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London EC4A 1PQ(GB)(54) **Air transfer system for a shell press.**

(57) An air transfer system for a shell press is provided which air conveys a blanked and formed shell (66) from a blanking and forming die station (14) in the shell press to a curling die station (16) in the same shell press. The air transfer system further provides for the blanked and formed part to be air conveyed within the curling die, and after the shell is curled within the die, provides for the curled shell to be air ejected from the curling die for subsequent fluid conveyance therefrom. A guide track (70) extending between the die stations is just slightly wider than the diameter of the shell being conveyed and the fluid conveyance is provided by a hollow tube (72) disposed in the upwardly facing surface of the guide track. The hollow tube has a diameter much smaller than the width of the guide track and shell diameter and further has a plurality of shaped openings (74) which provide perpendicular and parallel air velocity components relative to the guide track when high pressure air is provided through the hollow tube. The curling station includes an air escapement mechanism for conveying the part through it.

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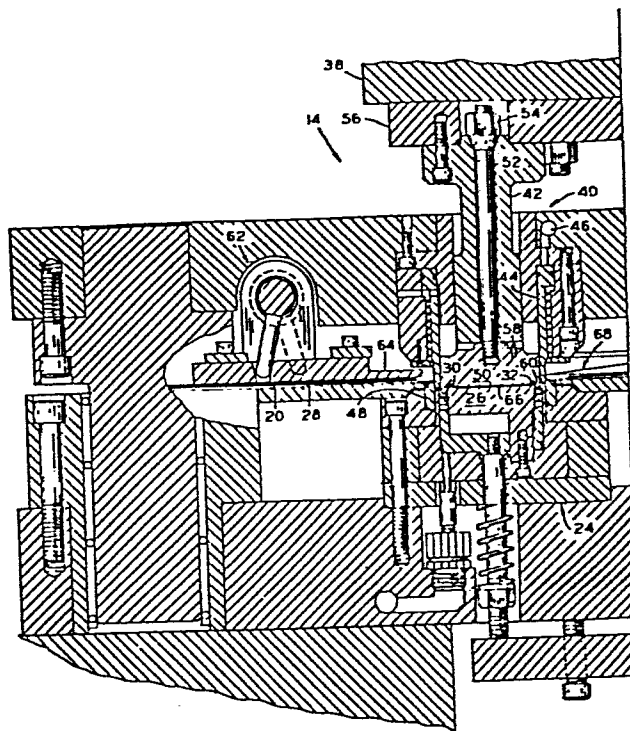


FIG. 1A

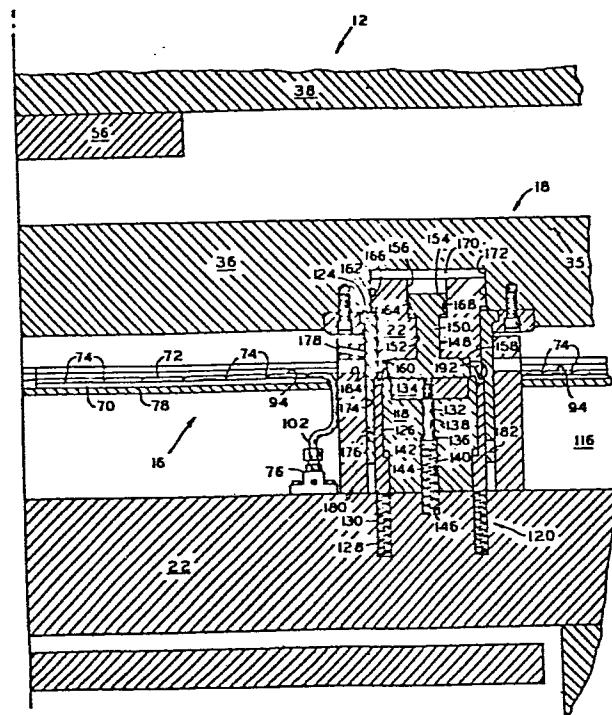


FIG. 1B

AIR TRANSFER SYSTEM FOR A SHELL PRESS

The invention relates to an air transfer system, and more particularly to an air transfer system for a shell press having a blanking and forming die station and a curling die station commonly operated therein.

Beverage cans, food cans and the like have a can body and separately manufactured ends, which are called shells that are sealed to the can body.

Generally, the shells are manufactured from sheet steel, aluminum, or other acceptable material in a series of presses, wherein the shell is blanked and formed in one press and then transported to a second press which curls the edges of the blanked and formed shell. The uncurled shell has a peripheral edge that is generally perpendicularly disposed to the main body of the shell, and, before the shell is stacked and then sealed to the beverage can it must first be curled at its peripheral edge and then coated with a sealant which forms a resilient gasket against the can body.

A major problem currently existing in the industry is directly related to the use of separate presses to blank and form the shell and to curl the shell. Depending upon the layout of the manufacturing plant, the blanked and formed shells may first have to be stacked one upon the other and then transported to the curling die station to be curled, or the situation may arise wherein it is necessary to store stacked blanked and formed shells due to unforeseen circumstances, for example, an inoperable

curler. In any event, the shapes of the blanked and formed shells permit them to be conveniently stacked since one shell tightly nests within another. However, because the blanked and formed shells tightly nest one upon the other, it is virtually impossible to mechanically cut an individual shell from a tightly nested stack of shells. This requires the shells to be stored in an unstacked state, which requires considerable space and is time consuming, costly and inefficient.

In some shell press installations, the blanking and forming die station and curling die station are in close proximity with one another so that the blanked and formed shells may be transported to the curling die station, for example, by use of a conveyor assembly. The shells are generally blanked and formed from the strip stock in groups of twelve, fourteen, or sixteen. For example, a group of sixteen may be blanked and formed from the strip stock in two rows of eight, which rows are staggered relative to each other to minimize the strip stock skeleton remaining after the blanking and forming operation. Since it is not practical to stack the blanked and formed shells, it is necessary to keep them separated from each other between the blanking and forming die station and curling die station.

A typical prior art embodiment of the above shell press installation comprises a double acting press that blanks and forms the shells, a ring curler for curling the blanked and formed shells, and a conveyor assembly extending therebetween. The blanked and formed shells may be delivered to the

conveyor assembly in one of two common ways. The blanking and forming shell press may be designed to tilt towards the conveyor assembly so that the blanked and formed shells slide from the press onto the conveyor for conveyance to the ring curler, or a mechanical kicker-type device may be used with a stationary blanking and forming shell press to eject the blanked and formed shells onto the conveyor. In this particular embodiment, the ring curler generally comprises two rotating rollers between which the shells pass to be curled.

Although the above embodiment permits the blanking and forming operation and the curling operation to be performed in close proximity to each other, certain problems and disadvantages exist such as the requirement for additional space for the conveyor assembly, frequent denting of shells by the kicker device in ejecting the shells onto the conveyor assembly, and the tendency of the ring curler to produce shells having nonuniform curled edges.

