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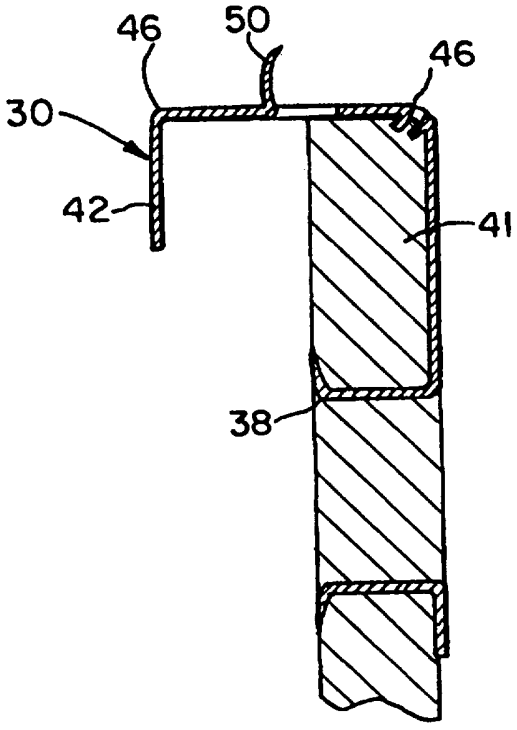
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(54) Title: CUTTING BLADE FOR CUTTING SHEET MATERIALS

(57) Abstract

A cutting blade (30) for cutting sheet materials such as plastic film or metal foil is provided. The cutting blade (30) incorporates a row of cutting teeth (50) projecting from a flat surface. The depth of cut of the cutting blade (30) is limited by the height that the cutting teeth (50) project from the flat surface. In addition, by spacing the cutting teeth (50) sufficiently closely together, the cutting teeth (50) provide a bearing surface sufficient to support human skin so that the cutting blade (30) cuts plastic film and metal foil but does not easily puncture human skin.



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CUTTING BLADE FOR CUTTING SHEET MATERIALS

RELATED APPLICATION

This application incorporates provisional US Applications Nos. 60/007,854 and 60/008,587.

FIELD OF THE INVENTION

The present invention relates to cutting blades for cutting sheet materials. More specifically, the present invention relates to cutting blades used to cut plastic film or metallic foils that are dispensed from a roll.

BACKGROUND OF THE INVENTION

Plastic film and metal foil are widely used throughout the food industry to wrap or cover various food products. The film or foil is typically dispensed from a roll contained in a box. Whenever a piece of film or foil is required, the length of the film or foil is withdrawn from the box and cut to length by a cutting blade that is attached to the carton or to a cardboard insert placed in the front of the carton. The cutting blade commonly used for many years has been a thin metallic saw-toothed blade having cutting points extending along the exposed edge of the blade. Although the points of the cutting blade can nick or cut the user, the real risk to the user is due to the fact that the cutting blade is made of a thin strip of metal. Just as a piece of paper can cause a cut, a thin strip of metal, with or without saw-toothed points, can cut.

SUMMARY OF THE INVENTION

In accordance with the present invention, a cutting blade for cutting sheet materials is provided

which reduces the risk of inadvertent cuts to the users. The cutting blade allows a user to withdraw a length of sheet material, such as plastic film or metal foil from a dispenser, and cut the film or foil to length without serious risk of injury to the user. The cutting blade has two parallel longitudinally elongated edges connected by a substantially flat surface. Two longitudinally-elongated fold lines extend along the edges, and a row of teeth project from the flat surface intermediate the edges, so that the row of teeth is parallel to the fold lines and separated from the edges of the blade.

In addition, a method for producing a coil of cutting blade blanks is also provided. The method allows the cutting blade blank to be mass produced and then rolled into a coil that protects the cutting teeth of the cutting blade blank and allows the blank to be more easily stored or transported and dispensed to a blade-forming machine which may also stake the blade to a carton or a cardboard insert. The method includes the step of providing a longitudinally-elongated band having two parallel edges, an upper surface and a lower surface. A row of teeth are formed on the band so that the teeth project from the upper surface intermediate the edges. In addition, a row of blade connectors is formed on the band so that the connectors projects from the lower surface. One of the edges of the band is then bent transverse the upper surface, and the band is bent to form a spiral coil of overlapping convolutions.

