This invention relates to methods and apparatus for baling or packaging staple fiber and the like, and other fibrous or particulate material, such as grass, hay, alfalfa, etc.

This application is a continuation-in-part of my copending application Serial No. 58,594, filed November 5, 1948.

It is an object of the invention to provide an improved system of packaging fibrous materials, which term in the present specification and the claims is intended to be generic to all types of materials which it may be desirable to compress for the preparation of a package for storage, shipment and the like. A more particular object of the invention is to provide an improved system of packaging in which the material to be packaged is preliminarily compressed and then transferred after compression into a wrapper, such as a carton for protecting the product during shipment, storage and the like.

A further object of the invention is to provide an automatic apparatus adapted to carry out the invention. Other objects and advantages of the invention will be apparent from the drawing and the description thereof hereinafter.

In the drawing, which is illustrative of the invention, a preferred form of an automatic apparatus constituting one embodiment and adapted to execute the methods of the invention in an efficient manner, is shown.

Figure 1 is a side elevation of the automatic apparatus with cylinder 5 (see Figure 2) removed to facilitate a clear showing. Also the hydraulic lines to the cylinders and the control for those lines are removed to clarify the illustration.

Figure 2 is a section taken on lines II—II of Figures 1 and 3.

Figure 3 is an end view with the carton magazine and baling chamber in section.

Figure 4 is a section on line IV—IV of Figure 2.

Figure 5 is a longitudinal section through the baling chamber on line V—V of Figure 2.

Figure 6 is an enlarged detail view of a portion of the machine shown in Figure 5.

Figure 7 is a diagrammatic view showing the electrical and hydraulic connections for operating the automatic apparatus.

Figure 8 is a graph showing operation of the timer.

Figure 9 is a perspective view of the main carton blank before flattening, and

Figure 10 is a vertical mid-section through the ram and feed end of the tamping chamber.

Figure 11 is a plan view of a preferred form of the ram head showing its relationship with the forked fiber-retaining member, the rods of which are shown in section.

The present invention generally involves the pressing of the material to be baled in an endwise direction while confining it within lateral limits, and after sufficient material has been compressed in this fashion, transferring the material endwise into an open-ended carton. Before the transfer is made, a closing carton end is placed against one end of the compressed material, and this carton end is simultaneously transferred with the material into the carton, the material entering first and the carton end closing the open end of the receiving carton, after which the carton is bound, fastened or secured, as by stapling and then discharged for storage or shipment.

This compressing action within laterally confining walls provides a compact mass which has a tendency to expand endwise and very little of such tendency in other directions. The greatest pressure is, therefore, exerted on the ends having comparatively small areas, but the bulging at the ends can easily be prevented or reduced to an unobjectionable minimum by a single strap. The lateral surfaces of the carton have practically no bulging tendency but the compacted fibers support or back up the carton sides as well as the ends so that a sound package is obtained, the container walls of which are well protected against deformation or puncture when accidentally dropped or struck by other objects.

As shown in the drawing, the invention comprises as one aspect an automatic apparatus for accomplishing the method hereinabove described. This apparatus comprises a ram adapted to be reciprocated through a tamping, packing or compressing chamber one or more times, depending upon how compact it is desired that the package be and the relative amount of material received at a single feeding compared to the dimensions of the package desired. The apparatus also comprises a bailing or packaging chamber adapted to receive a carton and to hold such carton while the packed or compressed material is transferred from the tamping chamber. Other auxiliary means necessary to form a complete packaging operation will be mentioned as they come into the description hereinafter.

Referring particularly to Figures 1 and 2, the press comprises a hollow casing 15 supported on suitable pedestals 18 and 19. The interior of the casing is divided into two main chambers 18 and 19, the former serving as a tamping or compressing chamber, and the latter serving as a pack-
A vertically reciprocable plate 20, having an aperture 21 (see Figure 5) in its lower end, slides within a suitable guideway formed by grooves 22 in the opposed upright members 23. The plate 20 passes through slots 24 and 25 in the upper and lower walls respectively of the casing 15 and additional guiding members 26 provided particularly for the reciprocable ram 28. The plate 20 is operated by a piston reciprocably driven within the cylinder 6 by means of a fluid, and preferably a liquid. The aperture 21 is sufficiently large to allow the passage of the ram 28 which operates within the casing 15. The cross-section of the ram corresponds with that of the interior of the casing 15 but is somewhat smaller, so as to provide a clearance of about ¼ inch or so around the front end of the ram. This allows the ram head 29 to fit within the folded side flaps of the first carton end to be inserted. A slide bearing strip 28c (see Figure 10) of brass or the like may be provided beneath the ram or all around it at the back portion thereof. The cross-section may be round, oval, or any desired shape, but a rectangular or specifically a square section is preferred. The ram 28 is connected by means of the rod 29 to a piston within the main ram cylinder 30 which is hydraulically operated.

An opening 31 in the top of the casing 15 (Figure 10) serves as the entrance for the material to be packaged and a hopper 32 may be provided to guide the material into the entrance. This opening 31 is preferably near the end of the casing 15 to which the ram 28 moves when it is retracted. While horizontal disposition of the casing and ram is shown, the invention is equally adaptable to vertical disposition with the chamber 19 below it. A downwardly inclined chute would then serve to feed the fiber through opening 31 in the side.

At the top of the casing 15 and extending from the ram end under the hopper 32, there is provided a slidable closure or cover plate 31a which slides through a slot 31b and along the guideway formed between the fixed plates 31c and 31d. A transverse bracket 31e secures a permanent or electromagnetically operated cover 31a. The ram head 29 is of a magnetic material. So that forward motion of the head 29 draws the plate 31a into position closing the opening 31. The abutment 31g limits the forward motion of the plate 31a but the ram 28 positively engages and pushes the plate 31a out of opening 31 on the return stroke of the ram.

A plate 33 is reciprocated vertically by a piston within cylinder 7 adjacent the end of casing 15 from which the final package is adapted to be discharged. Members 34 are provided to serve as a guideway for the plate 33.

A plate 33 is in its lower position serving to close the discharge end of the casing 15 and plate 20 is in its lower position, the tamping chamber 18 is separated from the packaging chamber 19. This makes it possible to position the wrapper materials within the packaging chamber 19 and then after closing the plate 20 to feed and tamp the material to be packaged within the chamber 15 without disturbing the wrapper sections in position within the chamber 19.

Means is provided for inserting wrapping sections into the packaging chamber and for some of these sections use is made of the ram, whereas for others, a separate means is provided. The means for inserting the main body of the carton comprises a hopper or magazine 35 disposed to one side of the packaging chamber. The adjacent side wall 36 of the packaging chamber 19 is hinged as at 37 (Figure 3) and is adapted to be swung to closed position shown in solid lines in Figure 3 and to the open position shown in dotted lines 27. The plate 20 may be disposed on opposite sides of the path of the plate 20 beneath the casing 15. The plate 20 is operated by a piston reciprocably driven within the cylinder 6 by means of a fluid, and preferably a liquid.
As shown in the drawings, the two loading systems are similar in construction but one is turned around relative to the other for purposes that will be apparent from the description hereinafter. Each loading system comprises a lower chamber 55 in alignment with one of the apertures 51 or 52 where the other of such apertures is in alignment with the chamber 16 of the press. This loading chamber 55 may be considered to be defined by a stationary backing plate 56 and the end wall and lateral walls of a recessed encasing member 58a to which is concentrically secured a supporting flange 57 for one of the operating cylinders 4 and 8. