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Applicant: **Brown, William F.**
239 Beverly Road
Barrington Illinois 60010(US)

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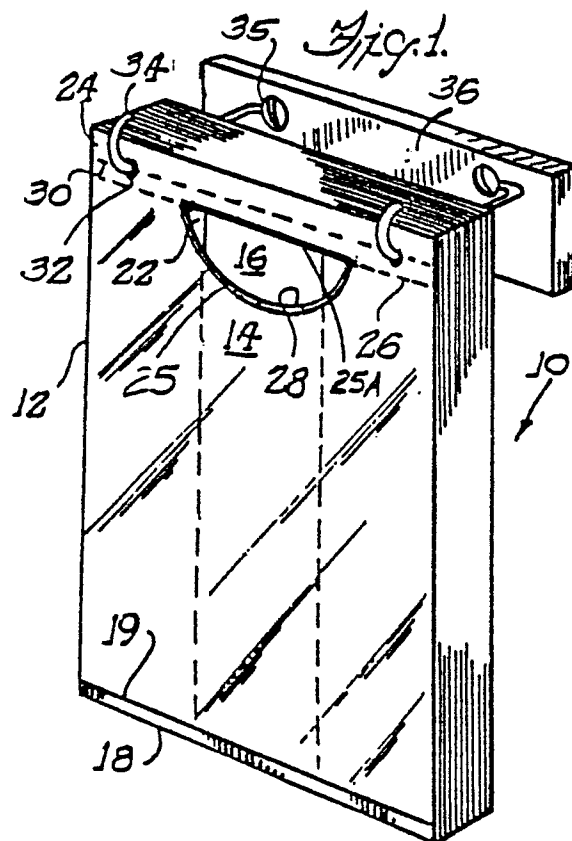
Inventor: **Brown, William F.**
239 Beverly Road
Barrington Illinois 60010(US)

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Representative: **Carpenter, David et al**
MARKS & CLERK Alpha Tower Suffolk Street
Queensway
Birmingham B1 1TT(GB)

Bag bundles and method of and apparatus for manufacture.

A bag bundle (10) comprises a plurality of plastic bags (12). Each such bag (12) includes a first sidewall (14), a second sidewall (16) integral with the first sidewall (14) at lateral end portions thereof, a closed bottom (18), an opening (20) in distal relations to the bottom (18) and a tab (24). A longitudinal end portion of the first and second sidewalls (14, 16) defines the opening (20). The tab (24) is integral with at least one of the first and second sidewall end portions adjacent the opening (20). The tab (24), moreover, is readily separable from such sidewall end portion because of the presence of a plurality of perforations formed in such sidewall end portion (26) adjacent the opening (20). Only one of the first and second sidewalls (14, 16) includes a hand hole (28) formed through such sidewall. The hand hole (28) has a thickened, reinforcing edge (25) in a front sidewall and the tab (24) is attached only to the back sidewall. The bags (12) are affixed together at their tabs (24) in a stacked, folded manner, all such bag hand holes (28) being uniformly disposed. The affixed tabs (24) preferably include at least one support hole (32) therethrough for securing the bag bundle (10) to a support (34, 36). Also disclosed are methods and apparatus for manufacturing the bag bundles (10).



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BAG BUNDLES AND METHOD OF AND APPARATUS FOR MANUFACTURE THEREOF

Background of the Invention

This invention relates to bags, and to a method of and an apparatus for, manufacture of such bags. More particularly, this invention relates to bundles of plastic bags, to the method of manufacture of such bundles and to an apparatus for manufacturing such bundles.

A traditional and long-accepted method for packaging merchandise, such as groceries at check-out counters, has generally included the loading of bags. Individual, flattened bags were generally piled, one atop another, up to a finite pile height. As a check-out person grasped an uppermost bag from such a pile, it was often difficult (for such a person) quickly to engage in a bag-loading procedure which included removing the uppermost bag from the pile, locating the uppermost bag opening, opening the bag and positioning the bag for receipt of goods. Such a bagging procedure thus was often inefficient, time consuming and expensive for the merchandiser. In the past, such bags had generally been made of paper.

Packaging goods in plastic bags, on the other hand, is now quickly becoming the preferred method of packaging merchandise. For example, a plastic handled bag has generally been encountered by the public at a variety of check out counters. Yet, many of such plastic bags, too, are generally known to be difficult quickly to open and load with goods. It is currently thought, for example, that charge builds up on the sidewalls of many plastic bags, such charge buildup causing the bag sidewalls to adhere together.

Many plastic bags, accordingly, may require a fixture for supporting the bag in an open position for rapid loading. See, for example, the 4,062,170 patent to Orem.

Objects and Summary of the Invention

It is therefore a general object of this invention to provide a novel plastic bag which is readily openable and fillable.

A more specific object is to provide a bundle of such bags, such a bag bundle including a plurality of such bags uniformly disposed and fastened together at one end thereof.

A further object is to provide such a bundle having an uppermost or closest bag wherein a mouth or opening of such a bag is readily graspable for opening such bag.

Yet another object is to provide such a bundle

wherein any individual bag (but preferably the uppermost or closest bag) is readily removable, as by a flip of the wrist, from the remainder of bags in the bundle.

A related object is to provide a method for the manufacture of such a bag and bag bundle.

Another related object is to provide an apparatus for the manufacture of such a bag and bag bundle.

Briefly, and in accordance with the foregoing objects, a novel bag bundle according to the present invention will now be summarized. The bundle comprises a plurality of plastic bags. Each such bag includes a first sidewall, a second sidewall integral with the first sidewall at lateral end portions thereof, a closed bottom, an opening in distal relation to the bottom and a tab. A longitudinal end portion of the first and second sidewalls defines the opening. The tab is integral with at least one of the first and second sidewall end portions adjacent the opening. The tab, moreover, is readily separable from such sidewall end portion because of the presence of a plurality of perforations formed in such sidewall end portion adjacent the opening. Only one of the first and second sidewalls includes a hand hole formed through such sidewall proximate to the tab. The bags are affixed together at their tabs in a stacked, folded manner, all such bag hand holes being uniformly disposed. The affixed tabs preferably include at least one support hole therethrough for securing the bag bundle to a support.

Methods of and apparatus for manufacturing bag bundles, according to the present invention, will be described below in greater detail.

Brief Description of the Drawings

The foregoing, as well as other objects, features and advantages of the present invention will become more readily understood upon reading the following detailed description of the illustrated embodiments, together with reference to the drawings, wherein:

Fig. 1 is a front perspective view of a first embodiment of the bag bundle of the present invention;

Fig. 1A is a front perspective view of a second embodiment of the bundle;

Fig. 1B is a front perspective view of a third embodiment of the bag bundle;

Fig. 2 is a perspective view illustrating removal of an uppermost or closest bag from the bag bundle of Fig. 1 by insertion of a hand into the bag hand hole and tearing along the perforations;

Fig. 3 is a perspective view of an individual bag (of the first embodiment), partially opened;

Fig. 4 is a top view taken substantially along the plane 4-4 of Fig. 3;

Fig. 5 is a top view of a method and apparatus for manufacture of the bag bundles of the present invention;

Fig. 5A is a side view of the method and apparatus of Fig. 5, Fig. 5A including certain details not presented in Fig. 5;

Fig. 6 is a front perspective view of a first embodiment of a structure useful for supporting the first embodiment of the bag bundle of Fig. 1;

Fig. 6A is a front perspective view of a second embodiment of a structure useful for supporting the first embodiment of the bag bundle of Fig. 1;

Fig. 7 is a projected sectional view taken from the plane 7-7 in Fig. 5A;

Fig. 8 is a projected sectional view taken from the plane 8-8 in Fig. 5A;

Fig. 9A is a perspective view of a modified apparatus for producing the hand hole in an operation similar to step four of Fig. 5A, and illustrating the open position of upper and lower reciprocating platens;

Fig. 9B is an end elevation view of the apparatus in Fig. 9A, illustrating the upper and lower platens closed against upper and lower webs of bag material, and a melting tool carried on the lower platen;

Fig. 9C is a perspective view, partially broken away, of the webs in Fig. 9B following the withdrawal of the melting tool and fabrication of a hand hole;

Fig. 10 is a perspective view, partially in section, of the melting tool shown in Figs. 9A-9C;

Fig. 11 is a sectional view taken along the line 11-11 in Fig. 10 and further illustrating the corresponding section through the lower platen;

Fig. 12 is a top plan view of the forming mandrel shown in Fig. 9A;

Fig. 13 is a perspective view of the roller assembly of the mandrel in Fig. 12, and further illustrating the supporting and guide rollers shown in Fig. 9A;

Fig. 14 is an end elevation view of the rollers shown in Fig. 13;

Fig. 15 is a front plan view (partially broken away) of a fourth embodiment of a bag bundle of the invention lying flat;

Fig. 16 is a front perspective view of the bag bundle in Fig. 15, hanging vertically in use; and

Fig. 17 is a side elevation view of the bag bundle in Fig. 16.

5 Detailed Description of the Illustrated Embodiments

A first embodiment of the bag bundle 10 (Fig. 1) comprises a plurality of (preferably from about 50 to about 100) joined, collapsed bags 12. The bags 12 are made of plastic and preferably have relatively thin walls.

Each such bag 12 includes a first or forward sidewall 14 and a second or rearward sidewall 16 integral with the first sidewall 14 at lateral end portions thereof (Figs. 2-4). Each such bag 12 further includes a bottom 18 formed by joining together the lower longitudinal end portions of the forward and rearward sidewalls 14, 16 along a transverse line 19 (Fig. 3).

Each such bag 12 yet further includes a mouth or opening 20 in distal relation to the bottom 18 (Figs. 2,3).

Each such bag 12 additionally includes a tab 24 (Fig. 1). As to each bag 12, the tab 24 is integral with first and second sidewall upper longitudinal end portions adjacent the opening 20 (Fig. 2). Such sidewall upper longitudinal end portion, moreover, is separable from its tab 24 because each such bag 12 further includes a linear perforated boundary or margin 26 (Fig. 1) for separating the bag 12 from the tab 24.