BRIEF DESCRIPTION OF THE DRAWINGS

All of the objectives of the present invention are more fully set forth hereinafter with reference to the accompanying drawings in which like numbers represent like features, wherein:

Fig. 1 is a fragmentary perspective view of a cutting blade incorporating aspects of the present invention, shown in combination with a dispensing carton;

Fig. 2 is an enlarged fragmentary cross-sectional view of the dispensing carton shown in Fig. 1, taken along line 2-2;

Fig. 3 is an enlarged fragmentary cross-sectional view of the carton shown in Fig. 2, taken along line 3-3;

Fig. 4 is an enlarged fragmentary plan view of a cutting blade blank incorporating aspects of the present invention;

Fig. 5 is an enlarged fragmentary cross-sectional view of the cutting blade blank shown in Fig. 4, taken along line 5-5;

Fig. 6 is an enlarged fragmentary cross-sectional view of the cutting blade shown in Fig. 2, taken along line 6-6;

Fig. 7 is an enlarged fragmentary view of the portion of the cutting blade illustrated in Fig. 2 bounded by the circle designated 7;

Fig. 8 is a diagrammatic view of the steps in the process for forming a coil of the cutter blade blanks in Figs. 4-5;

Fig. 9 is an enlarged fragmentary cross-sectional view of the cardboard insert having a cutting blade as illustrated in Fig. 2;

Fig. 10 is an enlarged fragmentary cross-sectional view of a dispenser carton having a second embodiment of a cutting blade;

Fig. 11 is an enlarged fragmentary elevational plan view of a cutting blade incorporating a third embodiment of a cutting blade incorporating aspects of the present invention; and

Fig. 12 is an enlarged fragmentary cross-sectional view of the cutting blade illustrated in Fig. 11, taken along line 12-12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in general and Fig. 1 specifically, there is shown a cutting blade 30 used for cutting sheet materials such as plastic film or metal foil. In Fig. 1, the cutting blade 30 is shown in connection with a dispensing carton 10. A roll of plastic film or metal foil (not shown) is contained within the carton 10. The cutting blade 30 is shown connected to a cardboard insert 18 that is placed in the front of the carton 10. Alternatively, the cutting blade 30 can be attached directly to the carton 10. In operation, a user draws a length of the film or foil from the roll in the dispenser carton 10 and cuts the material to length by pulling the material downward over the cutting blade 30. To ensure that the entire width of the film or foil is cut, it is desirable for the cutting blade 30 to be at least as wide as the roll of film or foil in the dispenser carton.

The cutting blade 30 may be made from a continuous thin metal band. As shown in Fig. 8, the metal band is formed into a cutting blade blank 30a, which is illustrated in greater detail in Figs. 4 and 5. After the blank is formed, one edge of the blank is bent, and the blank is then either rolled into a coil as shown in Fig. 8, or is cut to length, attached to a cardboard backing and bent again to form a cutting blade 30.

Referring to Figs. 4 and 5, the cutting blade blank has two longitudinally elongated scalloped edges 32,34. The first scalloped edge 32 has a trough 33 between each scallop. The troughs 33 are

longitudinally aligned forming a bend line 37, about which the cutting blade blank 30a is bent approximately 90° to form a scalloped flange 42, which is shown in phantom lines in Fig. 5. The second scalloped edge 34 has a series of circular stakes 38 punched into the scallops. The circular stakes 38 are formed by a circular piercing punch that bursts through the cutting blade blank 30a to deform the metal of the blank so that the circular stakes protrude from the lower surface of the blank. As will be discussed below further, the circular stakes 38 are used to attach the cutting blade blank 30a to a suitable backing.

The cutting blade blank 30a also includes a row of slots 40 parallel to the first bend line 37 formed by the troughs 33 in the first scalloped edge 32. The row of slots 40 creates a second bend line 39 about which the cutting blade blank 30a is bent to produce the cutting blade 30 as is discussed further below. A plurality of cutting teeth 50 are punched through the cutting blade blank to create a row of teeth parallel to the two bend lines 37,39. The cutting teeth 50 may be straight as shown in Fig. 5; however, in the preferred embodiments, the teeth are curved as shown in Fig. 9.

It may be desirable to create a bulk coil of the cutting blade blank 30a that is shown in Fig. 4. By coiling the cutting blade blank, the cutting blade blank 30a can be produced in high volume and more easily stored or transported and dispensed to a blade-forming machine which creates the fold line 39 and attaches the blade to a suitable substrate. However, as most clearly seen in Fig. 5, the circular stakes 38 project from the lower surface of the blank, and the cutting teeth 50 project from the upper surface of the blank. Therefore, the blank will not roll evenly to

form a spiral coil. In addition, each successive convolution in the coil will rest upon the teeth 50 in the preceding convolution of the coil, which can cause damage to the teeth. To overcome these problems, the blank is bent along the first bend line 37 to create the scalloped flange 42 before the blank is rolled into a coil. As shown in Fig. 5, the flange 42 and the circular stake 38 create a two-point contact so that the cutter blade blank can be rolled into a coil as shown in Fig. 8. In addition, the scalloped flange 42 and the circular stakes 38 preferably are greater in height than the cutting teeth 50, so that the two-point contact of the circular stakes and the flange protects the cutting teeth from contact with successive convolutions of the coil.

