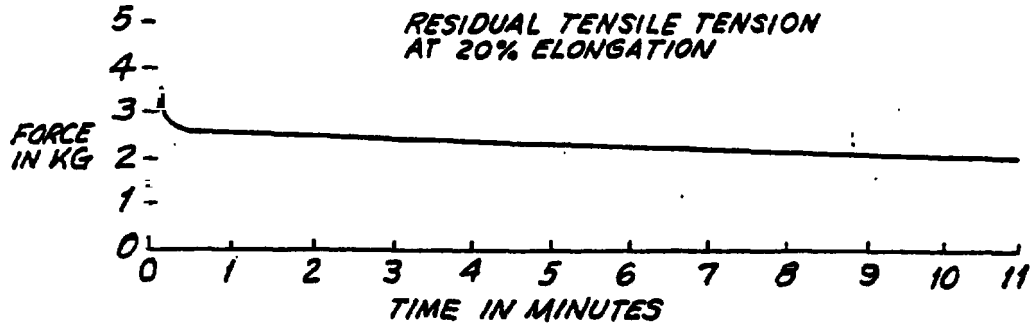


FIG.4A

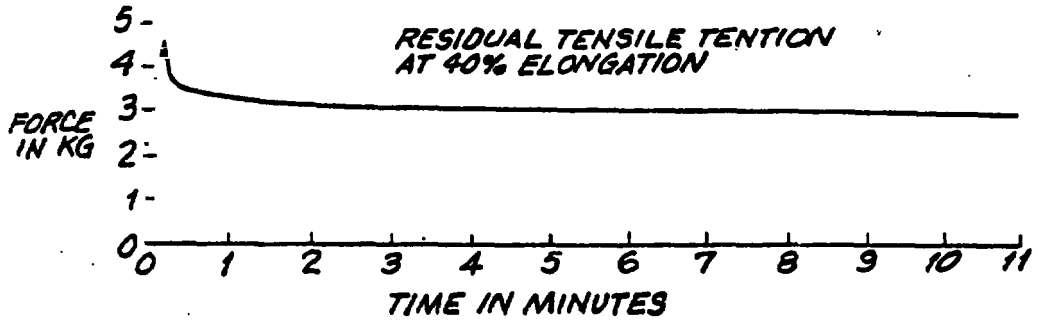


FIG.4B

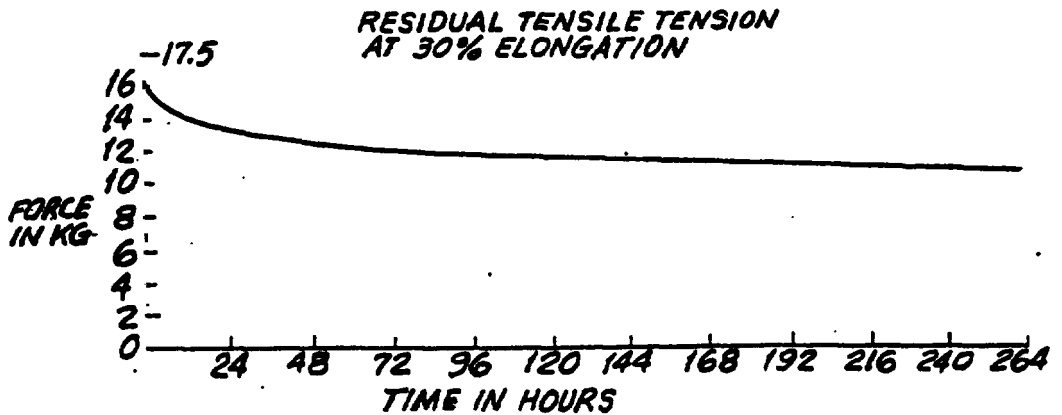


FIG.5

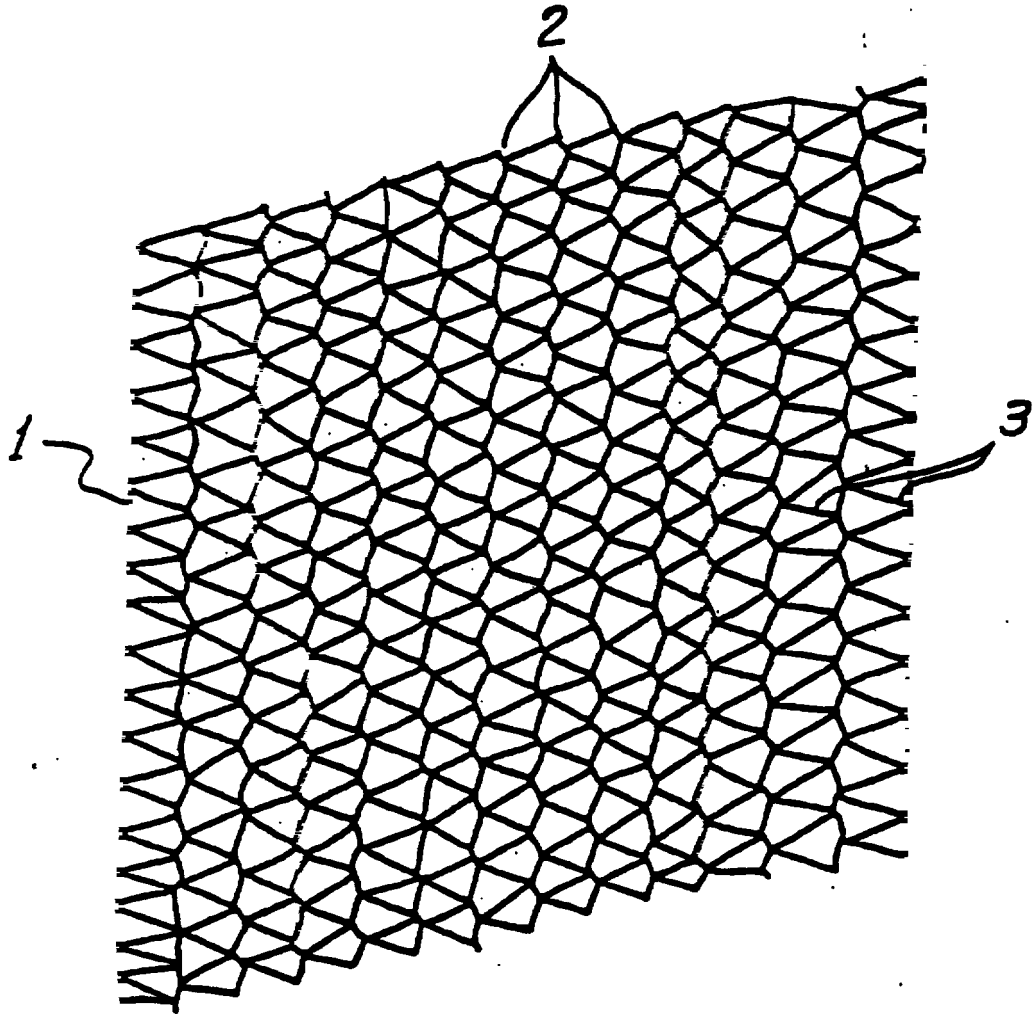


FIG. 6

## METHOD OF MAKING ELASTIC PLASTIC NETTING MADE OF ORIENTED STRANDS

This is a divisional application of co-pending application Ser. No. 07/444,057 filed Nov. 30, 1989, now U.S. Pat. No. 5,104,714.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to plastic knitted netting and its use in wrapping loads on pallets and in wrapping agricultural loads such as cylindrical bales of hay. Further, this invention relates to a method of making thermoplastic ribbons used to knit the netting so as to achieve the surprising result of excellent elasticity, elongation and residual elasticity.

