(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 618 134 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **94100583.7**

(22) Date of filing: **17.01.94**

(51) Int. Cl.[5]: **B65B 5/06**, B65B 39/06, B65B 7/08

(30) Priority: **26.02.93 US 23341**

(43) Date of publication of application:
05.10.94 Bulletin 94/40

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

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(54) **Method and apparatus for bagging container ends.**

(57) An assembly is provided for supplying a plurality of container ends to a bag and folding the open end of the bag closed. The assembly comprises a bag retaining device for retaining the open end of the bag in a position for receiving the container ends. A positioning device is employed for positioning the container ends into the bag. The positioning device may include a trough for directing the container ends toward the open end of the bag, a separating device for separating a plurality of container ends, and a displacing member for inserting the plurality of container ends into the bag. The bag is longer than the plurality of container ends and thus has an empty portion near its open end after the container ends are inserted therein. A folding device is further provided for folding a part of the empty portion of the bag into overlapping relation with another part of the bag, wherein the folding device engages opposing surfaces of the empty portion of the bag.

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FIELD OF THE INVENTION

The present invention generally relates to the production of containers and, more particularly, to a method and apparatus which enhances one or more aspects of the bagging of container ends for distribution.

BACKGROUND OF THE INVENTION

In the container-making industry, containers are typically manufactured in at least two parts: a container body and at least one container end. The container body may be drawn and ironed such that only a single container end is required (two-piece container), or the container body may be formed by rolling a stamped sheet into cylindrical form and welding the seam such that two container ends are required (three-piece container). Regardless of the particular container structure, container manufacturers typically separately supply large quantities of container bodies and container ends to customers who introduce substances into the container bodies and subsequently attach the container end(s) to the container body. In this regard, a predetermined number or "stick" of container ends are typically packaged by the manufacturer in face-to-face relation in cylindrical bags having a diameter slightly greater than the container ends for shipment to the customer.

The container end bagging process is generally initiated by counting and separating a stick of container ends and such has been automated to some degree in many existing systems. However, after this initial step many devices still require one or more manual operations. For instance, such operations include manually removing one of the container ends from the stick as a sample, manually positioning a bag onto/over a loading horn, manually inserting the stick of container ends into the bag, manually closing the open end of the bag, and manually securing the closed portion for shipment. As can be appreciated, devices incorporating one or more of these types of manual procedures can entail significant labor costs. In addition, many aspects of these types of manual operations, and particularly including the manual folding and securing of the bags, involves repetitive movements, potentially resulting in lost worker time and related costs.

Various aspects of the container end bagging process have been automated to a degree in an attempt to increase production efficiency and/or overcome other deficiencies associated with the container end bagging process. For instance, devices are available for retrieving an empty bag and/or transporting such to a bagging station for receipt of container ends. Moreover, devices are available for holding the bag in an open condition for receiving a stick of container ends. Furthermore, devices are available for receiving a continuous flow of container ends in a trough, counting a stick of container ends, separating the stick from the continuous flow, and thereafter automatically transporting the stick of container ends into the bag. In addition, devices are available for closing the bag after the container ends are positioned therein. Generally representative of these types of devices are U.S. Patent Nos. 5,163,073 to Chasteen et al., issued November 10, 1992; 4,742,669 to Mojden, issued May 10, 1988; 4,442,652 to Wakamatsu et al., issued April 17, 1984; 4,395,864 to Anderson et al., issued August 2, 1983; 3,962,845 to Mojden et al., issued June 15, 1976; and 3,878,945 to Mojden et al., issued April 22, 1975.

In addition to in-line devices and bagging devices (i.e., wherein container ends are fed into a stationary trough which is aligned with the bag), more elaborate multiple line devices are available which utilize multiple feed troughs for receiving, counting, and separating container ends in a further attempt to increase production capacity. For instance, in U.S. Patent No. 4,442,652 sticks of container ends are generally alternately transferred from two feed troughs to a central, common trough which is aligned with the bag.

Although the above-referenced types of devices have contributed to the automation of container end baggers, many of these devices tend to be space-consuming, expensive to operate at production capacity, and/or unnecessarily complex due to the large number of moving parts. Consequently, it is an object of the present invention to provide a reliable, low cost, automated end bagger. It is a related object of the present invention to reduce the number of moving parts and to decrease the overall size of an automatic end bagger. In addition, it is a further object of the present invention to increase the efficiency of one or more aspects of the container end bagging process to thereby increase overall operational efficiency. Furthermore, it is an object of the present invention to automate the container end bagging process in a manner which reduces the potential for lost worker time and related costs and/or the potential for end products which are not satisfactory to the consumer.

SUMMARY OF THE INVENTION

Accordingly, the present invention is embodied in an assembly particularly adapted to automatically separate a stick of container ends from a flow of container ends, insert the stick of container ends into an open bag, and fold the open end of the bag

into a closed and secured state for subsequent distribution. The assembly generally includes a plurality of operatively interconnected subassemblies, each of which contributes in some respect to automating the process of bagging container ends to achieve one or more of the above-identified objectives.

In one aspect, the container end bagging assembly may incorporate a bag opening and retaining subassembly which opens and retains the bag in a position for receiving container ends. As can be appreciated, a bag removing device may operatively interface with the bag opening and retaining subassembly by moving the bag into position for activation of the bag opening and retaining assembly after the bag is removed from the magazine. The bag opening and retaining subassembly includes a base portion having an orifice extending therethrough which is defined by a surface for interfacing with an exterior surface of the bag. When the bag is appropriately positioned at least partially within the orifice, the coinciding portion of the bag is engaged with the interfacing surface of the orifice to open the bag for receiving container ends. In order to provide for this engagement, at least one port, and preferably a plurality of spaced ports, may be provided on the interfacing surface and connected to a suction source to draw the exterior surface of the bag into engagement with the interfacing surface of the orifice. The ports not only serve to open the bag, but may also be employed to maintain the open end of the bag in this position while receiving container ends (e.g., the bag may be maintained in an open condition without having any device, such as a sleeve or horn, positioned within the open end of the bag). In order to reduce the likelihood that the edge of the open end of the bag will snag the container ends as they are inserted into the bag and thus interfere with their movement, a channel may be provided on the interfacing surface and such may be shaped to match/approximate the contour of the outer edge of the open end of the bag, or at least a portion thereof, so that the edge of the bag is retained within the channel while ends are positioned in the bag. A nozzle may also be incorporated into the subassembly for directing a stream of gas, or other appropriate medium, toward the open end of an approaching empty bag to at least assist the suction ports in the initial opening of the bag.

With the bag properly positioned, preferably by utilizing the above-described bag opening and retaining subassembly, container ends may be provided to the bag. A number of subassemblies may be incorporated to contribute to the actual positioning of the container ends into the bag. For instance, the container end bagging assembly may incorporate a trough(s) (e.g., a substantially U-shaped member) for directing/guiding the container ends toward the bag and a displacing subassembly for advancing the ends along the trough. In high production applications, a flow of container ends are provided to the trough and a counter identifies a predetermined number of container ends flowing into the trough past a certain location and such container ends are separated (e.g., by a separating device) from the flow for provision to the bag.

After a stick of container ends are separated from the flow of container ends, a sample may be removed from the stick such as for quality control purposes. Thus, in another aspect of the invention, a sampling subassembly is provided for automatically removing one of the ends from the stick. The sampling subassembly includes a gripping member moveable by a moving device between a first position and a second position adjacent the stick of can ends. When in the second position, the gripping member is capable of engaging a can end(s) in the stick (e.g., by suction). After the stick of can ends has been separated from the flow, the moving device is actuated to move the gripping member from the first position to the second position such that the gripping member may engage a can ends(s) in the stick. Subsequent movement of the gripping device back to the first position results in removal of the can end(s) from the stick.

In yet another aspect of the invention, a displacing subassembly is provided to move the separated container ends along the trough towards the bag. More particularly, a displacing member is advanced through a portion of the trough from a position out of the path of the container ends to a position where the displacing member is at least partially in the path after the ends have advanced thereby (i.e., the displacing member is positioned upstream of the last of the separated container ends). The displacing member may subsequently be horizontally advanced downstream to engage the last container end and further advanced to position the stick into the bag through its open end. By locating the displacing member out of the path when not in use (e.g., vertically below the trough), visual and mechanical access to the container ends during the counting, separating, and/or sampling stages is enhanced. In order to provide a smooth transition for the stick of ends while it travels over the displacing member when in the first position, the displacing member may be contoured to actually form part of the trough. That is, the displacing member may form a portion of the trough such that, after a stick has been separated from the flow, the displacing member can move vertically through the trough, horizontally to contact the end of the stick, and further horizontally to displace the stick into the bag.

In yet another aspect of the invention, the assembly may further incorporate a compressing subassembly to maintain the ends in a compressed, or upright, condition prior to closure of the bag. This particular subassembly may include at least two pawl members which are each engageable with side portions of the bag. When the above-described bag opening and retaining subassembly is being utilized by the assembly, the pawl members are positioned downstream thereof.

In one configuration, while a bag is being loaded onto the bag opening and retaining subassembly as described above, the pawl members are in a first position displaced from the sides of the bag. During the introduction of a stick into the bag, the pawl members are movable to a second position to exert a force on the perimeter of the container ends passing thereby (through engagement with the side portions of the bag). The pawl members may be resiliently biased toward this second position. The pawl members may also be configured to allow the container ends to flow into the bag, but prevent such from moving in the opposite direction and out of the bag. Furthermore, the pawl members may be disposed for further inward advancement generally toward a central axis of the bag after the last container end has passed thereby (e.g. due to the biasing force) so as to retain the ends within the bag until properly sealed. The pawl members may subsequently be movable back to the first position where the pawl members are displaced from the sides of the bag to allow for removal of the bag from the assembly.

In another configuration, the pawl members can be rigidly mounted on moving devices (e.g., air cylinders). Similar to the previous configuration, the pawl members are positionable in a first position displaced from the sides of the bag. In this configuration, however, the pawls are not moved to the second position until the last container end has passed thereby. In the second position, the pawls retain the ends within the bag until properly sealed. The pawls may subsequently be movable back to the first position to allow for removal of the filled bag from the assembly.

The compressing subassembly may also incorporate a compressing device for applying a compressive force to the leading end of the stick of ends within the bag, and such is preferably used in combination with a displacing member and the above-described pawl members. In this regard, the compressing device is positioned downstream of the pawl members adjacent the closed end of the bag such that, when the leading end of the stick reaches the closed end of the bag, the compressing device is positioned to engage the leading end of the stick (through engagement with the closed end of the bag). Further downstream displacement of the stick (e.g., by the displacing member) causes the bag to disengage from the bag opening and retaining subassembly, resulting in compression of the compressing device. The compressing device consequently applies an opposing force on the leading end of the stick generally directed upstream toward the displacing member. The displacing member continues to push the stick of ends until the trailing end of the stick is pushed beyond the pawl members, at which time the displacing member retracts and the pawl members hold the stick in place, as described above. As a result, prior to closure of the bag, the container ends are maintained in a compressed condition between the compressing device and the pawl members.

Once the stick is positioned within the bag, preferably utilizing each of the above-described subassemblies, the open end of the bag must be closed for shipment. Therefore, in another aspect of the invention, the assembly may incorporate a folding subassembly to further automate the bagging process. Initially and based upon the manner of the closure operation, the folding subassembly effectively requires the bag to be longer than the stick of container ends such that there is an occupied portion of the bag (i.e. defined by the presence of the stick) and an empty portion of the bag proximately coinciding with the open end of the bag. The folding subassembly engages opposing sides of at least part of the empty portion to fold such over onto another part of the bag to close the bag in preparation for shipment. Although it is desirable to fold onto the occupied portion of the bag, the fold may also be onto a part of the empty portion of the bag.

One configuration of the folding subassembly which folds in the described manner includes two members positionable to coincide with opposing sides at least part of the empty portion of the bag. A pivoting device is provided for pivoting one of the members substantially about the other member to fold at least part of the empty portion of the bag into overlapping relation with another part of the bag.

In another configuration, the folding subassembly includes a clamping device for clamping at least part of the empty portion of the bag and a device for moving a first part of the empty portion of the bag most adjacent the open end into overlapping relation with another part of the bag. The clamping device includes two fingers movable with respect to each other between a spaced relationship and a clamped relationship. When properly positioned on opposing sides of the empty portion of the bag in the spaced relationship, the two fingers are automatically moved into the clamped relationship to close the bag by a clamping-type

action. The device for moving a part of the empty portion of the bag may further desirably include a third finger displaced from the co-acting first and second fingers and such may be positionable to coincide with at least a portion of the first part of the bag. Moreover, the third finger may be mounted on a rotating device such that actuation of the rotating device pivots the third finger (e.g. about the clamping device) and subsequently overlaps the first part of the bag onto another part of the bag. The clamping device can further be mounted on the rotating device such that rotation of the rotating device results in pivoting of all three fingers simultaneously.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side elevational view of an assembly comprising features of the present invention for bagging container ends;
Figure 2 is a top plan view of the assembly shown in Figure 1;
Figure 3a is a side elevational view of the bag removing subassembly with the bag remover in the at-rest position;
Figure 3b is a side view of the subassembly shown in Figure 3a with the bag remover in the engaged position;
Figure 3c is a side view of the subassembly shown in Figure 3a with the bag remover in the lowered position;
Figure 3d is a side view of the subassembly shown in Figure 3a with the bag remover in the transported position;
Figure 4 is a sectional view of the bag removing subassembly taken along line 4-4 in Figure 2;
Figure 5 is a top plan view of the bag opening and retaining subassembly;
Figure 6 is a front elevational view of the bag opening and retaining subassembly;
Figure 7a is a sectional view of the bag opening and retaining subassembly taken along section line 7-7 in Figure 5;
Figure 7b is the sectional view of Figure 7a with the bag approaching the bag opening and retaining subassembly;
Figure 7c is the sectional view of Figure 7a with the bag entering the orifice of the bag opening and retaining subassembly;
Figure 7d is the sectional view of Figure 7a with the bag fully opened and retained in the channel of the bag opening and retaining subassembly;
Figure 8 is an exploded view of the interior wall of the orifice of the bag opening and retaining subassembly detailing the interface between the channel and the bag;
Figure 9a is a side elevational view of the sampling subassembly in the resting position;
Figure 9b is a side elevational view of the sampling subassembly in the engaging position;
Figure 9c is a side elevational view of the sampling subassembly in the resting position with a container end engaged;
Figure 10a is a side elevational view of the displacing subassembly in the at-rest position;
Figure 10b is the side elevational view of Figure 7A with the displacing subassembly in the raised position;
Figure 10c is the side elevational view of Figure 7A with the displacing subassembly in the fully displaced position;
Figure 11 is a top plan view of the displacing subassembly;
Figure 12a is a sectional view taken along the line 12-12 in Figure 11 with the displacing subassembly in the at-rest position;
Figure 12b is a sectional view taken along the line 12-12 in Figure 11 with the displacing subassembly in the raised position;
Figure 13 is a side elevational view of the compressing subassembly;
Figure 14 is a rear elevational view of the compressing subassembly taken along line 14-14 in Figure 13;
Figure 15a is a top plan view of one configuration of the compressing subassembly in the opened condition;
Figure 15b is the top elevational view of Figure 15a with the retaining pawls subassembly in the closed condition while the container ends are being inserted into the bag;
Figure 15c is the top elevational view of Figure 15a with the retaining pawls subassembly in the closed condition and the container ends fully inserted into the bag;
Figure 16 is a top plan view of another configuration of the compressing subassembly.
Figure 17a is a top plan view of the folding subassembly in the retracted position;
Figure 17b is a top plan view of the folding subassembly in the extended position;
Figure 18 is a front elevational view of the folding subassembly;
Figure 19a is a side elevational view of the folding subassembly taken along line 19-19 in Figure 17b with the folding subassembly in the opened position;
Figure 19b is the side view of Figure 19a with the folding subassembly in the clamped position;
Figure 19c is the side view of Figure 19a with the folding subassembly in the partially rotated position;
Figure 19d is the side view of Figure 19a with the folding subassembly in the fully rotated position.