The further processing of the cutter blade blank 30a is similar regardless of whether the blank is rolled into a coil or not. After the blank is bent along the first bend line 37 to form the scalloped flange 42, the blank is cut to length. The blank is then bent along the second fold line 39 to form a finished cutting blade 30 and attached to a support substrate, such as corrugated cardboard or other paper board. For production efficiency, it is desirable to attach the blank 30a to the support substrate before the blank is bent along fold line 39. Typically, bending the blank after the blank is attached to the support substrate would be hampered by the fact that the support substrate is easily deformable. Therefore, the support substrate will tend to bend or crush when bending the blank. However, in the present instance, the slots 40 that form the second bend line 39 reduce the stiffness of the blank along the second fold line. Therefore, the blank 30a will readily fold along the second fold line 39 after the blank is attached to the support substrate, without

significantly crushing or deforming the support substrate.

In the present instance, the support substrate is corrugated cardboard, and the blank 30a is attached to the cardboard by pressing the circular stakes 38 into the cardboard. As shown in Fig. 9, when the blank is attached to the cardboard 41, the circular stakes 38 are deformed to flare radially outwardly. Once the blank 30a is attached to the cardboard 41, the blank is bent along the second bend line 39 to form the cutting blade 30 as shown in Fig. 9.

Referring now to Figs. 4 and 9, the cutting blade 30 comprises an aligned row of cutting teeth 50. The two bend lines 37,39 along which the cutter blade blank 30a was bent, form two longitudinally-elongated edges 46. Between the two edges 46, the upper surface 44 of the cutting blade 30 is flat except for the row of teeth 50 projecting from the upper surface. Because the cutting teeth 50 project from a flat surface, the cutting teeth 50 will only cut as deep as the height that the cutting teeth project from the flat surface 44. Therefore, to limit the depth of a potential cut to a user, the teeth 50 are preferably 0.015"-0.035" in height. In the present instance, the cutting teeth 50 project approximately 0.020" from the flat surface 44. In addition, the teeth 50 are closely spaced from one another to reduce the possibility of cutting a user.

If the cutting teeth are spaced sufficiently close to one another, the weight supported by any one tooth is insufficient to puncture the skin of the user. The result is similar to a bed of nails employed by fakirs. In the same way that the bed of nails are closely spaced so that the fakir can lie upon the bed of nails without puncturing his skin, if the teeth in the cutting blade are closely spaced, the

risk of puncturing human skin is reduced. However, the cutting teeth must still be able to cut the plastic film or metal foil. Therefore, a satisfactory design will act like a fakir's bed of nails when in contact with the skin of the user, and also act like a cutting blade when the film or foil is pulled down over the cutting blade. This may be accomplished because plastic film is typically more elastic than human skin, thus being easily pulled down over the points of the cutting teeth and thereby cut. In addition, foil is typically much less elastic than human skin and thus easily tears when pulled down over the cutting teeth. To produce the bed of nails effect so that the cutting blade cuts the film or foil, and not human skin, the teeth 50 are preferably spaced apart longitudinally within the row of teeth so that there are approximately 12-22 teeth per inch. In the present instance, there are approximately 18 teeth per inch in the row of teeth. In addition, as shown in Fig. 9, although the teeth 50 are slightly curved, the teeth project substantially perpendicular to the flat surface 44. The bases of the triangular teeth are aligned generally parallel to the fold lines 37 and 39, so that the curved surfaces of the teeth cooperate to define an upstanding cutting edge which is also parallel to the fold lines.

Referring now to Fig. 10, a second embodiment of the improved cutting blade is illustrated. The cutting blade 130 illustrated in Fig. 10 is similar to the cutting blade illustrated in Figs. 1-9, except the second embodiment is designed to be attached to the carton by the end users, rather than being attached by the manufacturer of the blade. Like the first embodiment, the second embodiment has a flat upper surface 44 between two longitudinally elongated edges or fold lines 46. A row of aligned teeth 50

configured and spaced similarly to the teeth described above project upwardly from the flat surface 44. Two sides 70 extend transverse from the edges 46. The lower ends of the sides 70 curve upwardly and inwardly toward one another, forming curved flanges 70. Configured in this way, the user can slip the cutting blade 130 over a support material 41, such as a piece of cardboard 41. Typically, the user will simply slip the cutting blade 130 over the front edge of a dispenser carton 10. The curved flanges 72 of the cutting blade 130 tend to grip the cardboard 41 so that the cutting blade 130 resists being removed from the cardboard. In addition, by bending back the lower edge of the sides 70, the thin metal edge of the sides is bent inward, thus eliminating the risk that the lower edges of the sides can inadvertently cut the user.

