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(54) Extrusion with variable neutral axis wire core

Strangpressen mit einem Drahtkern mit einer variablen neutralen Achse

Extrusion avec un noyau filamenteux et avec un axe neutre variable

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(56) References cited:
EP-A- 0 154 121
EP-A- 0 408 291
EP-A- 0 553 018
US-A- 4 343 845
US-A- 4 963 403
US-A- 4 982 529
US-A- 5 009 947
US-A- 5 143 666
US-A- 5 204 157
US-A- 5 416 961

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Description

Field of the Invention

[0001] The present invention relates to an elastomeric extrusion having a wire core reinforcement. More particularly, the present invention relates to extruded elastomeric strips which are generally U-shaped in cross-section and which are well adapted for gripping and covering the edges of flanges around doors of automotive vehicles and which often carry a sealing or decorative member.

Background of the Invention

[0002] U-shaped extruded elastomeric strips are in general use in the manufacture of automotive vehicles for sealing and decorative purposes. While it will be appreciated that such strips have many uses, such as in the appliance industry, the present invention will be described in the context of the automobile industry where such strips are commonly used to cover flanges which extend around various openings such as are found around doors, trunks and the like. The strips can simply cover the flange, or in many cases, cover the flange and also carry another member such as a sealing member bulb or a fin to cover an associated gap running along the flange.

[0003] Generally speaking, the extrusions are made by coextruding an elastomeric material about a metallic core which serves to reinforce the legs of the U-shaped extrusion so that the extrusion will effectively secure to an associated flange with sufficient clamping force. Some cores are stamped or lanced from a metal sheet. Other cores are made by winding a wire in surpentine fashion. The present invention especially relates to extrusions made using the wire type of core. Wire core based extrusions are well-suited to provide clamping force in a direction transverse to the extrusion but require additional tensile strength in the longitudinal direction, particularly during the extrusion process when the elastomeric material is not yet cured. The conventional exrusion process involves first extruding the elastomeric material about the core and then pulling the elongated extrudate by primary puller rolls or belts for cooling and further processing steps. Satisfactory extrusion requires that the extruded strip maintain a neutral geometry in the extruder and have tensile strength along its longitudinal axis in order to allow pulling of the strip through curing and cooling steps after the extruder.

[0004] One method of providing tensile strength to wire cores is to employ warp threads to knittingly hold adjacent parallel transverse wire segments in spaced relationship. This method deals with the processing limitations imposed by lack of tensile strength but introduces a problem when the extruded strip is applied to the usual curved flange. Flange edges commonly extend around the periphery of openings and are curved. It has been found that application of extrusions with threads rigidly holding the wire core in spaced relationship to a curved flange results in a bending axis which twists an associated seal or fin out of alignment if the extrusion has a neutral geometry. Thus, it has been found desirable to provide some flexibility in the wire to provide the extrusion with assymetric geometry to accommodate use of the extrusion on a curved flange edge.

[0005] One method of providing additional support to metal wire core is taught in U.S. Patent No. 5,416,961 January 26, 1994, to Vinay. The Vinay patent teaches a knitted wire core for use in the manufacture of weather seals comprising, a wire folded into a zigzag configuration for carrying a plurality of polymeric warp threads knitted on the wire and at least one meltable filament laid into at least two adjacent warp threads, whereby on heating, the melted filament causes the at least two adjacent warp threads to be bonded to the wire and/or to each other.

[0006] Another patent relating to support frames having longitudinally displaceable frame portions that are reinforced with longitudinally extending degradable reinforcing material is U.S. Patent No. 5,143,666 September 1, 1992 to McManus et al. The McManus patent involves advancing a reinforced support frame through an extrusion die where a coating of an elastomeric material is extruded on the support frame to form an elastomeric strip without degrading the degradable material. Then, longitudinally-spaced regions of the degradable reinforcing material corresponding to the longitudinally-spaced curved sections of the flange are then degraded, allowing the elastomeric strip to more faithfully follow the curved sections of the flange when the strip is mounted thereon. See also U.S. Patent No. 5,009,947 April 23, 1991, to McManus et al.

[0007] U.S. Patent No. 4,343,845 August 10, 1982, to Burden et al relates to an elastomeric strip which has a support frame having selected regions of longitudinally displaceable frame portions such as wire loops reinforced by degraded and nondegraded materials that are nondegradable during the frame coating operation for inhibiting longitudinal displacement of the frame portions during the frame coating operation. The degraded material breaks down when the strip is flexed to allow increased flexibility of the strip and the nondegraded material prevents undue elongation or stretching of the strip.