The sidewalls 14, 16 preferably include longitudinally-disposed inwardly-folded (or gusseted) integral side panels 22 (Fig. 4) at lateral end portions thereof.

Only one (preferably the forward sidewall 14) of the sidewalls 14, 16 includes a hand hole 28 (Fig. 3) formed through such sidewall 14, large enough for readily inserting the fingers of a hand of a grasper (Fig. 2) into the opening 20 intermediate the forward and rearward sidewalls 14, 16. The perforations of the boundary 26 are spaced such that when the tab 24 is held securely by a support, a quick flip of the wrist (after the fingers have been inserted intermediate the forward and rearward sidewalls 14, 16) provides sufficient force for removing such a grasped bag 12 from the tab 24. The hand hole 28 can have a thickened peripheral edge 25 which reinforces the sidewall 14 and prevents tearing the edge 25 when grasped to remove the bag 12; the linear edge 25A is on or above the margin 26 so it remains with the tab 24. It is noted that the gusseted side panels 22 serve to space the sidewalls 14 and 16 from each other to facilitate inserting of the fingers into the opening 20 and behind the forward wall 14.

In the first embodiment of the bag bundle 10, the perforated margin 26 overlies an upper edge

25A of the hand hole 28 (Fig. 1). Accordingly, when the user inserts his fingers through the hand hole 28 (of a bag 12) for the purpose of removing such a grasped bag 12 from the bundle 10 (Fig. 2), the hand hole 28 of the bag 12 (Fig. 3), now removed from the bundle 10, provides the bag 12 with a notch 29 (Fig. 3) along the upper longitudinal end portion of only the forward sidewall 14.

The inertia or attraction (electrostatic or otherwise) as between the forward and rearward sidewalls 14, 16, surprisingly, is readily overcome by a quick thrust of the fingers through the hand hole 28. For example, the fingers (thus thrust) initially separate upper portions of the forward and rearward sidewalls 14, 16, and subsequent downward disposition of the fingers permits the user to grasp the forward sidewall 14 (preferably along the hand hole 28) for removing the bag 12 from the tab 24 as above described.

The bags 12 of the first embodiment of the bag bundle 10 are joined together in a manner such that the tabs 24 are one atop another, and such that the hand holes 28 are uniformly disposed, i.e., preferably directed toward the user (Fig. 2).

The tabs 24 are fastened together preferably along an upper transverse line 30 (Figs. 1, 2) located intermediate the perforated margin 26 and an upper edge of each tab 24, thereby forming the first embodiment of the bundle 10. The tabs 24 of the first embodiment, moreover, include punched holes 32 preferably through spaced opposite end portions of the tabs joined 24, and further preferably centered on the transverse line 30 for supporting the bundle 10 in a known manner using hooks 34 and a support structure 36 (Fig. 1). The hooks 34 are preferably fastened to the support structure 36 by screws 35.

A first embodiment of a structure 36A (Fig. 6) particularly useful for supporting the first embodiment of the bag bundle 10 comprises hooks 34A, a pair of legs 33A and a metal plate 37A for resisting rearward motion of the bundle 10 when a user thrusts a hand into the hand hole 28 as above described. The legs 33A are preferably mounted into a counter top 39 in an upright manner.

A second embodiment of a structure 36B (Fig. 6A), also particularly useful for supporting the bag bundle 10, similarly comprises hooks 34A, a single leg 33B and a metal plate 37B serving a function similar to that of the metal plate 37A. The leg 33B similarly is preferably mounted into the counter top 39 in an upright manner.

In a second embodiment (Fig. 1A) of the bag bundle 10A, the upper longitudinal edge portions of the forward and rearward sidewalls 14A, 16A respectively include a hand hole 28A and an arcuate tab 24A. The tab 24A, integral only with the rearward sidewall 16A, is separable from the rearward

sidewall 16A along an arcuate perforated boundary or margin 26A.

Bags 12A (of the second embodiment of the bag bundle 10A) are stacked, one atop another, in a manner such that the tabs 24A are one atop another, and such that the hand holes 28A are uniformly disposed. The stacked tabs 24A, moreover, preferably include at least one hole 32A formed therethrough for supporting bundle in 10A (substantially as described above, using a single hook 34). The tabs 24A are joined together preferably along the circumference of the holes 32A.

In a third embodiment (Fig. 1B) of the bag bundle 10B, the first and second sidewalls 14A, 16A further include elongated patches 41 (preferably plastic) which respectively have been affixed to the first and second sidewalls 14A, 16A intermediate the side panels 22. The patches 41 are located proximate to the hand hole 28A and tab 24A and are transversely disposed relative to the side panels 22.

The third embodiment further preferably includes a second hand hole 43 (Fig. 1B) formed through the first and second sidewalls 14A, 16A and centered on the patches 41. The second hand holes 43 are transversely disposed relative to the side panels 22, and serves as a means for carrying the bag 12B when such bag 12B has been removed from its bag bundle 10B and filled with merchandise. The patches 41 serve as a reinforcement for eliminating tearing of the sidewalls 14A, 16A. Accordingly, the thickness of the patches 41 is sufficient for accomplishing such a purpose.

The second and third embodiments of the bags 12A and 12B can also have thickened, melt-hardened hand hole edges similar to edge 25 of the first bag 12. Throughout the description of the three embodiments of the bags 12, 12A and 12B and bag bundles 10, 10A and 10B, like reference numerals have been given to like parts.

The bags 12, 12A and 12B are preferably made of a relatively thin gauge plastic, and are preferably individually heat sealed at the transverse line 19 (Fig. 4) thereby providing each bag 12, 12A and 12B with its respective closed bottom 18. The bags 12, 12A and 12B of each respective bag bundle 10, 10A and 10B, moreover, are fastened together, using commercially available heat-welding apparatus, either along the line 30 or along the circumference of the holes 32A.

Method and Apparatus for Manufacture of the Bag Bundles

The following discussion is specifically directed toward a method of an and apparatus for manufacture of the first embodiment (Fig. 1) of the bag

bundles 10. Minor modifications to the method and apparatus (Figs. 5, 5A) the manufacturing the second and third embodiments (Figs. 1A, 1B), will also be briefly discussed.

Referring to Fig. 5, it will be seen that an extruder 38, which receives plastic material from a source (not shown), extrudes (step 1) a molten form of the plastic material. The extruded plastic material assumes the shape or form of a tube or sleeve 40.

Feed rollers 42 (within a tube-transfer station 45) transfer the extruded tube 40 from the extruder 38 to heat sealers 44. The feed rollers 42 of the tube-transfer station 45 serve to flatten the tube 40 as the tube is advanced past the heat sealers 44. The heat sealers 44 are spaced above and below the extruded tube 40, and are spaced transverse to the direction of travel of the extruded tube 40 so as to substantially equally divided (step 2) the extruded tube 40 into a plurality of (in Fig. 5, for example, 3) relatively narrower, longitudinally-joined tubes 46. The tubes 46 are then drawn past cutters 48 which cut (step 3) the tubes 46 along a margin or region 50, where such tubes 46 had been joined.

Advancing rollers 49 then advance individual tubes 46 (now severed one from another) through a tension-adjusting station 52 preferably comprising five rollers (Fig. 5A) so that each tube 46 can be punched on one side only (Fig. 5A: step 4).

Directing attention to Fig. 5A, it will be seen that within each tube 46 an internal mandrel 54 having an anvil 56 is supported within the tube 46 by support rollers 58. The internal mandrel 54 separates the walls of the tube 46, and changes the shape of the tube 46 from substantially flat (Fig. 7) to relatively open (Fig. 8). A punch 60, external to the tube 46, at predetermined time intervals strikes the mandrel anvil 56 forming the hand hole 28 through one side only of the tube 46 (see Fig. 5).

An indexing station 62 (preferably comprising three rollers) advances each tube 46 from its respective mandrel 54 to a folding station 64 where guiding vanes 66 (Figs. 5, 5A) cause folds or gussets to be formed (step 5) in the lateral sides of each tube 46. (These folds or gussets become the side panels 22 when the tubes 46 are later formed into bags 12, 12A or 12B.) The indexing station 62 serves to flatten the tubes 46 as they are drawn over their respective mandrels 54. (As between Figs. 5 and 5A, the tension-adjusting station 52, mandrels 54 and indexing station 62 are included within an area 63.)

With the lateral sides thus folded in, each tube 46 is advanced by advancing rollers 68 to heat sealers 70 and cutters 72. The function of the heat sealers 70 is to heat seal transversely-disposed,

longitudinally-spaced portions of each tube 46, and the function of the cutters 72 is to cut (step 6) each such tube 46 along these transversely-disposed, heat-sealed portions. Each such tube 46 is cut along a longitudinal end portion which is in distal relation to the hand hole 28. See Fig. 5.

(At this point it will be appreciated that the severed tubes 46, which have been cut along one longitudinal end thereof and which have been heat sealed at such longitudinal end, are thus being transformed into the above-described bags 12. Where the tubes 46 have been sealed, for example, corresponds to the above-described transverse line 19.)

Severed tubes 46 are conveyed by a conveyor 74 from the heat sealers 70 and cutters 72 to a stacker 76 which causes the severed tubes 46 to become stacked vertically (step 7). The advancing rollers 68 serve to advance the unsevered tubes 46 past the heat sealers 70 and cutters 72. The heat sealers 70 and cutters 72 perform their respective functions upon the tubes 46 at predetermined time intervals. The advancing rollers 68, heat sealers 70 and cutters 72, moreover, cooperate in a manner such that a leading end portion of the unsevered tubes 46 is permitted to be advanced onto the conveyor 74 before the cutters 72 cut such leading end portions from the remainder of each tube 46.