Referring now to Figs. 11 and 12, a third embodiment of the improved cutting blade is illustrated. The cutting blade 230 illustrated in Figs. 11 and 12 is similar to the cutting blade illustrated in Figs. 1-9, except that the cutting teeth alternate in direction. As previously described and as illustrated in Fig. 9, the cutting teeth 50 are slightly curved or cupped. Because of this curvature, the cutting teeth cut better in one direction. For example, the cutting blade illustrated in Fig. 9 will cut film better if the film is pulled over the cutting blade from right to left and pulled downward to cut the film.

The cutting blade 230 illustrated in Figs. 11 and 12 has alternating teeth 250 so that the cutting blade cuts equally well in both directions. The cutting teeth are spaced and configured similarly to the cutting teeth 50 illustrated in Figs. 1-9 and described above, except that the teeth are punched out

in alternating directions so that alternating teeth curve in opposing directions.

As shown in Fig. 11, the cutting blade 230 comprises a flat upper surface 44 extending between two longitudinally elongate edges 46. A row of teeth 250 projects from the flat surface intermediate the edges 46. The curvature of the teeth 250 results from the direction that the teeth 250 are punched through the cutting blade. Therefore, as can be more clearly seen in Fig. 11, the curvature of the teeth is alternated by alternating the direction that the cutting teeth are punched through the cutting blade. The teeth are generally triangular and their bases are aligned with each other and are disposed generally parallel to the fold line 46. Preferably, the longitudinal spacing between the bases of the teeth allows approximately 12-22 teeth per inch. The alternating cutting teeth 250 are aligned in a row, so that when viewed from the end, as shown in Fig. 12, the row of cutting teeth resembles the set in a conventional cross-cut saw blade. In this way, the cutting blade 230 cuts equally well regardless of the direction in which the film or foil is pulled over the cutting blade 230.

The cutting teeth 250 may alternate so that a plurality of adjacent teeth are curved in the same direction. For instance, the cutting teeth 250 may be configured so that two adjacent cutting teeth curve in one direction, and the next two adjacent cutting teeth curve in the opposite direction. However, in the present instance, the cutting teeth 250 alternate so that adjacent cutting teeth curve in opposite directions, as illustrated in Fig. 11.

While particular embodiments of the invention have been herein illustrated and described, it is not intended to limit the invention to such disclosures,

but changes and modifications may be made therein and thereto within the scope of the following claims.

CLAIMS

1. A cutting blade for cutting sheet materials, comprising:

two parallel longitudinally-elongated edges;

a substantially flat surface connecting said edges;

two longitudinal fold lines extending along said edges; and

a row of teeth projecting from said flat surface intermediate said edges, wherein said row is parallel to said fold lines.

2. The cutting blade of claim 1 comprising two longitudinally-elongated sides connected to said edges, wherein said sides are transverse said flat surface.

3. The cutting blade of claim 2 comprising two opposing inwardly-curved flanges connected to the lower edges of said sides.

4. The cutting blade of claim 1 comprising a plurality of longitudinally-aligned slots in said flat surface parallel to said fold lines.

5. The cutting blade of claim 1 wherein each of said teeth is a single curved cutting component, and adjacent teeth in said row are curved in opposing directions.

6. A cutting blade for cutting sheet materials, comprising:

two parallel longitudinally-elongated edges;

a substantially flat surface connecting said edges;

a row of longitudinally aligned teeth intermediate said edges, wherein each of said teeth is a single substantially triangular cutting component projecting transverse said flat surface.

7. The cutting blade of claim 6 comprising two longitudinal fold lines extending along said edges.

8. The cutting blade of claim 6 comprising two longitudinally-elongated sides connected to said edges, wherein said sides are transverse said flat surface.

9. The cutting blade of claim 8 comprising two opposing inwardly-curved flanges connected to the lower edges of said sides.

10. The cutting blade of claim 6 comprising a plurality of longitudinally-aligned slots in said flat surface parallel to said fold lines.

11. A cutting blade for cutting sheet materials, comprising:

two parallel longitudinally-elongated edges;

a substantially flat surface connecting said edges;

a row of teeth projecting from said flat surface intermediate said edges wherein each of said teeth is a single curved cutting component, and adjacent teeth in said row are curved in opposing directions.

12. The cutting blade of claim 11 comprising two longitudinal fold lines extending along said edges.

13. The cutting blade of claim 11 comprising two longitudinally-elongated sides connected to said edges, wherein said sides are transverse said flat surface.

14. The cutting blade of claim 13 comprising two opposing inwardly-curved flanges connected to the lower edges of said sides.

15. The cutting blade of claim 11 comprising a plurality of longitudinally-aligned slots in said flat surface parallel to said fold lines.