#### 2. Description of Related Art

Wrapping pallet loads and agricultural loads with plastic film and with plastic netting to hold and stabilize the loads has become a widespread practice. The plastic netting which has heretofore been used has been either extruded netting or knitted netting, such as Raschel netting. Some manufacturers of extruded netting have discovered that it is desirable to manufacture a netting having a high degree of stretch before tensile failure and having a high degree of elasticity. In the past, users of netting who have wanted high strength in their netting have had to use extruded netting. Extruded netting has had greater strength than knitted netting due to the much greater amount of material (i.e., greater cross-sectional area) contained in each strand of netting. With the recent awareness that extruded netting could also be made elastic as well as strong, there has been more interest in the use of extruded netting than in the past.

Knitted plastic netting is made of very thin ribbons of thermoplastic material in order to allow it to be knitted; and because of the thinness of the ribbons, knitted netting has not been considered as useful as extruded netting for heavy loads where tensile strength is important. Because of this perception, manufacturers of knitted netting have always attempted to make their netting as strong as possible while still using thin ribbons of thermoplastic in order to keep cost and weight as low as possible.

Whether one is using extruded netting or knitted netting, it is desirable to have a netting which is both strong and elastic. Strength is obviously an important physical characteristic in order to avoid having the netting break and causing the load to spill. Elasticity in a netting is a desirable characteristic because it provides continued tension to the load after wrapping and after the load may have experienced settling and a reduction in volume. A load wrapped by a netting having insufficient elasticity will become loose and unstable. Even with loads which will not settle or reduce in volume, it is undesirable to use a non-elastic netting because tightening the netting sufficiently to hold the load can sometimes damage the contents. Whereas, use of an elastic netting can provide sufficient load-holding tension without damage to the contents.

Although extruded netting is advantageous to use in some applications, it has many undesirable characteristics when compared to knitted netting. One, much less extruded netting can be wound on the same diameter spool compared to a spool of knitted netting. This disadvantage is important when one realizes how frequently rolls have to be changed on a pallet wrapping machine

or how much storage space is needed to store the necessary inventory of netting. The same amount of knitted netting of this invention takes one-third the space of some conventional extruded netting.

Also, extruded netting creates great disposal problems. Because of the integral joining of the strands in extruded netting, the structure is very inflexible and is very difficult, if not impossible, to compact into a small space; and when it is done, the netting tends to spring open. The knitted netting of this invention is very easy to dispose of and can be easily gathered into a small volume for disposal.

It would be very desirable to combine the benefits of extruded netting and knitted netting in one netting product; however, in the past there has never been a way to combine the features of strength, stretchability and elasticity in one netting. This has been because the techniques used to strengthen a thermoplastic ribbon were the very techniques used to make a ribbon inelastic, and the techniques used to make a thermoplastic ribbon elastic resulted in a weaker ribbon.

### SUMMARY OF THE INVENTION

This invention is directed to knitted plastic netting possessing an elongation (i.e., stretching) of more than about 60% before breaking, an elastic limit of more than about 6%, and will retain at least about 15% of its original length when stretched more than 40%. Further, in use, the netting of this invention is preferably stretched about 30-50% when wrapped around its load. This invention is particularly directed to a method of creating such a netting.

It has been discovered that the desired properties of the knitted netting of this invention is achieved by producing a substantially unoriented primary film consisting essentially of a thermoplastic, such as a polyolefin, slitting the primary film into ribbons, then orienting the ribbons by an amount to maximize the tensile energy at break or to at least about 80% of such maximum value, and then knitting such ribbons into a netting having longitudinal and lateral ribbons. It has been found that practicing this invention can optimize the relationship between the strength, elasticity, and stretchability. In particular, the preferred knitted netting of this invention will have an elongation at break of more than about 60%, an elastic limit of more than about 6%, and elasticity of more than about 15% when elongated more than 40%.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a force-elongation graph comparing the elastic limit of a prior art knitted netting not made by the method of this invention with a knitted netting made by the preferred embodiment of this invention.

FIG. 2 is a force-elongation graph showing the tensile strain recovery for a knitted netting made by the preferred embodiment of this invention after various amounts of elongation.