When a predetermined quantity of severed tubes 46 have accumulated at the stacker 76, a leading longitudinal end portion of the severed tubes 46 are heat sealed together (step 8) at the transverse line 30 (Figs. 1, 5) by a heat sealer 78 (Figs. 5, 5A). A conveyor 80, which operates at predetermined time intervals in cooperation with the stacker 76, receives the severed tubes 46 from the conveyor 74 and permits a quantity (preferably from about 50 to about 100) to accumulate as to each pile of severed tubes 46 (there are 3 such piles: see Fig. 5) before advancing the stacks of tubes 46 from the stacker 76 to the heat sealer 78. The conveyor 80 transfers the joined and severed tubes 46, now unfinished bag bundles 10, to a punch 82 which punches and cuts (step 9) the bag bundles 10, through the leading end portions thereof thereby forming the perforated boundaries or margins 26 and the tabs 24. The punch 82 preferably forms the linear perforated margin 26 when the apparatus (of the present invention) is used to form the first embodiment (Fig. 1) of the present invention. The punch 82, moreover, preferably forms the arcuate perforated margin 26A when the apparatus is used to form the second and third embodiments (Figs. 1A, 1B). In addition to forming the perforated margins 26 and 26A, the punch 82 is used for forming the holes 32 or 32A through the tabs 24 or 24A of the first or second and third embodiments of the bundles 10 or 10A and 10B of

the present invention. Where two holes 32 are formed through the tab 24 (Fig. 1), such holes 32 are preferably spaced at opposite end portions of the transverse line 30 for additional support of the bag bundle 10 by the hooks 34.

As to the second and third embodiments of the bag bundle 10A and 10B, the punch 82, moreover, cuts each bag 12A or 12B at the upper or leading longitudinal edge 27 thereof (Figs. 1A, 1B). As to the second and third embodiments of the bag bundle 10A and 10B, the punch 82 includes means for hot punching the tabs 24A together thereby forming the holes 32A whereby the tabs 24A are joined together at the circumferences of the holes 32A.

In the operation of step 4 to fabricate the hand hole 28 through one side or web of the tube 46, modifications of the apparatus are illustrated in Figs. 9A, 9B and 9C. Referring to Fig. 9A, from the tension-adjusting roller 152 an individual tube 146 is advanced and separated by the steel plate 154 of an internal mandrel or former assembly 155. The former plate 154 is mounted on a frame 156 which assembly also secures an upstream roller assembly 158, more fully described with reference to Figs. 12-14, and a downstream roller 160, which are supported on respective support roller assemblies 162 and 164. As shown in Fig. 9A, a pair of reciprocating platens 166 and 168 are arranged in vertical alignment with the former plate 154. The upper wall or web 147 travels between the former plate 154 and the upper platen 166. The lower web 148 travels between the former plate 154 and the lower platen 168. The vertically reciprocating motions of the platens 166 and 168 are driven by fast-acting, pneumatic piston-cylinder units 170 and 172, respectively. The lower platen 168 supports a heated melting tool which is generally designated by reference character 174.

As illustrated in Fig. 9B, when all of the rollers and the webs 147 and 148 are momentarily halted during a stop cycle measured in time periods as short as milliseconds, both the upper platen 166 and lower platen 168 are simultaneously closed upon the respective webs 147 and 148 which are thereby each clamped against the former plate 154. As the hot annular edge 176 of the melter 174 just contacts the lower web 148 which is thereby impinged against a Teflon coating 180 on the bottom surface of the former plate 154, the entire area of the plastic web circumscribed by the hot edge 176 is immediately melted and removed within the millisecond time period of the stop cycle. The temperature of the edge 176 will be approximately the melting temperature of the specific type of plastic being fabricated, for example approximately 194° C when high density polyethylene webs are fabricated in typical thicknesses of about 0.4 to

1.25 mil. Following the melting operation a thickened bead at the melt-hardened peripheral edge 129 is formed around the resulting hand hole 128 as shown in Fig. 9C. The thickened peripheral edge 129 provides tough, integral reinforcement at the hand hole and prevents the bag wall from ripping at the hand hole when the user pulls the bag from the bundle.

Although the edge 176 applies negligible force against the Teflon®-coated plate 154, the clamping action of the upper platen 166 holds the plate 154 and the webs 147 and 148 stationary without any shifting to ensure registry of the edge 176 with the precise location for melting and removal of the plastic material to produce the hand hole 128 so that the upper edge thereof is coextensive with or above the correct line of margin, for example, perforated margin 26 in the first embodiment of the bundle 10 in Fig. 1.

The lower surface of the upper platen 166 is covered with a rubber sheet 167 which promotes the interfacial purchase with the upper web 147 during the stop cycle. The instantaneously melted film area 182 is removed in downward motion under the combined action of gravity and the inward shrinking of the film melt with surface tension promoted by a downward flaring or reverse inside taper of the interior wall 178 of the melter tool 174 through which the generally vertical passageway 184 is formed, as more fully illustrated in Figs. 10 and 11. The Teflon coating 180 also promotes the instantaneous release of the melt so that the film can advance at high speed as the platens are withdrawn as shown in Fig. 9C.

Referring again to Fig. 9B, the passageway 184 is downwardly extended entirely through the tool 174, through a heat insulation layer 186 between the tool 174 and the platen 168, and further extending through the platen 168 itself to an opening 188 at the bottom of the platen. Although the melt adheres to the interior wall 178 of the tool 174 and therefore creates a progressive build-up of melt resulting from the high frequency of removal cycles, the gradual descent of the melt build-up through the passageway 184 allows increased cooling and hardening of the melt so that eventually the motion of the platen 168 will produce fracture and discharge of the hardened melt 189 from the opening 188 in the platen 168 without interference from the drive piston 172 which is offset from the opening 188. Consequently, removal of the melt from the lower web 148 does not require additional discharge equipment at very high cycle frequencies.

Referring now to Figs. 10 and 11, the melter 174 includes a pair of generally cylindrical, electrical resistance heaters 190 which extend through a heat-conducting base 192. In the embodiment illustrated in Fig. 10, the heaters 192 are aligned

horizontally parallel so that the longitudinal dimension of the passageway 184 is positioned between the heaters 192. The heated wall 178 upstanding from the base 192 has an interior surface which tapers upwardly toward the opening edge 176 which forms the outline for the hand hole 28.

Referring to Fig. 11, the melter 174 is mounted on the lower platen 168 from which it is separated by the heat insulation layer 186. The lower platen 168 includes upper and lower plates 194 and 196, respectively, on which are secured the opposite ends of multiple helical, or hair, springs 198, two of which are shown in the sectional view of Fig. 11. The springs 198 regulate the very light pressure with which the heated edge 176 impacts the lower web 148 and then the Teflon® coating 180 following the instantaneous melting, in order to prevent excessive impact force which could produce denting in the Teflon coating in a short period of time since the impacts are repeated at a very high cycle frequency. The springs 198 thus provide the lower platen 168 with a floating action which is coordinated with the stop position at the top of the pneumatic piston upstroke closing the lower platen 168, in order to protect both the fine ground edge 176 and the Teflon coating 180.

Referring again to Fig. 9A and Fig. 12, the upstream roller assembly 158 includes a segmented, stationary bearing shaft which is mounted at opposite ends on the frame 156 which carries the former plate 154. As shown in Figs. 12, 13 and 14, the alternating, off-set shaft segments 202 and 204 provide spaced, parallel center lines for the bearings on which two sets of freely rotating upper and lower tension rollers 206 and 208, respectively, are mounted in alternate sequence. The lower web 148 is advanced between the lower set of rollers 208 and a pair of supporting rollers 210 (shown as part of assembly 162 in Fig. 9A) which rotate with and support the lower rollers 208 (as well as the former plate 154 and frame 156) in addition to tensioning the lower web 148. While the lower rollers rotate counterclockwise as viewed in Figs. 13 and 14, the upper rollers 206 rotate clockwise to advance the upper web 147 which passes between the upper rollers 206 and a swing-arm roller 212.

As shown best in Fig. 14, the operating position of swing-arm roller 212 and the supporting rollers 210 are vertically spaced sufficiently closely to prevent the roller assembly 158 from passing between in the horizontal direction of the web advancement; this relative spacing provides the restraint on the roller assembly 158 and the former assembly 155 to oppose the horizontal force exerted by the webs 147 and 148 which are accelerated from stop to high speed advancement, for example, 260 feet per minute, in millisecond cycle times. Because the acceleration and deceleration

of the webs is generated at such high frequency, the former assembly 155 must be light in order to provide as small inertia as possible to prevent excessive stretching or distortion of the plastic webs of film. The rollers 206, 208, and 160 of the former assembly 155 all have small diameters and produce little friction or resistance to the advance and stop of the film.

Referring to Figs. 15, 16 and 17, a fourth embodiment of a bag bundle 10C is similar to the first bag bundle 10 shown in Fig. 1, with the same reference numerals designating like features. Unlike the bundle 10 in which the margin line 26 is a continuous series of perforations through successive bags 12, the margin line 126 is a cut line through both the left and right lateral portions of the bundle 10C (including cuts through all of the gussets 22); however, a medial portion 126a of the line 126 is a perforated line, or series of spaced perforations, similar to perforated line 26 of the bundle 10. Consequently, the combined knife and punch 82, described with reference to step 9 in Figs. 5 and 5A, will be modified in configuration accordingly.

In the preferred embodiment shown in Figs. 15, 16 and 17, the perforated line 126a is aligned within the expanse of the hand hole 28, parallel to and below the linear, upper portion 25A of the peripheral edge 25, and preferably terminates between the gussets 22. Consequently, the perforated line 126a is formed only in the rearward sidewall 16C of each bag 12C in the bundle 10C. The important benefit from locating the perforated margin line 126a only in the rearward sidewall 16C is illustrated in Fig. 16 wherein only the relatively short length of centrally located perforation line 126a must be torn from the tab 24C when the leading bag 12C is detached from the bundle 10C by the user, since the cut lines 126 have already separated all of the forward sidewall 14C and both left and right lateral portions of the rearward sidewall 16C. In addition, the cut lines 126 allow the forward sidewall 14C of the leading bag 12C to extend outwardly from the bundle 10C, augmented by the natural expansion of the gussets 22 when incorporated, as in the illustrated embodiment. The separation and outward extension of the forward sidewall 14C and the gusset 22 not only promote access to the peripheral edge 25 of handle 28, but also promote opening of the bag which reduces the time and effort required by the user to open the bag, often using a single hand.

