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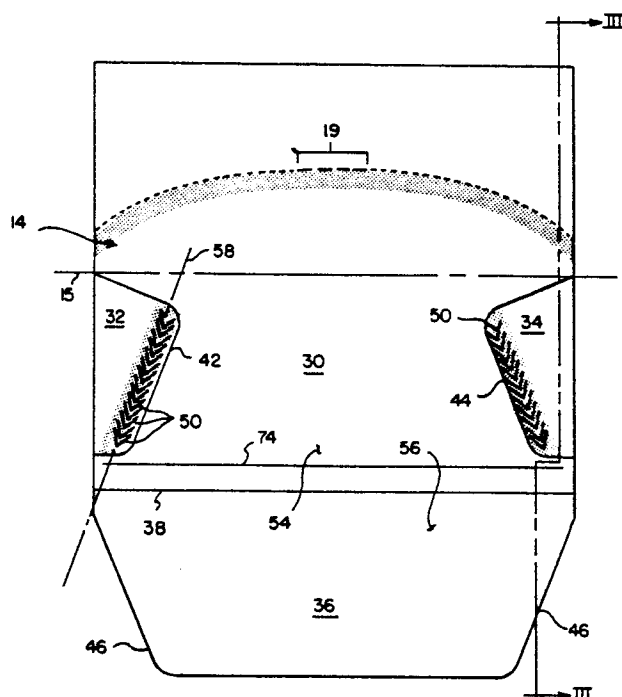
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**Envelopes constructed for ink jet printing.**

There is disclosed an envelope (10) that is constructed to allow it to be printed using a minimum of modifications to a printer. To achieve this, a leader extension (16) is attached to the envelope by a novel perforation that is more readily severed, and features (50) are included to allow flexure of the envelope around the curved surface of a support drum (100) of the printer. One of such features that permits this is slits formed within a portion of the overlapping edges (42, 44, 46) of the side (32, 34) and bottom panels (36). Another of such features is the scoring - (74; 76) of the central (30) and/or bottom panels - (36) to cause the pocket (12) formed by these panels to flex towards the axis (110) of curvature of the drum (100).



**FIG. 2**

## ENVELOPES CONSTRUCTED FOR INK JET PRINTING

This invention concerns envelopes used in correspondence, and particularly the construction of such envelopes so that they can be printed on ink jet printers.

Ink jet printers are quickly becoming a printer of choice for the rapid printing of a variety of documents. Such printers are particularly useful in printing images on a large scale basis. However, one type of document that has not been readily printed in this manner is the envelope. The reason is that a prepared envelope does not behave like a single sheet of paper in the automatic paper handling mechanism of the printer and thus cannot be fed into the printer using the automatic feed, or otherwise handled correctly. The problem is particularly acute in printers that use a rotating drum support and a vacuum holddown, as shown for example in U.S. Patent No. 4,237,466, issued on December 2, 1980. Because of the folded portions of the envelope forming the pocket, the envelope is too rigid to flex out of its preferred plane to conform to the circumference of the drum, even when using the vacuum hold-down.

The problem then, prior to this invention, has been to construct an envelope that could be fed into and handled automatically on ink jet printers, particularly those that used a rotating drum support for the paper being printed. This problem has been aggravated by the necessity to have an envelope that otherwise has the appearance of an ordinary envelope. This appearance requirement occurs because of constraints of acceptable envelope aesthetics demanded by the end-user.

In accord with one aspect of the invention the problem has been solved by an envelope comprising a central panel, two side panels, a bottom panel, and a sealing flap, the side panels, bottom panel and sealing flap being foldably connected to the central panel with the side and bottom panels being joined together along overlapping respective edges by joining means to form, with the central panel, the pocket of the envelope, one of the side and bottom panels being on top of the other. The envelope is characterized in that at least a portion of the joined edges of the side panels or the bottom panel that are underneath the respective overlapping edge of the other of the joined panels, includes slits of a shape and spacing effective to allow the joined respective edges to stretch while still joined, when the envelope is wrapped around a drum, whereby the envelope can be printed on a printer using a support drum during printing.