[0008] In summary, the manufacture of elastomeric extrusions having wire cores encounter certain difficulties. The neutral geometry of the core must be maintained while it travels through the extruder. After the extrusion leaves the die, it must be provided with sufficient tensile strength to allow pulling through the curing and cooling steps. Furthermore, when applied to a curved flange of a vehicle, the strip must have asymetric geometry to allow bending the strip around relatively small radius curves.

[0009] These issues are addressed by the present invention which provides a variable neutral axis wire core employing relatively low temperature and relatively high temperature threads. Further understanding of the

present invention will be had from the accompanying drawings and following disclosure.

Summary of the Invention

[0010] According to the present invention there is provided an extruded U-Shaped strip in accordance with claim 1, and a method of making an extruded U-shaped strip in accordance with claim 11

Brief Description of the Drawings

[0011]

Fig. 1 shows an example of an extruded strip not within the scope of the claims in perspective and in partial section and broken away;
Fig. 2 shows a plan view of a flat wire core with low temperature threads knitted to the wire and which is suitable for use in the method of the present invention; and
Fig. 3 is a schematic view illustrating a process.

Description of the Invention

[0012] Now referring to Figure 1, an example of an extruded strip not within the scope of the claims is illustrated and indicated generally by the numeral 10. Extruded strip 10 is U-shaped in cross section with a pair of legs 12 and 14 joined by a web 16. Strip 10 comprises a U-shaped wire core 18 with elastomeric cover 20 extruded thereabout. Preferred material for elastomeric core 20 is selected from the group consisting of EPDM rubber, polyvinylchloride and thermoplastic rubber. Wire core 18 has transversely extending lengths 22 bent into a generally U-shape and with lengths joined at opposite ends by bights 24. Elastomeric cover 20 has gripping ribs 26 for secure retention of strip 10 onto a flange as is conventional in the art. A high temperature thread 28 extends longitudinally through cover 20 and is in bonding relationship therewith.

[0013] Now referring to Figure 2, a core used in the process for making strip 10 is illustrated. A conventional flat wire core is indicated generally by the numeral 30 and is the type of core to be used as starting material in the process of the present invention. Wire core 30, with transversely extending lengths 22 joined by bights 24, has low temperature threads 34 extending longitudinally in the central portion thereof. Also, further low temperature threads 36 and 38 extend longitudinally along the edges of wire core 30 near bights 24. The low temperature threads 34, 36 and 38 are attached to the associated lengths of wire core 30 by knitting or other conventional means. The term "low temperature threads" is intended to mean that the threads, which are preferably made of a polymeric material such as polyester, have a melting point which is lower than the temperature to which they will be subjected in the extruder, i.e., the temperature at which the elastomeric material will have when extruded thereover. Suitable low temperature yarns may, for example, be polyester yarns which soften at a temperature between about 145 degrees Centegrade and about 160 degrees Centegrade and which melt at between about 160 degrees Centegrade and about 170 degrees Centegrade. It will be appreciated by those skilled in the art that the particular temperatures are dependent upon the temperatures of the extrudate and are functionally determined.

[0014] Now referring to Figure 3, the process is illustrated in somewhat schematic form with steps occurring as viewed from left to right. The step on the extreme right showing the high temperature thread woven through the core 30 is incorrect, and not within the scope of the claim. First, wire core 30, is fed through forming rolls 40 which bend core 30 into the desired U-shape as is conventional in the art. Then, now U-shaped wire core 30 is fed into extruder 42. Elastomeric material, rubber is coextruded about core 30 to form an elastomeric cover 20 in a generally conventional manner except that a high temperature thread 28 is also fed into the extruder just before the elastomeric material 44. High temperature thread 28 is positioned with respect to core 30 in a selected manner to achieve the desired neutral bending axis.