The perforated line 126a in the illustrated embodiment of the bundle 10C is terminated between the gussets 22, which extend to the interior of the hand hole 28. In modification, the perforation line 126a can extend transversely beyond the lateral portions of the peripheral edge 25 of the hand hole

28, thus forming lines of perforation in the forward sidewall 14C which then must be torn to detach the bag, similar to the bundle 10 of Fig. 1. The cut lines 126 can also be abbreviated to provide additional perforated line portions at the free side edges of the bag, for example when very large bags may require increased attachment to the supporting tabs. Most importantly, the perforated lines 126a must be on or below the linear peripheral edge 25A so that edge 25A remains with the tab 24C when the line 126a is torn to detach the bag from the bundle.

It will therefore be appreciated by those skilled in the art that certain steps of the above-described apparatus and method can be interchanged, modified or combined with deviating from the spirit and scope of the present invention.

What has been illustrated and described herein is a novel bag bundle. In addition, an apparatus and a method for producing such bag bundles has been illustrated and described. While the bag bundle method and apparatus of the instant invention have been illustrated and described with reference to several embodiments, the invention is not limited thereto. On the contrary, alternatives, changes or modifications may become apparent to those skilled in the art upon reading the foregoing description. For example, the method and apparatus as illustrated in Figs. 5 and 5A show forming the hand holes and severing the tube at the leading margins of the bags, but in many instances, it may be preferred to arrange the tooling so as to form the handholes and sever the tube at the trailing end of the bags. Of course, the tooling at steps 7, 8 and 9 would be correspondingly relocated. Accordingly, such alternatives, changes and modifications are to be considered as forming a part of the invention insofar as they fall within the spirit and scope of the appended claims.

Claims

1. A bundle (10) of bags (12) respectively comprising a collapsed plastic tube (46) including a first front wall (14), a second back wall (16), a closed bottom (18, 19) at a first longitudinal end portion of said first and second walls, an open upper end (20) defined by end edges (26) at a second longitudinal end portion of said first and second walls opposite from said bottom (18, 19), and only one of said walls (14) having an unobstructed hand hole (28) therethrough defined by a thickened, melt-hardened peripheral edge (25) thereof intersecting said end edge (26) of said one wall, the material of said one wall (14) corresponding to said hand hole (28) being completely removed for facilitating entry of the hand of a user and removal of a bag (12)

from the bundle (10), the other of said walls (16) having uninterrupted material thereof traversing said hand hole (28), said bags (12) being disposed in the bundle (10) in the same orientation with their respective hand holes (28) in alignment so that upon removal of each bag (12) from the bundle (10), the hand hole (28) of a successive (12) bag will be completely uncovered for facilitating successive removal of all bags (12) from the bundle (10).

2. The bag bundle (10c) of claim 1 wherein each one of said plurality of bags (12c) has a tab (24c) joined to only one (16c) of said respective first (14c) and second walls (16c) along a perforated margin (126c) adjacent said opening (28).

3. The bag bundle (10c) of claim 1 wherein said tab (24c) is joined to said second back wall (16c) and said tab (24c) is separated from said first, front wall (14c) by at least one cut line (126).

4. The bag bundle (10c) of claim 3 wherein said hand hole (28) is formed through only said front wall (14c).

5. An apparatus for forming a uniformly-disposed, joined bag bundle (10) from a collapsed plastic tubular member (146), said tubular member (146) defined by a first wall (148) and a second wall (147) joined along lateral end portions thereof to said first wall (147), comprising: means (174) for forming a hand hole (128) through only said first wall (148) of said tubular member (146); separating means (155) for maintaining said first (148) and second (147) walls in spaced-apart relationship during formation of said hand hole (128), including a roller assembly (158) comprising a first roller means (208) rotating in engagement with said first wall (148) advancing thereover, and a second roller means (206) rotating in engagement with said second wall (147) advancing thereover, wherein said roller assembly (158) further includes a stationary bearing shaft (200) having first (204) and second (202) offset, parallel segments on which said respective first (208) and second (206) roller means rotate; means (72) for severing from said tubular member a tube (46), said tube including said hand hole (28) proximate to a first longitudinal end portion (26) thereof; means for sealing (72) an opposite longitudinal end portion (19) of said tube (46) thereby forming a bag (12) from said tube (46), said bag (12) including a first sidewall (14), a second sidewall (16) integral with said first sidewall at lateral end portions thereof, a sealed bottom (19) and an opening (20) in distal relation to said bottom (19); means (76) for stacking a plurality of said bags (12) in a manner such that the respective hand hole (28) of each one of said plurality of bags (12) is uniformly disposed relative to the hand hole (28) of an adjacent one of said plurality of bags thereby forming a stacked, uniformly-disposed plu-

rality of bags (10); means (78) for affixing said
 stacked plurality of bags together along a margin
 (30) of each respective one of said plurality of bags
 (12); means for forming perforations through at
 least one of said first and second sidewalls inter- 5
 mediate said margin (30) and said hand hole (28)
 of each respective one of said bags for removing
 each respective one of said plurality of bags (12)
 from the remainder of said plurality of bags.

6. The apparatus of claim 5 wherein said first 10
 roller means comprises a plurality (208) of roller
 members, said first (208) and second roller (206)
 members being mounted in alternate sequence on
 said respective off-set shaft segments (204, 202).

7. The apparatus of claim 5 wherein said 15
 means (155) for maintaining the spacing of said
 first (148) and second (147) walls further includes a
 reinforcing plate (154) positioned between the
 spaced first and second walls, and engageable with
 said first wall (148) during formation of said hand 20
 hole (28), said plate (154) being located down-
 stream from said roller assembly (158) with respect
 to the direction of said advancement of the first
 (148) and second (147) walls.

8. The apparatus of claim 7 wherein said re- 25
 inforcing plate (154) and said roller assembly (158)
 are mounted on a common frame (156) to form a
 unitary assembly (155).

9. The apparatus of claim 5 wherein said hand 30
 hole forming means (174) comprises melting
 means (176) for melting said wall material to form
 said hand hole (128).