Another typical prior art embodiment, which may be a modification of the above described embodiment, uses a die curler in place of the ring curler. Here the blanked and formed shell is curled at a die station, which is commonly housed in a press separate from the blanking and forming shell press and operated independently thereof. The distance between the blanking and forming shell press and the die curler may be such that a conveyor assembly may be used to transport blanked and formed shells to the die curler. Stacking for transporting to the die curler

is not practical due to the tight nesting of a stack of blanked and formed shells.

Concerning the conveyance of parts between different shaping operations, means other than conveyor belt assemblies have been utilized, for example, pneumatic systems which generally comprise a large plenum and duct assembly. In these systems, parts such as bottles, cans, records, silicon wafers and the like are transported along a guide track overlying the ducts. The ducts have a plurality of openings disposed therein and the plenum provides a source of low pressure air which flows through the ducts and out the openings to convey the part from one area to another. This type of system poses numerous disadvantages when adapted to a shell press wherein a plurality of shells are formed simultaneously.

Recalling from above, shells are blanked and formed in groups of twelve, fourteen, or sixteen and in rows which are staggered relative to each other such that shells formed in one row overlap shells of adjacent rows. Therefore, it is desirable to transport alternate rows along different paths or tracks, which may be disposed relative to each other in a vertically adjacent manner. In such an arrangement, it is not practical or efficient to utilize the pneumatic systems of the prior art because of the large size of the ducts that provide air flow to the tracks. Such prior art systems would be difficult to adapt to a blanking and forming die station and a curling die station operated in the same shell press,

and would also require an undue amount of material and space.

Examples of such pneumatic systems may be found in U.S. Patents 3,874,740; 3,975,057; 3,953,076; 3,941,070; 3,293,414; and 3,645,581.

The present invention eliminates the disadvantages and problems inherent in the prior art and provides certain feature unique to a shell press. Particularly, there is provided a shell press having a blanking and forming die station and a curling die station operated by a common slide assembly disposed in the shell press, thereby eliminating the need of having to stack formed and blanked shells.

Since the shells are formed, blanked and curled in the same shell press, the curled shells may be easily stacked and, more importantly, easily cut mechanically from a stack. A further advantage of utilizing a die curler in the same shell press with a blanking and forming die station is the uniform shape of curled edges produced by the die in contrast to the curled edges produced by a ring curler.

Another feature of the present invention is the provision of a unique pneumatic transfer system which is compact and easily interfaced between the blanking and forming die station and curling die station in the same shell press. Basically, the pneumatic transfer system comprises two guide tracks extending between the die stations in a double-deck arrangement. Disposed in the upwardly facing surface of each of the guide tracks is a hollow tube having a diameter much smaller than the width of the guide track or the diameter of the shell being conveyed.

Each hollow tube has a plurality of uniquely shaped openings which provide air flow velocity components in the direction of the curling station, and each is connected to an air source which provides a flow of high pressure air. Because the pneumatic system of the present invention utilizes a very small diameter hollow tube in place of the large plenum and duct assembly of the prior art pneumatic systems, the pneumatic system of the present invention is easily installed between a doubledeck guide track arrangement, thereby reducing space requirements and costs.

The present invention minimizes the number of dented shells caused by mechanical kicker-type devices in ejecting the shells from a particular die station. Specifically, there is provided with the curling die station an ejecting or escapement mechanism which directs a pulse of air against a curled shell to eject the shell from the curling die station onto a guide track leading therefrom.

The present invention provides a shell press for making shells for beverage cans and the like comprising a blanking and forming die station and a curling die station, both of which are operated by a common slide assembly disposed in the shell press. An ejector is provided for ejecting a blanked and formed shell from the blanking and forming die station onto a fluid conveyor device extending between the blanking and forming die station and curling die station.

Another aspect of the present invention provides a pneumatic transfer system in combination with a press including a reciprocating slide and a die station, which has a pair of cooperating tools

therein. One of the tools is connected to the reciprocating slide for reciprocative movement relative to the other tool element. This pneumatic transfer system comprises a fluid conveyor track leading to the die station and a guide track leading away from the die station. Connected to the reciprocating slide to reciprocate therewith are a first wall member having a hole therein disposed between the fluid conveyor track and die station and a second wall member having a hole therein disposed between the guide track and die station. A reciprocating mechanism is provided to reciprocate the slide downwardly from its uppermost position to an intermediate position wherein the first wall opening is aligned with the fluid conveyor track to permit a part to be fluid conveyed into the station, and then to a lowermost position where the part is shaped by the tool elements. Thereafter, the reciprocating mechanism moves the slide member upwardly from its lowermost position to a second intermediate position wherein the second wall opening is aligned with the guide track and a source of air is caused to emit a pulse of air against the shaped part to eject it through the second wall opening onto the guide track. The reciprocating mechanism then moves the slide upwardly to its uppermost position for subsequent reciprocative movements.

A further aspect of the present invention is an air transfer apparatus for moving a part from a first die station to a second die station in a press installation. The air transfer apparatus comprises a guide track extending between the die stations and

having an upwardly facing surface, opposed sides extending substantially the length of the upwardly facing surface, and a downwardly facing surface above the upwardly facing surface and extending substantially the length thereof. The facing surfaces and opposed sides generally define therebetween an elongated space extending between the die stations. A hollow tube member is disposed in the guide track and has a diameter much smaller than the transverse distance between the opposed sides, and has a plurality of openings therein to provide fluid communication between the hollow tube and the elongated space. The openings are shaped to provide air flow velocity components in the elongated space directed toward the second die station when a flow of air is supplied to the hollow tube by a source of air flow connected thereto.

It is an object of the present invention to provide a shell press for making shells for beverage cans and the like having a blanking and forming die station and a curling die station operated by a common slide assembly, and a fluid conveying track extending between the die stations for conveying an uncurled shell from the blanking and forming die station to the curling die station.

Another object of the present invention is to provide an air transfer system which in part utilizes a hollow tube having a plurality of openings therein for air conveying a shell from a blanking and forming station to a curling station.

A further object of the present invention is to provide a pneumatic system for air conveying a part

to a die station and for ejecting the part therefrom with a pulse of air.

Figure 1A is a partially broken-away and partially sectioned front elevational view of the blanking and forming die station area of a shell press incorporating the present invention;

Figure 1B is an extension of the right hand side of the shell press of Figure 1A illustrating an air transfer apparatus extending between a blanking and forming die station and a curling die station incorporating a pneumatic transfer system;

Figure 2 is an enlarged, fragmentary, sectional view of a blanking and forming die station illustrating a blanked and formed shell ready for ejection therefrom;

Figure 3 is a top plan view of a portion of an air transfer apparatus;

Figure 4 is a cross-sectional view of Figure 3 taken along line 4-4 and viewed in the direction of the arrows;

Figure 5 is a cross-sectional view of Figure 3 taken along line 5-5 viewed in the direction of the arrows and illustrates the position of an uncurled shell being conveyed;

Figure 6 is an enlarged, fragmentary, sectional view of the air transfer apparatus;

Figure 7 is a cross-sectional view of Figure 6 taken along line 7-7 and viewed in the direction of the arrows;

Figure 8 is a sectional view of the curling die station depicting an uncurled shell in a stationary

position out of the die station and a curled shell being ejected from the die station;

Figure 9 is a view similar to Figure 8 with the uncurled shell entering the curling die station;

Figure 10 is similar to Figure 9 illustrating the shell being curled by the die station; and

Figure 11 is similar to Figure 10 illustrating a curled shell in a position for ejection from the curling die station.