[0015] In extruder 42, the low temperature threads 34, 36 and 38 at first provide tensile support to core 30 in the longitudinal direction. However, when elastomeric material 44 comes in contact with the threads they are heated thereby which results first in softening and then in melting of the threads. Threads 34, 36 and 38 thus provide tensile strength at first in the extruder to help maintain the neutral geometry of the core, but then melt and are of no further use at which time the transverse lengths 22 of core 30 would be free to move longitudinally. However, at least one high temperature thread 28 is fed into the extruder just before the elastomeric material. Suitable high temperature threads 28 are those threads which will not lose their strength at the processing temperatures encountered in the extrusion process. Suitable high temperature threads 28 may comprise polyamide or fiberglass material or metal. An adhesion coating may be used to enhance the bond between the high temperature thread and the elastomeric material 44. High temperature thread 28 is positioned with respect to core 30 in selected fashion to provide the desired neutral bending axis of the final product. In Figure 1, high temperature thread 28 is positioned generally medially on leg 14. However, high temperature thread 28 can be selectively positioned to obtain a desired neutral bending axis and more than one thread 28 can be employed. For example, a high temperature thread 28 could be positioned along web 16 as well as along either leg 14 or 12. High temperature thread 28 further provides the tensile strength required to pull the strip through the extruder.

[0016] While a specific preferred embodiment of the present invention has been described above, it will be appreciated that the invention is subject to modification

and variation and such modifications and variations are intended to be included within the fair scope of the following claims.

Claims

1. An extruded U-shaped strip (10) having a wire core (18) with transversely extending, parallel wire lengths (22) joined only at alternating ends with bights (24) in a continuous serpentine manner, said strip (10) having an elastomeric cover (20);
characterised in that said elastomeric cover (20) has (i) a selectively positioned high temperature thread (28) extending longitudinally therethrough to thereby select the neutral bending axis of said strip (10), and (ii) a low temperature (34) thread extending longitudinally and encapsulated in the elastomeric cover (20), the high temperature thread (28) being separate from the wire core and having a melting temperature higher than the melting temperature of the elastomeric cover (20) and the low temperature thread (34) having a melting temperature lower than the melting temperature of the elastomeric cover (20), whereby the low temperature thread (34) has melted during the extrusion of the strip (10).

2. The strip (10) of claim 1 wherein said high temperature thread (28) is positioned along one of the legs (12, 14) of the strip (10).

3. The strip (10) of claim 1, wherein said low temperature thread (34) has a melting temperature of from about 160 degrees Centigrade to about 170 degrees Centigrade.

4. The strip (10) of claim 3, wherein said high temperature thread (28) has a melting temperature of greater than 250 degrees Centigrade.

5. The strip (10) of claim 4, wherein the elastomeric cover (20) comprises a material selected from the group consisting of EPDM rubber, polyvinylchloride and thermoplastic rubber.

6. The strip (10) of claim 5 wherein said high temperature thread (28) comprises a polyamide material.

7. The strip (10) of claim 6, wherein said high temperature thread (28) comprises a fiberglass material.

8. The strip (10) of claim 7 wherein said high temperature thread (28) includes a bonding agent thereon.

9. The strip (10) of claim 1, wherein said strip (10) carries a sealing bulb.

10. The strip (10) of claim 1, wherein said strip (10) carries a lip.

11. A method of making an extruded U-shaped strip (10) comprising the steps of:

(A) feeding a wire core (30) to an extruder (42);
(B) said core (30) having transversely extending, parallel wire lengths (22) joined only at alternating ends with bights (24) in a continuous serpentine manner, said wire lengths (22) joined in a longitudinal direction by low temperature threads (34);
(C) coextruding an elastomeric material (44) about said wire core (30) in said extruder (42)
(D) feeding a high temperature thread (28) separate from the wire core into said extruder (42) just upstream of said elastomeric material (44) and positioning said high temperature thread (28) to selectively determine the neutral bending axis of said strip (10); and
(E) pulling said strip (10) from said extruder (42);

said elastomeric material (44) having a temperature in said extruder (42) which is higher than the melting temperature of said low temperature threads (34) and lower than the melting temperature of said high temperature thread (28).

12. The method of claim 11, wherein a plurality of high temperature threads (28) are fed into said extruder.

13. The method of claim 12, wherein said elastomeric material (44) is EPDM and said high temperature thread (28) comprises polyester.

14. The method of claim 13, wherein said elastomeric material (44) is EPDM and said high temperature thread (28) comprises fiberglass.

15. The method of claim 14, wherein said high temperature thread (28) is positioned along a leg portion (12, 14) of said strip (10).

16. The method of claim 15, wherein said high temperature thread (28) is positioned along the web portion (16) of said strip (10).

17. The method of claim 16, wherein at least one said high temperature thread (28) is positioned along a leg (12, 14) of said strip (10) and at least one said high temperature thread (28) is positioned along the web (16) of said strip (10).