In accord with another aspect of the invention, the envelope noted above is characterized in that at least one of the bottom panel and the central panel is scored along a line extending at least the majority of the width of the envelope, the scoring being done from a side of the paper comprising the envelope that encourages the envelope to flex in one direction only, to approximate a curve with the pocket on the inside of the curve, whereby the envelope can be printed on a printer using a support drum during printing.

Thus, it is an advantageous feature of the invention that envelopes constructed in accordance with the invention will readily flex out of their preferred plane, and particularly will take on the radius of the support drum in a printer.

It is a related advantageous feature of the invention that such an envelope is constructed so that the features encouraging such flexing are not readily discernable in the finished envelope.

Yet another advantageous feature of the invention is the provision of an improved perforation for more readily removing for discard, a leader extension used for feeding the envelope to a printer.

The present invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is a plan view of the back side of an envelope constructed in accordance with the invention;

Fig. 2 is a plan view similar to that of Fig. 1, but illustrating the envelope's configuration before the bottom and side flaps are joined together along their overlapping edges;

Fig. 3 is a section view taken generally along the line III-III of Fig. 2;

Fig. 4 is a side elevational view of the envelope of Fig. 3, after it has been completely formed prior to printing;

Fig. 5 is a side elevational view of a support drum in an ink jet printer, with the envelope of the invention mounted thereon having an exaggerated thickness for clarity;

Fig. 6 is a fragmentary side view similar to Fig. 5, but of a comparative example; and

Fig. 7 is a sectional view taken generally along the line VII-VII of Fig. 1.

This invention is described hereinafter primarily in connection with the preferred embodiments particularly useful in ink jet printers. That is, the envelope preferably includes slits along one of the overlapping, joined edges of the bottom and side panels, as well as the scoring lines adjacent the

bottom edge of the pocket, described hereinafter. In addition, the invention includes envelopes constructed with each of such features separately, and regardless of the printing technology used.

An envelope 10 prepared in accordance with the invention comprises, Fig. 1, a pocket portion 12 into which the contents (not shown) are placed, and a sealingflap 14 connected to pocket portion 12 along fold line 15. To ensure that the envelope will feed into an ink jet printer properly, a leader extension 16 is provided on flap 14. The leader extension is readily removed after printing by tearing along perforated line 18. Adhesive is applied at portion 20 adjacent to line 18, as is conventional. Preferably, for best feeding results, corners 22 on leading edge 23 of leader extension 16 are relatively sharp corners.

In accordance with one aspect of the invention, perforated line 18 is constructed so as to have break-away perforations in a portion 19 that is approximately midway between ends 21 and 25 of the perforation line. (The lengths of the cuts in portion 19 are exaggerated for clarity.) The remainder portions 27 of the line are tear perforations. As used herein, "break-away" perforations mean those that will sever at the ties merely by pushing an object through portion 19. It has been found that a useful example of a break-away perforation, in contrast to a tear perforation, is one in which the length of the cut is at least 1.5 mm and the length of the tie is 0.2mm.

The use of the break-away perforation allows the user to more readily initiate the tearing off of the leader extension 16 prior to sealing flap 14 to the pocket portion.

As is conventional, pocket portion 12 comprises a central panel 30, two side panels 32 and 34 hingedly connected thereto, and a bottom panel 36 also hingedly connected to panel 30 along a fold line 38. Panels 32, 34 and panel 36 overlap along their respective edges 42, 44 and 46, respectively, Fig. 2. Panels 32 and 34 do not extend down to fold line 38, so that corners 47 adjacent line 38 are double ply only, for easier handling on the printer.