Referring now to Figs. 1A and 1B the relevant portion of shell press 12 is shown comprising blanking and forming die station 14, air conveyor assembly 16, and curling die station 18. Not shown is a strip stock feeder which feeds strip stock 20 to shell press 12 and a scrap cutter for collecting the skeleton of strip stock 20.

Continuing to refer to Figs. 1A and 1B, blanking and forming die station 14 comprises stationary bolster 22 secured to a press bed (not shown) and cutting die retainer assembly 24 secured on the upper surface thereof. Lower forming die 26, the cross section of which is circular in a plain parallel to tin line 28, is securely mounted within cutting die retainer assembly 24. Bolster 22 and cutting die retainer assembly 24 are rigidly connected to the shell press frame (not shown). Lower forming die 26 also includes an annular bead portion 30, which forms a correspondingly shaped bead portion 32 in shell 66.

Double action slide assembly 35 comprises blanking slide 36 slidably received on shell press posts (not shown) and forming slide 38 slidably guided by blanking slide 36. Slides 36, 38 are

driven by connecting rods and a crankshaft operated by an electric motor (not shown) similar to that shown in US Patent 3,902,347. Securely mounted to blanking slide 36 is housing assembly 40, which is slidably disposed with respect to spindle 42 and which retains punch 44 for slidable movement relative thereto. Air pressure from air passage 46 yieldably and continuously urges punch 44 downwardly towards annular cutting die 48 in cutting die retainer assembly 24.

Upper forming die 50 is rigidly connected to spindle 42 by retaining rod 52, which is threadedly secured at its lower end to forming die 50 and held against spindle 42 at its upper end by nut 54. Spindle 42 is secured to top plate 56, which is connected to forming slide 38. A dowel 58 prevents rotation between forming die 38 and spindle 42, and forming die 50 has an annular bead portion 60 about its periphery.

Referring now to Figs. 1A, 1B, and 2, ejector mechanism 62 has ejector bar 64 in a ready position to eject blanked and formed shell 66 from blanking and forming die station 14. When blanked and formed shell 66 is positioned as indicated in Figure 2 during the shell press cycle, ejector bar 64 is positively moved by ejector mechanism 62 to a position wherein it contacts shell 66 and thereafter is positively, rapidly accelerated to eject shell 66 from die station 14 upwardly along incline 68 to air conveyor assembly 16.

Referring to Figs. 1A, 1B, 3 and 7, air conveyor assembly 16 comprises elongated guide track 70,

hollow tube 72 extending the length of guide track 70, shaped openings 74 disposed in hollow tube 72, and a source of high pressure air flow (not shown) connected to hollow tube 72 by a suitable connector 76. Although the disclosure is concerned with the conveyance and subsequent shaping of a single shell 66, the present invention fully contemplates a plurality of shells 66 being blanked and formed for conveyance along at least two guide tracks 70 positioned one on top of the other to a plurality of curling die stations 18.

In Figs. 1A, 1B, 5, a support plate 78 extends between blanking and forming die station 14 and curling die station 18 and has incline 68 secured to its left hand end portion by screws 80 received through incline holes 82 and threaded holes 84 in support plate 78. Incline 68 has a narrow neck portion 86 (Fig. 3) for ease of installation only, and upwardly facing surface 88 (Fig. 4) of incline 68 is formed by a tapering end section of guide track 70, which is secured to support plate 78 by screws 90 received through guide track holes 92 and threaded holes (not shown) in support plate 78.

Viewing Figs. 3 and 7, guide track 70 has a lower surface 94 with a groove 96 centrally disposed longitudinally therein. Secured within the length of groove 96 is hollow tube 72 having one end 100 closed and the other end 102 (Fig. 1B) connected to connector 76 to supply high pressure air flow through the length of hollow tube 72. Important to the invention is the very small diameter of hollow tube 72 in relation to the width of lower surface 94 and the

diameter of a shell 66. This allows hollow tube 72 to be easily installed in narrow spaces, for example, between guide tracks positioned one upon the other to provide fluid conveyance of shells from one area to a second area within shell press 12. Hollow tube 72 has a plurality of shaped openings 74 uniquely stamped therein. Each stamped portion 104 (Figs. 6, 7) of hollow tube 72 has a concave surface 106 and a convex surface 108, which faces generally inwardly of hollow tube 72. Consequently, when a supply of high pressure air is provided in hollow tube 72, a flow of high pressure air is discharged through each of the shaped openings 74 providing generally perpendicular and generally parallel velocity components relative to lower surface 94, whereby a shell 66 may be lifted upwardly and moved along lower surface 94 in the direction of the parallel velocity components. To confine shells 66, opposite side walls 110 (Fig. 5) upstand from lower surface 94 and each side wall 110 has an overhanging extension 112 inwardly disposed over lower surface 94. Side walls 110 are spaced apart a distance slightly greater than the diameter of a shell 66, and remote ends 114 of overhanging extensions 112 are spaced apart a distance slightly less than the diameter of shell 66. Side walls 110 and overhanging extensions 112 permit a shell 66 to be fluid conveyed over lower surface 94 in a manner depicted in Fig. 5. Note that shell 66 is lifted above lower surface 94 by the perpendicular velocity components exiting shaped openings 74 and moved along lower surface 94 by the parallel velocity components exiting shaped openings 74.

Referring to Figs. 1B, 8 and 11, curling die station 18 comprises curling die retainer assembly 116, lower curling die 118, liftout device 120, upper curling die 122, and sleeve 124. Curling die retainer assembly 116 is securely mounted to stationary bolster 22 and has lower curling die 118 and liftout device 120 included therein.

Lift out device 120 comprises annular lift out element 126 slidably received within curling die retainer assembly 116 and about lower curling die 118. Lift out element 126 is also receivable within circular groove 130 in bolster 22, however, lift out element 126 is biased upwardly by annular spring 128 disposed within groove 130. Lift out arm 132 is slidably received within opening 136, which has a narrow upper portion 138 and a wider lower portion 140. Lift out arm 132 has cylindrical seat 134 secured to its upper end, and a small piston 142 secured to its lower end in lower portion 140 of opening 136. Lift out arm 132 is biased upwardly by spring 144, which is disposed below piston 142 and in opening lower portion 140 and cylindrical bore 146 in bolster 22.

Slidably disposed in upper curling die 122 is piston 148 which has a narrow midportion 150 slidably received within opening 152, upper portion 154 slidably received within opening 156, and lower portion 158 slidably received within opening 160. Two O-ring seals 162, 164 are disposed in respective grooves 166, 168 in upper curling die 122 and piston upper portion 154, respectively. A source (not shown) of air provides air under pressure to space 170

defined by opening 156 in upper curling die 122 and slide opening 172 in which upper curling die 122 is slidably received.