Patentansprüche

1. U-förmiger Extrusionsstreifen (10) mit einem Drahtkern (18) und quer laufenden parallelen Drahtlängen

(22), die nur an den wechselseitigen Enden über Ausbuchtungen (24) stetig verschlingt sind, wobei der Streifen (10) einen Elastomerüberzug (20) besitzt, **dadurch gekennzeichnet, dass** der Elastomerüberzug (20) (i) einen gezielt positionierten Hochtemperaturfaden (28) besitzt, welcher längs hindurchläuft und so eine neutrale Biegeachse des Streifens (10) bestimmt, sowie (ii) einen Niedertemperaturfaden (34), der in dem Elastomerüberzug (20) längs verläuft und dort eingekapselt ist, wobei der Hochtemperaturfaden (28) eine Schmelztemperatur besitzt, welche höher liegt als die Schmelztemperatur des Elastomerüberzugs (20), und der Niedertemperaturfaden (34) eine Schmelztemperatur besitzt, die niedriger liegt als die Schmelztemperatur des Elastomerüberzugs (20), wodurch der Niedertemperaturfaden (34) bei der Extrusion des Streifens (10) geschmolzen ist.

2. Streifen (10) nach Anspruch 1, wobei der Hochtemperaturfaden (28) längs einem Fuß (12, 14) des Streifens (10) positioniert ist.

3. Streifen (10) nach Anspruch 1, wobei der Niedertemperaturfaden (34) eine Schmelztemperatur von etwa 160°C bis etwa 170°C besitzt.

4. Streifen (10) nach Anspruch 3, wobei der Hochtemperaturfaden (28) eine Schmelztemperatur von mehr als 250°C besitzt.

5. Streifen (10) nach Anspruch 4, wobei der Elastomerüberzug (20) ein Material enthält, ausgewählt aus der Gruppe EPDM-Kautschuk, Polyvinylchlorid und Thermoplastkautschuk.

6. Streifen (10) nach Anspruch 5, wobei der Hochtemperaturfaden (28) ein Polyamidmaterial enthält.

7. Streifen (10) nach Anspruch 6, wobei der Hochtemperaturfaden (28) ein Glasfasermaterial enthält.

8. Streifen (10) nach Anspruch 7, wobei auf dem Hochtemperaturfaden (28) ein Bindemittel aufgebracht ist.

9. Streifen (10) nach Anspruch 1, wobei der Streifen (10) eine Verschlussbirne trägt.

10. Streifen (10) nach Anspruch 1, wobei der Streifen (10) eine Lippe trägt.

11. Verfahren zum Herstellen eines U-förmigen Extrusionsstreifens (10), umfassend die Schritte:

(A) Einführen eines Drahtkerns (30) in einen Extruder; wobei
(B) der Kern (30) quer laufende parallele Drahtlängen (22) besitzt, die nur an wechselseitigen Enden über Ausbuchtungen (24) stetig verschlungen sind, wobei die Drahtlängen (22) in Längsrichtung durch Niedertemperaturfäden (34) verbunden sind;
(C) Koextrudieren eines Elastomermaterials (44) um den Drahtkern (30) im Extruder;
(D) Zuführen eines Hochtemperaturfadens (28) getrennt vom Drahtkern (30) in den Extruder (42) kurz stromaufwärts des Elastomermaterials (44) und Positionieren des Hochtemperaturfadens (28), so dass gezielt die neutrale Biegeachse des Streifens (10) festgelegt wird; und
(E) Ziehen des Streifens (10) aus dem Extruder (42);

wobei das Elastomermaterial (44) in dem Extruder (42) eine Temperatur besitzt, die höher ist als die Schmelztemperatur der Niedertemperaturfäden (34) und niedriger als die Schmelztemperatur des Hochtemperaturfadens (26).

12. Verfahren nach Anspruch 11, wobei eine Anzahl Hochtemperaturfäden (28) dem Extruder zugeführt werden.

13. Verfahren nach Anspruch 12, wobei das Elastomermaterial (44) EPDM ist und der Hochtemperaturfaden (28) Polyester enthält.

14. Verfahren nach Anspruch 13, wobei das Elastomermaterial (44) EPDM ist und der Hochtemperaturfaden (28) Glasfasern enthält.

15. Verfahren nach Anspruch 14, wobei der Hochtemperaturfaden (28) längs einem Fußabschnitt (12, 14) des Streifens (10) positioniert wird.

16. Verfahren nach Anspruch 15, wobei der Hochtemperaturfaden (28) längs dem Gewebeabschnitt (16) des Streifens (10) positioniert wird.