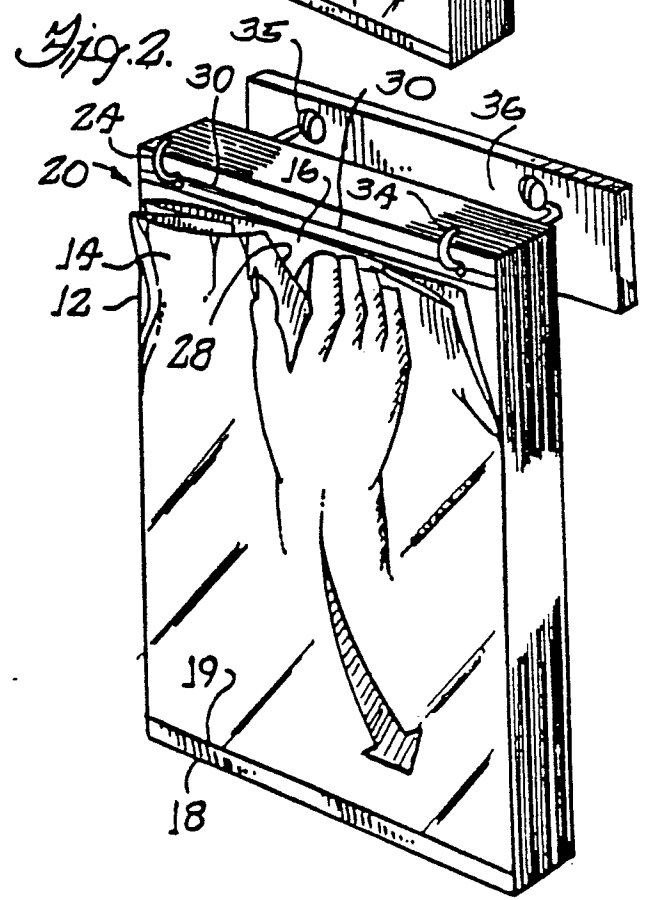
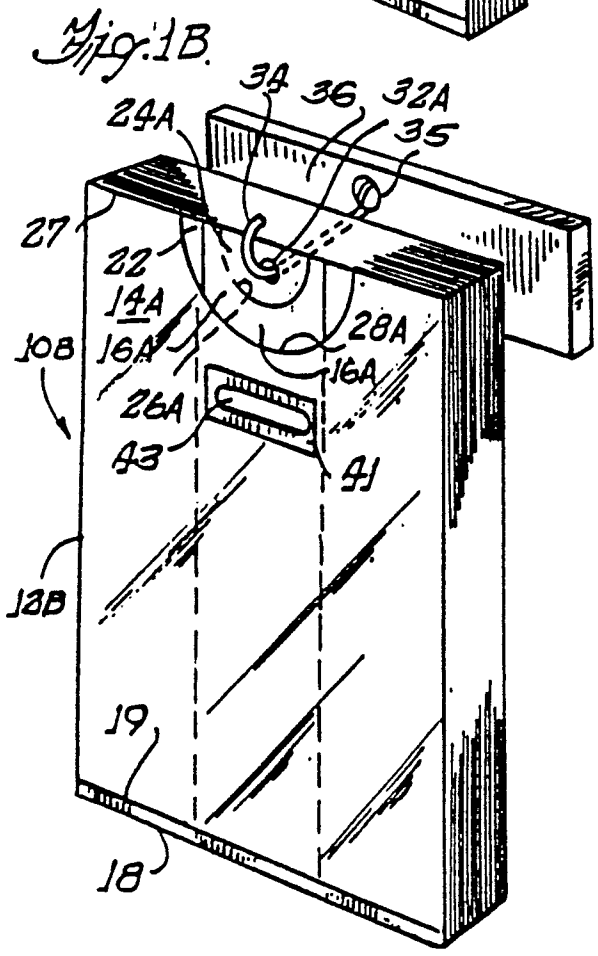
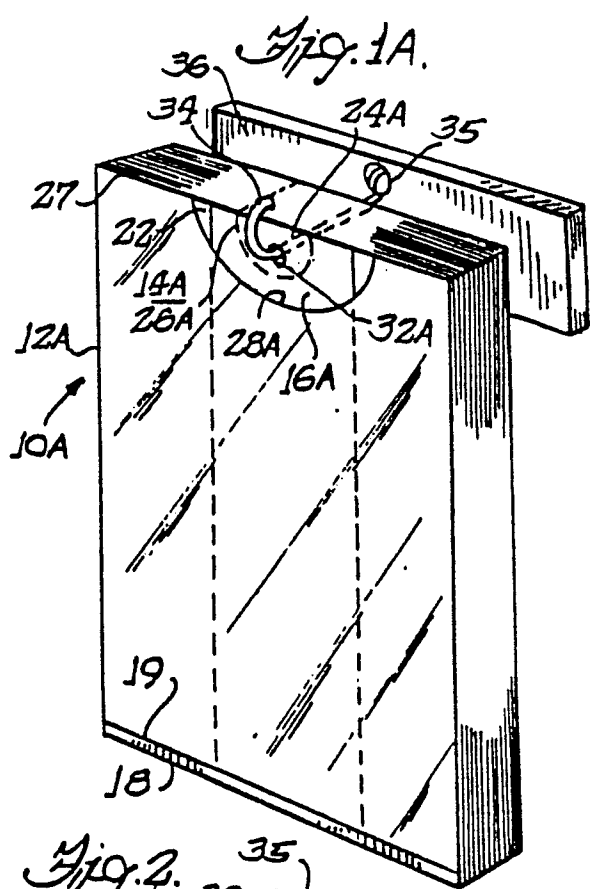
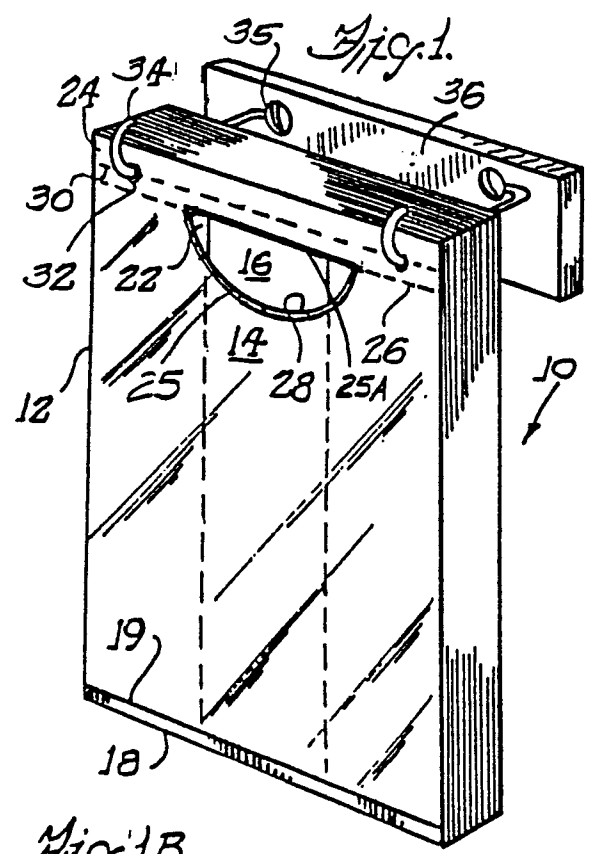
10. The apparatus of claim 9 wherein said 35
 melting means (176) further comprises a generally
 annular wall (178) having a passageway (184)
 therethrough opening at a heated edge for contact
 and removal of said melted material (182) through
 said passageway (184).