DETAILED DESCRIPTION

The present invention will be described with regard to the accompanying drawings which assist in illustrating the pertinent features thereof. In this regard, an assembly 30 is generally illustrated in Figures 1-2 for bagging container ends. For ease of description, in the discussion of the end bagging assembly 30 the following terminology will be used. The direction of flow of the container ends will be termed the "downstream direction" and corresponds with movement from right to left in Figures 1-2. The opposite direction will be termed the "upstream direction" and corresponds with movement from left to right in Figures 1-2. The "flow of container ends" refers to the plurality of container ends in face-to-face relation before being counted and separated. A "stick" refers to a counted and separated group of container ends. Finally, the "path of container ends" refers to the volume of space which, at some moment during the bagging process, is occupied by the stick of container ends and generally corresponds with the interior of the trough 32.

Briefly, the end bagging assembly 30 includes a trough 32 which receives a flow of container ends 34 in face-to-face relation and directs a stick 36 in the downstream direction toward the bag opening and retaining subassembly 90 (see Figs. 1-2). In this regard, a bag removing subassembly 50, positioned downstream from the trough 32, removes an empty bag 38 from the bottom of a stack 64 of bags 38 contained within a bag magazine 52 and transports the bag 38 toward a bag opening and retaining subassembly 90 (see Figs. 3a-d). The bag opening and retaining subassembly 90 receives the open end of the bag 40 from the bag removing subassembly 50, opens the open end of the bag 40, and retains the bag 38 in the opened condition such that the stick 36 can be inserted therein (see Figs. 7a-d).

Near the upstream portion of the trough 32, a counting device 110 counts a predetermined number of container ends passing the counting device 110 and generates a signal in response thereto (see Figs. 1-2). This signal is provided to a separating device 120 which separates the stick of container ends 36 from the flow of container ends 34 in response to the signal from the counting device 110. The separating device 120 is also designed to be transportable in the downstream direction to provide a gap between the stick 36 and the flow of container ends 34 and may even partially insert the stick 36 into the bag 38 if desired. A sampling subassembly is provided for removing at least one container end from the stick for quality control purposes (see Figs. 9a-c). A displacing subassembly 150, utilizing a displacing member 152, displaces the stick 36 all the way into the bag 38 (see Figs. 10a-c). During at least a portion of the advancement of the displacing subassembly 150, compressing subassembly 170 compresses the stick 36 in the bag 38 and holds the stick 36 in a compressed, upright position in the bag 38 (see Figs. 15a-c). Once the stick 36 is securely positioned within the bag 38, a folding subassembly 200, positioned between the compressing subassembly 170 and the bag retaining subassembly 90, closes the open end of the bag 40 by a clamping and a pivoting-like action to fold the bags 38 closed (see Figs. 19a-d).

Having generally described the end bagging assembly 30, each of the various subassemblies will be described with more detail below. Although it may be desirable to incorporate each subassembly into a given bagging process, since the various subassemblies each contribute in some respect to the end bagging process, they may also be individually incorporated in existing devices to enhance their operational characteristics.

The end bagging assembly 30 generally takes a flow of container ends 34 and transports a predetermined number thereof to a bag. In this regard, the assembly 30 includes a trough 32 as illustrated in Figures 1-2 and allows for the transport of a plurality of container ends in an upright, face-to-face relation in a downstream direction. Although a variety of configurations may be appropriate, in one embodiment the trough is substantially semicircular or U-shaped as illustrated in Figures 12a-12b. The trough 32 extends substantially linearly from the counting device 110 to the bag opening and retaining subassembly 90 and defines a flow path for the container ends. The trough 32 does not necessarily have to be linear, and multiple trough arrangements may be utilized when incorporating one or more aspects of the present invention. However, a linear configuration for the trough provides for a degree of simplicity and this configuration may be advantageous for interfacing with one or more of the various subassemblies.

Referring to Figures 3-4, the bag removing subassembly 50 is positioned downstream of the trough 32 and comprises a bag magazine 52 which holds a stack of empty bags 64. The bag removing subassembly 50 includes a suction device 70 for pulling an empty bag 38 from the bottom of the stack 64. In this regard, the magazine 52 includes a bottom portion 54, a front wall 56, and two side walls 60 forming a rectangular box-like structure dimensioned to receive a stack 64 of collapsed bags. The top 62 of the magazine 52 is open so that the supply of bags can be replenished to the magazine 52 during operation of the assembly 30. A longitudinally-extending cut-out portion 66 is provided in the bottom portion 54 of the magazine 52

to provide access to the bottom of the stack 64 by the suction device 70.

The suction device 70 includes suction cups 72 mounted on a support 73. The support 73 is mounted on vertical cylinders 74 which are further mounted on a horizontal cylinder 76. The portion of the trough 32 between the bag removing subassembly 50 and the bag opening and retaining subassembly 90 is provided with a longitudinally-extending slot 78 to allow for the movement of the suction cups 72 from the bag removing subassembly 50 to the bag opening and retaining subassembly 90 (see Figure 14).

Referring specifically to Figures 3a-3d, the operation of the bag removing subassembly 50 is as follows. When a bag sensor 84 senses that a bag 38 is needed by the assembly 30, the bag sensor 84 sends a signal to a control circuit (not shown) via a bag sensor interconnect 86. Upon receiving the signal, the control circuit starts operation of the assembly 30. All further reference to movement and timing of assembly components are controlled by the control circuit. In operation, the vertical cylinders 74 raise the suction cups 72 through the cut-out portion 66 of the magazine 52 into engagement with the bottom bag 38 of the stack 64, as shown in Figure 3b. Suction is applied at the suction cups 72 such that engagement with the bottom bag 38 in the magazine 52 is maintained. The vertical cylinders 74 are then lowered while engagement with the bottom bag 38 is maintained, thus removing the bottom bag as shown in Figure 3c. Finally, the horizontal cylinder 76 transports the suction cups 72 upstream toward the bag opening and retaining subassembly 90 while engagement with the bag 38 is maintained, as shown in Figure 3d.

Once removed from the magazine, the bag 38 is transported toward a bag opening and retaining subassembly 90. Although a separate subassembly could be used for the transport of the bag 38, in order to reduce complexities, the bag removing subassembly 50 may actually advance the bag 38 to the desired position.

The bag opening and retaining subassembly 90 is positioned at the downstream end of the trough 32 as illustrated in Figures 5-8. The bag opening and retaining subassembly 90 includes a base portion 92 positioned in the path of the container ends 34 and having an orifice 94 extending therethrough. The orifice 94 is cylindrically shaped with a diameter approximately equal to the "diameter" of the bag 38. The orifice 94 is positioned coaxially with the trough 32 such that the transition from the trough 32 to the orifice 94 is relatively unobstructed, thus allowing for smooth travel of the container ends from the trough 32 into the orifice 94.

The interior surface 96 of the orifice 94 is provided with a channel 98 having a rectangular cross section as is best shown in Figure 8. However, it should be appreciated that the cross section of the channel could be any of a multitude of shapes, such as triangular, semi-circular or any other shape that provides an adequate recess. The channel 98 is also circumferential such that it substantially follows/approximates the contour of the edge 42 of the open end of the bag 40 when the bag 38 is fully opened. The bottom of the channel 104 is provided with a plurality of vacuum ports 100 spaced in circumferential relation around the channel and such are used to open and/or retain the bag 38 in an opened position for receiving a stick of ends 36. The vacuum ports 100 are operatively connected to a vacuum generating device (not shown) such that suction can be created in the channel 98. In order to assist in the initial opening of its bag 40, the bag opening and retaining subassembly 90 may further include an air nozzle 102 for directing a flow of pressurized air or other appropriate fluid medium in a downstream direction toward the open end of the bag 40 from the bag opening and retaining subassembly 90. The air nozzle 102 is operatively connected to an air compression device (not shown) and are positioned such that, at the appropriate time, pressurized air can be blown toward an approaching collapsed bag 38 in such a manner that the collapsed bag 38 is forced partially open due to the entrance of the pressurized air into the open end of the bag 40. It should be appreciated that the activation of the air nozzle 102 could also occur after the bag 38 has entered the orifice 94. In such a situation, the air nozzle 102 could be located on the interior surface 96 of the orifice 94.

The bag opening and retaining subassembly 90 is designed to receive a collapsed bag 38 from the suction device 70 as shown in Figure 7a. As the bag 38 approaches the base portion 92, the sensor 84 detects the presence of the bag 38 and instructs the air nozzle 102 to direct pressurized air toward the open end of the bag 40. The result is that the pressurized air enters and partially opens the open end of the bag 40 as shown in Figure 7b. The bag 38 is further transported upstream into the orifice 94 until the leading edge 42 of the open end of the bag 40 is aligned with the channel 98 as shown in Figure 7c. At this point, the bag 38 is stopped and suction is created in the channel 98 as described above. The suction in the channel 98 causes the open end of the bag 40 to be pulled radially into the channel 98 as shown in Figure 7d. It can be appreciated that by retaining the leading edge 42 of the open end of the bag 40 in the channel 98 as shown in Figure 8, there is a reduced likelihood that the container ends will snag

on the open end of the bag 40 as the container ends are being inserted into the bag 38. Also, the use of a channel 98 accommodates for a slight variance in the diameter of the bag 38. In addition, since the bag opening and retaining subassembly 90 is pneumatically operated, there are less moving parts than the prior art devices, resulting in a more reliable, more compact, and less expensive subassembly. Furthermore, since no internal guide or horn needs to be inserted into the bag 38 prior to insertion of the container ends, the bag 38 can be opened to a larger effective diameter, thus providing for easier insertion of the container ends into the bag 38.

Referring back to Figures 1 and 2, a counting device 110 is positioned near the upstream portion of the trough 32 in the path of the flow of container ends 34. The counting device 110 is designed to count the container ends as they pass through/by the counting device 110. After a predetermined number of container ends have been counted, the counting device 110 sends a signal to the separating device 120. The separating device 120 is designed to physically separate the predetermined number of container ends from the flow of container ends 34 in response to the signal from the counting device 110.

The separating device 120 includes a movably mounted wedge portion 122 mounted on a horizontal cylinder 124 for movement in the downstream and upstream directions. In operation, the wedge portion 122 is initially positioned adjacent the counting device 110. When the separating device 120 receives the signal from the counting device 110 indicating that a predetermined number of container ends have passed the counting device 110, the wedge portion 122 is automatically inserted into the path of the container ends such that a stick of container ends 36 is separated from the flow of container ends 34. The separating device 120 subsequently transports the wedge portion 122 downstream by way of the horizontal cylinder 124 while simultaneously sensing (e.g., through the bag sensor 84) if a bag 38 has been positioned in the bag retaining subassembly 90. If a bag 38 has not been properly positioned, the separating device 120 will stop at an intermediate location such that the stick 36 is between the counting device 110 and the bag retaining subassembly 90 until a signal from the bag sensor 84 indicates that a bag 38 is properly positioned. If a bag 38 is properly positioned, the separating device 120 will transport the stick of container ends 36 to the point where the upstream end of the stick 126 is positioned at the load line 128, as shown in Figure 9. The counting and separating devices 110, 120 are described in more detail in U.S. Patent No. 5,163,073 to Chasteen, issued November 10, 1992, the entire disclosure of which is incorporated herein by reference.

A sampling subassembly 140 is positioned above the load line 128 as illustrated in Figures 9a-9c. The sampling subassembly 140 includes a rotary actuator 142 operatively connected to a shaft 144 and to one end of a sampling arm 146. On the other end of the sampling arm 146 there is mounted a suction cup 148 operatively connected to a suction device (not shown). A sampling sensor 149 and sensor interconnect 147 are also provided for monitoring whether a sample has been taken.

In operation, after the separating device 120 moves the stick of ends 36 to the load line 128 and retracts to its resting position, the sampling subassembly 140 receives a signal from an appropriate detector/sensor (not shown) indicating that a sample should be taken. Upon receiving this signal, the rotary actuator 142 rotates the shaft 144, and consequently the arm 146 and the suction cup 148, 180° from the resting position as shown in Figure 9a, to the engaging position as shown in Figure 9b. When in the engaging position, the suction cup 148 is positioned within the trough 32 adjacent the upstream end 126 of the stick 36. Upon actuation of the suction device (not shown), the suction cup 148 engages the last container end 45 of the stick 36. After engagement of the container end 45 by the suction cup 148, the rotary actuator 142 rotates the shaft 144 (and the arm 146 and suction cup 148) back to the resting position. The human operator of the assembly 30 can subsequently remove the container end 45 from the suction cup 148 without having to reach into the trough 32 and risk injury. The sampling sensor 149 can detect whether the operator has removed the container end 45 from the suction cup 148. If the operator forgets to remove the end 45, the sensor 149 will not allow the stick to be loaded into the bag 38. In addition, the sensor 149 can send a signal to a visual or auditory alarm to inform the operator that the end 45 must be removed from the suction cup 148 before the process can continue.

Referring now to Figures 10-12, there is shown a displacing subassembly 150 positioned upstream of the bag opening and retaining subassembly 90. The displacing subassembly 150 includes a displacing member 152 having a base portion 154 and an arm portion 156 extending downstream from the base portion 154. The displacing member 152 is mounted on a vertical cylinder 164 which is further mounted on a horizontal cylinder 166. As shown in Figures 10a and 12a, when the displacing member 152 is in the at-rest position it is positioned "flush" with or below the trough 32. In the area immediately above the displacing member 152, the trough 32 is provided with a cut-out portion 158, thus allowing for vertical movement of the displacing member 152 from the at-rest position to a

raised position (as shown in Figures 10b and 12b) through the trough 32. Although not required, the top surface 160 of the displacing member 152 may be contoured to generally match/approximate the interior surface 162 of the trough 32 and positioned such that the top surface 160 is aligned (flush) with the interior surface 162 of the trough 32 when the displacing member 152 is in the at-rest position, as shown in Figure 12a. This configuration provides a displacing member 152 that forms a portion of the trough 32, thus providing a smooth path along the trough 32 when the displacing member 152 is in the at-rest position. The positioning of the displacing member 152 such that is passes through a portion of the trough 32, reduces space limitations, and reduces the potential for injury to the operator, particularly when positioned vertically below the trough 32.