17. Verfahren nach Anspruch 16, wobei mindestens ein Hochtemperaturfaden (28) längs des Fußes (12,14) des Streifens (10) positioniert wird und mindestens ein Hochtemperaturfaden (28) längs dem Gewebe (16) des Streifens (10).

Revendications

1. Ruban extrudé en forme de U (10) ayant une âme (18) en fil métallique présentant des longueurs de fils parallèles (22) s'étendant transversalement et jointes uniquement à des extrémités en alternance avec des anses (24) de manière à former un serpentin continu, ledit ruban (10) ayant une couverture en élastomère (20) ;

caractérisé en ce que ladite couverture en élastomère (20) comprend (i) un filament à haute température (28) positionné de manière sélective et s'étendant longitudinalement à travers ladite couverture pour sélectionner ainsi l'axe de flexion neutre dudit ruban (10), et (ii) un filament à basse température (34) s'étendant longitudinalement et encapsulé dans la couverture en élastomère (20), le filament à haute température (28) étant séparé du fil d'âme et ayant une température de fusion plus élevée que la température de fusion de la couverture en élastomère (20), et le filament à basse température (34) ayant une température de fusion plus basse que la température de fusion de la couverture en élastomère (20), grâce à quoi le filament à basse température (34) fond pendant l'extrusion du ruban (10).

2. Ruban (10) selon la revendication 1, dans lequel ledit filament à haute température (28) est positionné le long de l'une des branches (12, 14) du ruban (10).

3. Ruban (10) selon la revendication 1, dans lequel ledit filament à basse température (34) a une température de fusion d'environ 160 °C à environ 170 °C.

4. Ruban (10) selon la revendication 3, dans lequel ledit filament à haute température (28) a une température de fusion supérieure à 250 °C.

5. Ruban (10) selon la revendication 4, dans lequel la couverture en élastomère (20) comprend un matériau choisi parmi le groupe comprenant le caoutchouc EPDM, le chlorure de polyvinyle et le caoutchouc thermoplastique.

6. Ruban (10) selon la revendication 5, dans lequel ledit filament à haute température (28) comprend un matériau en polyamide.

7. Ruban (10) selon la revendication 6, dans lequel ledit filament à haute température (28) comprend un matériau à fibres de verre.

8. Ruban (10) selon la revendication 7, dans lequel ledit filament à haute température (28) inclut un agent de collage sur lui-même.

9. Ruban (10) selon la revendication 1, dans lequel ledit ruban (10) porte une ampoule de scellement.

10. Ruban (10) selon la revendication 1, dans lequel ledit ruban (10) porte une lèvre.

11. Procédé pour réaliser un ruban extrudé en forme de U (10), comprenant les opérations consistant à :

(A) alimenter une âme en fil métallique (30) dans une extrudeuse (42) :

(B) ladite âme (30) comprenant des longueurs de fils parallèles (22) qui s'étendent transversalement et qui sont jointes uniquement à des extrémités en alternance avec des anses (24) de manière à former un serpentin continu, lesdites longueurs de fils (22) étant jointes en direction longitudinale par des filaments à basse température (34) ;

(C) coextruder un matériau élastomère (44) autour de ladite âme en fil métallique (30) dans ladite extrudeuse (42) ;

(D) alimenter un filament à haute température (28) séparé de l'âme en fil dans ladite extrudeuse (42) immédiatement en amont dudit matériau élastomère (44) et positionner ledit filament à haute température (28) pour déterminer de manière sélective l'axe de flexion neutre dudit ruban (10) ; et

(E) tirer ledit ruban (10) depuis ladite extrudeuse (42) ;

ledit matériau élastomère (44) ayant une température dans ladite extrudeuse (42) qui est supérieure à la température de fusion dudit filament à basse température (34) et inférieure à la température de fusion dudit filament à haute température (28).

12. Procédé selon la revendication 11, dans lequel une pluralité de filaments à haute température (28) sont alimentés dans ladite extrudeuse.

13. Procédé selon la revendication 12, dans lequel ledit matériau élastomère (44) est du EPDM, et ledit filament à haute température (28) comprend du polyester.

14. Procédé selon la revendication 13, dans lequel se ledit matériau élastomère (44) est du EPDM, et ledit filament à haute température (28) comprend des fibres de verre.

15. Procédé selon la revendication 14, dans lequel ledit filament à haute température (28) est positionné le long d'une partie de branche (12, 14) dudit ruban (10).