FIG. 3 is a graph which compares the force-elongation characteristics of a prior art knitted netting with a knitted netting made according to this invention.

FIG. 4A is a graph which illustrates the residual tensile tension characteristics of the preferred knitted netting of this invention after 20% elongation up to 11 minutes.

FIG. 4B is a graph which illustrates the residual tensile tension characteristics of the preferred knitted net-

3

ting of this invention after 40% elongation up to 11 minutes.

FIG. 5 contains a graph which shows the residual tensile tension characteristics of the preferred knitted netting of this invention up to 264 hours.

FIG. 6 shows a sample of the preferred netting of this invention.

**DETAILED DESCRIPTION OF THE INVENTION AND BEST MODE**

In the preferred mode of this invention, the primary thermoplastic film is made by a conventional blow-film technique utilizing small thermoplastic pellets. Although, other methods of making the primary film can be used, such as the chill roll slot cast extrusion method or the water-quenched slot cast extrusion method, the blown film method is preferred. The netting may be formed of any thermoplastic material which can be formed into knitable ribbons. The thermoplastic material may be single polyolefin or a blend of polyolefins. The presently preferred material is linear low density polyethylene (LLDPE) which has been copolymerized with the alpha olefin, octene, and having a specific weight of about 0.92 g/cc.

It is well-known that when making primary film, increased orientation is achieved by pulling the end of the film out faster than it enters, wherein the ratio of the output velocity to the input velocity is the orientation value. It has been discovered that the desirable netting of this invention is obtained by using primary film that is substantially unoriented in any direction. Particularly, the film should have an orientation in the lateral direction of about 1.0, and an orientation in the longitudinal direction of between about 1.0-1.2. The preferable method of producing a primary film which is substantially unoriented in both directions is by producing the film with a blow-up ratio of 1:1 to 1:1.2. It is preferred that the thickness of the primary film which is used to make the longitudinal ribbons to be knitted into the netting be between about 0.08 mm to 0.10 mm, and preferably about 0.09 mm; and that the primary film which is to be used to make the lateral ribbons have a thickness of between about 0.04 mm and 0.06 mm, and preferably about 0.05 mm.

After the primary film is made, it is then passed to a machine for slitting the film into ribbons. The ribbons which are to be used as the longitudinal ribbons in the knitted netting, as well as the ribbons which are to be used as the lateral ribbons in the knitted netting are preferably slit into the same width of between about 2.4 mm and 2.6 mm and preferably about 2.5 mm. After the slitting process the ribbons are then stretched and oriented in the longitudinal direction to a value of between about 1.4 and 1.5, and preferably about 1.4.25. This orientation produces a longitudinal ribbon having a thickness of between about 0.04 mm and 0.05 mm, and preferably about 0.044 mm, and a lateral ribbon having a thickness of between about 0.02 mm and 0.03 mm, and preferably about 0.024 mm. After orientation, both the longitudinal and the lateral ribbons have a width of between 1.2 mm and 1.3 mm, and preferably about 1.23 mm. The denier of the preferred longitudinal ribbons is between about 430 and 460, and preferably about 448, and the denier of the preferred lateral ribbons is between 240 and 250, and preferably about 244. The denier of a ribbon is a unit of weight and is defined as the weight in grams of 9000 meters of the ribbon. The

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next step in the process is to oil the ribbons and to knit them using a Raschel machine into a knitted netting.

It has been determined that by using a primary film which was substantially unoriented during its manufacture and by properly orienting the ribbons after cutting the film into ribbons, the desired characteristics for elongation at break, elastic limit, and elasticity can be achieved. The desired properties are achieved by having a high "tensile energy to break" value, preferably more than 80% of the maximum possible value, and more preferably maximizing the "tensile energy to break" (TEB). The TEB is defined in ASTM D 882-83 as the area under the stress-strain curve to the break point. However, because netting having an elongation at break value of more than 130% are generally of no commercial value, it is preferred to measure and maximize the TEB up to 130% elongation. If netting having a greater elongation at break is commercially useful, for example, 150% or more, then the TEB should be measured and maximized up to this greater value.