In operation, upon receiving a signal from the sampling sensor 149 indicating that a sample has been removed from the stick 36, the displacing member 152 is moved from the at-rest position (Figs. 10a and 12a) to the raised position (Figs. 10b and 12b) by the vertical cylinder 164. When the displacing member 152 is in the raised position, the arm portion 156 extends downstream in the path of the container ends 36. The horizontal cylinder 166 provides for downstream displacement of the displacing member 152 such that the arm portion 156 contacts the stick of container ends 36 and forces the stick into the bag 38 (Fig. 10c). In the fully displaced position, the arm portion 156 extends through the orifice 94 of the bag opening and retaining subassembly 90 and beyond the pawl members 182, 184 of the compressing subassembly 170 as further described herein. After displacement of the stick of container ends 36 beyond the pawl members 182, 184, the displacing member 152 is retracted in the raised position and then lowered to the at-rest position so that the next stick of container ends 36 can be separated and transported to the load line 128.

When the stick of ends 36 has been inserted into the bag 38 by the displacing subassembly 150, it is desirable to retain the container ends in the bag 38 in a compressed, substantially upright position. In order to accomplish this, there is provided a compressing subassembly 170 positioned downstream of the bag opening and retaining subassembly 90 as shown in Figures 13-15. The compressing subassembly 170 includes a retaining device 172 and a compression spring device 190. Generally the retaining device 172 is designed to maintain the container ends in a substantially upright position after the container ends have been inserted beyond the retaining device 172 by the displacing member 152. In addition, the retaining device 172 prevents the container ends from moving upstream, thus providing a counteracting force against which the compression spring device 190 can act to compress the container ends within the bag 38, as further described herein.

In one configuration, the retaining device 172 includes first and second support members 174, 176 positioned on opposite sides of the bag support members 78 with enough space between them to allow for the insertion of the stick of ends 36 into the bag 38. The first and second support members 174, 176 are mounted on transverse cylinders 178 such that, by activating and deactivating the cylinders, the first and second support members 174, 176 are movable from a first position, shown in Figure 15a, to a second position, shown in Figures 15b and 15c. The support members 174, 176 are each provided with a recessed portion 180 into which first and second pawl members 182, 184 are pivotally mounted on pins 186 to allow pivoting of the pawl members 182, 184 from a retracted position, as shown in Figure 15b, to a latched position, as shown in Figure 15c. Springs 188 are provided for biasing the pawl members 182, 184 toward the latched position. A mass sensor 189, and sensor interconnect 187 are further provided for detecting the presence of container ends in the bag 38.

In operation, the support members 174, 176 are in the first position when no container ends are being inserted into the bag 38 as shown in Figure 15a. Once the mass sensor 189 indicates that the container ends have been partially inserted into the bag 38, the transverse cylinders 178 are actuated to move the support members 174, 176 to the second position, as shown in Figure 15b. When the support members 174, 176 are in the second position, the pawl members 182, 184 contact and apply a slight compressive force on the outside of the bag 38 as the container ends are being inserted into the bag 38. Once all of the container ends have been inserted beyond the retaining device 172, the pawl members 182, 184 rotate/pivot into the latched position due to the biasing force of the springs 188. The pawl members 182, 184 maintain the container ends in the upright position and prevent them from moving upstream, as shown in Figure 15c.

In another configuration of the retaining device 172, the pawl members 182, 184 are rigidly (e.g. not rotatably) mounted to the transverse cylinders 178, as shown in Figure 16. In this configuration, the transverse cylinders 178 would not be activated until all of the stick 36 has been inserted beyond the pawl members 182, 184. Activation of the transverse cylinders 178 would cause the pawl members 182, 184 to be inserted into the flow path of the stick 36 to maintain the container ends in the upright position and prevent them from moving upstream.

As noted above, in order to apply a compressive force on the container ends in the bag 38 a compression spring device 190 is positioned downstream from the retaining device 172. The compression spring device 190 includes a longitudinal rod 192 positioned at the downstream end of the bag supporting members 78 in axial alignment with the trough 32 as illustrated in Figures 13-14. The rod 192 is slidably mounted on a support member 194 which is further mounted onto a support beam 195. The support beam 195 can be mounted off the front wall 56 of the bag magazine 52. The sliding interaction between the rod 192 and the support member 194 allows the rod 192 to slide in the downstream and upstream directions. A compression plate 196 is mounted on the upstream end of the rod 192 and a compression spring 198 connects the support member 194 to the compression plate 196 such that the rod 192 and compression plate 196 are biased in the upstream direction. It should be appreciated that the compression device 190 could alternatively comprise an air cylinder instead of the rod 192/support member 194/spring 198 combination, or any other device capable of applying the required compressive force on the stick 36.

In operation, as the stick of ends 36 is being inserted into the bag 38, the compression spring device 190 is in the fully biased/extended position as shown in Figure 15a. Once the stick of container ends 36 reaches the closed end of the bag 44, the bag 38 is fully opened and the closed end of the bag 44 is in contact with the compression plate 196. At this point, the upstream end 126 of the stick 36 has not yet reached or at least completely passed by the pawl members 182, 184. Further downstream movement of the container ends by the displacing member 152 forces the bag 38 out of engagement with the bag opening and retaining subassembly 90 and compresses the compression spring device 190 to apply a compressive force on the stick 36 within the bag 38, as is best shown in Figures 10c and 15c. When the upstream end 126 of the stick 36 reaches the retaining device 172, the pawl members 182, 184 rotate to the latched position and hold the container ends in an upright, compressed orientation.

Referring now to Figures 17-19, there is shown a folding subassembly 200 for closing the open end of the bag 40 after the stick 36 has been fully inserted into the bag 38. The folding subassembly 200 includes a gripping device 202 having first and second fingers 204, 206 movable with respect to each other from a spaced relationship, as shown in Fig. 19a, to a clamped relationship, as shown in Figure 19b. The gripping device 202 is mounted on a rotating device 210, thus allowing for rotation of the gripping device 202 generally about a certain point or axis. The rotating device 210 is further mounted on a linear cylinder 212 such that the rotating device 210 and gripping device 202 can be linearly moved from a retracted position to an extended position, as shown in Figures 17a and 17b, respectively. The gripping device 202 further includes a third finger 208 positioned upstream of, and operatively connected to, the second finger 206 such that the third finger 208 moves with the second finger 206 from a spaced relationship to a clamped relationship.

In operation, the folding subassembly 200 is in the retracted position, as shown in Figure 17a, until the container ends are fully inserted into the bag 38 and the displacing member 192 is retracted. At this point, a signal is sent by an appropriate sensor/detector (not shown) to start the folding operation. Subsequently, the linear cylinder 212 is actuated to extend the rotating device 210 and gripping device 202 to the extended position as shown in Figure 17b. In the extended position, the first and second fingers 204, 206 are positioned on opposing sides of the open end of the bag 40 and the third finger 208 is positioned upstream of the second finger 206 adjacent the open end of the bag 40 as is best shown in Figure 19a. The gripping device 202 is then actuated to move the fingers 204, 206, 208 from the spaced relationship, as shown in Figure 19a, to the clamped relationship, as shown in Figure 19b. Subsequent actuation of the rotating device 210 results in the gripping device 202 being rotated substantially about the first finger 204 until the third finger 208 forces the open end of the bag 40 into overlapping relation with the filled portion of the bag 38 as shown in Figures 19c and 19d. The folding subassembly 200 can then be linearly retracted. Because the third finger 208 is longer than the first and second fingers 204, 206, the third finger 208 maintains contact with the folded portion of the bag 40 after the folding subassembly 200 has been linearly retracted. This assures that the bag 38 stays folded. In addition, the third finger 208 is flexible to accommodate removal of the folded bag 38 from above, if desired. After removal of the folded bag 38, the folding subassembly 200 is rotated back to the starting position until the next stick of container ends 36 has been fully inserted into the bag 38.

Having thus described the structure and operation of the individual subassemblies of the present invention, the operation of the complete assembly 30 will now be briefly summarized from beginning to end. The operation of the assembly 30 begins by removing a bag 38 from the magazine 52 and transporting the bag 38 to the bag opening and retaining subassembly 90. When the bag sensor 84 senses that a bag 38 is needed by the assembly 30, the suction cups 72 are raised through the cut-

out portion 66 of the magazine 52 and into engagement with the bottom bag 38 of the stack 64. The suction cups 72 are then lowered to remove and subsequently transport the bag 38 upstream toward the bag opening and retaining subassembly 90. As the open end of the bag 40 approaches the bag opening and retaining subassembly 90, the sensor 84 detects the presence of the open end of the bag 40 and instructs the air nozzles 102 to direct pressurized air at the open end of the bag 40. The result is that the pressurized air enters and partially opens the open end of the bag 40, as shown in Figure 7b. The bag 38 is further transported upstream into the orifice 94 until the leading edge 42 of the open end of the bag 40 is aligned with the channel 98, as shown in Figure 7c. Suction created in the channel 98 causes the leading edge 42 of the open end of the bag 40 to be pulled radially into the channel 98, as shown in Figure 7d.

During the time in which the bag is being removed and loaded, the counting device 110 is counting the container ends. After a predetermined number of container ends have been counted, the counting device 110 sends a signal to the separating device 120, telling it to insert the wedge portion 122 into the path of the container ends such that a stick of container ends 36 is separated from the flow of container ends 34. Upon receiving a signal from the bag sensor 84 indicating that a bag 38 is installed in the bag retaining subassembly 90, the separating device transports the stick 36 downstream until the upstream end of the stick 126 is positioned at the load line 128 in Figure 1. After receiving a signal from an appropriate sensor/detector (not shown) indicating that the stick 36 has been transferred to the load line 128, the separating device retracts and the sampling subassembly 140 is actuated to rotate the sampling arm 146 180° to the engaging position shown in Figure 9b. In the engaging position, the suction cup 148 is positioned within the trough 32 such that the last container end of the stick 36 is engaged by the suction cup 148. Subsequently, the sampling arm 146 is rotated back to the resting position where the human operator of the assembly 30 can remove the sample from the suction cup 148. The sampling sensor 149 will not allow the stick 36 to be inserted fully into the bag until the sample has been removed from the suction cup 148 by the operator.

Upon receiving a signal from the sampling sensor 149 indicating that a sample has been removed from the stick 36, the displacing member 152 is moved from the at-rest position to the raised position as shown in Figure 10b. The displacing member 152 is subsequently transported downstream such that the arm portion 156 contacts the stick of container ends 36 and forces the stick 36 into the bag 38. A mass sensor 189 detects the presence of the container ends in the bag 38, resulting in the support members 174, 176 being moved from the first position, shown in Figure 15a, to the second position, shown in Figure 15b. Once the stick of ends 36 reaches the closed end of the bag 44 as shown in Figure 15b, the bag 38 is fully opened and the closed end of the bag 44 is in contact with the compression plate 196. Further downstream movement of the stick 36 by the displacing member 152 forces the open end of the bag 40 out of engagement with the bag opening and retaining subassembly 90 and compresses the compression spring device 190 to apply a compressive force on the stick 36 within the bag 38. When the displacing member 152 has moved the upstream end 126 of the stick 36 to the retaining device 172, the pawl members 182, 184 rotate to the latched position and, due to the compressive force from the compression spring device 190, hold the container ends in an upright, compressed orientation. The displacing member 152 is subsequently retracted in the raised position and then lowered to the at-rest position so that the next stick of container ends 36 can be separated and transported to the load line 128.

Upon receiving a signal from an appropriate sensor/detector (not shown) indicating that the displacing member 152 is retracted, the linear cylinder 212 is actuated to extend the rotating device 210 and gripping device 202 to the extended position as shown in Figure 17b. The gripping device 202 is then actuated to move the fingers 204, 206, 208 from the spaced relationship, as shown in Figure 19a, to the clamped relationship, as shown in Figure 19b. Subsequent actuation of the rotating device 210 results in the gripping device 202 being rotated about the first finger 204 until the third finger 208 forces the open end of the bag 40 into overlapping relation with the filled portion of the bag 38 as shown in Figures 19c and 19d. The folding subassembly 200 is then linearly retracted while still in the fully-rotated position. The filled and folded bag 38 may subsequently be removed from the trough 32 by any appropriate means (e.g., manually). The bag sensor 84, sensing that no bag is present, sends a signal to the bag removing subassembly 50 to start the process again from the start.

As previously noted, each of the above-described subassemblies contribute in some respect to the end bagging process. Consequently, each of such subassemblies may be separately incorporated into a given end bagging process. However, as indicated above, such subassemblies may desirably interact and/or operatively interface in a manner which further contributes to the overall end bagging process.

The foregoing description of the present invention has been presented for purposes of illustration and description. Furthermore, the description is not intended to limit the invention to the form disclosed herein. Consequently, variations and modifications commensurate with the above teachings, and the skill or knowledge of the relevant art, are within the scope of the present invention. The embodiments described hereinabove are further intended to explain best modes known for practicing the invention and to enable others skilled in the art to utilize the invention in such, or other, embodiments and with various modifications required by the particular applications or uses of the present invention. It is intended that the appended claims be construed to include alternative embodiments to the extent permitted by the prior art.

It should be noted that the objects and advantages of the invention may be attained by means of any compatible combination(s) particularly pointed out in the items of the following summary of the invention and the appended claims.

The invention may be summarized as follows:

1. An assembly for providing a plurality of container ends to a bag having an open end, said assembly comprising:

means for retaining the open end of the bag in a position for receiving the container ends;

means for positioning the container ends into the bag, wherein the container ends define an occupied portion of the bag and wherein an empty portion of the bag is defined between the open end and the container end closest to the open end; and

means for folding a first part of the empty portion of the bag into overlapping relation with another part of the bag to close the open end of the bag, said means for folding engaging opposing surfaces of the empty portion.

2. An assembly, wherein said means for retaining is substantially free from engagement with an interior surface of the bag.

3. An assembly, wherein said means for retaining comprises:

a base portion having an orifice extending therethrough for receiving at least the open end of the bag, said orifice being defined by an inner surface; and

means for engaging an exterior portion of the bag against said inner surface.

4. An assembly, wherein said base portion comprises:

a substantially circumferential channel positioned about said inner surface, whereby the open end of the bag is retained within said channel by said means for engaging.

5. An assembly, wherein said means for engaging comprises:

at least one port in said channel of said base portion; and

means for drawing suction through said at least one port.

