Oct. 21, 1969 E. CULPEPPER 3,473,290

APPARATUS FOR STACKING AND PACKING ARTICLES

Filed April 7, 1967 2 Sheets-Sheet 1

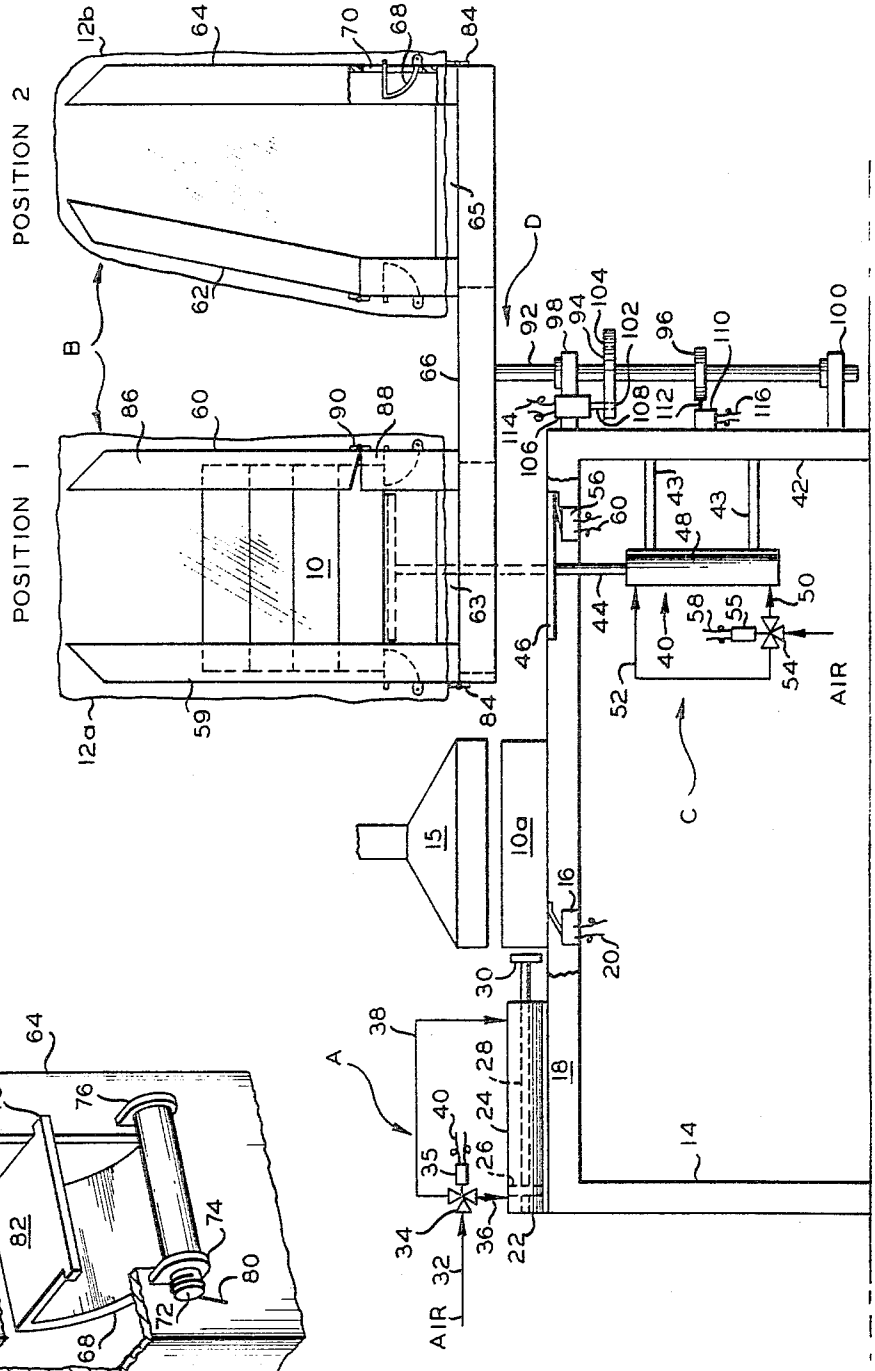

FIG. 1

FIG. 2

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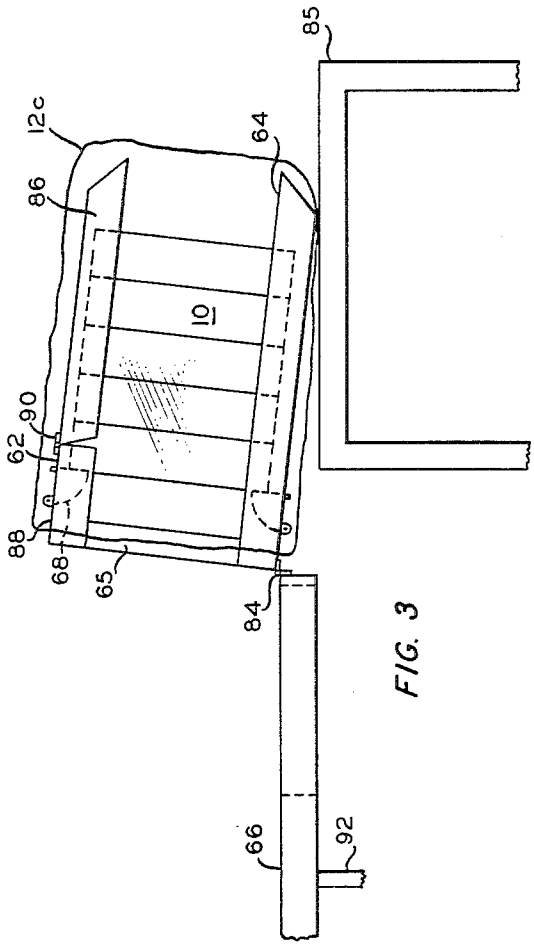

FIG. 3

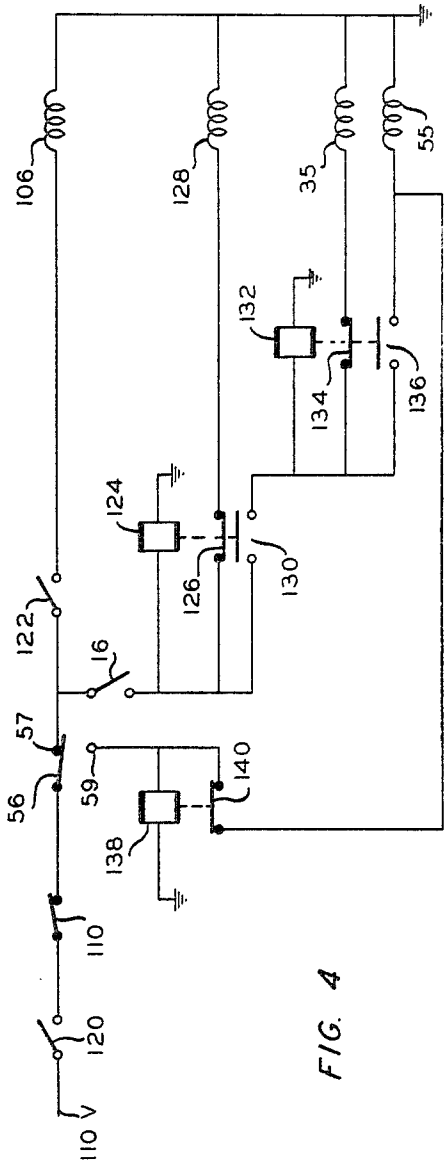

FIG. 4

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APPARATUS FOR STACKING AND PACKING ARTICLES

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U.S. Cl. 53—77 5 Claims

ABSTRACT OF THE DISCLOSURE

Semi-automatic apparatus for stacking and packing articles into containers for shipment or storage whereby the articles are fed automatically into and stacked within one of a plurality of stacking and packing magazines holding the container in an inverted position. The magazines are manually tilted for removal of a filled container and installation of an empty container.