Sleeve 124 has opening 174 disposed in its side and vertically aligned with guide track lower surface 94, and an angled opening 176 disposed in its side just slightly below opening 174. Opening 174 has vertical and lateral dimensions sufficient to allow a blanked and formed shell 66 to pass therethrough into curling die station 18. Conduit 178 is disposed in support 180 of curling die retainer assembly 116 and has a source (not shown) of air flow connected to it opposite end. A limit switch (not shown) in curling die station 18 causes the source of air connected to the opposite end of conduit 178 to emit a pulse of air flow through conduit 178 when angled opening 176 becomes aligned therewith (Fig. 8). Disposed in sleeve 124 on its side opposite opening 174 and just slightly below opening 174 is opening 182 which has vertical and lateral dimensions sufficient for the ejection of a curled shell 188 there through.

Guide track 70 is connected to support 180, which has a hole 184 disposed therein to allow a conveyed blanked and formed shell 66 to pass there-through into curling die station 18. Support 180 has a second hole 186 disposed therein to allow an ejected curled shell 188 to pass therethrough for further conveyance by air conveyor assembly 16 or other suitable conveying means.

Fig. 9 illustrates a blanked and formed shell 66 being received within curling die station 18 and it should be noted that the upper surface 190 of seat

134 is substantially coplaner with guide track lower surface 94 and support hole 184 so that shell 66 may be smoothly conveyed within curling die station 18. Likewise, Fig. 8 illustrates a curled shell 188 being ejected from curling die station 18, and it should be noted that upper surface 190 is substantially coplanar with support hole 186 and lower surface 94 of air conveyor assembly 16 or other suitable conveying means.

Upon receiving a portion of strip stock 20, blanking and forming die station 14 blanks and forms a shell 66 and ejector mechanism 62 ejects shell 66 onto guide track lower surface 94 of air conveyor assembly 16. Blanked and formed shell 66 is then conveyed from blanking and forming die station 14 to curling die station 18 by the air jets having perpendicular and parallel velocity components directed through shaped openings 74 of hollow tube 72. Fig. 5 illustrates the position of shell 66 in air conveyor assembly 16 during transport and it may be seen that shell 66 has been lifted by the perpendicular velocity components so that shell bead portion 32 is in contact with overhanging extension 112 to prevent shell 66 from being thrown from lower surface 94, and the parallel velocity components convey shell 66 over lower surface 94 to curling die station 18.

Fig. 8 illustrates curling die station 18 when the crankshaft (not shown) of shell press 12 is at about $0\frac{1}{4}$ of crankshaft rotation. Consequently, blanked and formed shell 66 is shown in its position relative to curling die station 18 at about $0\frac{1}{4}$

crankshaft rotation, and the previous shell is shown as curled shell 188.

Beginning at approximately $0\frac{1}{4}$ crankshaft rotation, blanked and formed shell 66 is positioned as illustrated in Fig. 8 in abutment with sleeve 124. As the crankshaft continues to rotate, blanking slide 36 is moved downwardly and at approximately $67\frac{1}{4}$ crankshaft rotation (Fig. 9) sleeve 124 has moved downwardly to align sleeve opening 174 with support hole 184 to permit shell 66 to be fluidly conveyed through hole 184, opening 174, and into curling die station 18 so that shell 66 is centrally positioned on upper surface 190 of seat 134. Throughout this evolution, space 170 has a supply of air therein at a predetermined pressure to bias piston 148 downwardly as depicted in Fig. 8.

Fig. 10 illustrates curling die station 18 at approximately $180\frac{1}{4}$ crankshaft rotation. During crankshaft rotation from about $67\frac{1}{4}$ to about $180\frac{1}{4}$, piston lower portion 158 contacts the upper surface of shell 66 to firmly hold it in place during the curling operation. As blanking slide 36 continues to move downwardly, lower curling die 118 is forced downwardly against the spring forces of springs 128, 144. After springs 128, 144 have been fully compressed, upper curling die 122 is forced downwardly by blanking slide 36 under a force that is greater than the force applied against piston 148 by the air in space 170. The greater force supplied by blanking slide 36 to upper curling die 122 causes it to curl shell bead portion 32 against inner curling surface 192 of sleeve 124. Just shortly before this curling

operation, lift out arm 132 has fully compressed spring 144 so that further downward movement by seat 134 is prevented. Annular lift out element 126 then moves downwardly a small distance against spring 128 to allow die annular bead portion 196 to fully seat with die annular bead portion 194 to curl shell bead portion 32 against inner curling surface 192.

As the crankshaft rotates from about $180\frac{1}{4}$ to approximately $264\frac{1}{4}$, the position of curled shell 188 within curling die station 18 is as illustrated in Fig. 11. As the crankshaft begins to rotate past approximately $180\frac{1}{4}$, blanking slide 36 begins to move upwardly to a position where the force exerted by it on upper curling die 122 becomes less than the force exerted against piston 148 by the air within space 170. At this particular point, and as blanking slide 36 continues to move upwardly, upper curling die 122 moves upwardly so that die annular bead portion 196 separates from curled shell 188 while piston lower portion 158 remains forced against the upper surface of shell 188. Upon further upward movement by blanking slide 36, lower curling die 118 is stopped from further upward movement while liftout element 126 and liftout arm 132 move upwardly under the spring forces exerted by springs 128, 144, respectively. This causes the die annular bead portion 194 to separate from shell bead portion 32, and at this point curled shell 188 is being firmly held by seat 134 and piston lower portion 158.

As the crankshaft approaches approximately $264\frac{1}{4}$ rotation, blanking slide 36 continues to move upwardly to draw piston lower portion 158 away from the

upper surface of curled shell 188 as depicted in Fig. 11, so that curled shell 188 now rests on lift out element 126 and upper surface 190 of seat 134 as depicted in Fig. 11.

Referring again to Fig. 8, curled shell 188 is being conveyed from curling die station 18 onto lower surface 94 of air conveyor assembly 16 or other suitable conveying means. As the crankshaft rotates from about $264\frac{1}{4}$ to about $294\frac{1}{4}$, sleeve 124 moves upwardly so that sleeve opening 182 becomes aligned with curled shell 188 and sleeve opening 176 becomes aligned with conduit 178. Shortly before sleeve opening 176 aligns with conduit 178, a limit switch (not shown) in curling die station 18 is tripped to cause the source of air connected to the opposite end of conduit 178 to emit a pulse of air flow through conduit 178 and sleeve opening 176 against curled shell 188 to eject it through sleeve opening 182 and support hole 186 onto lower surface 94 of air conveyor assembly 16 or other suitable conveying means.

As the crankshaft rotates from about $294\frac{1}{4}$ to about $360\frac{1}{4}$, curled shell 188 is fully ejected fluidly from curling die station 18 and a second blanked and formed shell 66 is fluidly conveyed by air conveyor assembly 16 against sleeve 124 to be curled by curling die station 18.