Although it has been determined that in the preferred embodiment using the preferred thermoplastic material, the preferred ribbon orientation is about 1:4.25, when other materials are used, the proper ribbon orientation will need to be determined by preparing stress-strain curves for the netting made from the material at various ribbon orientations and then determining which orientation maximizes the TEB value. This ribbon orientation will provide a knitted netting having the most desired balance of strength (i.e., stress at break), elongation at break, elastic limit, stretchability (i.e., strain at break), and elasticity. Although it is preferable to select this proper orientation for both the longitudinal and lateral ribbons, the invention could be practiced by orienting only the longitudinal ribbons pursuant to this invention and orienting the lateral ribbons by any of the prior art methods not in accordance with this invention. This new netting has been compared to a prior art netting which is made from high density polyethylene. This comparison is best seen in Table I on the following page and in FIGS. 1-3.

**TABLE I**

|  | <u>LONGITUDINAL RIBBONS OF PRIOR ART NETTING</u> | <u>LONGITUDINAL RIBBONS OF NEW NETTING</u> |
|--|--|--|
| Ratio Of Tape Orientation              | 1:7.2  | 1:4.25                                     |
| Width Of Tape Prior To Orientation     | 3.06 M.M.  | 2.5 M.M.                                   |
| Width Of Tape After Orientation        | 1.89 M.M.  | 1.23 M.M.                                  |
| Thickness Of Tape Prior To Orientation | 0.080 M.M.                                       | 0.09 M.M.                                  |
| Thickness Of Tape After Orientation    | 0.030 M.M.                                       | 0.044 M.M.                                 |
| Denier Of Tape After Orientation       | 483 DEN.   | 448 DEN.                                   |
|  | <u>LATERAL RIBBONS OF PRIOR ART NETTING</u>      | <u>LATERAL RIBBONS OF NEW NETTING</u>      |
| Ratio Of Tape Orientation              | 1:4.1  | 1:4.25                                     |
| Width Of Tape Prior To Orientation     | 2.54 M.M.  | 2.5 M.M.                                   |
| Width Of Tape After Orientation        | 0.97 M.M.  | 1.23 M.M.                                  |
| Thickness Of Tape Prior To Orientation | 0.07 M.M.  | 0.05 M.M.                                  |
| Thickness Of Tape After Orientation    | 0.027 M.M.                                       | 0.024 M.M.                                 |
| Denier Of Tape After Orientation       | 223 DEN.   | 244 DEN.                                   |



TABLE 1-continued

| Orientation MATERIAL                                       | EDPE                 | LLDPE                |
|--|----------------------|----------------------|
| Specific Weight  | 0.947 GR/CC          | 0.92 GR/C            |
| Weight Per Square Meter Of Netting                         | 10 GR/M <sup>2</sup> | 10 GR/M <sup>2</sup> |
| Recommended Elongation Under Normal Palletizing Conditions | 3-4%                 | 30-50%               |
| Elastic Limit  | 3%                   | 10%                  |
| Elasticity   | 4%                   | 30%                  |

FIG. 1 represents the relationship between the elongation of the respective netting and the applied load. The upper portion of the curves represents elongation as the load is increased, and the bottom portion represents the elongation as the load is released. It is seen that the new netting material is more elastic than the old netting, both in the sense of being more easily elongated and in having a higher elastic limit. The elastic limit is defined as that percentage of elongation experienced by the ribbon after which the ribbon can return to its original length. If the ribbon is stretched beyond the elastic limit, the ribbon undergoes irreversible deformation, meaning that when the load is released, the ribbon does not return to its original length.