This invention relates to an apparatus for stacking and packing articles. In another aspect, this invention relates to semi-automatic apparatus for stacking and packing articles into containers, such as bags or cartons, for storage or shipment.

After various stages of manufacture, or after cleaning for reuse, some articles are stacked and packaged for shipment or storage. Previously such stacking and packaging has been done by manually inserting and packing the articles in containers supported with their open tops in a convenient position for access by the operator. When high speed production or efficiency is desired, this manual procedure is incapable of meeting such operating goals. The manufacture of plastic bottle-carrying cases is a specific example of an operation wherein high speed and efficient stacking and packing of the cases into storage or shipment containers, after final cleaning, is desired so that a reasonable overall production rate can be efficiently obtained.

Automation of any of the various manual functions involved in the stacking and packaging operation will enhance increased production rates and operating efficiency. Complex apparatus completely automating the entire operation may not be justified economically nor is necessary for many operations. Therefore, simple, semi-automated apparatus capable of performing the most strenuous and time-consuming functions is more desirable for operations of this type. For instance, if the functions of stacking and inserting bottle-carrying cases into plastic bags for storage or shipment are automated, the functions of installing an empty plastic bag for filling and removing a filled bag containing the desired number of cases can be performed manually at a reasonably high production rate.

As is the case with any semi-automatic apparatus where an operator is performing some manual functions, certain safety features must be incorporated to prevent potential personnel injuries.

Accordingly, an object of this invention is to provide apparatus for stacking and packing articles into a shipment or storage container which is capable of efficient and high production.

Another object of this invention is to provide apparatus for stacking and packing articles into a shipment or storage container whereby the operator's activities are limited to removing containers filled with the desired number of articles and installing empty containers for filling.

A further object of this invention is to provide apparatus of the above-mentioned type with safety features which prevent mechanical operation unless in a safe operating condition.

A still further object of this invention is to provide semi-automatic apparatus for stacking and packing bottle-carrying cases into plastic bags for storage or shipment.

Other aspects, objects and several advantages of this invention will be apparent to those skilled in the art from the following detailed description, drawings, and appended claims.

According to this invention, apparatus is provided comprising a rotatable bagging frame having multiple stacking and packing magazines for holding the containers to be filled in an inverted position, mechanical means for transferring the articles to be packed to a platform, which is elevated to insert the article into the inverted container, and retaining means within the packing magazines for retaining the articles in a stacked manner when the platform is retracted to receive the next article. More than one stacking and packing magazine is provided on the rotatable bagging frame so that an empty container can be installed in one position while the container in the other position is being packed. When a container is filled with the desired number of articles, the bagging frame is manually rotated so that an empty container is in the packing position and the filled container is in the unloading position. The stacking and packing magazines are pivotally mounted to the bagging frame so that they can be manually tilted to remove the filled container. Limit switches and solenoid valves are connected electrically and mechanically to insure that the bagging frame cannot be rotated unless the elevator platform is in the retracted position and to insure that the article-transfer mechanism and elevator platform cannot be operated unless the bagging frame is in a safe operating position.

FIGURE 1 is an elevation view, partially in section, of an apparatus embodying this invention.

FIGURE 2 is an enlarged fragmentary view of a rocker arm mounted in a container support member.

FIGURE 3 is an elevation view showing a stacking and packing magazine tilted for removal of a filled container.

FIGURE 4 is a schematic representation of an exemplary electrical circuit for controlling and sequencing the apparatus of this invention.

A preferred or exemplary embodiment of this invention, as shown in the drawings, is a machine for stacking and packing bottle-carrying cases **10** into a packing container, such as a plastic bag **12***a* (FIGURE 1). The apparatus is supported on a stationary framework **14** and comprises, generally, a feed or transfer unit A, stacking and packing magazines B on which bags, **12***a* and **12***b*, are installed in an inverted position, elevating unit C which receives the cases from unit A and elevates same into magazine B and a rotatable bagging unit D to which a plurality of stacking and packing magazines are mounted.

As shown in FIGURE 1, the cases are advanced in a single line processional order to vacuum cleaner **15** by a conventional conveying mechanism (not shown). As case **10***a* is moved into position under vacuum cleaner **15**, electrical limit switch **16**, mounted to horizontal frame member **18**, is depressed to the closed position. Electrical leads **20** connect limit switch **16** to an electrical circuit for sequencing and control of the machine as described hereinafter.

Transfer unit A includes pneumatic ram **22**, comprising cylinder **24**, piston **26**, piston rod **28**, and pusher blade **30**, mounted to horizontal frame member **18**.

Pressurized gas, such as compressed air, is supplied from a suitable source (not shown) through conduit **32**, solenoid-operated, three-way valve **34**, and conduits **36** and **38** to cylinder **24**. The description hereinafter will refer to the pressurized gas as air. Piston **26** and pusher blade **30** are reciprocated by the admission and exhaust

of air to and from cylinder 24 through conduits 36 and 38. Electrical leads 40 connect solenoid 35 on valve 34 into an electrical circuit for sequencing and control of the machine as described hereinafter.

When solenoid 35 is de-energized, air is supplied through conduits 32 and 38 to cylinder 24 and piston 26 is moved to the position shown. Any pressure on the back side of piston 26 is vented to atmosphere through conduit 36 and a vent port (not shown) in valve 34. When solenoid 35 on valve 34 is electrically energized, by means and in a manner described hereinafter, air is supplied through conduits 32 and 36 and piston 26 and pusher blade 30 are moved to the right (as viewed in FIGURE 1); meanwhile, pressure on the other side of piston 26 is vented to atmosphere through conduit 38 and a vent port (not shown) in valve 34.

As pusher blade 30 moves to the right, case 10*a* is transferred to the elevating unit C and limit switch 16 returns to the normally-open position. The travel of piston 26 is adjusted so that the case is properly positioned in elevating unit C. Upon de-energization of solenoid 35, pusher blade reciprocates as described above.

Elevating unit C includes pneumatic ram 40, mounted to vertical support member 42 by brackets 43, which operates in a manner similar to transfer unit pneumatic ram 22. That is, piston rod 44 and elevator platform 46 mounted thereto are reciprocated by the admission and exhaust of air to and from cylinder 48 through conduits 50 and 52 as controlled by solenoid-operated, three-way valve 54 in a manner similar to that described in regard to pneumatic ram 22. When solenoid 55 on valve 54 is de-energized, elevator platform 46 is in the lowered position; when solenoid 55 is energized, elevator platform 46 is in the raised position as shown by the dotted lines. Electrical leads 58 connect solenoid 55 into electrical circuit for sequencing and control of the machine as described hereinafter.

Electrical limit switch 56, mounted to horizontal frame member 18, is depressed to one position when elevator platform 46 is in the lowered position. As elevator platform 46 starts to move upward when solenoid 55 is energized, limit switch 56 actuates to another position. Electrical leads 60 connect limit switch 56 into an electrical circuit for sequencing and control of the machine as described hereinafter.

As elevator platform 46 is raised with a case thereon, the case enters a stacking and packing magazine B, as shown in FIGURE 1 at "Position 1." Each of these units comprises four vertical guide members 59, 60, 62, and 64 and four horizontal members (two of which are shown, 63 and 65). These guide members may be constructed from any rigid material having reasonable structural integrity, preferably iron, steel, or aluminum. Although other configurations can be used, the guide members are preferably L-shaped to facilitate the installation of the bags and alignment of quadrilateral objects to be stacked.

The four vertical guide members and horizontal members for each stacking and packing magazine are arranged so that the quadrilateral described thereby conforms to the shape of the case being packed, i.e. if square cases are being packed they are arranged to form a square; if rectangular cases are being packed they are arranged to form a rectangle of the same shape, etc. The vertical guide members are arranged so that the transverse inside dimensions therebetween are slightly larger than the outside transverse dimensions of the case being packed. The height of the vertical guide members is greater than the stack of cases to be packed. These guide members, so arranged and dimensioned, provide the means for guiding the cases into stack formation as they are fed into the stacking and packing magazine.