6. An assembly, further comprising:

means for automatically removing at least one of the container ends before being positioned within the bag.

7. An assembly, wherein said means for positioning comprises:

trough means for directing the container ends toward the open end of the bag.

8. An assembly, wherein said means for positioning further comprises:

means for providing a flow of container ends to said trough means.

9. An assembly, wherein said means for positioning further comprises:

means for separating the plurality of container ends from the flow of container ends.

10. An assembly, wherein a flow path is defined for the container ends within said trough means, and wherein said means for positioning further comprises:

a displacing member;

means for moving said displacing member between at least first and second positions, said displacing member being positioned out of said flow path when in said first position and at least partially within said flow path when in said second position, said displacing member passing through at least a portion of said trough means when moving to said second position; and

means for moving said displacing member toward the bag when said displacing member is in said second position, whereby said displacing member engages at least one of the plurality of container ends and displaces the container ends into the bag.

11. An assembly, wherein:

when in said first position at least a portion of said displacing member is substantially flush with an interior surface of said trough means engageable with the container ends.

12. An assembly, further comprising:

at least two pawl members engageable with side portions of the bag when in position for receiving container ends, said pawl members being positionable in a first position to exert a force on perimeter portions of the container ends as being positioned in the bag.

13. An assembly, wherein:

each of said pawl members are resiliently biased toward said first position.

14. An assembly, further comprising:

means for moving said pawl members be-

tween said first position and a second position, said pawl members being substantially disengaged from the side portions of the bag when said pawl members are in said second position.

15. An assembly, wherein:

said pawl members move generally toward a central axis of the bag after the last of the container ends passes said pawl members when being positioned within the bag, whereby said pawl members retain the container ends within the bag.

16. An assembly, wherein:

said pawl members allow movement of the container ends in a first direction and substantially prevent movement of the container ends in a second direction, said first direction coinciding with the positioning of the container ends into the bag and said second direction being generally away from said first direction.

17. An assembly, further comprising:

a compression device positioned adjacent a closed end of the bag when the bag is in position for receiving the container ends, wherein said compression device supplies a compressive force on one end of the plurality of container ends within the bag.

18. An assembly, wherein said means for folding comprises:

a first member positionable to coincide with at least part of the empty portion of the bag, whereby the first part of the empty portion is between said first member and the open end of the bag;

a second member positionable to coincide with at least a portion of the first part of the empty portion;

means for pivoting said second member substantially about said first member, whereby the first part of the empty portion is folded into said overlapping relation.

19. An assembly, wherein said means for folding comprises:

clamping means for clamping at least part of the empty portion of the bag, whereby the first part of the empty portion is between said clamping means and the open end of the bag; and

means for rotating said clamping means substantially about an axis, whereby the first part of the empty portion is folded into said overlapping relation.

20. An assembly, wherein said means for folding further comprises:

a pivotable member positionable to coincide with at least a portion of the first part of the empty portion of the bag at a location displaced from said clamping means;

means for pivoting said pivotable member substantially about said clamping means, whereby the first part of the empty portion is folded into said overlapping relation.

21. An assembly, wherein said clamping means comprises:

a clamping device comprising first and second members moveable relative to each other between at least first and second positions, wherein said first position corresponds with said first and second members being spaced apart and wherein said second position corresponds with said first and second members being substantially adjacent;

means for moving said first and second members between said first and second positions; and

means for positioning said first and second members into and out of alignment with opposing surfaces of the empty portion, wherein said first and second members are in said first position when being positioned into alignment with the opposing surfaces, wherein said means for moving moves said first and second members into said second position, wherein said means for rotating rotates said first and second members to close the bag, and wherein said means for positioning subsequently positions said first and second members out of alignment with the opposing surfaces.

22. An assembly, wherein said means for folding further comprises:

a third member positionable to coincide with at least a portion of the first part of the empty portion of the bag at a location displaced from said first and second members;

means for pivoting said third member substantially about said clamping device, whereby the first part of the empty portion is folded into said overlapping relation.

23. A device for closing an open end of a bag, the bag having material occupying an occupied portion of the bag and having an empty portion extending between the material and the open end of the bag, said device comprising:

a first member which engages at least part of the empty portion of the bag, whereby a first part of the empty portion is between said first member and the open end of the bag;

a second member which engages at least a portion of the first part of the empty portion at a location displaced from said first member;

means for pivoting said second member substantially about said first member, whereby the first part of the empty portion is folded into overlapping relation with another part of the bag.

24. A device, further comprising:

a third member positionable on a side of the empty portion substantially opposite said first

member.

25. A device, wherein:

said first and third members are movable into and out of alignment with the opposing sides of the empty portion of the bag, and movable from an open position to a closed position, said first and third members being in said open position when moving into alignment with the opposing sides of the empty portion of the bag.

26. A device, further comprising:

means for substantially inverting a position of said first member relative to a position of said third member.

27. A device, wherein:

said means for substantially inverting occurs substantially coextensively with said means for pivoting said second member.

28. A method for closing an open end of a substantially cylindrical bag, the bag having a predetermined number of container ends in face-to-face relationship occupying an occupied portion of the bag and having an empty portion between the open end of the bag and the container end closest to the open end, said method comprising the steps of:

positioning a first member to engage at least part of the empty portion of the bag, whereby a first part of the empty portion is between said first member and the open end of the bag;

positioning a second member to engage at least a portion of the first part of the empty portion at a location displaced from said first member;

pivoting said second member substantially about said first member, whereby the first part of the empty portion is folded into overlapping relation with another part of the bag.

29. A method, further comprising:

positioning a third member on a side of the empty portion substantially opposite said first member.

30. A method, further comprising:

moving said first and third members from a first position to a second position, wherein said first and third members are out of alignment with opposing sides of the empty portion when in said first position, and wherein said first and third members are in alignment with opposing sides of the empty portion when in said second position; and

moving said first and third members from an open position to a closed position, said first and third members being in said open position when moving from said first position to said second position.

31. A method, further comprising:

substantially inverting a position of said first member relative to a position of said third member.

32. A method, wherein:

said inverting step occurs substantially coextensively with said pivoting step.

33. A method wherein:

at least one of said first and third members is substantially encased by portions of the bag when the first part is overlapped with another part of the bag by said pivoting step.

34. A method, further comprising the step of:

repositioning said first and third members from said second position to said first position after said pivoting step, wherein both of said first and third clamping members are substantially free from contact with the bag after said repositioning step.

35. A method, wherein:

said second member remains in contact with the bag after said repositioning step.

Claims

1. An assembly for providing a plurality of container ends to a bag having an open end, said assembly comprising:

means for retaining the open end of the bag in a position for receiving the container ends;

means for positioning the container ends into the bag, wherein the container ends define an occupied portion of the bag and wherein an empty portion of the bag is defined between the open end and the container end closest to the open end; and

means for folding a first part of the empty portion of the bag into overlapping relation with another part of the bag to close the open end of the bag, said means for folding engaging opposing surfaces of the empty portion.

2. An assembly, as claimed in Claim 1, wherein said means for retaining is substantially free from engagement with an interior surface of the bag.

3. An assembly, as claimed in Claim 1, wherein said means for retaining comprises:

a base portion having an orifice extending therethrough for receiving at least the open end of the bag, said orifice being defined by an inner surface; and

means for engaging an exterior portion of the bag against said inner surface.

4. An assembly, as claimed in Claim 3, wherein said base portion comprises:

a substantially circumferential channel positioned about said inner surface, whereby the open end of the bag is retained within said channel by said means for engaging.

5. An assembly, as claimed in Claim 4, wherein said means for engaging comprises:

at least one port in said channel of said base portion; and

means for drawing suction through said at least one port.

6. An assembly, as claimed in Claim 1, further comprising:

means for automatically removing at least one of the container ends before being positioned within the bag.

7. An assembly, as claimed in Claim 1, wherein said means for positioning comprises:

trough means for directing the container ends toward the open end of the bag.

8. An assembly, as claimed in Claim 7, wherein said means for positioning further comprises:

means for providing a flow of container ends to said trough means.

9. An assembly, as claimed in Claim 8, wherein said means for positioning further comprises:

means for separating the plurality of container ends from the flow of container ends.

10. An assembly, as claimed in Claim 9, wherein a flow path is defined for the container ends within said trough means, and wherein said means for positioning further comprises:

a displacing member;

means for moving said displacing member between at least first and second positions, said displacing member being positioned out of said flow path when in said first position and at least partially within said flow path when in said second position, said displacing member passing through at least a portion of said trough means when moving to said second position; and

means for moving said displacing member toward the bag when said displacing member is in said second position, whereby said displacing member engages at least one of the plurality of container ends and displaces the container ends into the bag.

FIG. 1

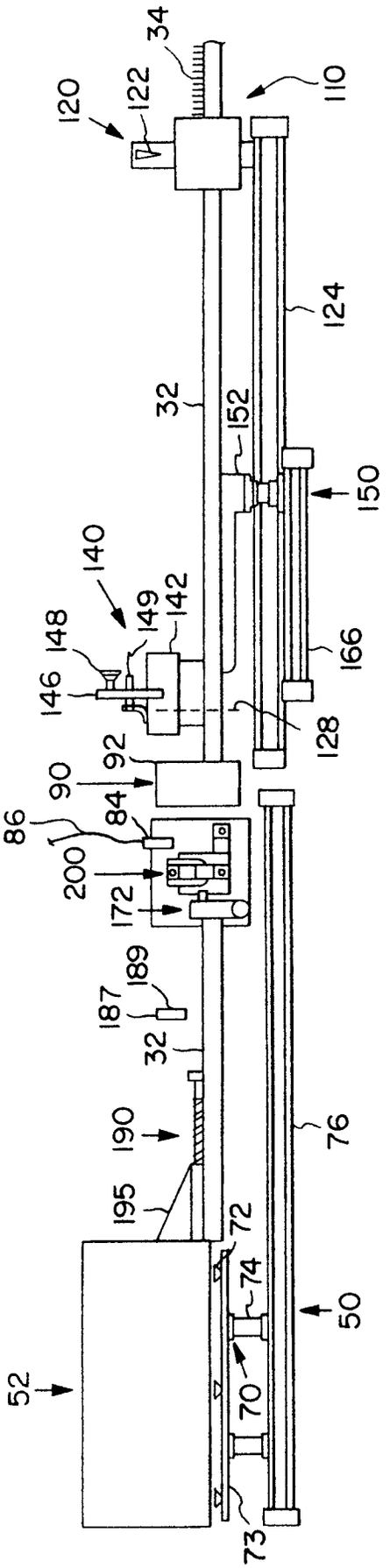
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FIG. 2

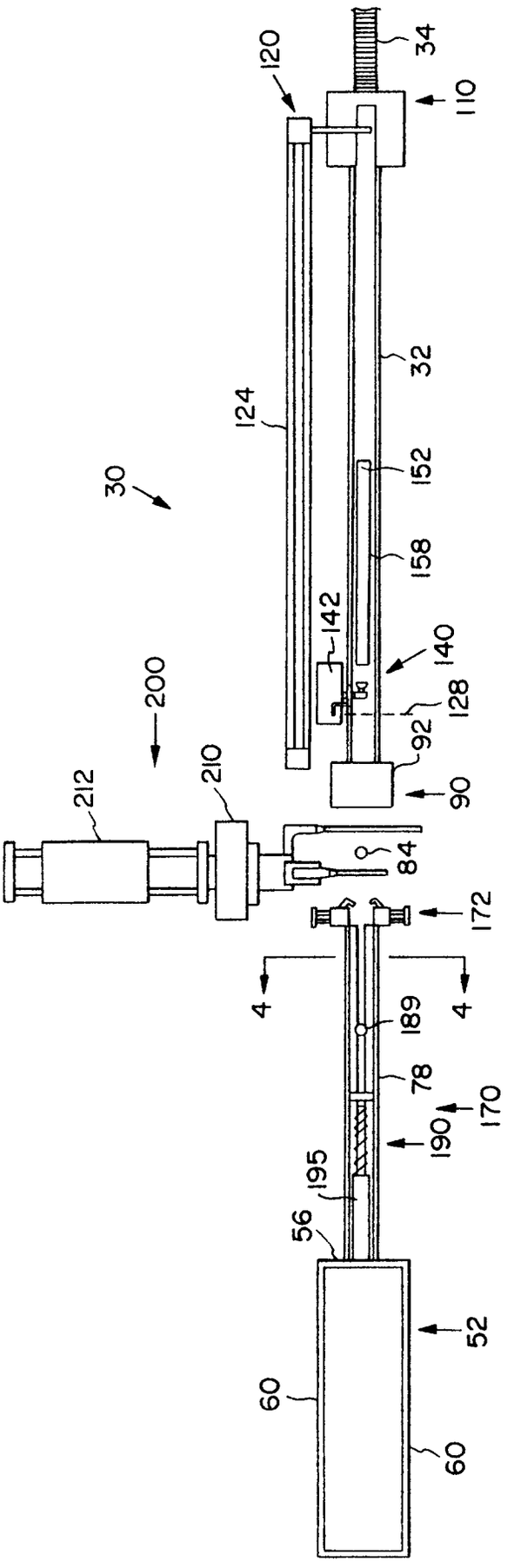
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FIG.3a

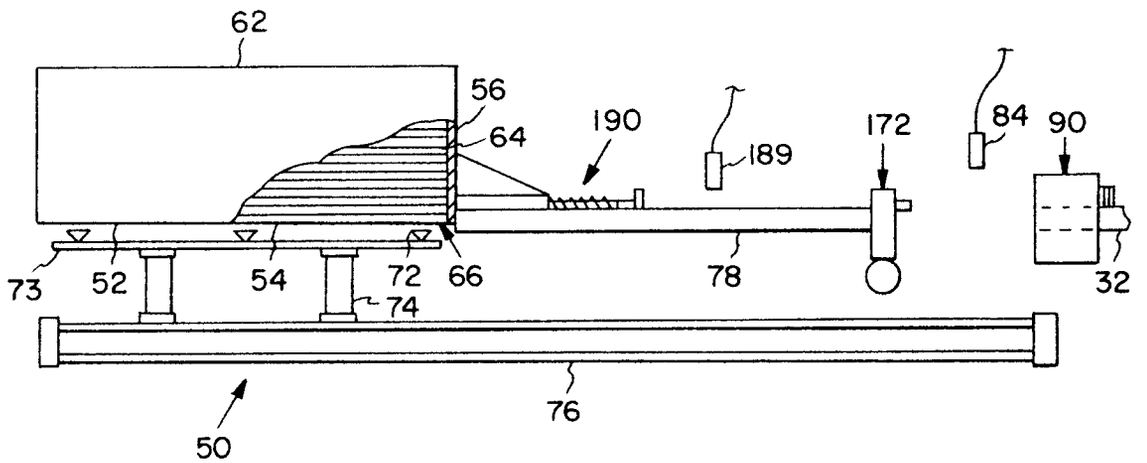
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FIG.3b