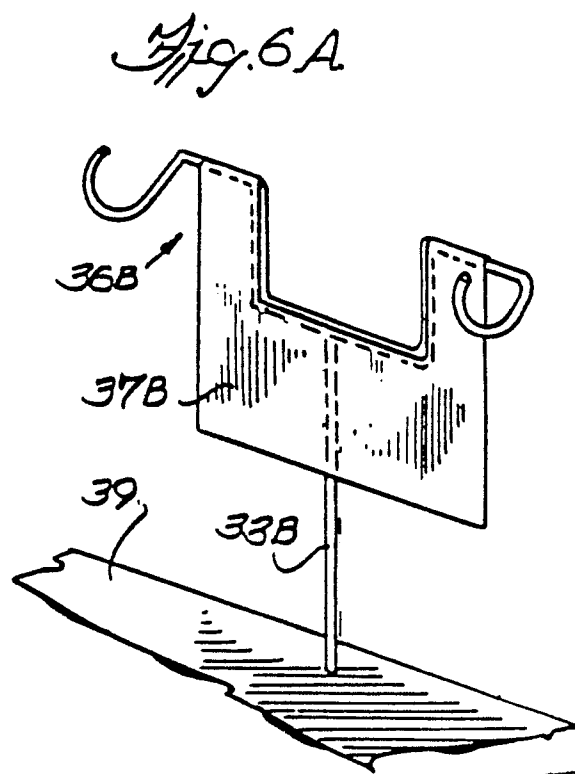
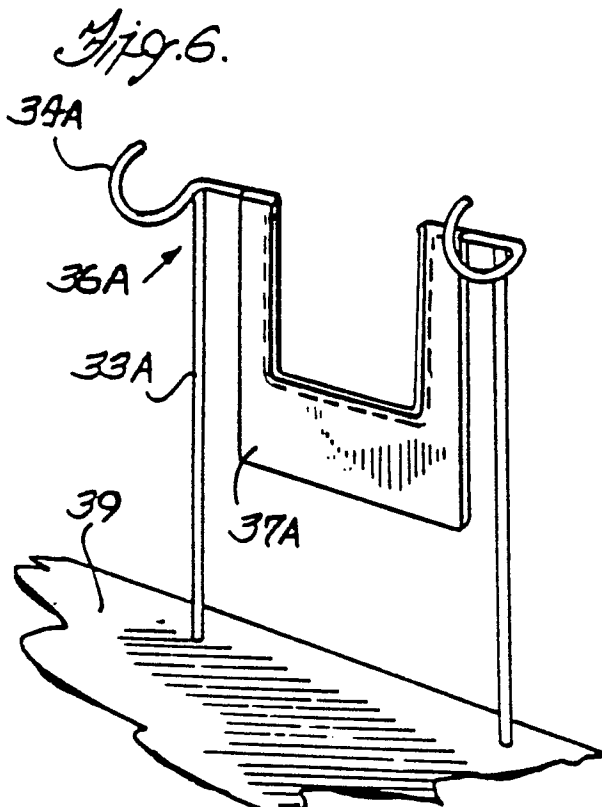
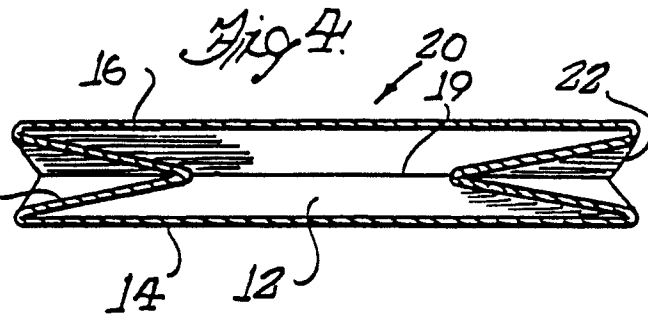
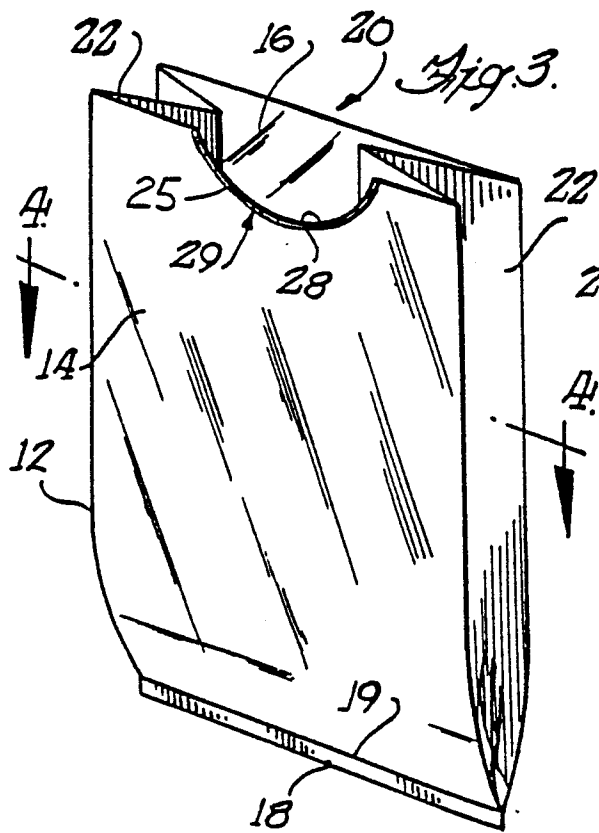
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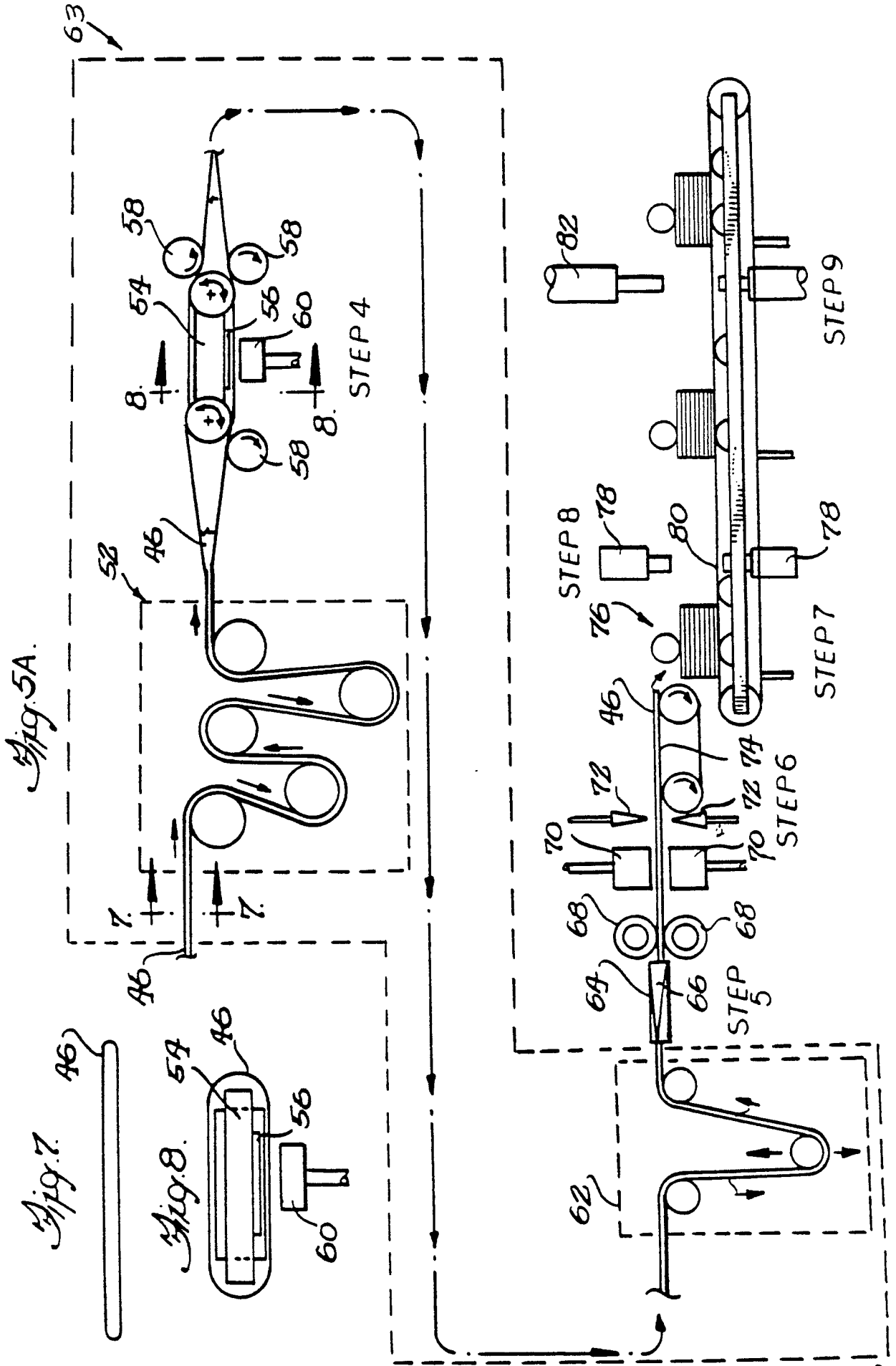
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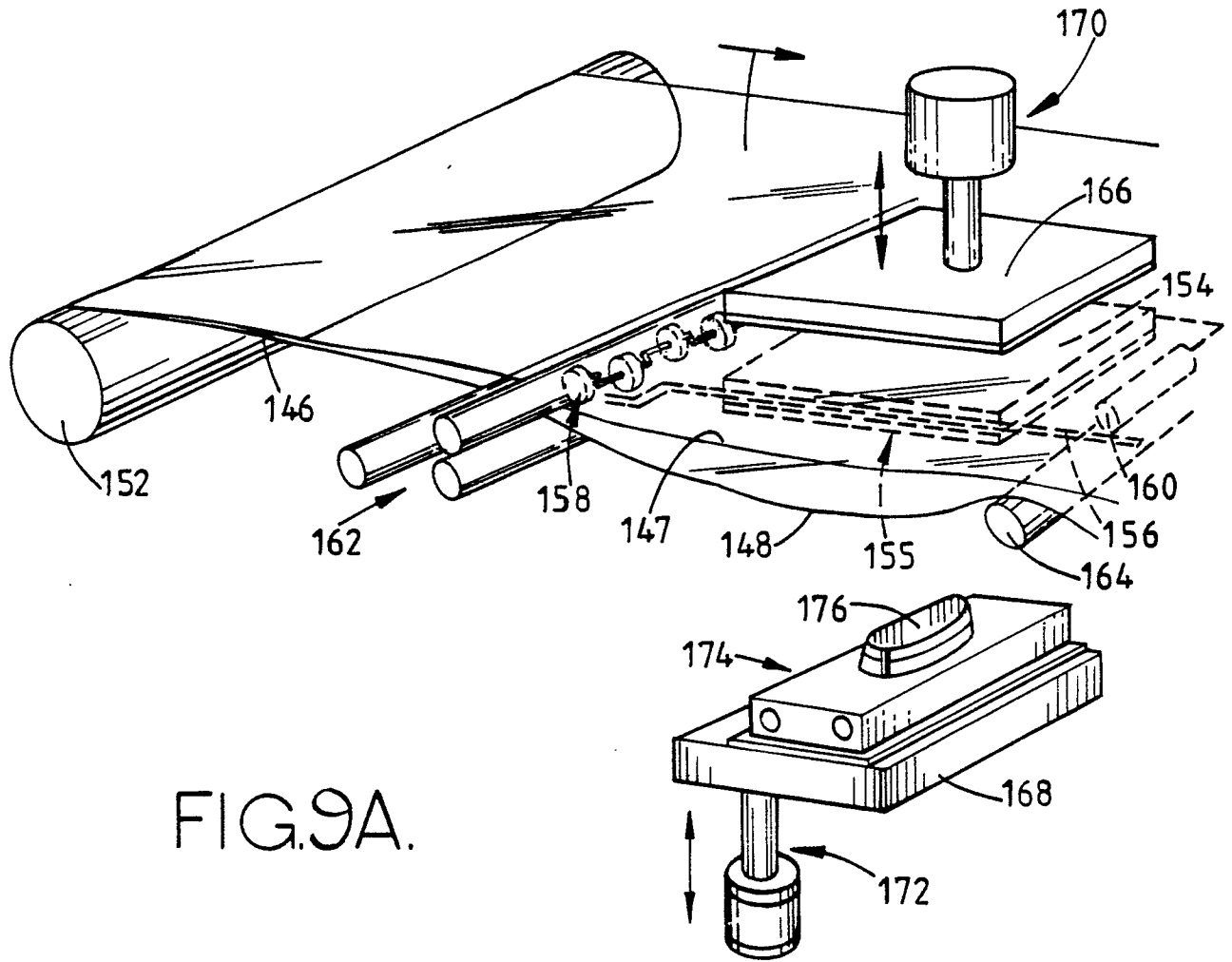


FIG. 9A.

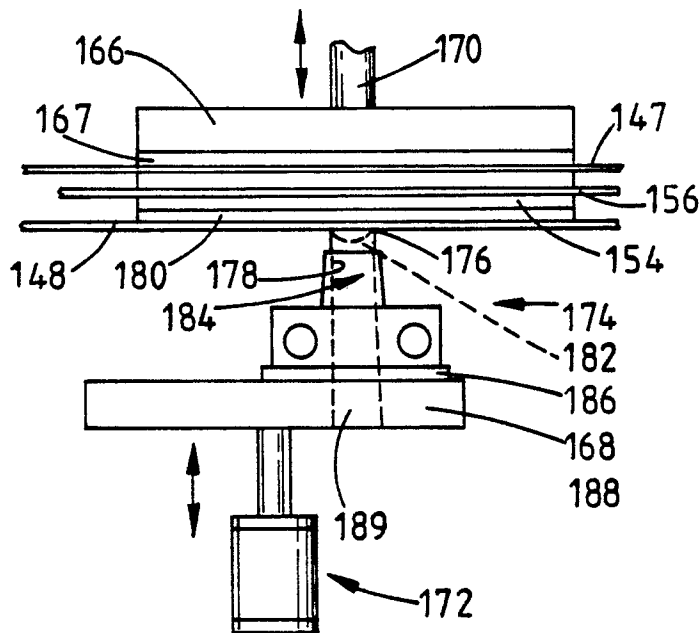


FIG. 9B

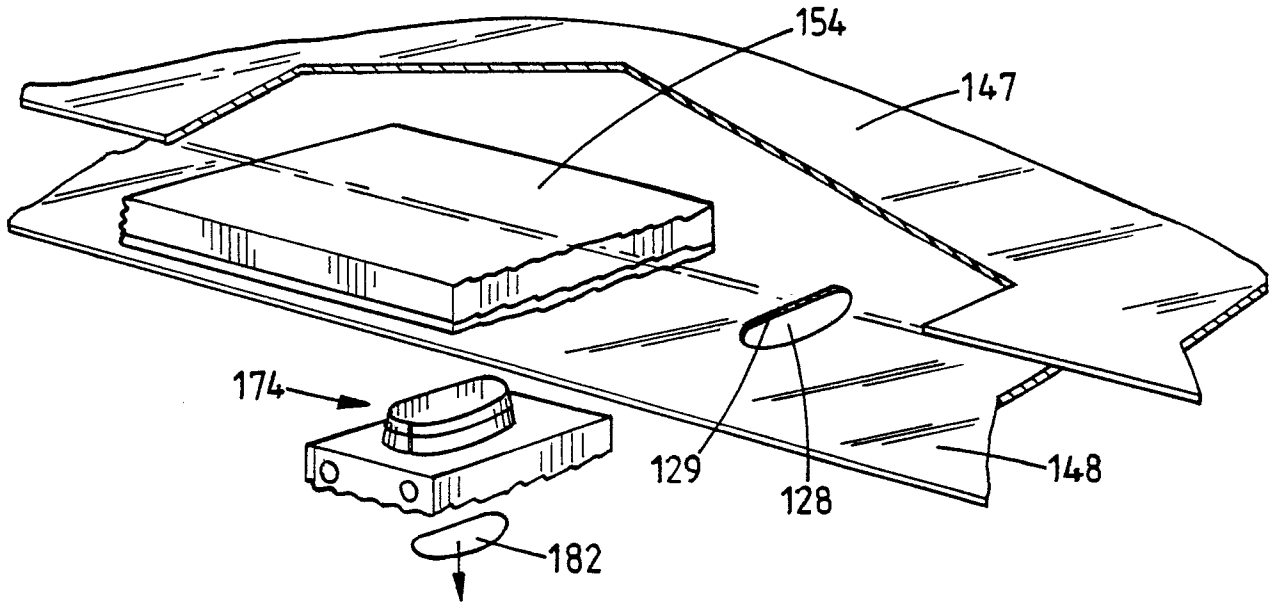


FIG.9C.