In accordance with another aspect of the invention, of the panels 32, 34 and 36 that are underneath when assembled (in this embodiment, panels 32 and 34), at least a portion of the panels' overlapping area, shown stippled, Fig. 2, is slit to provide tooth portions 50 extending along most of the overlapping edge. Tooth portions 50 allow panels 32 and 34 to slip, relative to panel 36, and thus the joined edges to stretch, when the envelope is forced out of the plane of the drawing, Figs. 1 and 2. The slits and therefore the teeth can have a variety of shapes, such as half-moons, and the number, spacing and size of the slits are not be-

lieved to be critical. However, each tooth must be complete; that is, the two sides of the "V" must join at the point. Furthermore, it is preferred that each tooth extend into the next tooth to provide a nesting of the teeth, in case the adhesive discussed below spreads out beyond its desired location. Also, the tooth portions 50 can be arranged to point in the opposite direction as well. By way of example, each edge 42 and 44 has adjacent thereto about 14 teeth formed by V slits that are about 7 mm long on each side of the "V", spaced apart about 3 mm.

Adhesive of conventional composition is applied along edges 42, 44 to join them to the overlapped edge 46. Preferably the adhesive is applied at the tips only of each tooth. Most preferably, tooth portions 50 form an alignment 58 that extends diagonally to fold line 15, that is, along a line which, when extended, intersects line 15 at non-orthogonal angles.

The effect of this arrangement is to provide a plurality of strips each with the shape <<, the point 52, Fig. 7, in each strip being secured by adhesive to panel 36. The ends 53 of each strip are still attached to panel 32 or 34 out of which they are severed. As a result, the strips can hinge up, arrow 57 out of the plane of panel 32 or 34, allowing the panel 36 attached to the tip of each tooth to slip, Figs. 1 and 2, with respect to panels 32 or 34. It is this relative sliding motion that aids in wrapping the envelope, and specifically pocket 12, about the drum support of a printer (shown).

In accord with another aspect of the invention, pocket 12 is preferably formed so as to be predisposed to flex fold line 38 up away from plane A, Figs. 3 and 4, which is otherwise the preferred plane of the envelope. The reason is that many print heads on ink jet printers have a very close spacing away from the rotating support drum. If the object on the drum protrudes much from the surface, e.g., as much as 0.8 mm, there is in many ink jet printers a high probability that the print head will physically strike the object, instead of just the jet of ink striking it. Such striking will cause a smearing of ink as well as potential harm to the print head.

It will be readily appreciated that a relatively stiff object, such as paper with several folds, as in an envelope, will tend to have its extreme edges project off the drum when held by a vacuum on the drum. Thus, it is preferred that the envelope be constructed so that edge 38 is biased to curve into the drum, particularly for printers having a close print head spacing. This is preferably accomplished as follows: Panels 30 and 36 have inner surfaces 54 and 56, respectively, and outer surfaces 60 and 66, respectively, Fig. 3. To cause such bias to edge 38, inner surface 54 of panel 30 and outer surface 66 of panel 36 are scored along

at least the majority of the width of each panel, forming score lines 74 and 76, respectively. Most preferably, score lines 74 and 76 extend the full width of the panel, as shown. Less than full width, or even discontinuous scoring, is useful for print heads having a greater spacing, and in some cases, the score lines can be omitted entirely. Alternatively (not shown), only one of the two panels can be scored if less bias of edge 38 out of plane A is needed. As is well known, the surface of a sheet that is scored tends to form a concave surface, and if the score is linear, the curve of the concave surface will be cylindrical about an axis parallel to such linear score. Because panel 36 is bent back over panel 30, the scoring is done on opposite surfaces 54 and 66, so that the flexing after assembly by folding, Fig. 4, is in the same direction for both panels, e.g., about an axis of curvature above the plane A as shown in Fig. 4.

Most preferably, score lines 74 and 76 are located relative to fold line 38 so that the two lines are superimposed when pocket 12 is fully formed. A useful, but not limitative, example is one in which the score lines are 1 cm from edge 38.