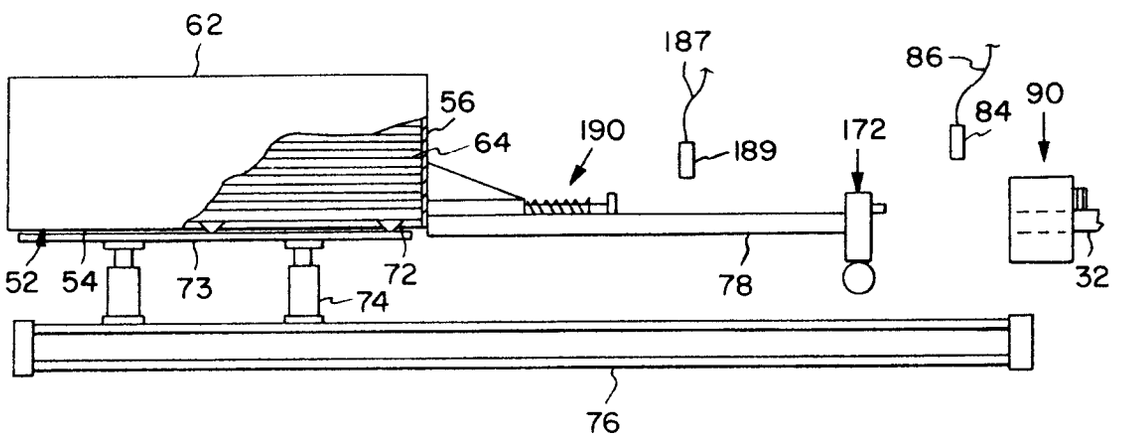
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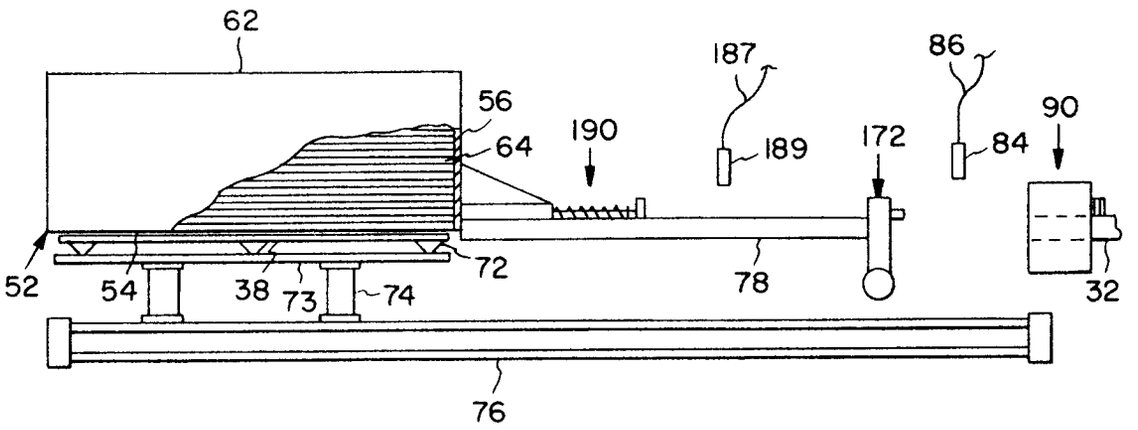
FIG. 3c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172
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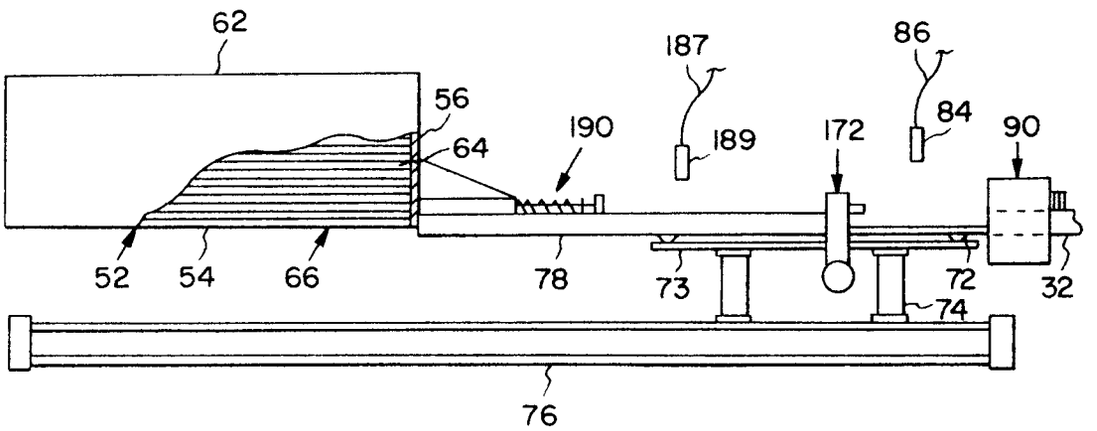
76

FIG. 3d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187
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189
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76

FIG. 4

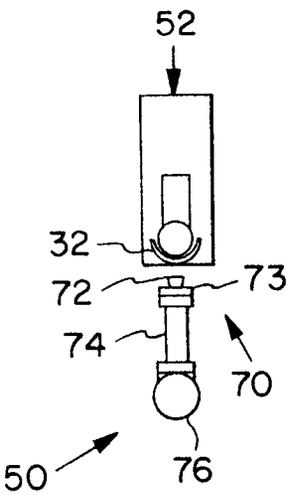

FIG. 5

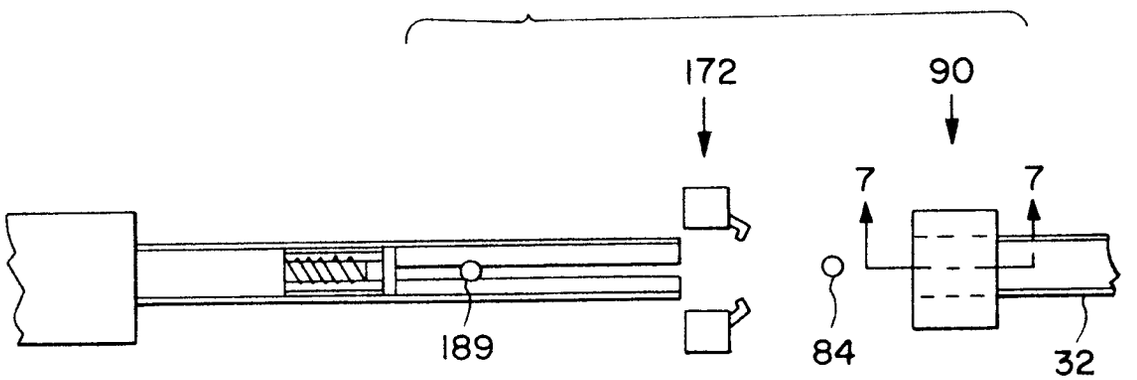

FIG. 6

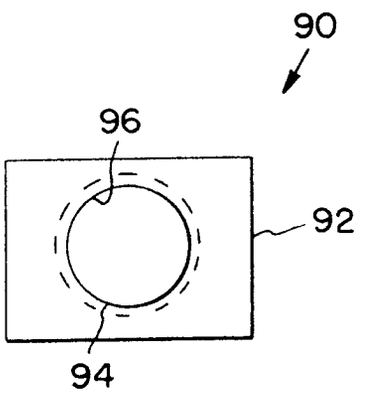

FIG. 7a

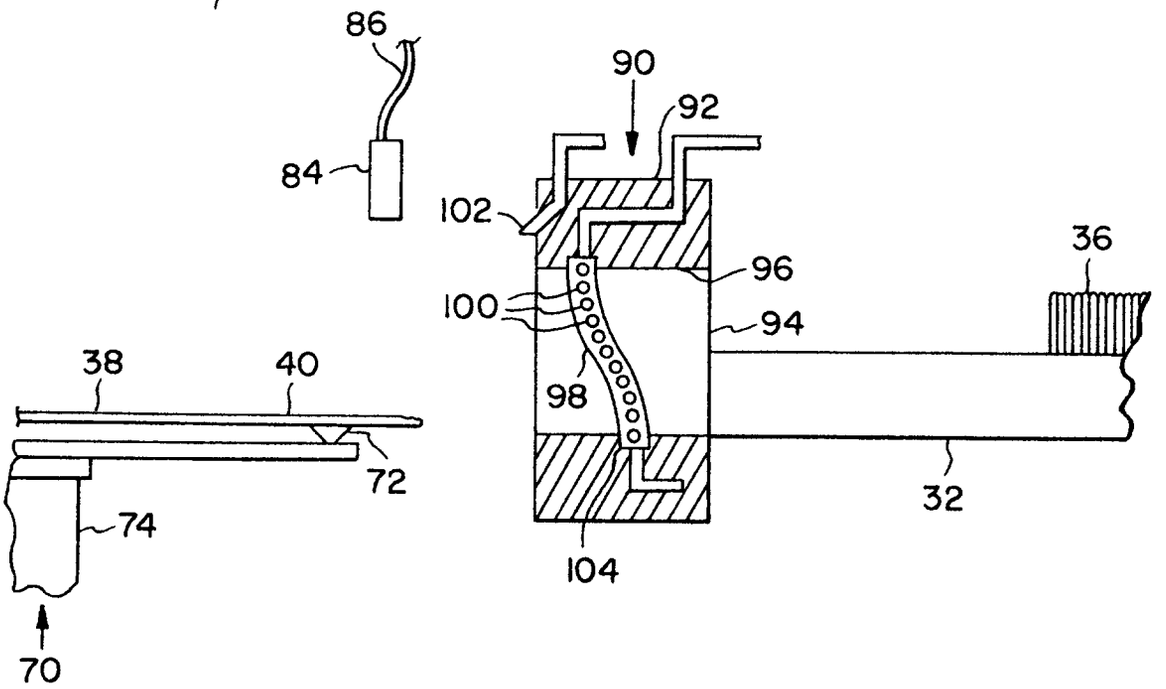
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FIG. 7b

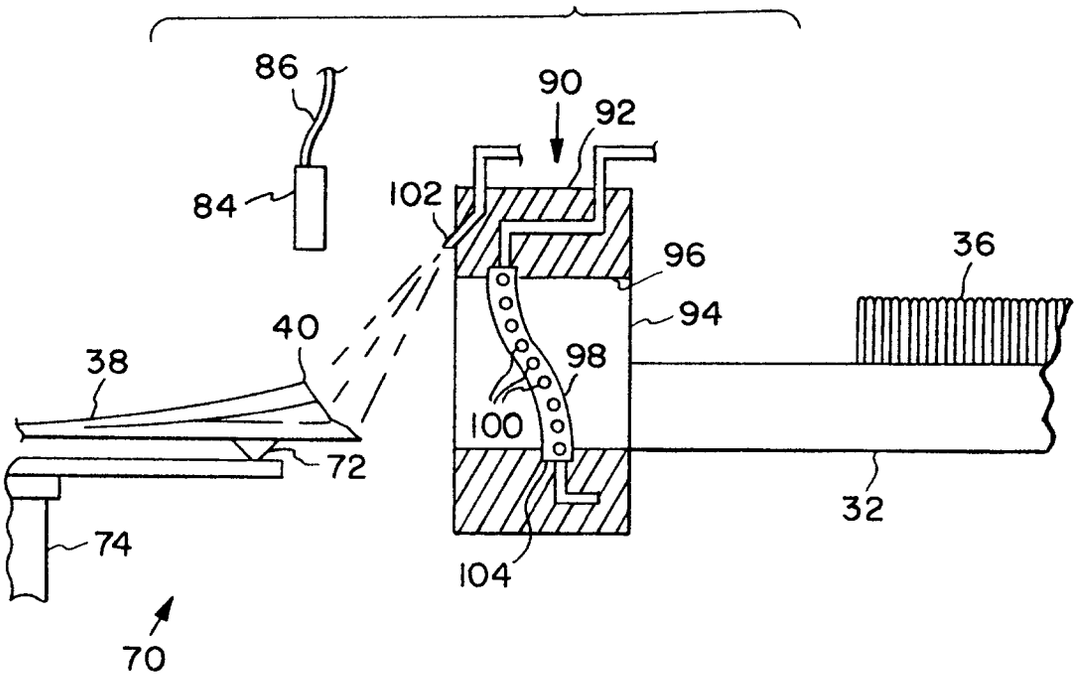
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FIG. 7c

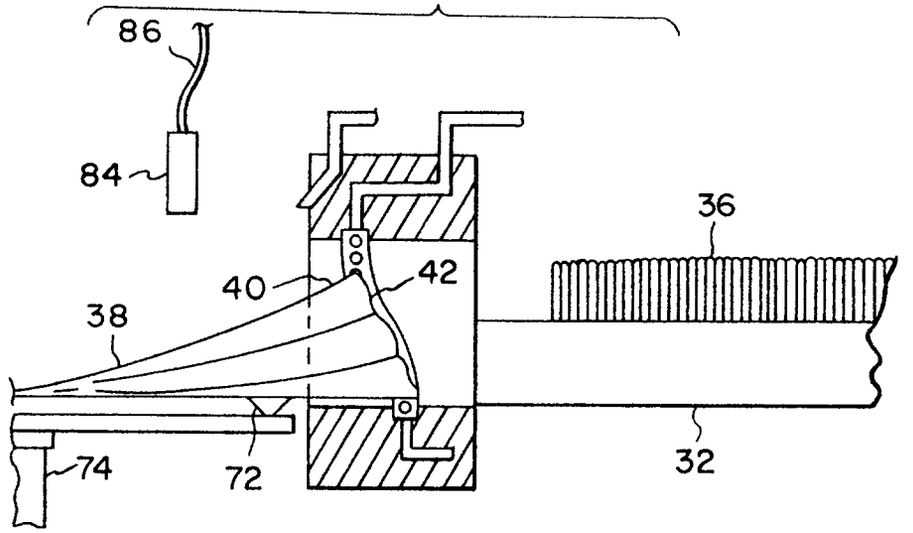


FIG. 7d

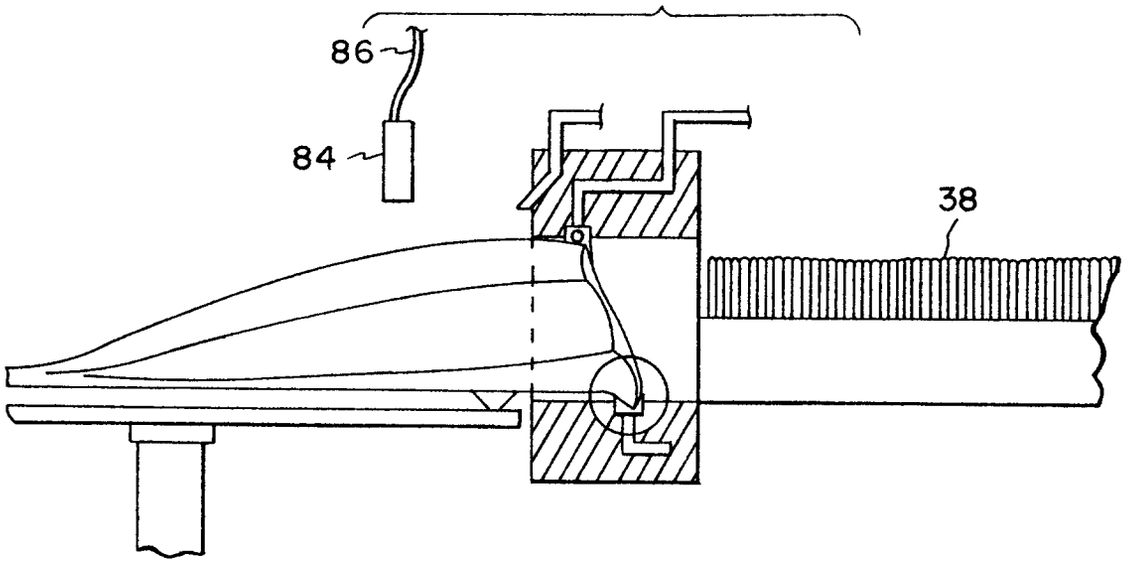
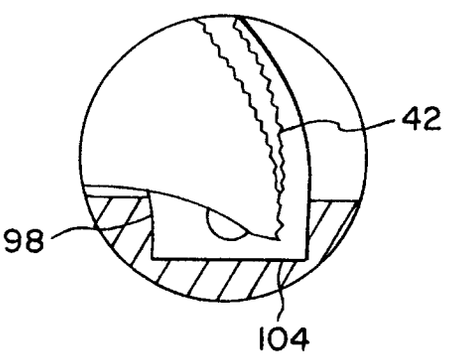