CLAIMS

1. A shell press for making shells for beverage cans and the like, comprising: a slide assembly having a first slide member (36) and a second slide member (38) guided to reciprocate relative to each other, the slide assembly including a blanking and forming die station (14) and a curling die station (18) both of which are operated by said slide assembly; a pair of first tooling means (44, 50) mounted in said blanking and forming station for blanking and forming a shell (66), one of said first tooling means connected to the first slide member (36) and the other of said first tooling means connected to the second slide member (38); means (62) for ejecting a blank and form the shell from the blanking and forming station, characterized by: a second tooling means (122, 124) mounted in said curling die station for curling a blank and formed shell, said second tooling means being connected to and driven by one of said first or second slide members, and fluid conveyor means (16) extending between said die stations for conveying the ejected shell from the blanking and forming station to the curling station.

2. The shell press of Claim 1 wherein said fluid conveyor means is characterized by: an upwardly facing surface (94), opposed side walls (110) extending substantially the length of said upwardly facing surface, and a downwardly facing surface (112) disposed above said upwardly facing surface and extending substantially the length thereof, said facing surfaces and side walls generally defining

therebetween an elongated space extending between said die stations (14, 18), a hollow tube member (72) being contiguous with and extending the length of said elongated space, said hollow tube member having a diameter much less than the transverse distance between said opposed side walls (110) and further having a plurality of openings (74) to provide fluid communication between said hollow tube member and said elongated space, said openings being shaped to provide air flow velocity components in said elongated space directed towards said curling die station when a flow of air is supplied through said hollow tube member, and means for supplying a flow of air through said hollow tube member, whereby a blanked and formed shell is fluid conveyed through said elongated space to said curling die station by the flow of air passing through said shaped openings.

3. The shell press of Claim 2 characterized in that: said downwardly facing surface is defined by a pair of ledges (112) disposed respectively from side walls (110) and have free ends (114) above said upwardly facing surface (94), said remote ends (114) being spaced apart a transverse distance less than the diameter of a shell being moved.

4. The shell press of Claim 3 characterized in that said hollow tube member (72) is disposed in said upwardly facing surface (94).

5. The shell press of Claim 1 characterized in that said ejecting means (62) is positively driven and synchronized with said slide assembly.

6. In a press installation including at least two die stations (14, 18), an air transfer apparatus

(16) for moving parts from a first one of said die stations to the second one of said die stations, characterized by: track means (70) extending between said die stations for guiding parts (66) from said first die station to said second die station, said track means comprising an upwardly facing surface (94), opposed side walls (110) extending substantially the length of said upwardly facing surface, and a downwardly facing surface (112) disposed above said upwardly facing surface and extending substantially the length thereof, said facing surfaces and side walls generally defining therebetween an elongated space extending between said die stations, a hollow conduit (74) being disposed in said track means and having a diameter much smaller than the transverse distance between said opposed side walls of said track means, said hollow conduit having a plurality of openings (74) to provide fluid communication between said conduit and said elongated space, said openings being shaped to provide air flow velocity components in said elongated space directed towards said second die station when a flow of air is supplied through said conduit, and means for supplying a flow of air through said conduit, whereby a part ejected from said first die station onto said upwardly facing surface (94) of said track means is fluidly conveyed through said elongated space to said second die station by the flow of air being emitted through said shaped openings (74) of said conduit.

7. The installation of Claim 6 characterized in that said conduit is a tube member (74) and said openings (74) are stamped from respective portions of

said tube member, said stamped portions having respective end parts remaining integral to said tube member and respective opposite remote end parts (104) disposed in the interior space of said tube member and toward a flow of air supplied therethrough to scoop a portion of the air flow through respective said openings (74).

8. The installation of Claim 6 characterized by a plurality of track means for guiding a plurality of parts (66) from said first die station (14) to said second die station (18).

9. The installation of Claim 6 wherein said downwardly facing surface comprises a pair of ledges (112) having free ends (114) above said upwardly facing surface (94), and being spaced apart a transverse distance less than the transverse dimension of the part being moved.

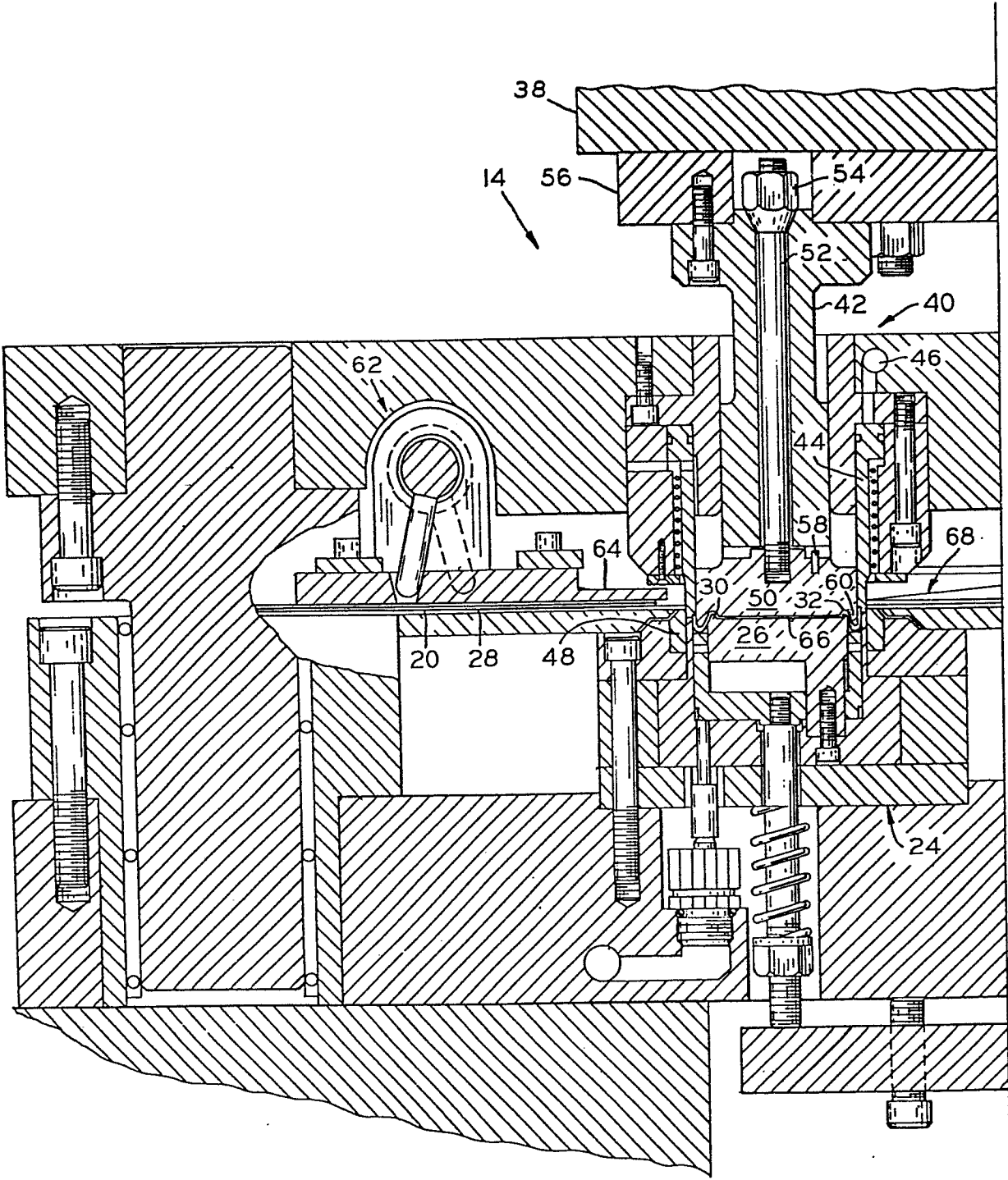
10. In a press including a reciprocating slide member (36) and a die station (18) having a pair of cooperating tool elements therein, one of said tool elements (122) being connected to said reciprocating slide member for reciprocative movement relative to the other of said tool elements (118) for performing a shaping operation on a part (66), a pneumatic transfer system comprising fluid conveyor means (16) leading to said die station for conveying a part to be shaped to said die station, and track means (70) leading from said die station for guiding a shaped part (188) away from said die station, characterized by: a first wall member (124) being disposed between said fluid conveyor means and said die station and connected to said reciprocating slide member to