Referring now to FIG. 3, this graph bears the important force—elongation curves for the new netting and the prior art netting. It is seen that the prior art netting is not nearly as stretchable as the new netting. It is seen that the new netting can undergo elongation of 130% of its original length, whereas the prior art netting can only undergo elongation of about 15%. It can be visualized by looking at the two curves in FIG. 3 that the tensile energy at break (TEB) for the new netting is much greater than that for the prior art netting. Calculating the TEB for each netting results in the new netting having a TEB value of about 58.75 MJoules/m<sup>3</sup> (mega joules per cubic meter), while the TEB value of the prior art netting is about 26.11 MJoules/M<sup>3</sup>.

Another benefit of the new netting can be seen by viewing FIG. 2, which shows the hysteresis of the new netting after undergoing elongation of 20%, 60%, and 100%. It is seen that after 20% elongation, the netting nearly returns to its original length, whereas, after elongations of 60% and 100%, the netting returns to 30% elongation and 70% elongation, respectively based on its original length. This characteristic of the new netting provides residual stress and continued tension on a load regardless of how much the netting is stretched during the wrapping process.

Turning now to FIG. 4, the residual tensile tension for the new netting after elongations of 20% and 40% is plotted versus time, and it is apparent that the new netting maintains its tension for a long time, as shown in FIG. 5.

#### EXAMPLE

Thermoplastic pellets consisting essentially of linear low density polyethylene (LLDPE) are extruded by the blow-film method into one primary film having a thickness of about 0.9 mm. This film will be used to make the longitudinal ribbons. The same thermoplastic is extruded into a film having a thickness of about 0.05 mm to be used to make the lateral ribbons. The LLDPE is made by Dow Chemical Company and is sold under the name DOWLEX 2045 E (General Purposes). The film

is produced under conditions such that it undergoes no orientation in either the longitudinal or lateral direction.

Once the primary film is made, it is fed into an I.S.O. machine for slitting into ribbons and stretching in order to produce the properly oriented ribbons. The I.S.O. machine is manufactured by I.S.O., a company located at Rosenfeld, West Germany. The film for both the longitudinal ribbons and the lateral ribbons are fed into the I.S.O. machine at a temperature of 100-110 degrees C. The longitudinal ribbons are first slit to a width of 2.5 mm and then oriented to a value of 1:4.25. The width and thickness of the longitudinal ribbons after orientation are 1.23 mm and 0.044 mm, respectively. The lateral ribbons are first slit to a width of 2.54 mm and then oriented to a value of 1:4.25. The width and thickness of the lateral ribbons after orientation are 1.23 mm and 0.024 mm, respectively.

The denier of the longitudinal ribbon prior to orientation is 1900, and after orientation of 1:4.25 is 448. The denier of the lateral ribbon prior to orientation is 1040 and after orientation of 1:4.25 is 244. The longitudinal ribbons and the lateral ribbons are then placed on their respective grooves for knitting on the Raschel knitting machines. The Raschel knitting machine then produces a knitted netting which is rolled up onto a spool for future use. The netting has a width of up to 500 cm and the weight of the netting is about 10 grams/square meter.

The completed netting is shown in FIG. 6 wherein a section of netting 1 is comprised of longitudinal ribbons 2 and lateral ribbons 3.

This netting stretches 130% when stretched at the rate of 100% per minute before breaking, has an elastic limit of 10%, and has a tensile strain recovery of 30% after elongation of between 40% to 130%. A 50 cm width of this netting will break at 40 Kg.

This knitted netting is utilized with a conventional pallet wrapping machine and the load is wrapped by stretching the netting around the load so that it elongates 20%-40% and is wrapped in a spiral or parallel fashion by a wrapping machine intended for this purpose or by hand. Because of the characteristics of this netting, round bales of hay can be wrapped by only one and one-third circumferences around the load.

Although the invention has been described in its preferred embodiment, it will be apparent to those skilled in the art that the procedures and techniques of this invention can be applied to other materials to achieve the desired results of this invention. Accordingly, the scope of this invention is defined by the scope of the following claims.