A rocker arm 68 is pivotally mounted to the outside of each guide member and extends through an opening 70 therein (FIGURES 1 and 2). All the rocker arms are identical, so for purposes of brevity the construction and operation of only one will be described. As shown in FIGURE 2, pin 72, extending through the lower portion of rocker arm 68 and clevises 74 and 76 mounted to guide member 64, provides the pivot point for rotation of rocker arm 68. The upper portion of rocker arm 68 has a lip 78 which is longer than the width of opening 70 and acts as a mechanical stop when contacting the outside surface of guide member 64. Torsion spring 80 is attached to pin 72 and rocker arm 68 so that lip 78 is urged against the surface of vertical guide member 64.

The rocker arms extend into the path of the case so that as a case is raised by elevator platform they are rotated by the force of the upward-moving case to allow passage thereby. When the case is forced past the rocker arms, the arms are snapped back to the original position by the torsion springs and provide a seat 82 for the elevated case 10*b* to prevent same from dropping back when elevator platform 46 is retracted, as shown in FIGURE 1 at "Position 1."

As shown in FIGURE 1, one side of each stacking and packing magazine B is mounted to bagging unit frame 66 by hinges 84. Even though not necessary if the magazine is reasonably heavy, the other side of each stacking and packing magazine can be held in contact with bagging unit frame 66 by any conventional latching means, such as spring clips (not shown). This permits the entire stacking and packing magazine to be manually tilted as much as 90 degrees or more onto an unloading table 85, as shown in FIGURE 3, where the bag 12*c* filled with cases 10 is removed and an empty bag installed and the magazine manually returned to an upright position as shown in FIGURE 1 at "Position 2."

Vertical guide members 60 and 62, those on the side of the stacking and packing magazine not hinged to bagging unit frame 66, have upper and lower sections, 86 and 88, which are joined by hinge 90. The upper section 86 is mitered so that it will drop inwardly, as shown at "Position 2" in FIGURE 1, when the stacking and packing magazine is tilted and the filled bag is removed. This facilitates the installation of an empty bag 12*b*. As the cases are raised into the stacking and packing magazine B by elevator platform 46, the upper sections 86 are forced outward and assume the position shown in FIGURE 1 at "Position 1."

Bagging unit D has at least two stacking and packing magazines so that a bag can be filled at one position, e.g. "Position 1" in FIGURE 1, while a filled bag is being removed and an empty bag installed as described previously, e.g. "Position 2" in FIGURE 1. This unit comprises bagging frame 66, collar 94, and cam 96, all mounted to shaft 92; electrical solenoid 106; and electrical limit switch 110. Shaft 92 is rotatably mounted to support brackets 98 and 100 which in turn are mounted to support 42. Conventional bearings, bearing sleeves, etc., required for load support as will be apparent to those skilled in the art are not shown for the sake of brevity.

Collar 94 contains holes 102 and 104 which are positioned 180 degrees apart corresponding to bagging unit "Position 1" and "Position 2," respectively. Electrical solenoid 106, mounted to support bracket 98, is aligned so that plunger 108 extends into one of the holes 102 or 104, in collar 94, i.e. when solenoid 106 is de-energized and bagging unit is in the position shown in FIGURE 1, plunger 108 extends into hole 102; when bagging unit D is rotated 180 degrees so that "Position 2" is in the loading position and solenoid 106 is de-energized, plunger 108 extends into hole 104. Electrical leads 114 connect solenoid 106 into an electrical circuit as described hereinafter. This provides the safety feature of preventing the bagging unit from being manually rotated unless solenoid 106 is energized.

Cam 96 is oval-shaped and is mounted to shaft 92 so that its maximum radii correspond to bagging unit "Position 1" and "Position 2." When the bagging unit is in either

of these two positions cam 96 engages plunger 112 of electrical limit switch 110 and actuates the switch to the closed position. If the bagging unit is in any other position, limit switch 100 is in the open position. Electrical leads 116 connect limit switch 110 into an electrical circuit as described hereinafter.