16. A method for producing a coil of cutting blade blanks comprising the steps of:

providing a longitudinally-elongated band having two parallel edges, an upper surface and a lower surface;

forming a row of teeth on said band that project from said upper surface intermediate said edges;

forming a row of blade connectors on said band that project from said lower surface;

bending one of said edges of said band transverse said upper surface; and

bending said band to form a spiral coil of overlapping convolutions.

17. A cutting blade for cutting sheet materials, comprising:

a longitudinally-elongated band having two parallel longitudinally elongated edges;

a single row of teeth integrally formed from said band, each of said teeth having a base coplanar with said band and a projecting portion extending outwardly from said band, projecting from said band

intermediate said edges, wherein the projecting portion of each of said teeth projects approximately 0.015"-0.035" from said base, and said teeth are longitudinally aligned and spaced so that there are approximately 12-22 teeth per inch.

18. The cutting blade of claim 17 comprising two longitudinally-elongated sides connected to said edges, wherein said sides are transverse said flat surface.

19. The cutting blade of claim 18 comprising two opposing inwardly-curved flanges connected to the lower edges of said sides.

20. The cutting blade of claim 17 comprising a plurality of longitudinally-aligned slots in said flat surface parallel to said fold lines.

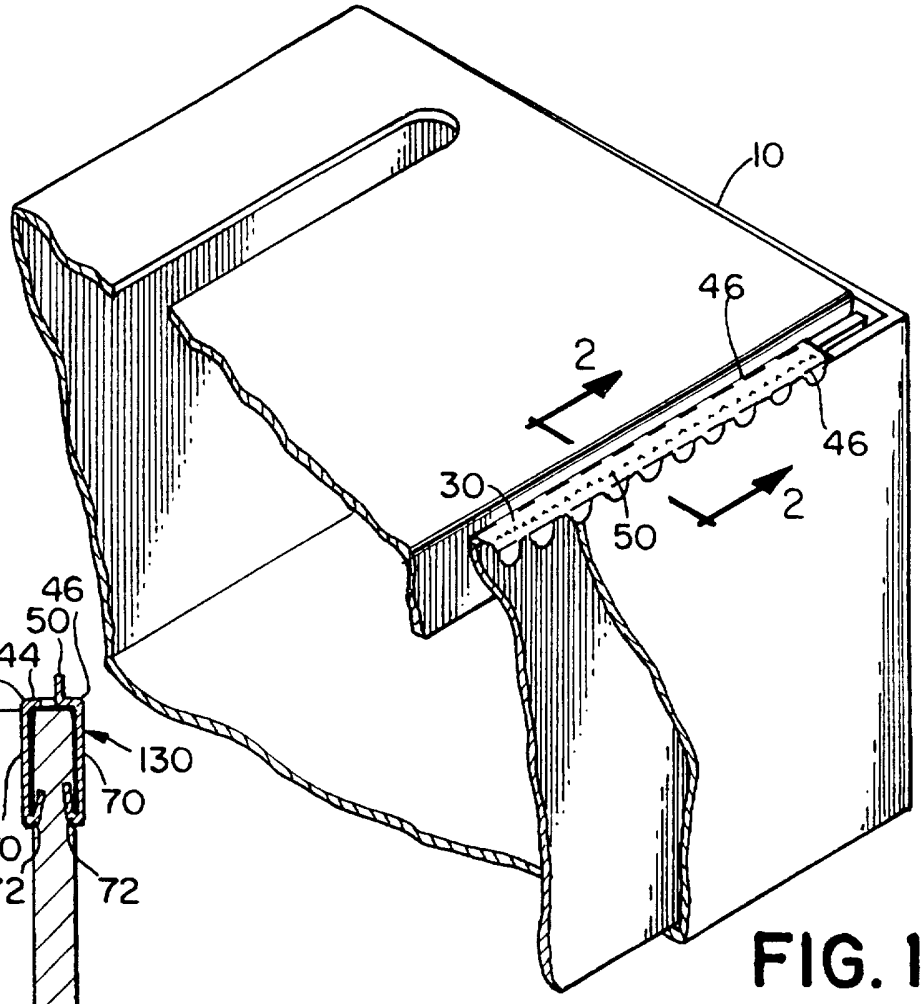


FIG. 1

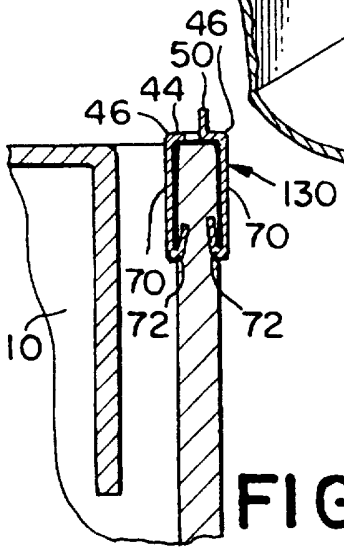


FIG. 10

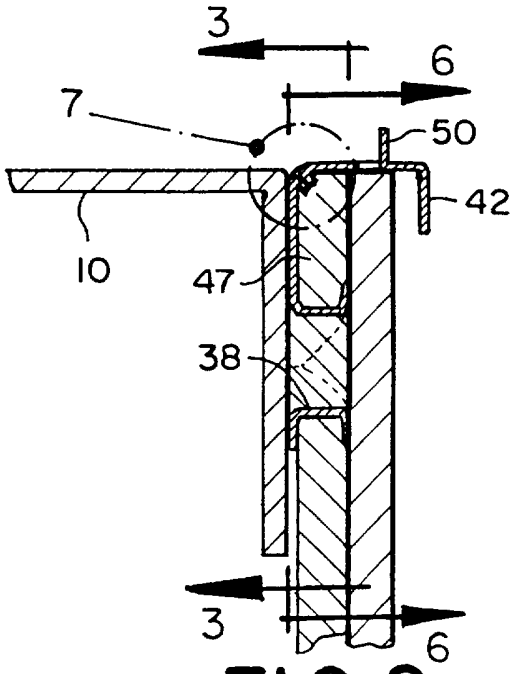


FIG. 2

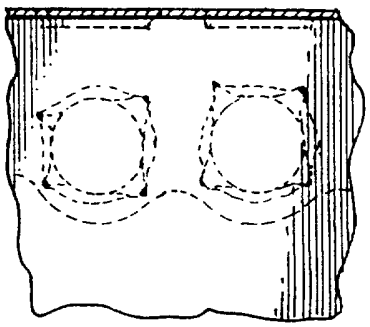


FIG. 3

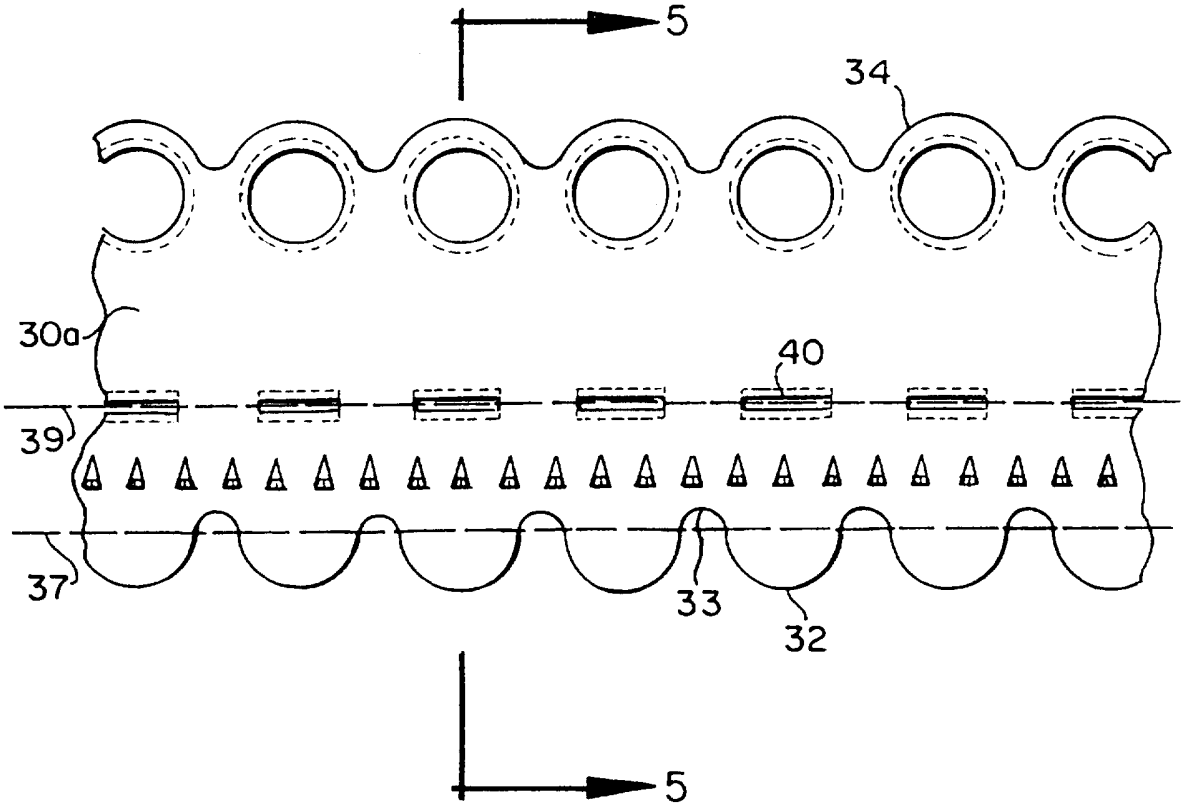


FIG. 4

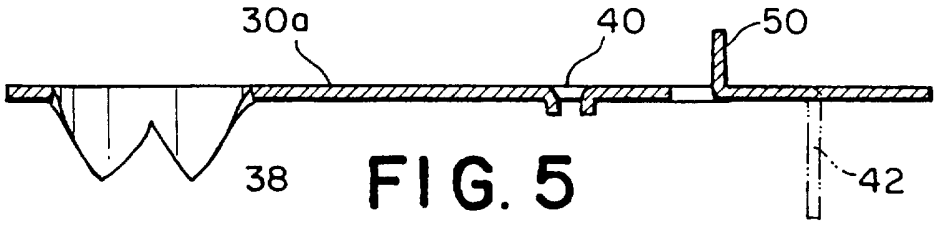


FIG. 5

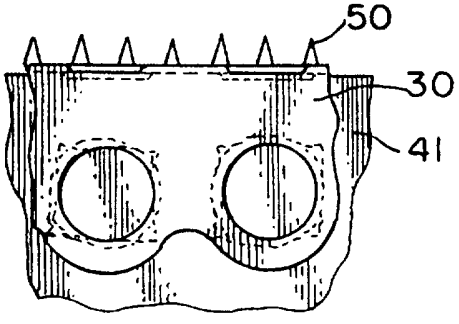


FIG. 6

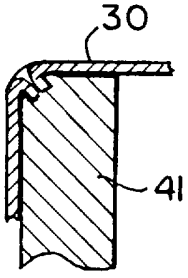


FIG. 7

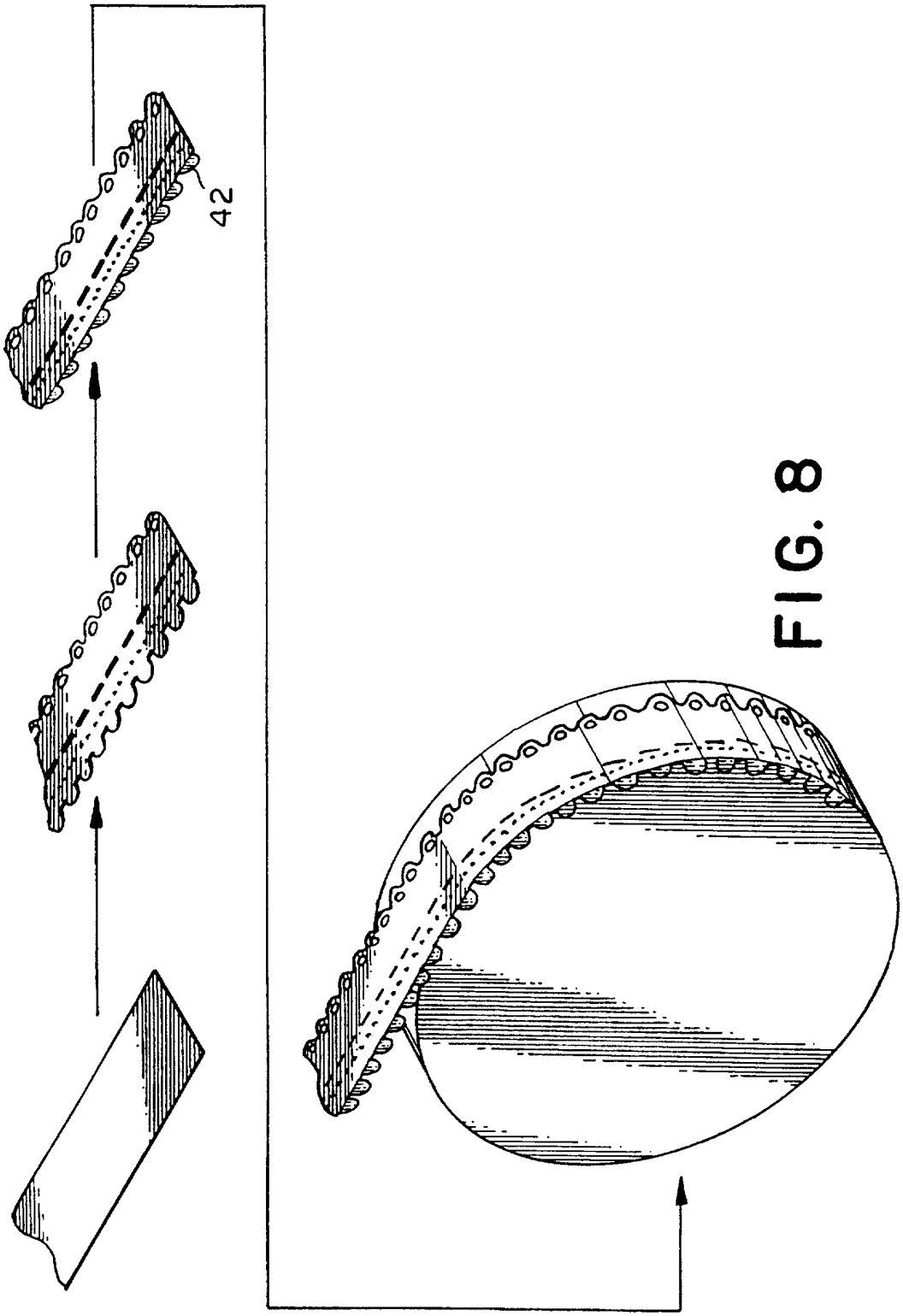


FIG. 8

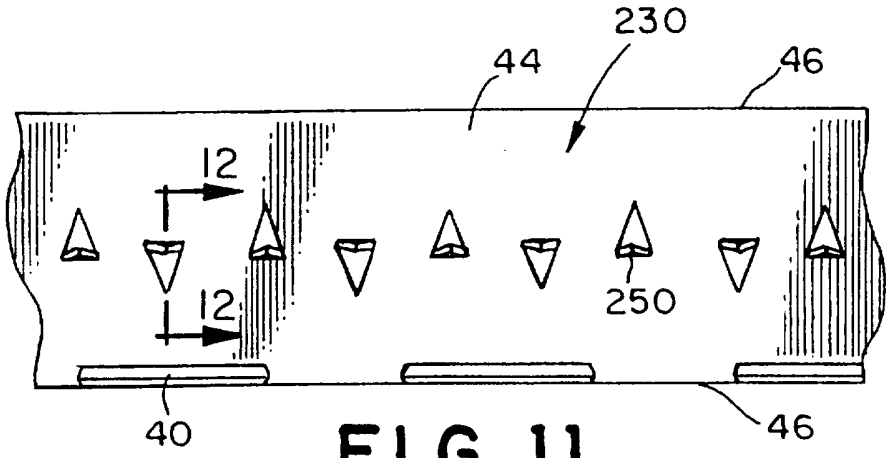


FIG. 11

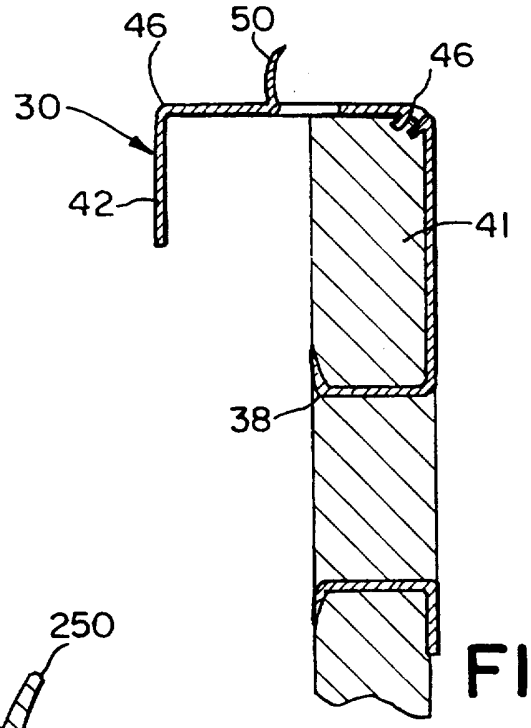


FIG. 9

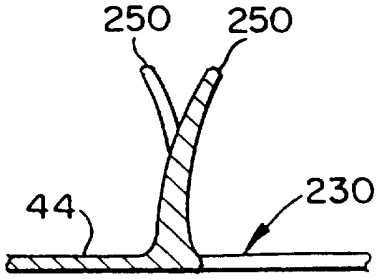


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/18923

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B26D 1/02; B26F 3/02
US CL :225/91; 76/101.1
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 225/39, 41-43, 46-49, 77, 91; 76/101.1; 493/86

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, 2,771,186 A (BURBANK) 11 November 1956, col. 2, lines 11-68.	1-4,6-10 --- 17-20
A	US, 1,939,812 A (HAMERSLEY) 19 December 1933, see entire document.	1-20
A	US 2,316,469 A (THOR) 13 April 1943, see entire document.	1-20
A	US 2,766,877 A (BURBANK) 16 October 1956, see entire document.	1-20
A	US 3,567,087 A (SCHRAMM) 02 March 1971, see entire document.	1-20
A	US 4,346,830 A (HAUSER) 31 August 1982, see entire	5, 11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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