It will be readily appreciated that score line 76 is not readily discernable by the ultimate user of the envelope, and further, that tooth portions 50 that allow relative slippage between panels 32 and 34, and panel 36, are also relatively non-discernable while covered and sealed by the outer panel 36.

When bottom panel 36 is folded over to seal against panels 32 and 34, tooth portions 50 are covered, and the envelope appears to be conventional. Alternatively, panel 36 can be the one that is folded under, so that panels 32 and 34 are on top of it (not shown). In that case, tooth portions 50 are formed in the overlapped portions of panel 36 adjacent to edges 46.

With the above features, the envelope will readily accommodate itself to the support drum of an ink jet printer. That is, Fig. 5, such a drum 100 has a radius of curvature R centered on an axis of curvature 110, and a support surface 120. As an example, R can be about 5 cm. Envelope 10 is placed onto the drum with flap extension 16 leading and the pocket side (12) down, or in other words, flipped over from the position shown in Fig. 4. It is held this way by vacuum, most preferably, for the actual printing. The vacuum is applied at least at flat portions 130 and 140, which line up with the leading and trailing edges 23 and 38 of the envelope. A preferred construction is one in which angle  $\theta$  is about  $245^\circ$ . It will be readily apparent that the predisposed flexure of pocket 12 in one direction only, out of plane A, Fig. 4, causes it to curve about an axis of rotation that favors the wrapping of the envelope about surface 120.

Failure to provide score lines 74 and/or 76 tends to cause envelope 10 to mount as shown in Fig. 6, with edge 38 protruding too far from surface 120.

## Claims

1. In an envelope (10) comprising a central panel (30), two side panels (32, 34), a bottom panel (36), and a sealing flap (14), said side panels, bottom panel and sealing flap being foldably connected to said central panel with said side and bottom panels joined together along overlapping respective edges (42, 44, 46) by joining means to form, with said central panel, the pocket (12) of the envelope, one of said side and bottom panels being on top of the other, characterized in that at least a portion of said joined edges (42, 44, 46) of said side panels (32, 34) or said bottom panel (36) that are underneath the respective overlapping edge of the other of said joined panels includes slits (see teeth 50) of a shape and spacing effective to allow said joined respective edges to stretch while still joined, when said envelope is wrapped around a drum.
2. In an envelope comprising a central panel - (30), two side panels (32, 34), a bottom panel (36), and a sealing flap (14), said side panels and bottom panel being foldably connected to said central panel and joined to said bottom panel and side panels, respectively, along overlapping respective edges (42, 44, 46) by joining means to form, with said central panel, the pocket (12) of the envelope - (10), characterized in that at least one of said bottom panel (36) and said central panel (30) is scored along a line (76; 74) extending at least the majority of the width of said envelope (10), said scoring being done from a side of the paper comprising said envelope that encourages the envelope to flex in one direction only to approximate a curve with said pocket on the inside of said curve.
3. An envelope as defined in claim 2, characterized in that the scoring (76; 74) is in both said bottom (36) and said central panels (30), for the full width of said panels.
4. In an envelope comprising a central panel (30), two side panels (32, 34) and a bottom panel (36) foldably connected to said central panel so that the side panels and bottom panel are joined to each other along respective overlapping edges (42, 44, 46) to form, with said central panel, the pocket - (12) of the envelope (10), and a sealing flap (14), foldably connected to said central panel, characterized in that said side (32, 34), central (30)

and bottom panels (36) are constructed to permit flexure of the envelope out of a single plane, said constructed panels including,

a) in at least a portion of said joined edges of said side panels or said bottom panel that are underneath the respective overlapping edges of the other of said joined panels, means (50) defining slits of a shape and spacing effective to allow said joined respective edges to stretch while still joined, when wrapped around an axis extending parallel to said plane,

and scoring lines (76; 74) in said bottom panel - (36) and said central panel (30), said lines a) extending at least the majority of the width of said envelope and parallel to said axis, and b) being formed to flex said panels in one direction only to approximate a curve favoring wrapping of the envelope around said axis.