FIG. 8



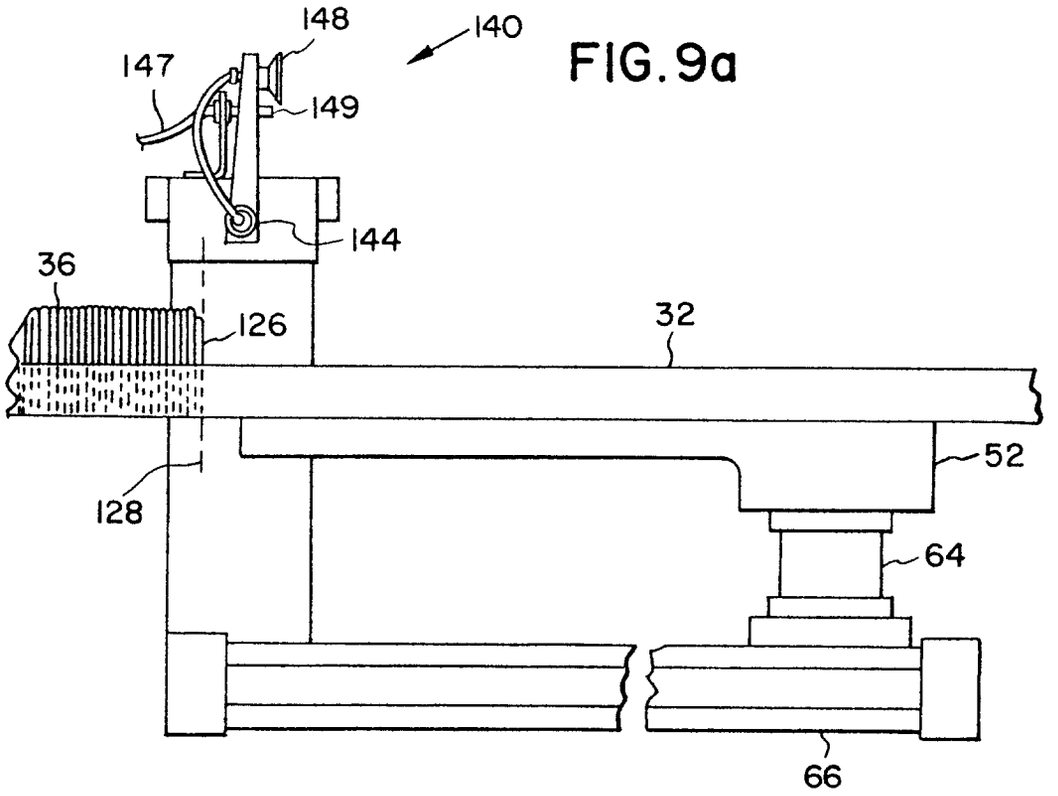

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FIG. 9a

FIG. 9b

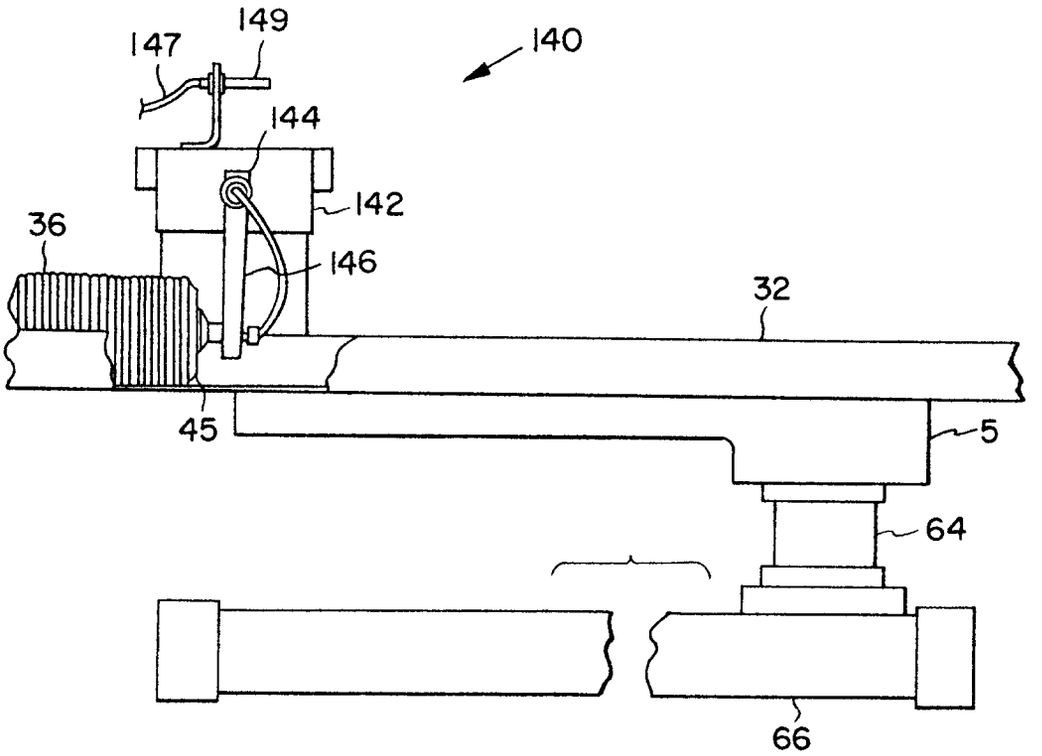
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FIG. 9c