reciprocate therewith, said first wall member having an opening (174) therein, a second wall member (124) being disposed between said track means (70) and said die station and connected to said reciprocating slide member to reciprocate therewith, said second wall member having an opening (182) therein, means (174) for providing a pulsed flow of air against a shaped part in said die station to eject it therefrom when said reciprocative slide member is at a predetermined position, and means for reciprocating said slide member downwardly from an uppermost position to an intermediate position wherein said first wall member opening (174) is aligned with said fluid conveyor means (16) to permit a part to be shaped to be fluidly conveyed into said die station, and to a lowermost position wherein the part is shaped by said tool elements, said reciprocating means then moving said slide member upwardly from said lowermost position to said predetermined position wherein said second wall member opening (182) is aligned with said track means and said pulsed air flow providing means (178) provides a pulsed flow of air against the shaped part to eject it through said second wall member opening (182) to said track means, and to said uppermost position for subsequent reciprocative movements.

11. The press of Claim 10 characterized in that said first and second wall members are a sleeve member (124) being disposed about said one tool element (122) and connected to said reciprocating slide member (36) to reciprocate therewith.

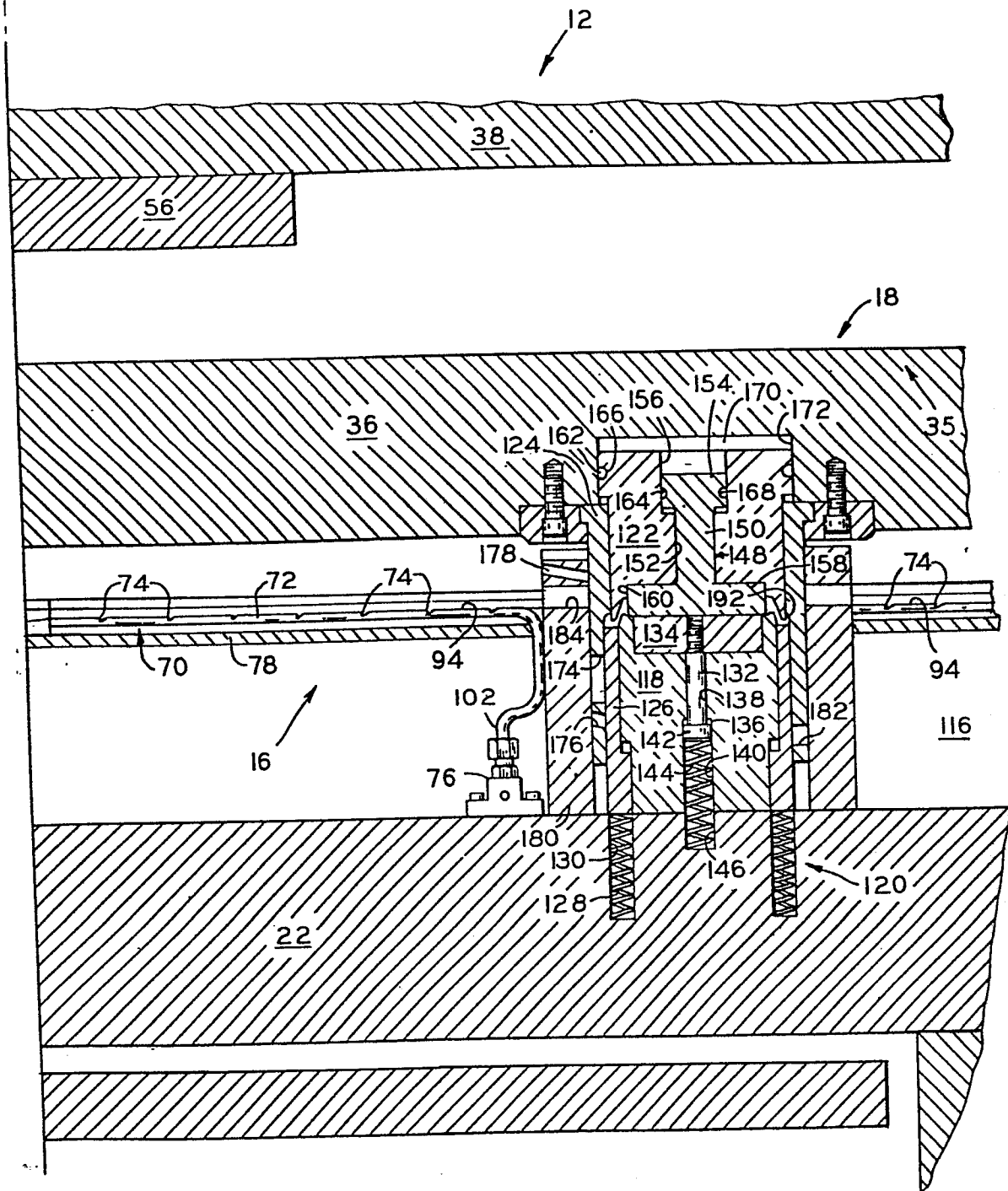
12. The press of Claim 11 characterized in that said first wall member (124) has a second opening (176) therein, and wherein said pulsed air providing means includes a conduit (178) leading to said first wall member to deliver a flow of air thereto, said conduit and said second opening in said first wall member being aligned with a shaped part (188) in said die station when said slide member (36) is at said predetermined position, whereby a pulsed flow of air is delivered through said second opening to eject the shaped part through said second wall member opening to said track means (70).