FIGURE 4 schematically exemplifies an electrical circuit for connecting the various limit switches and solenoids of this machine for control and sequencing. Where applicable corresponding reference numerals for the limit switches and solenoids shown in FIGURE 1 are used.

Main power switch 120 controls the supply of power from a suitable power source (not shown) to the electrical components. Manual on-off switch 122, which controls the supply of power to solenoid 106, is connected to limit switches 110 and 56 so that switch 56 must be in the closed position and contact 57 of limit switch 56 in the closed position before solenoid 106 can be energized by closing switch 122.

Impulse timing relay 124 is connected to the closed contact of limit switch 16. The normally-closed contacts 126 of timing relay 124 are connected to solenoid 128 which starts vacuum cleaner 15 when energized. Impulse timing relay 132 is connected to the normally-open contacts 130 of timing relay 124. The normally-closed contacts 134 of timing relay 132 are connected to solenoid 35. The normally-open contacts 136 of timing relay 132 are connected to solenoid 55. Impulse timing relay 138 is connected to contact 59 of limit switch 56 and its normally-closed contacts 140 are connected to solenoid 55. Impulse timing relays 124, 132, and 138 are conventional type relays that provide a fixed delay between the closing of a control circuit and the opening or closing of one or more load circuits. Such relays consist of a synchronous motor driving an adjustable arm that activates the switches.

Reference is made to FIGURES 1 and 3 for the following description summarizing the operation of the machine. At the start of the operating cycle, elevator platform 46 is in the lowered position and contact 57 of limit switch 56 is in the closed position as shown in FIGURE 4. With bagging unit D in the proper operating position, cam 96 on shaft 92 depresses plunger 112 on limit switch 110 and the switch is in the closed position as shown in FIGURE 4. Main power switch 120 is switched to the "on" position and the machine is ready for operation.

As a case is conveyed, by means not shown, into position under vacuum cleaner 15, limit switch 16 is depressed and moves to the "closed" position and power is supplied to and initiates timing relay 124 from power source (not shown) through closed switches 120, 110, 56, and 16. Simultaneously, power is applied to and energizes solenoid valve 128, which starts vacuum cleaner 15, through closed switches 120, 110, 56, 16, and normally-closed contacts 126 of relay 124.

When timing relay 124 times out, its normally-closed contacts 126 open interrupting power to solenoid valve 128, thereby de-energizing solenoid valve 128 and stopping vacuum cleaner 15. Simultaneously, the normally-open contacts 130 of relay 124 close, power is supplied to and initiates timing relay 132, and power is supplied to and energizes solenoid 35 through normally-closed contacts 134 of timing relay 132. As solenoid 35 is energized and valve 34 is actuated thereby, air is supplied to cylinder 24 of transfer unit pneumatic ram 22 through conduit 36 and pusher blade 30 moves to the right, as explained above, transferring case 10*a* to elevator platform 46.

When timing relay 132 times out, its normally-closed contacts 134 open interrupting power to solenoid 35. As solenoid 35 is de-energized and valve 34 actuated thereby, air is supplied to cylinder 24 of transfer unit pneumatic ram 22 through conduit 38 and pusher blade 30 is reciprocated as explained above. Simultaneously, with the time-out of relay 132, its normally-open contacts 136 close and power is supplied therethrough to energize solenoid 55. As solenoid 55 is energized and valve 54 is actuated thereby, air is supplied to cylinder 48 of elevating pneumatic ram 40 through conduit 50 and elevator platform 46 is raised with a case thereon into stacking and packing magazine shown at "Position 1" in FIGURE 1. Rocker arms 68 are rotated by the force of the rising case to allow the upward passage of the case and snap back to their original positions to provide a seat for the elevated case as explained above.