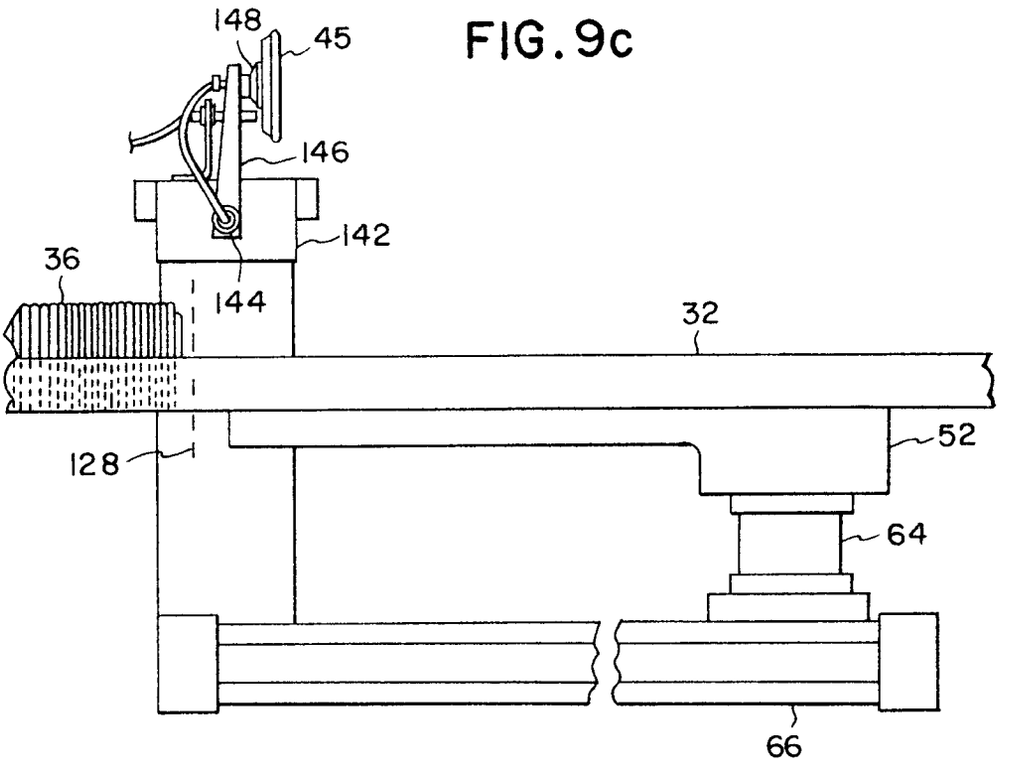

FIG. 10a

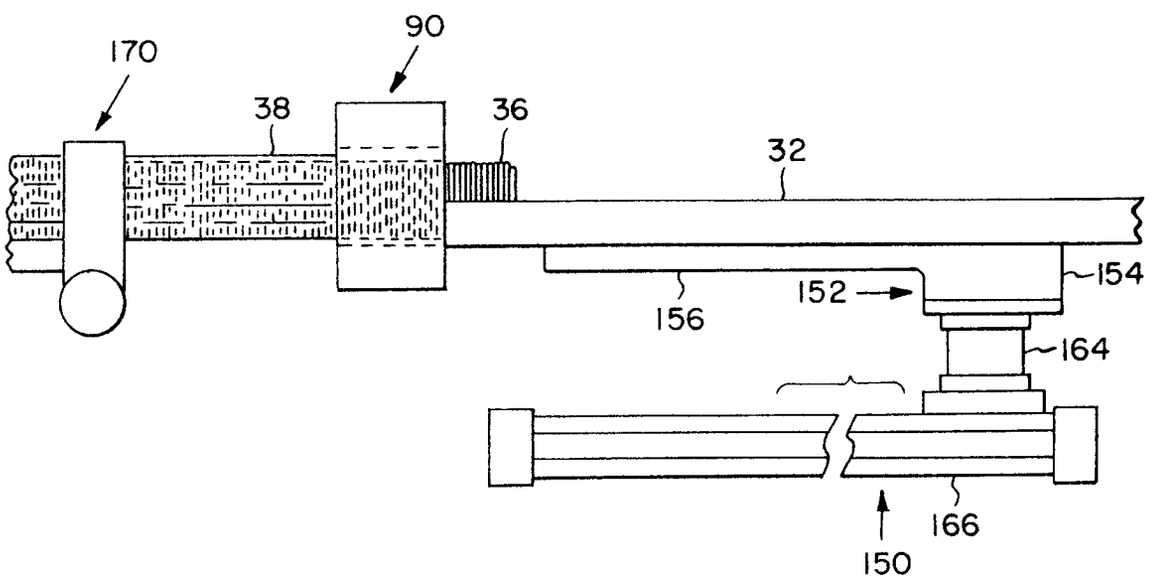

FIG. 10b

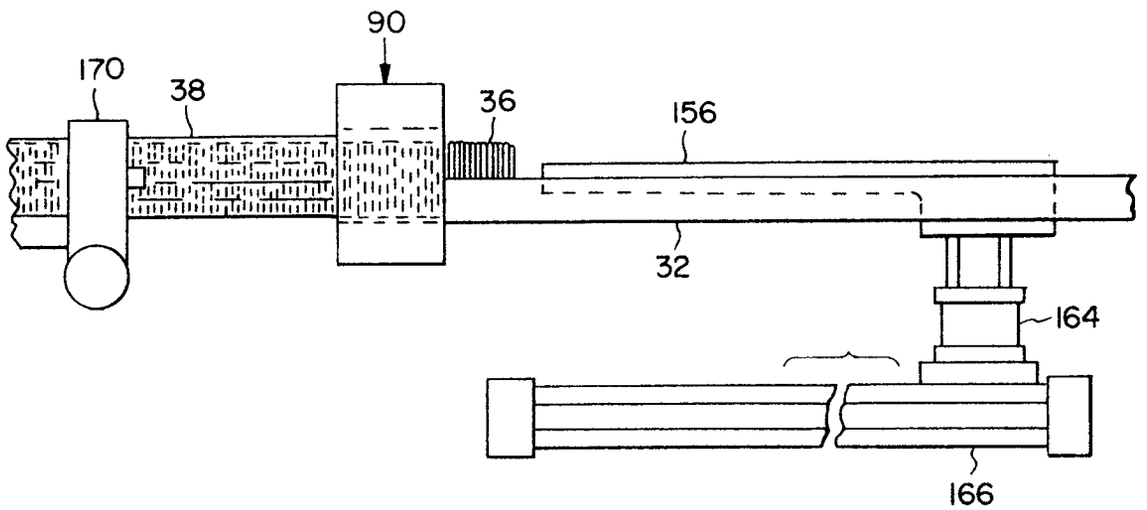

FIG. 10c

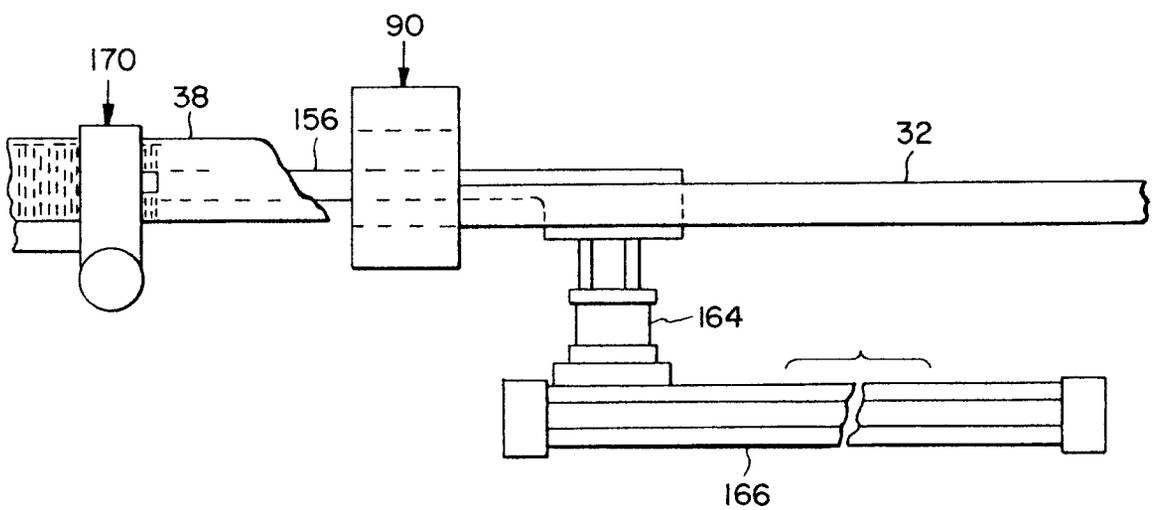

FIG. 11

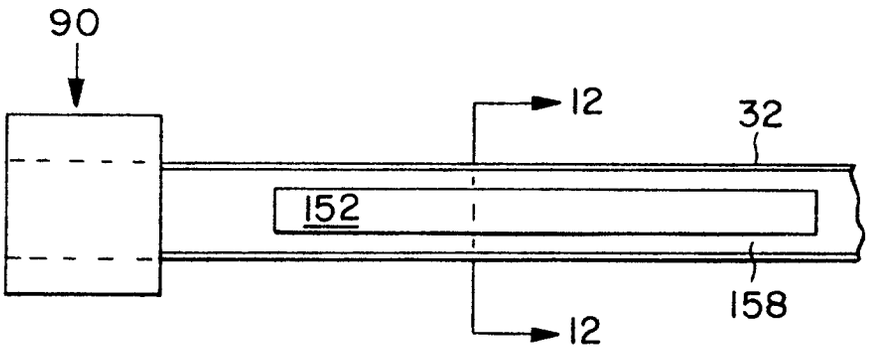

FIG. 12a

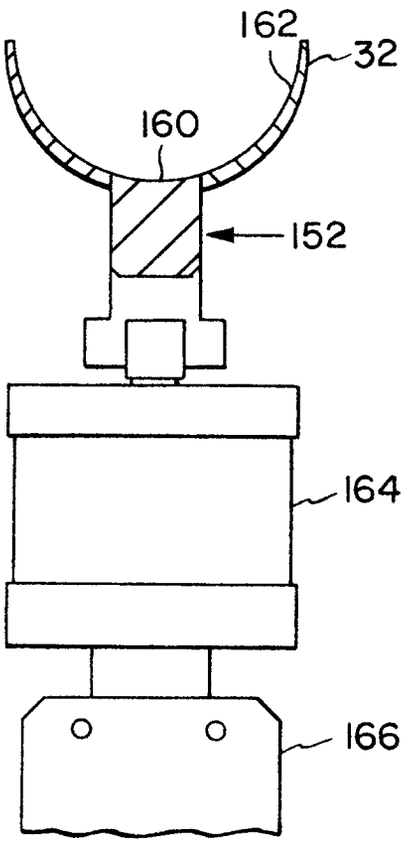

FIG. 12b

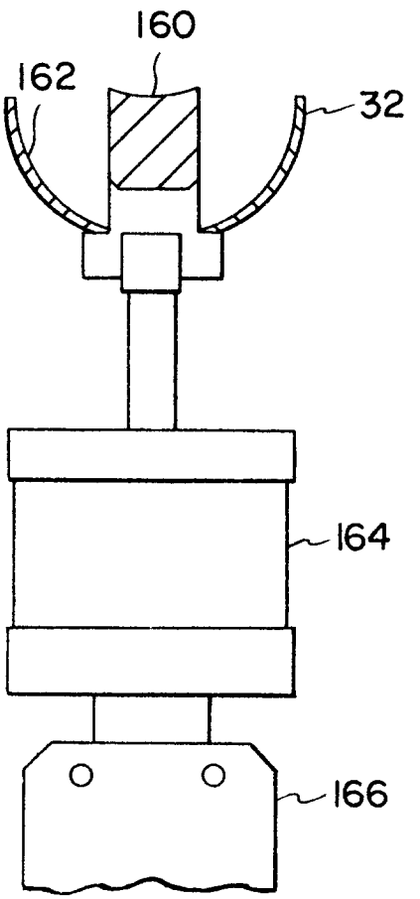

FIG. 13

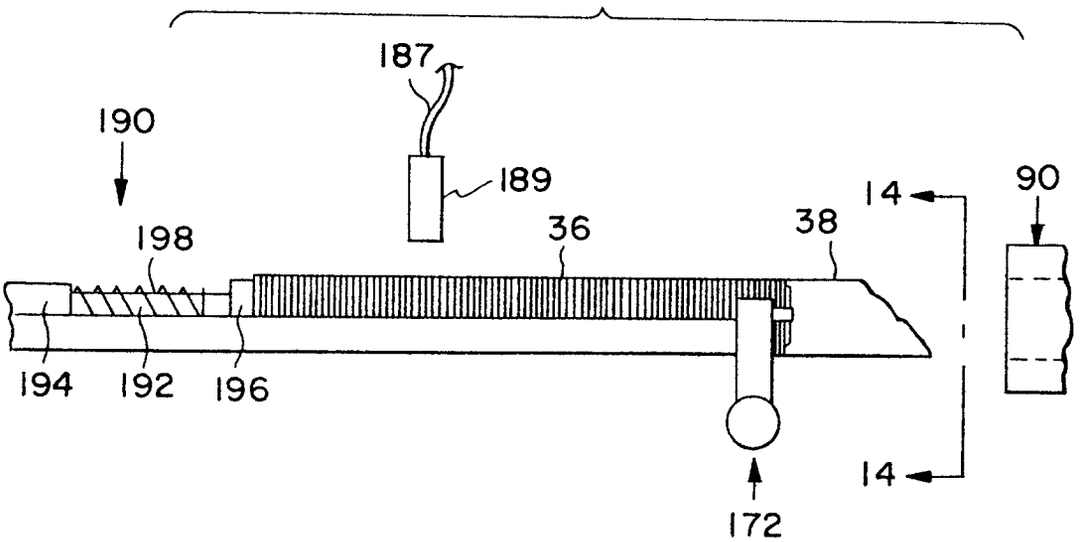
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FIG. 14

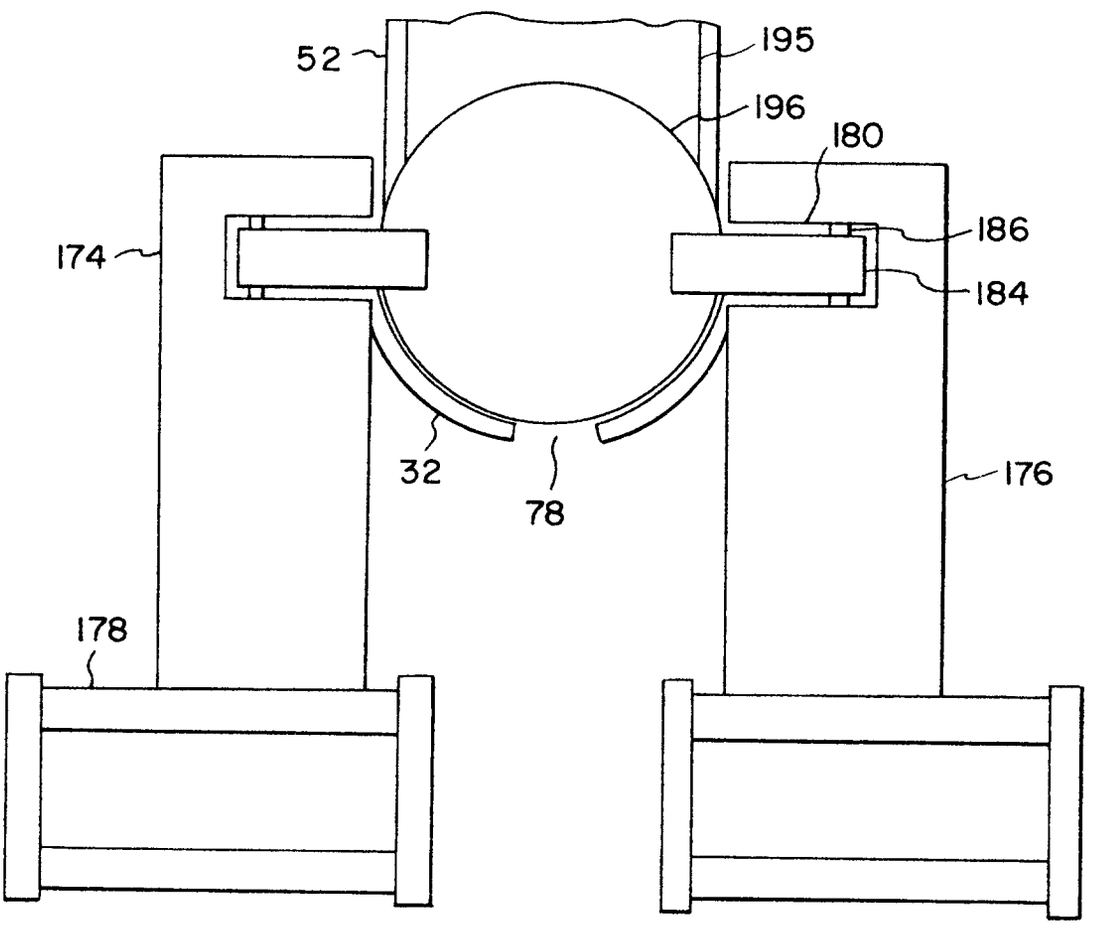
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FIG. 15a