5. An envelope as defined in claim 3 or 4, characterized in that said central (30) and said bottom panels (36) each have an inner surface - (54) and an outer surface (66), the inner surfaces being faced together to form said pocket, said score lines (74; 76) being formed in the inner surface of said central panel and the outer surface of said bottom panel.

6. An envelope as defined in claim 3 or 4, characterized in that said bottom panel (36) is folded relative to said central panel (30) so as to cause said score lines (74; 76) to be superimposed one above the other in the finished pocket (12).

7. An envelope as defined in claim 1 or 4, characterized in that said slits form teeth (50) on a line (58) that extends non-orthogonally to the line - (15) of foldable connection of said sealing flap (14) to said central panel (30).

8. An envelope as defined in claim 1 or 4, characterized in that the sealing flap (14) is provided with a leader extension (16) which is attached to the sealing flap by a perforated line (18).

9. An envelope as defined in claims 1 or 4 and 8, characterized in that approximately in the middle portion (19) of line (18) the perforation is a break-away perforation.

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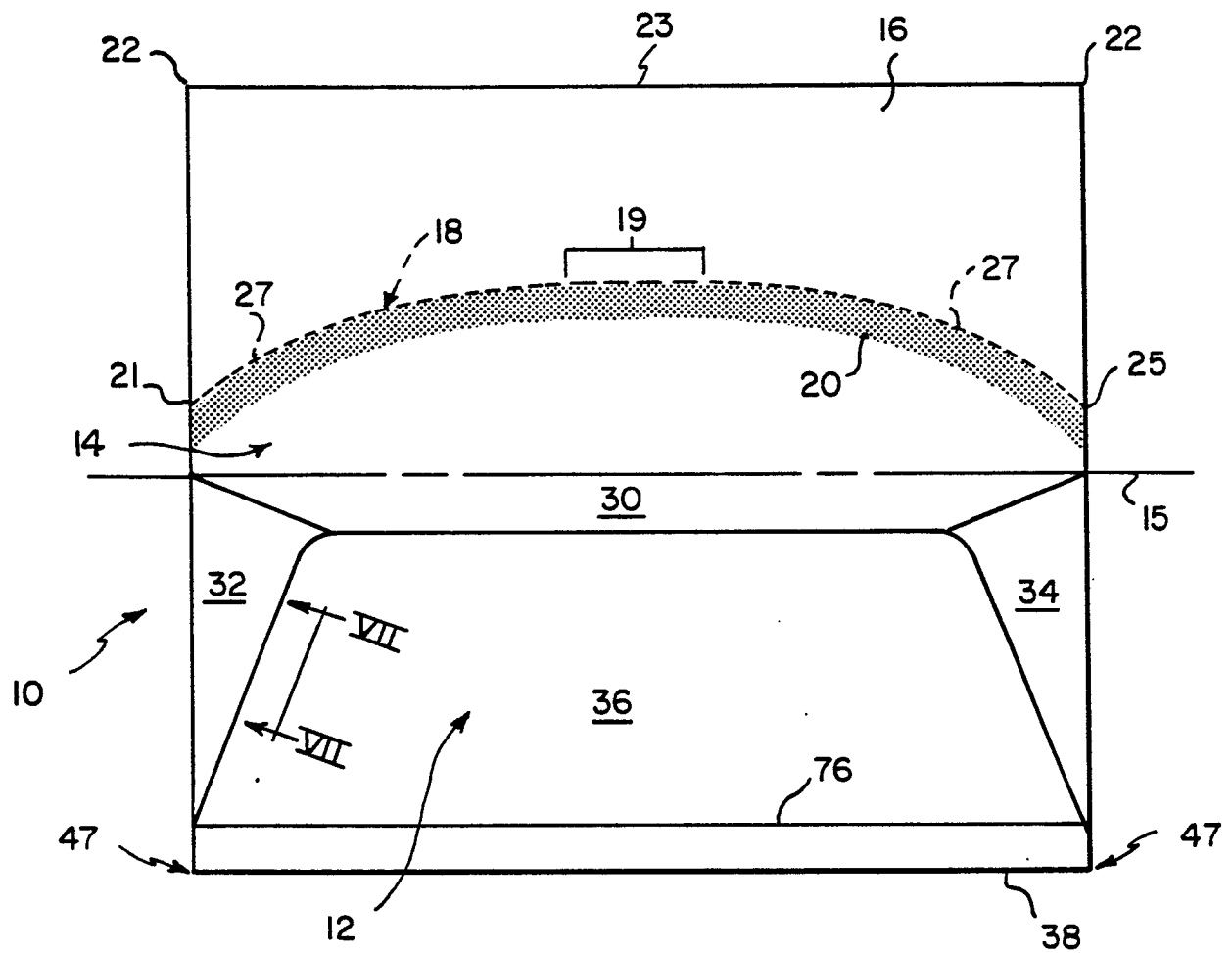