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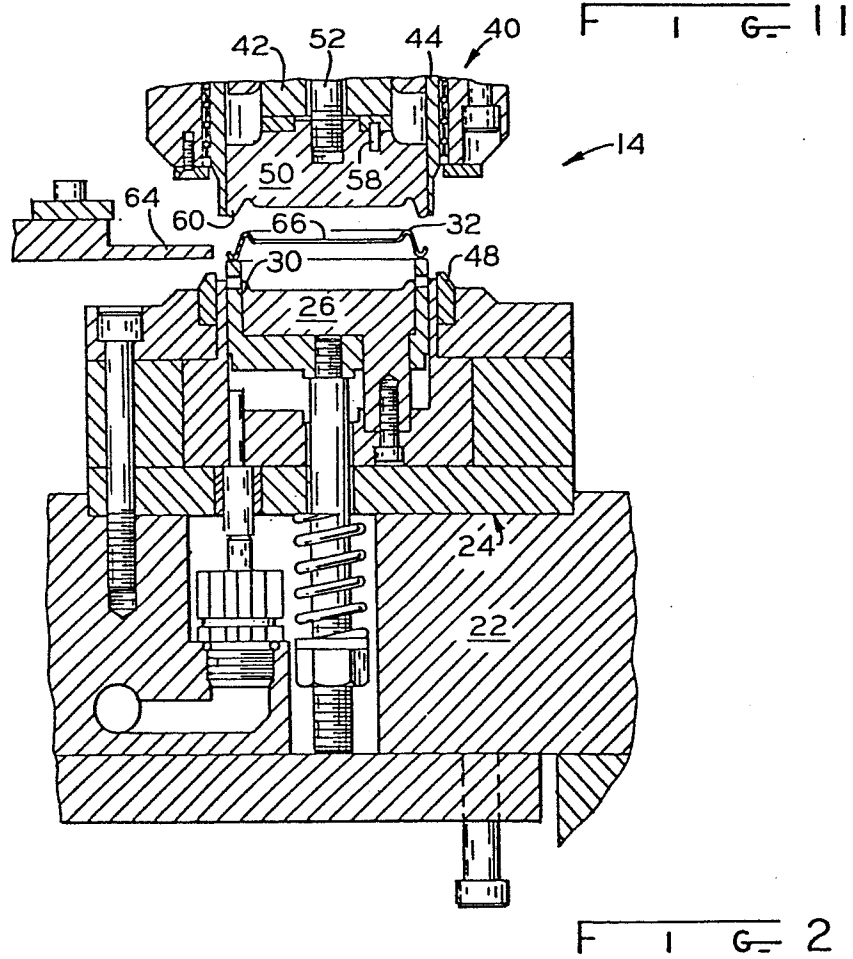
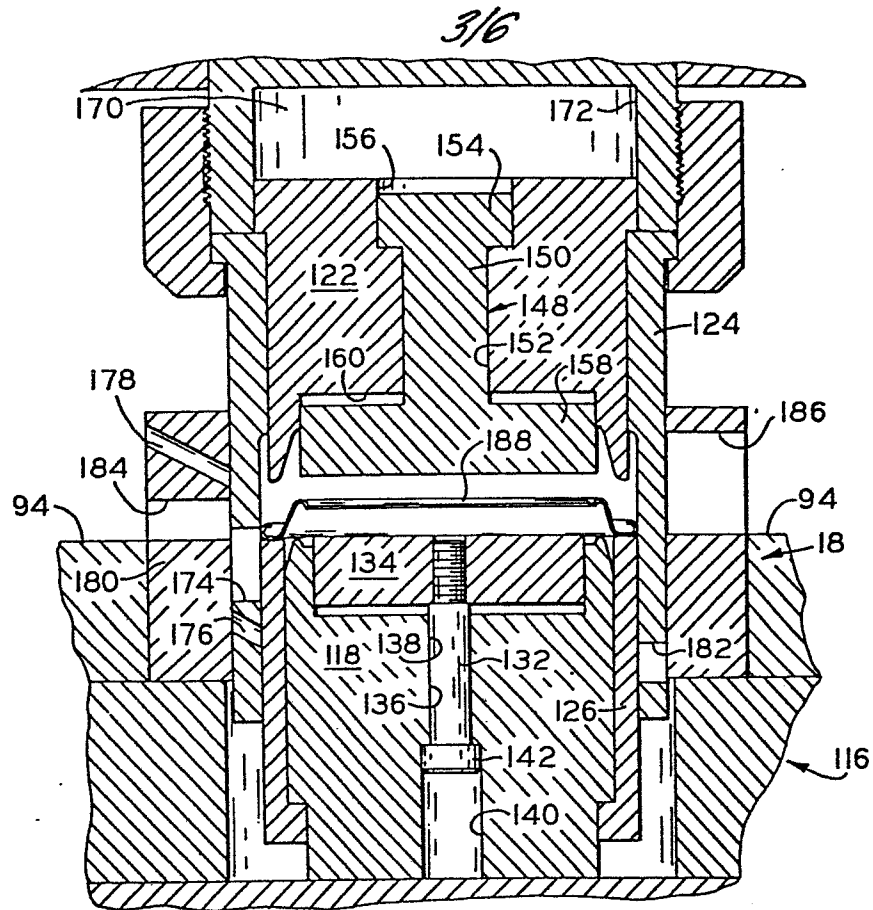