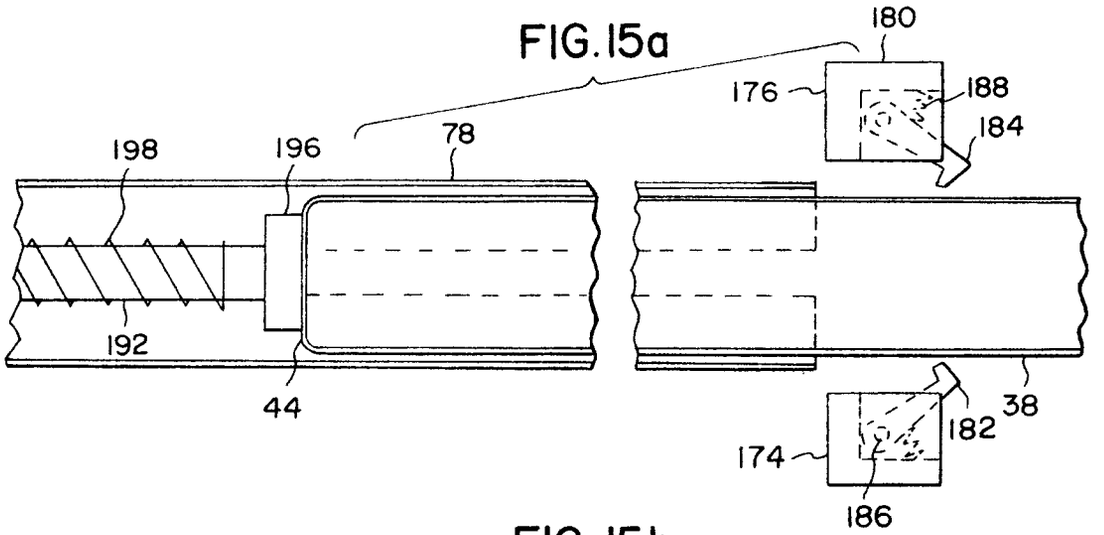


FIG. 15b

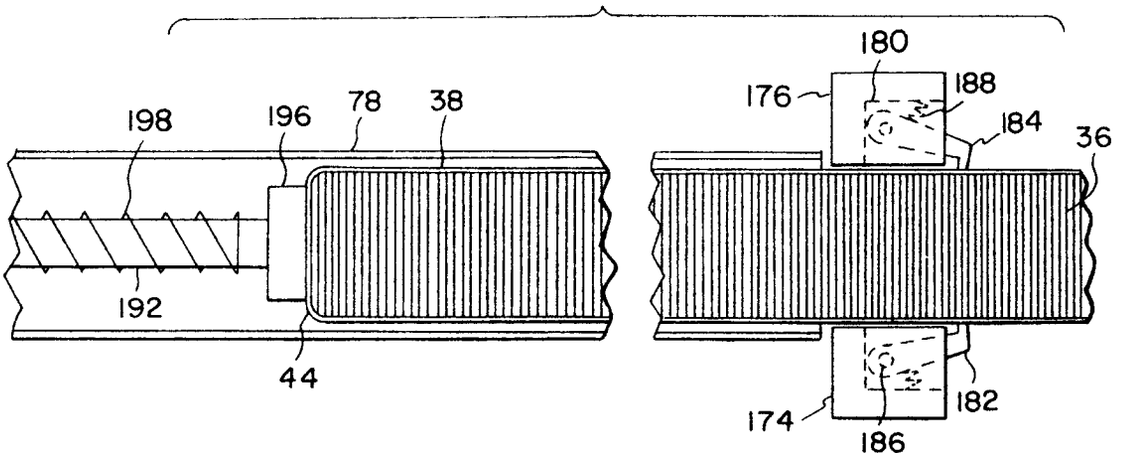


FIG. 15c

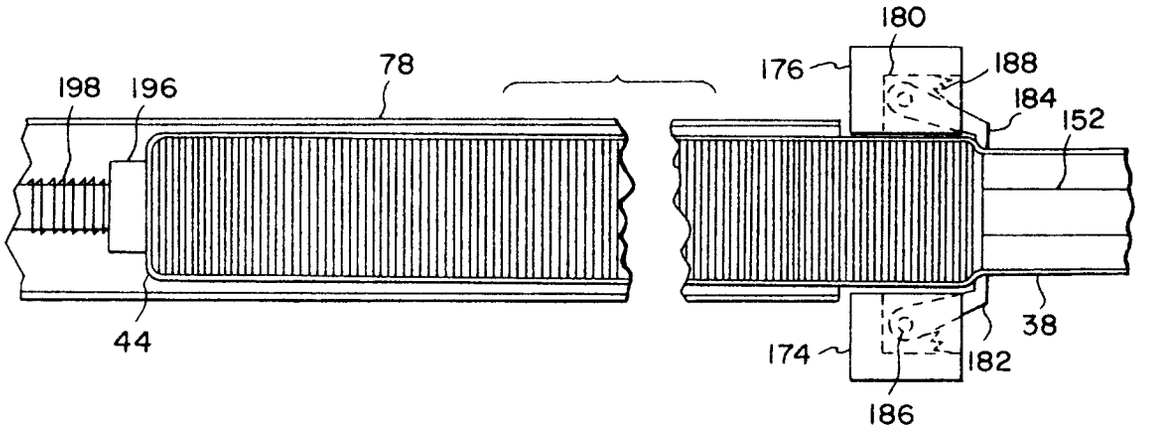


FIG. 16

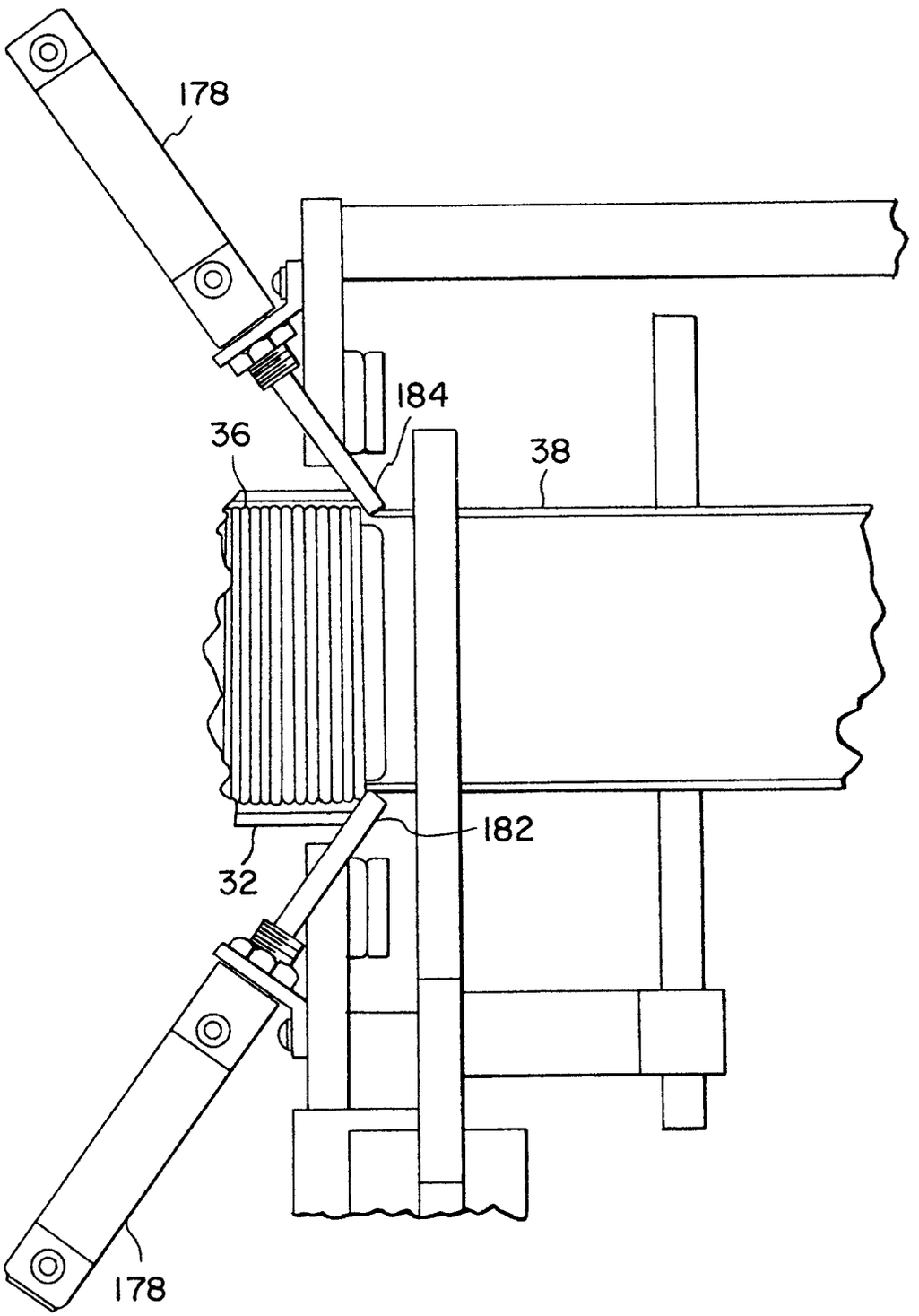


FIG. 17a

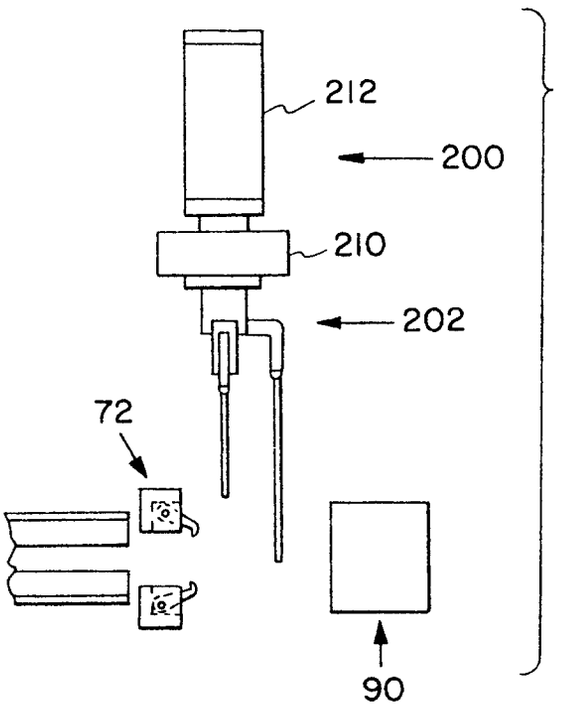


FIG. 17b

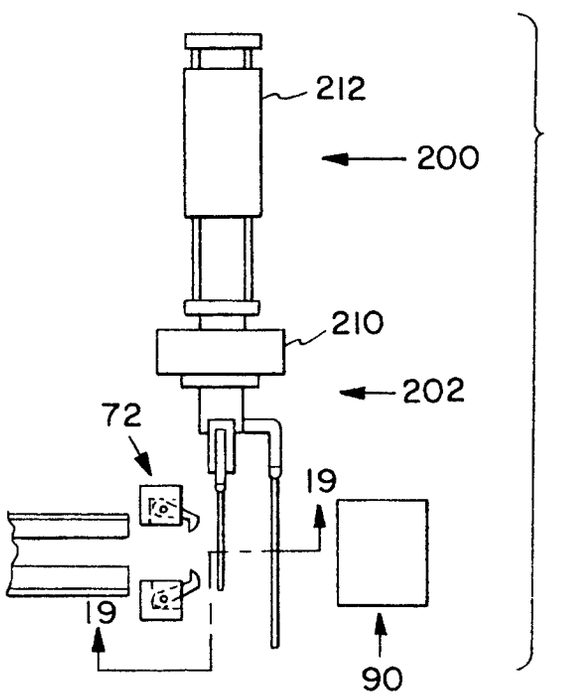


FIG. 18

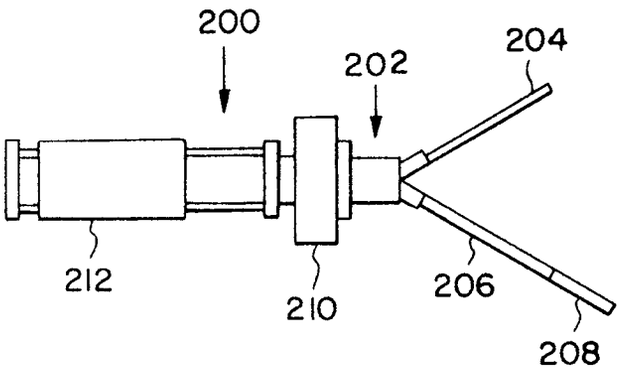


FIG. 19a

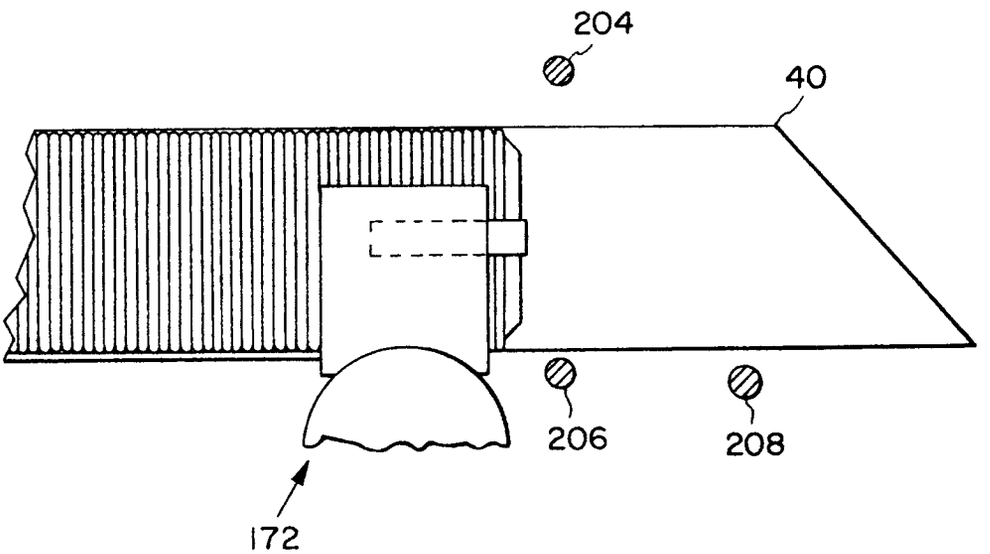


FIG. 19b

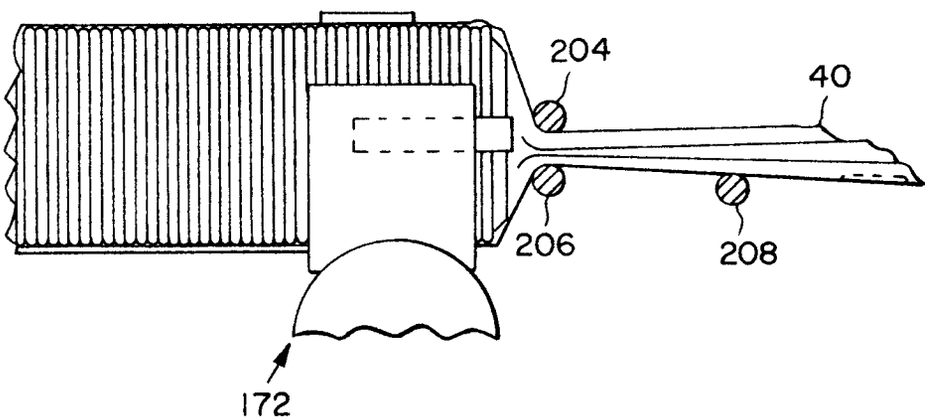


FIG. 19c

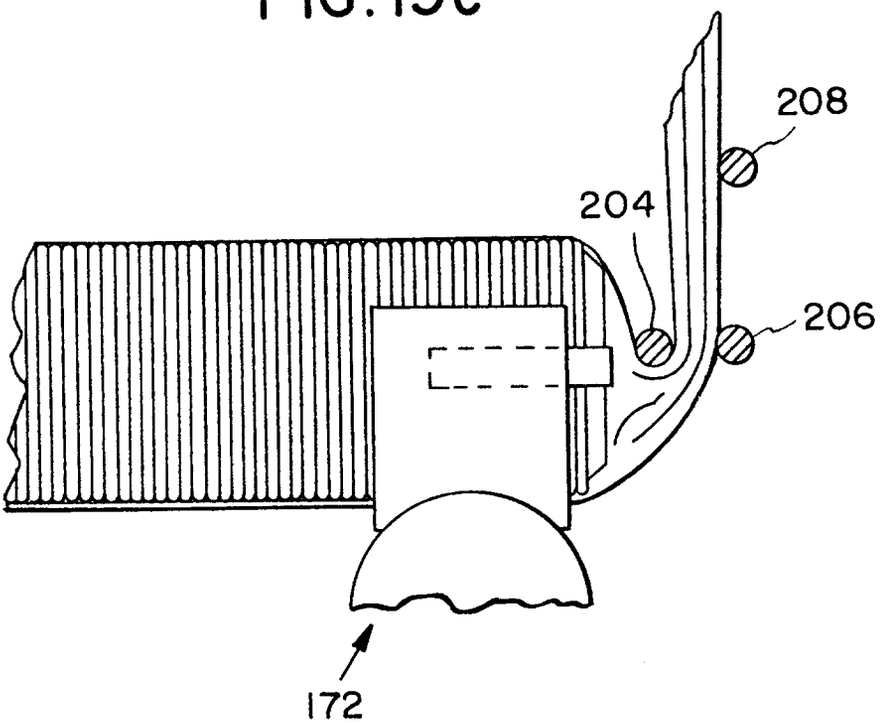
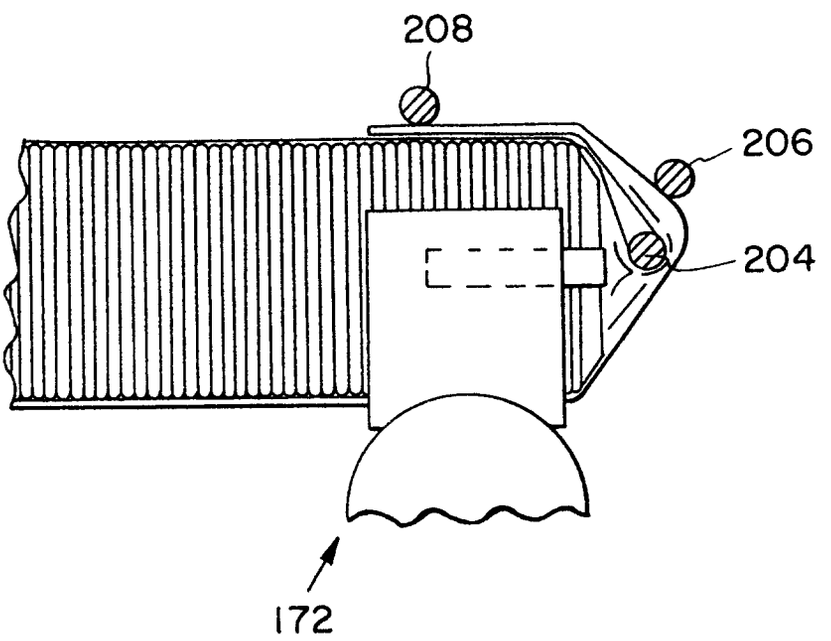


FIG. 19d



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 10 0583

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.5)
Y	US-A-2 643 496 (CLOUD) * column 5, line 32 - column 6, line 5; figure 2 *	1,2,7-10	B65B5/06 B65B39/06 B65B7/08
Y	GB-A-855 174 (ARENCO) * the whole document *	1,2,7-10	
Y	US-A-5 070 677 (HICKS) * figures 4,5 *	2	
D,Y	US-A-3 878 945 (FLEETWOOD) * column 5, line 1 - column 6, line 31; figures 1,2,4-6 *	7-10	
Y	FR-A-1 017 482 (SAPAL) * the whole document *	10	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 May 1994	Claeys, H

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