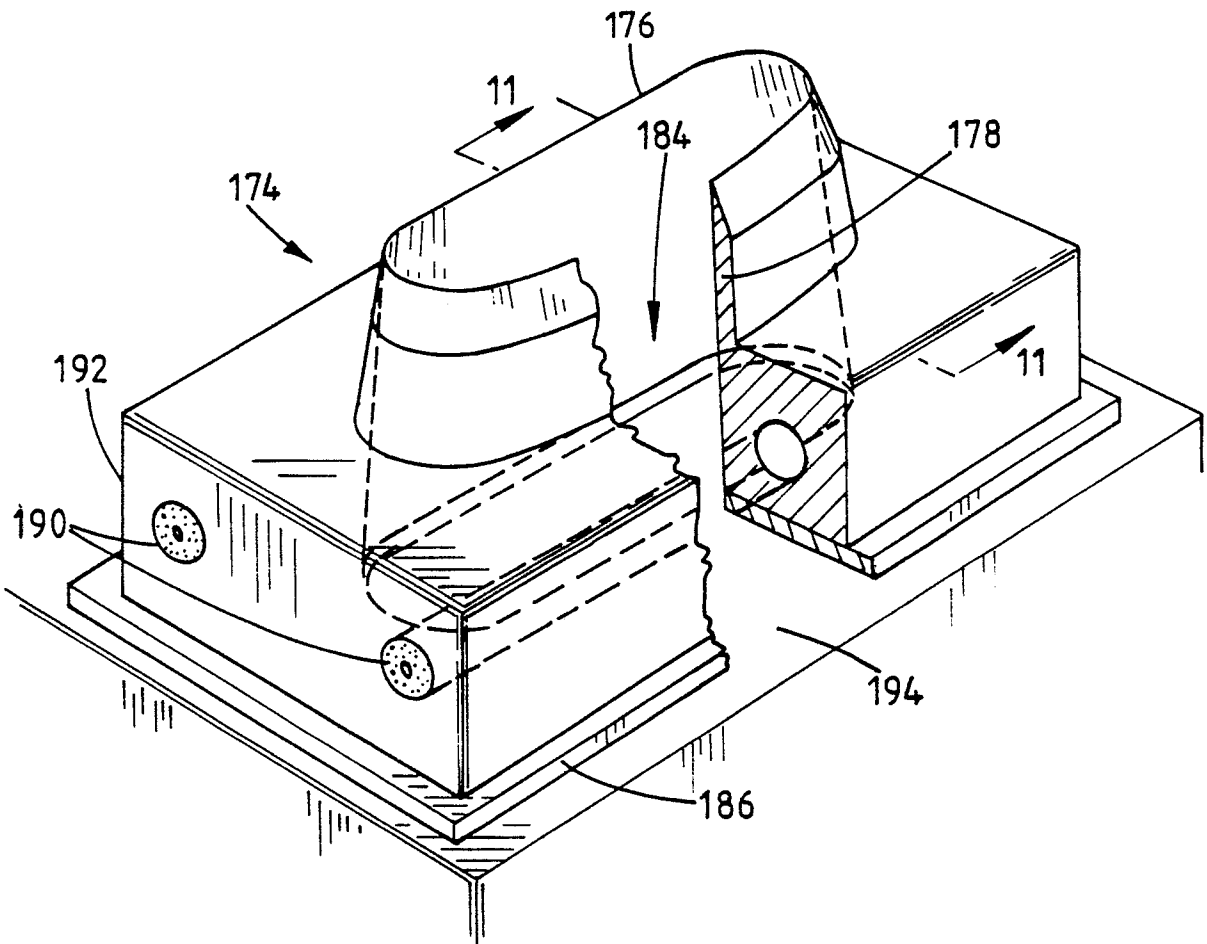


FIG.10.



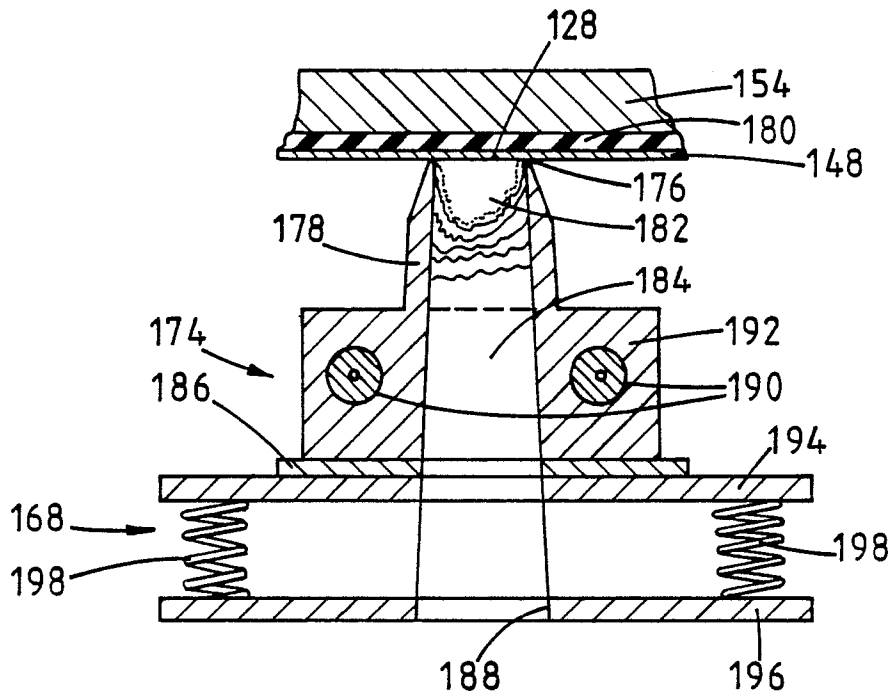


FIG. 11.

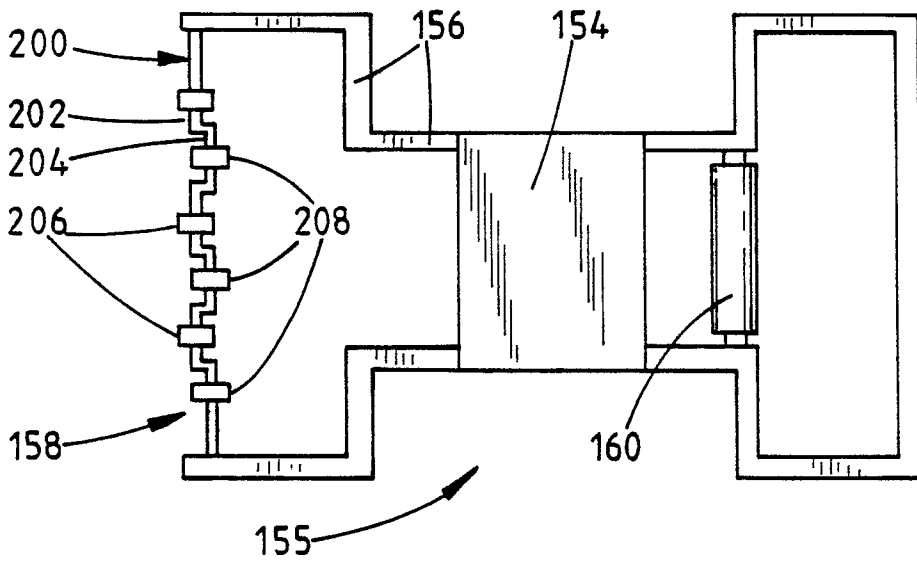


FIG. 12.



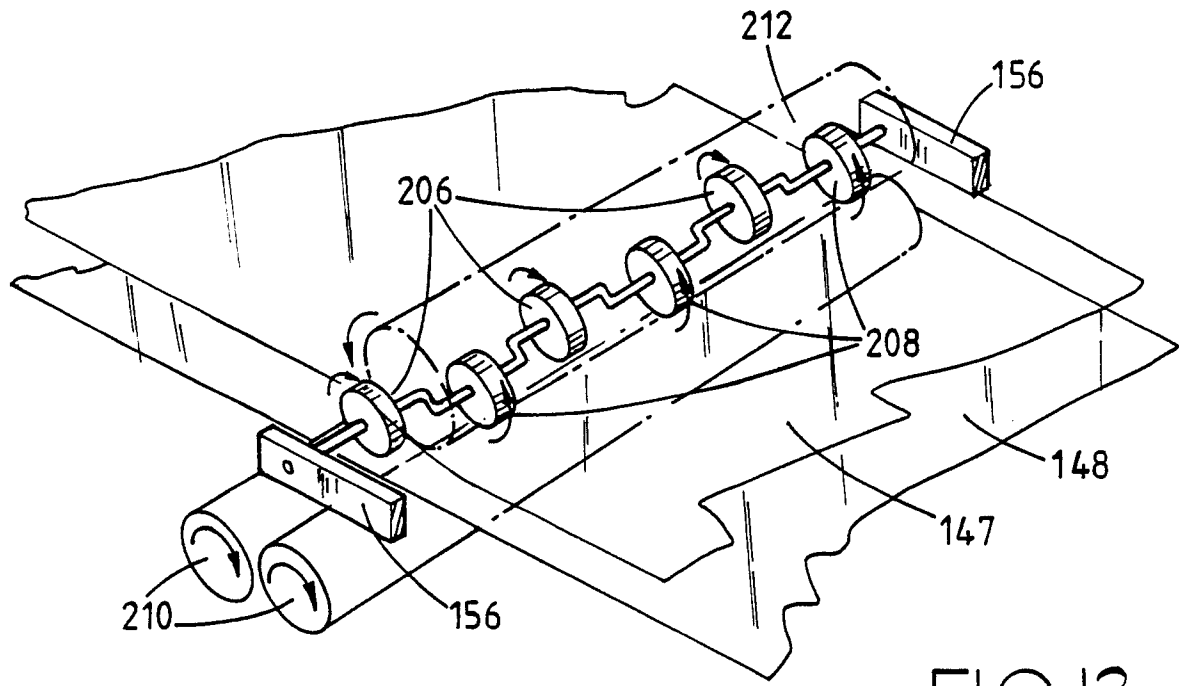


FIG. 13.