F I G. 1A

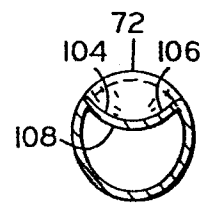
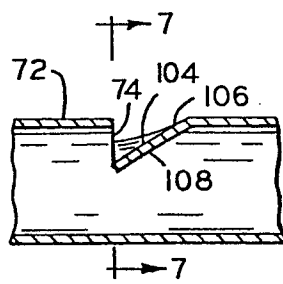
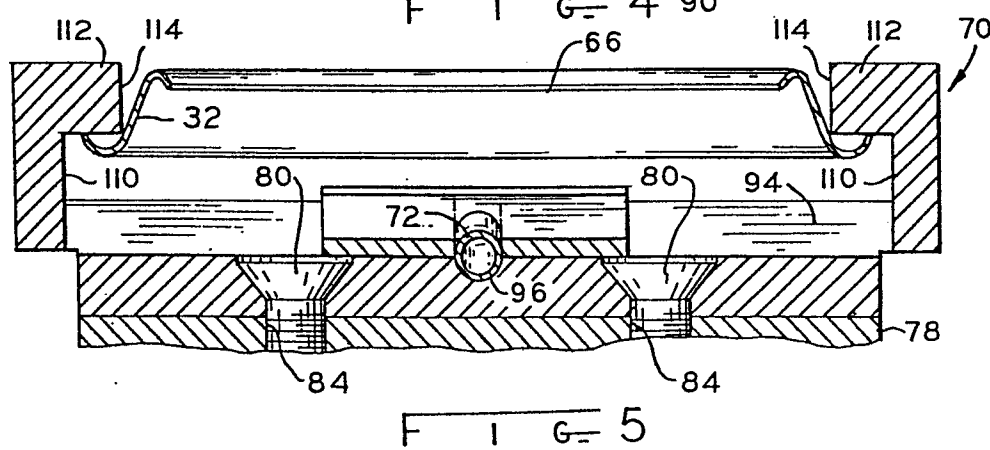
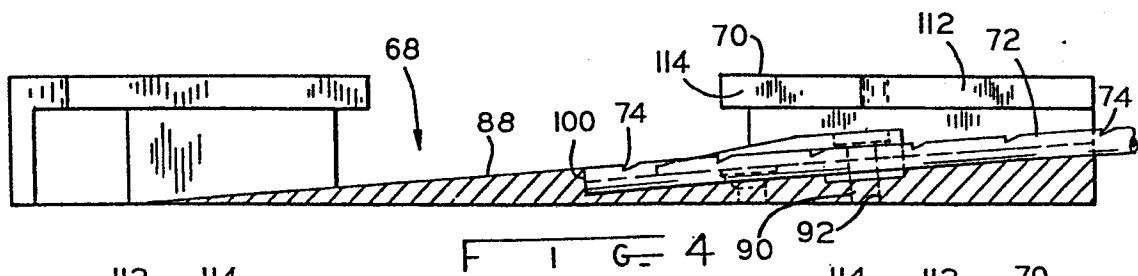
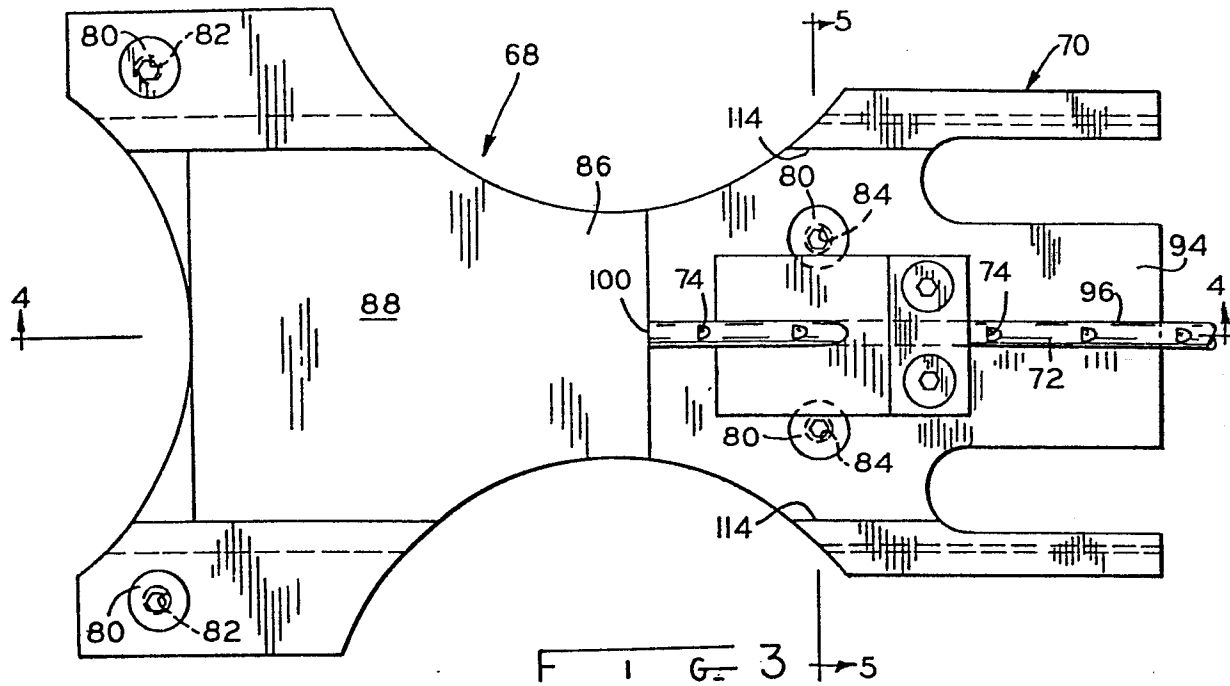
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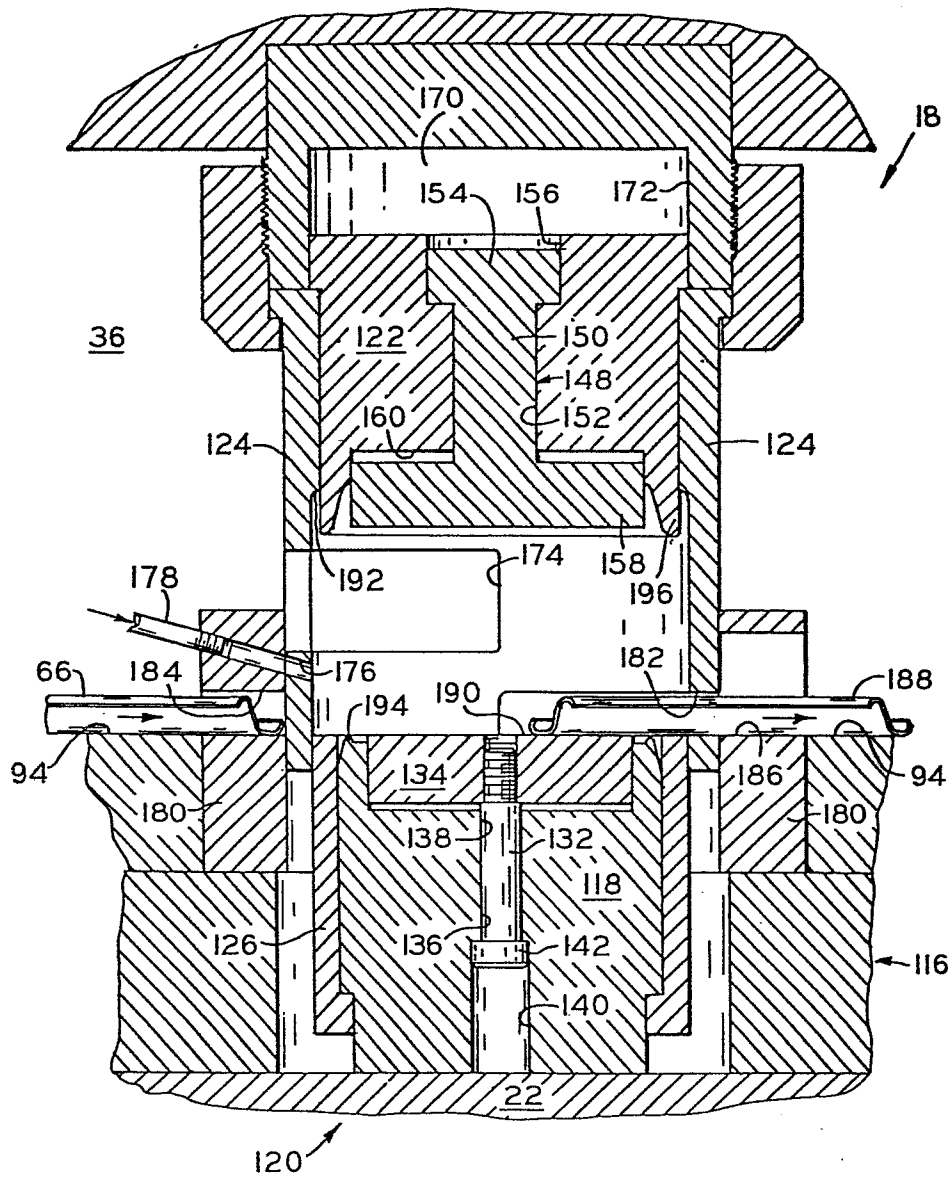
F I G. 1B



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F I G. 8

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