What is claimed is:

1. A method of making a knitted thermoplastic netting having longitudinal ribbons and lateral ribbons, comprising the steps of:
  - a. producing a substantially unoriented primary film consisting essentially of linear low density polyethylene;
  - b. slitting the substantially unoriented primary film into longitudinal ribbons;
  - c. orienting by stretching the longitudinal ribbons to have a ratio of stretched oriented length to original substantially unoriented length of about 1:4 to 1:5; and
  - d. knitting said oriented longitudinal ribbons and the lateral ribbons into a knitted net;
 wherein said knitted net has an elastic limit of more than about 6%, an elongation at break of more than

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about 60%, and an elasticity of more than about 15% when stretched more than 40%.

2. The method according to claim 1, further comprising of the step of orienting by stretching the longitudinal ribbons to produce a tensile energy at break (TEB) of about 80% of the maximum TEB possible for said ribbons measured up to an elongation of 130%.

3. The method according to claim 1, further comprising the steps of:

orienting by stretching said longitudinal ribbons to a width of between about 1.2 mm and 1.3 mm, a thickness of between about 0.04 mm and 0.05 mm, and a denier of between about 430 and 460; and orienting by stretching the lateral ribbons to have a width of between about 1.2 mm and 1.3 mm, a

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thickness of between about 0.2 mm and 0.03 mm, and a denier of between about 240 and 250.

4. The method according to claim 3, further comprising the step of orientating said longitudinal ribbons to a ratio of about 1:4.25.

5. The method according to claim 1, further comprising the step of orienting by stretching the lateral ribbons to have a ratio of stretched oriented length to original substantially unoriented length in excess of 1:4.

6. The method according to claim 1, further comprising the step of orienting by stretching the lateral ribbons to have a ratio of stretched oriented length to original substantially unoriented length of about 1:4 to 1:5.

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UNITED STATES PATENT AND TRADEMARK OFFICE  
CERTIFICATE OF CORRECTION

PATENT NO. : 5,256,353

DATED : October 26, 1993

INVENTOR(S) : Yuval Leiber, Ya'Acov Agayof and Yonatan Arnon

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

On the title page, Item [75]:

Under "Inventors"; "Megido" should be --Galed--,  
and "Haemek" should be  
--Mishmar Haemek--. Column 4, line 49 and 62, under  
the headings "Longitudinal Ribbons of New Netting" and  
"Lateral Ribbons of New Netting", respectively, the  
dimension "2.5 M.M." should be --2.54 M.M.--. Column 5,  
line 3, the column title "EDPE" should be --HDPE--;  
Column 5, line 4, the specific gravity "0.92 GR/C"  
should be --0.92 GR/CC--; Column 5, lines 5 through 7,  
the legend "Weight per Square Square Meter of Netting"  
should be --Weight Per Square Meter of Netting--.

Signed and Sealed this

Sixteenth Day of August, 1994

Attest:



BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks

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**EXHIBIT "F"**

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POLYSTAR

PAGE 01

**PRESS RELEASE**

Tama Plastic Industry today announced that it has brought a lawsuit in the United States District Court in Los Angeles for patent infringement against a number of companies. Tama is the owner of a U.S. patent on the method used to manufacture Tama's highly successful FLEX-NET® knitted thermoplastic netting product. The FLEX-NET® product is used as pallet wrap for fruits and vegetables, as well as in other applications.

Among the companies that have been sued for patent infringement is M&A Karatzis S.A., a Greek company who is the manufacturer of the product which is being accused. Other companies being sued include several distributors, importers and customers of Karatzis, including Rolling Hills Plastics, Inc. of Torrance, California, Marcus-James Company of DeSoto, Missouri and Pacon Paper, Inc. of Baldwin Park, California.

In addition to the charges of patent infringement brought against all of the companies, Tama has also accused Marcus-James of trademark infringement and of attempting to pass off the Karatzis' manufactured netting as genuine FLEX-NET® netting.

Tama's lawsuit seeks damages and injunctive relief against all of the accused infringers. Tama has declared that it intends to fully enforce all of its patent and trademark rights against anyone else that is found to be infringing. For further information on the availability of Tama's FLEX-NET® product, please contact:

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Dated: March 12, 2001