16. Procédé selon la revendication 15, dans lequel ledit filament à haute température (28) est positionné le long de la partie dorsale (16) dudit ruban (10).

17. Procédé selon la revendication 16, dans lequel au moins un desdits filaments à haute température (28) est positionné le long d'une branche (12, 14) dudit ruban (10), et au moins un desdits filaments à haute température (28) est positionné le long de la partie dorsale (16) dudit ruban (10).

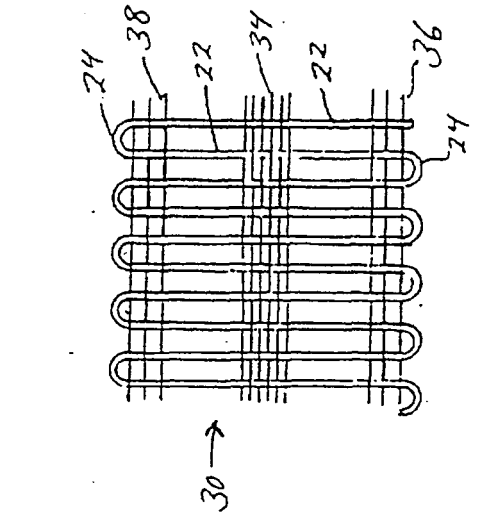

Fig 2

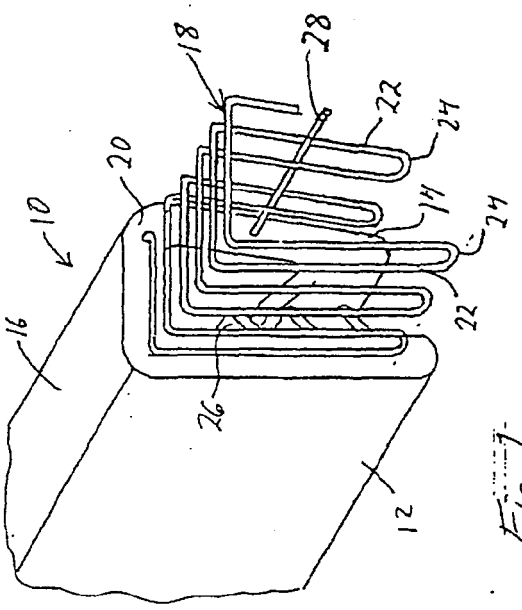

Fig 1

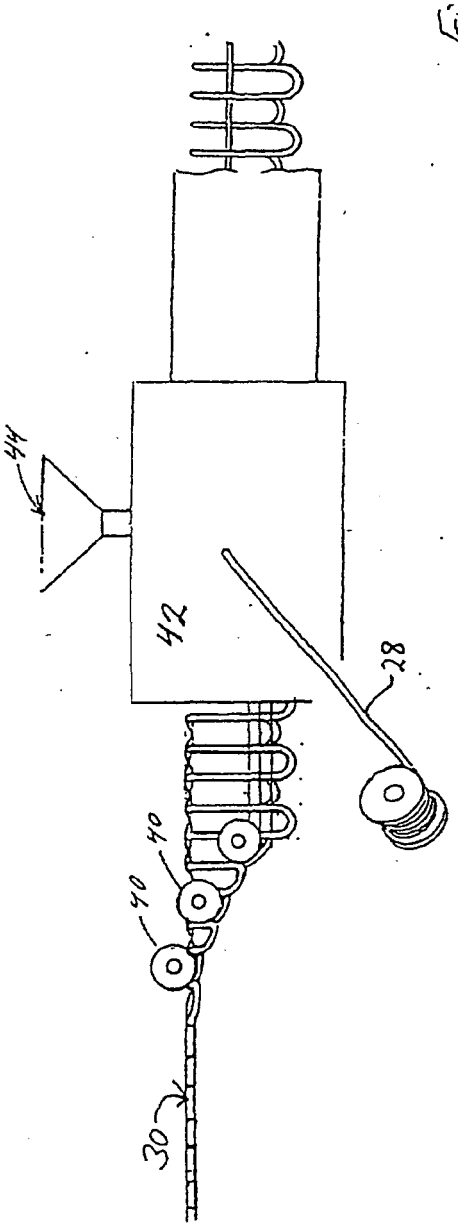

Fig 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5416961 A, Vinay **[0005]**
- US 5143666 A, McManus **[0006]**
- US 5009947 A, McManus **[0006]**
- US 4343845 A, Burden **[0007]**