FIG. 1

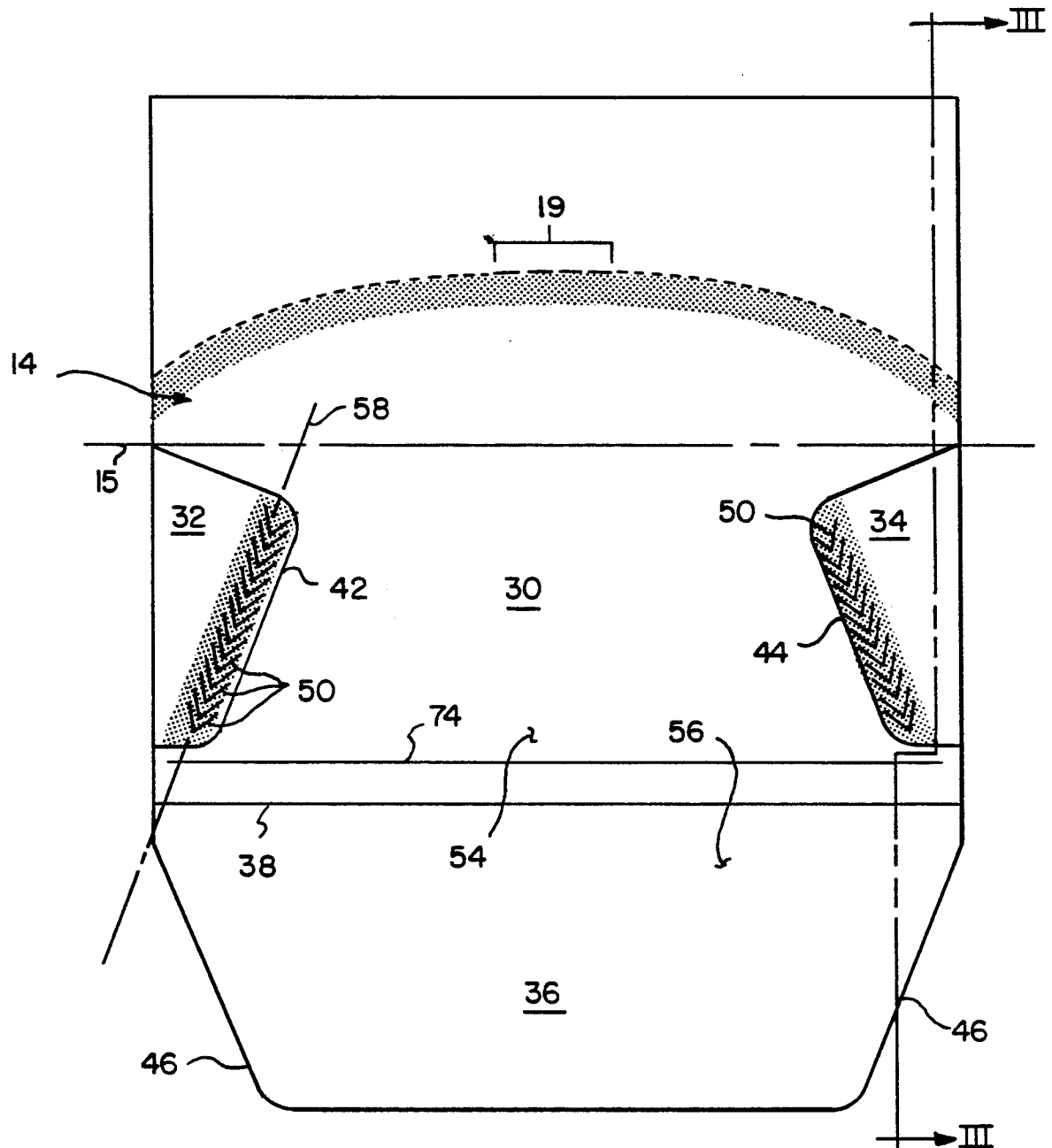


FIG. 2

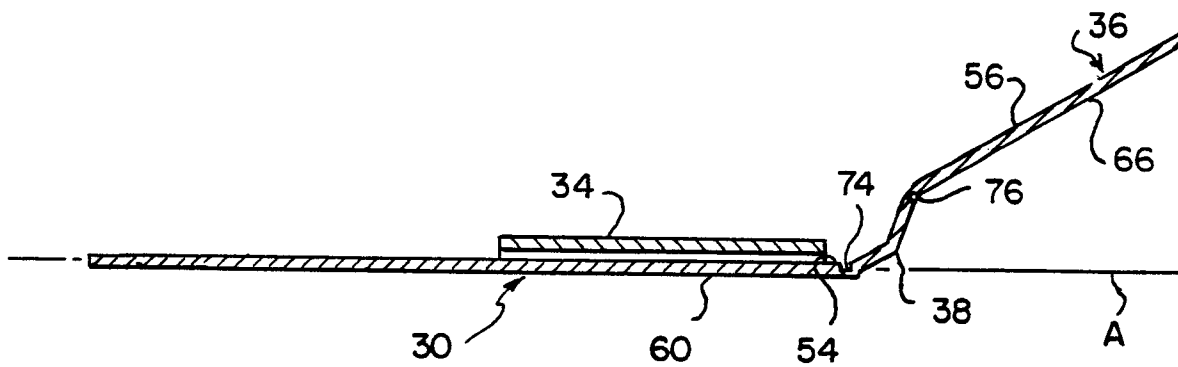


FIG. 3

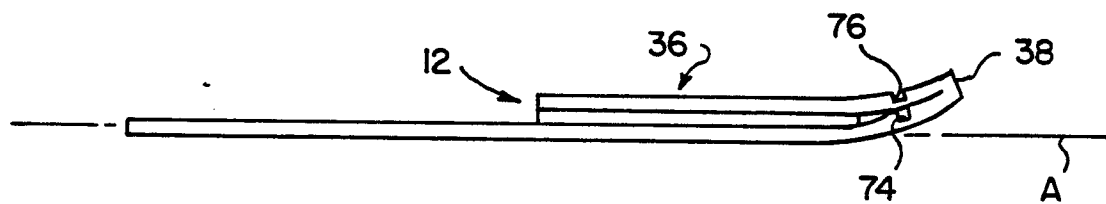


FIG. 4

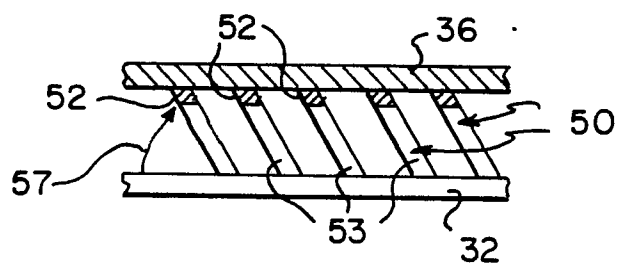
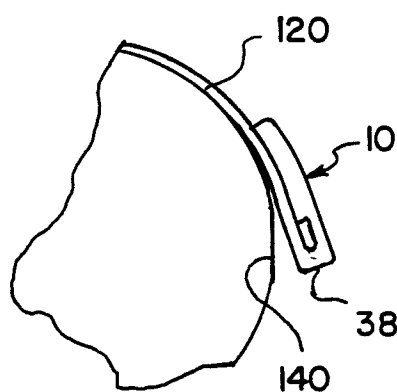
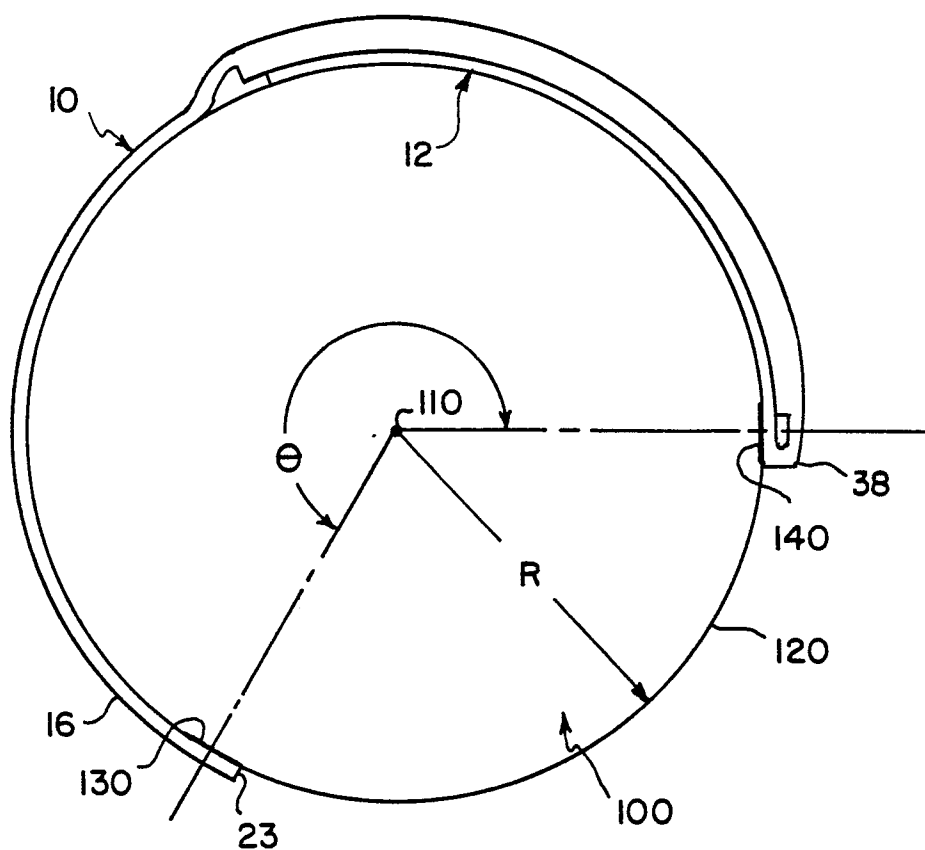


FIG. 7



FIG. 5



(COMPARATIVE EXAMPLE)

FIG. 6



EP 86 11 7403

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-3 088 653 (W.P. SWARTZ) * column 2, line 45 - column 3, line 36; figures 1-4, 6 *	1-4	B 65 D 27/00
A	--- DE-U-7 215 747 (HANNOVERSCHE GUMMIER-ANSTALT AUGUST WEGENER) * claims 1-3; figures 1, 2 * -----	1, 2, 4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 65 D 27/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 05-03-1987	Examiner GRUNFELD D.P.
<b>CATEGORY OF CITED DOCUMENTS</b>			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	