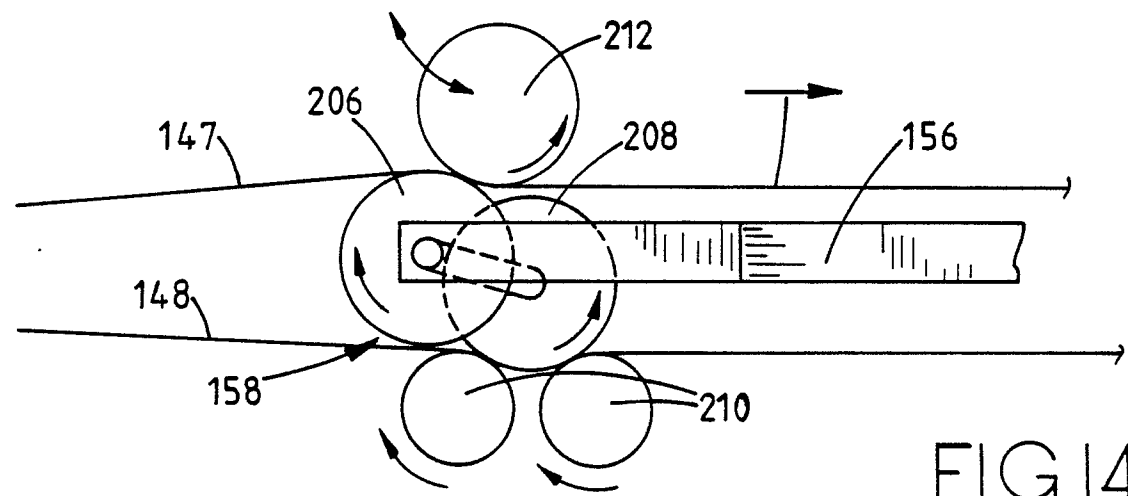


FIG. 14.

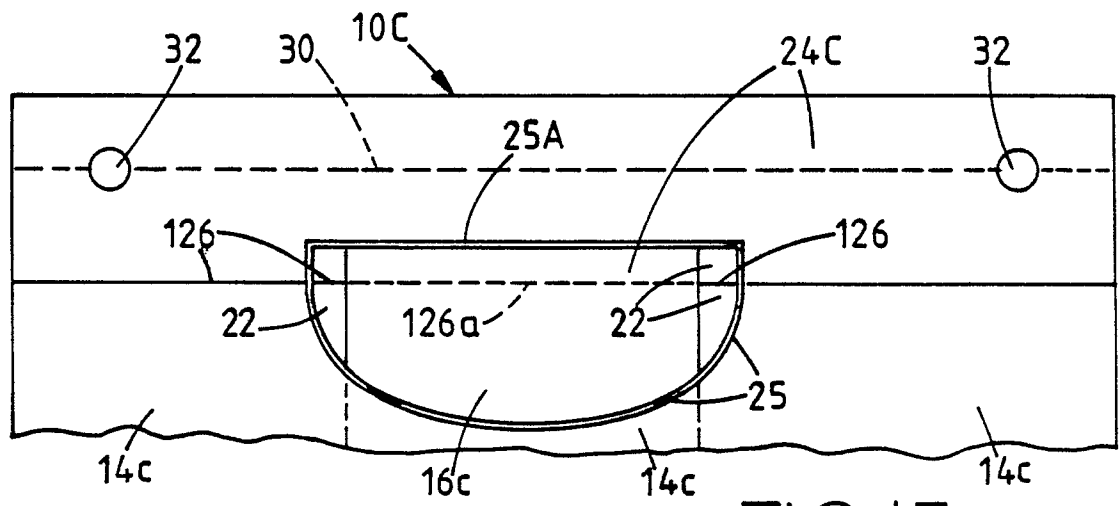


FIG. 15.

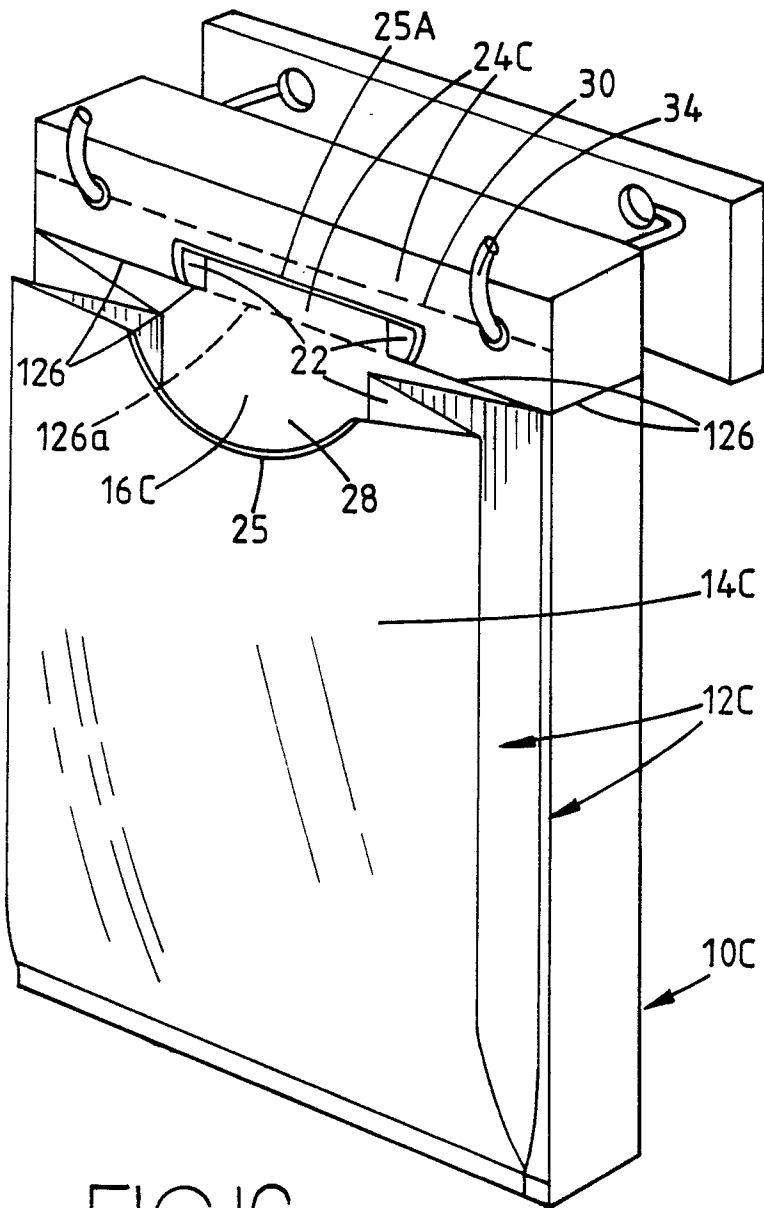


FIG. 16.

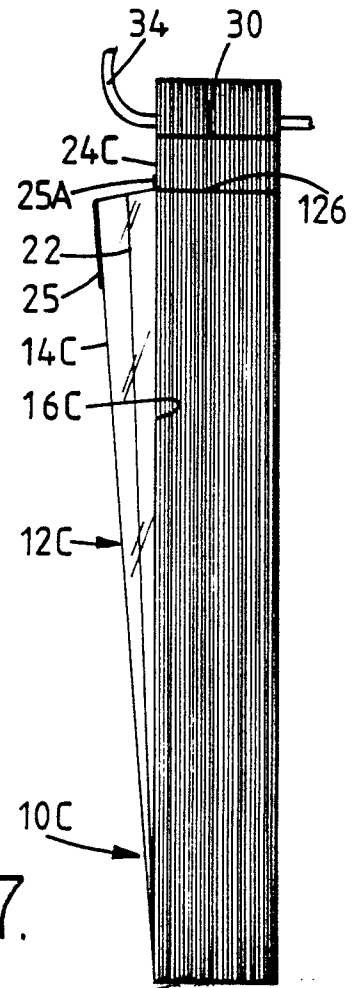


FIG. 17.





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)
Y	EP-A-0 136 171 (BROWN) * Figures 1-8 * ---	1,4,5,7 -10	B 65 D 33/00 B 31 B 23/00 B 31 B 19/14
Y	CH-A- 591 316 (GEBR. ZEHNDER AG) * Figure; column 2, lines 12-23 * ---	1,4,5,7 -10	
A	US-A-4 046 257 (LEHMACHER) * Figures 3,4,6; column 4, lines 45-50 * ---	1-3,5-7	
A	US-A-4 500 000 (MEMBRINO) * Figure 1 * ---	1-4	
A	WO-A-8 400 322 (YATES) * Figures 1-4; page 5, lines 7-11,26-29 * ---	1,4,5	
A	FR-A-2 227 108 (DAJEM S.A.) * Figure 3; page 2, lines 15-25 * -----	1,2,4,5 ,7	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 65 D B 31 B B 26 F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22-01-1988	Examiner STEEGMAN R.
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