As elevator platform 46 starts its upward motion, limit switch 56 moves from a closed position with contact 57 to a closed position with contact 59 and power is supplied through closed switches 120 and 110 and switch 56 to initiate timing relay 138. Simultaneously, power is supplied through the normally-closed contacts 140 of relay 138 thereby maintaining power to solenoid 55 after relay 132 returns to its de-energized position. When timing relay 138 times out, its normally-closed contacts 140 open interrupting power to solenoid 55. As solenoid 55 is de-energized and valve 54 actuated thereby, air is supplied to cylinder 48 of elevating unit pneumatic ram 40 through conduit 52 and elevator platform 46 is lowered as explained above. When elevator platform 46 is lowered, contacts 57 of limit switch 56 are closed permitting timing relay 124 to be initiated to start the operating cycle again when limit switch 16 is closed as a case is moved into position.

After the desired number of cases have been packed in bag 12*a* in the manner described, switch 122 is manually moved to the "on" position and solenoid 106 is energized, retracting plunger 108 from collar 94 on shaft 92. The bagging unit D may then be manually rotated so that the stacking and packing magazine at "Position 2" in FIGURE 1 is in the filling position. The stacking and packing magazine can be manually tilted, the filled bag removed, an empty bag installed, and returned to the upright position as described above.

While the bagging unit is being rotated, cam 96 on shaft 92 disengages from plunger 108 on limit switch 110 and the switch opens. As can be seen from FIGURE 4, opening of limit switch 110 interrupts power to the electrical circuit. This safety feature insures that none of the equipment can be electrically energized until the operator has returned the bagging unit to a safe operating position. Also, as shown in FIGURE 4, solenoid 106 cannot be energized, by closing switch 122, to allow rotation of the bagging unit unless contact 57 of limit switch 56 is in the closed position, i.e. elevator platform 46 is in the lowered position. This safety feature insures that the operator cannot rotate the bagging unit while the elevator platform is operating.

It will be seen from the foregoing description that the apparatus of this invention comprises simplified construction and conventional, inexpensive equipment yet provides an improved means with built-in operator safety features for stacking and packing articles in containers for storage or shipment.

It is not intended to limit this invention to any specific type of limit switch, for any suitable electrical limit switches can be employed. Furthermore, it is to be understood that the invention is not limited to the specific type of rams and valves which have been illustrated and described. The transfer unit A and elevating unit can be operated and controlled by other conventional type equipment, such as hydraulically-operated rams and valves.

For purposes of illustration and discussion the operation of the apparatus of this invention has been described in connection with bagging bottle-carrying cases. It should be understood that any reasonably flat article can be stacked and packed with the apparatus of this invention. Also various containers, including cloth bags, paper bags, cardboard cartons, etc., can be used with this apparatus.

Reasonable variations and modifications are possible

within the scope of this invention without departing from the spirit and scope thereof.

I claim:

1. Apparatus for stacking and packing articles comprising, in combination:

(a) a rotatable frame;

(b) a plurality of magazines for receiving and forming a stack of articles therein pivotally mounted to said rotatable frame, each of said magazines having an article inlet and an article outlet at the opposite end and including a plurality of vertical members, which are arranged to define the walls of said magazine, for guiding the articles into stack formation and for holding a packing container in the inverted position over and substantially encompassing said magazine;

(c) reciprocating means for feeding articles into one of said magazines, rotated into position and aligned therewith, through said article inlet;

(d) a plurality of retaining arms, carried by said vertical members in each said magazine adjacent to said article inlet and disposed in the path of articles being fed into said magazine, which are yieldable to the passage of incoming articles and provide support to the stack of articles as it builds up;

(e) means for transferring articles to said feeding means; and

(f) means for sequencing the operation of said transfer means so that the movement of articles transferred thereby is synchronized with the reciprocating movement of said feeding means.

2. The apparatus according to claim 1 wherein said feeding means comprises a platform motivated to and from a lowered position below said frame by a vertical, fluid-activated ram.

3. The apparatus according to claim 2 further comprising a means for locking said rotatable frame so that when one of said magazines is rotated into position and aligned with said platform, said rotatable frame is immovable until said platform is in the lowered position.

4. The apparatus according to claim 3 wherein said transfer means comprises a pusher blade mounted to a fluid-activated ram.

5. The apparatus according to claim 4 further comprising a means for inactivating said feeding means and said transfer means when said rotatable frame is positioned so that none of said magazines are aligned with said feed means.

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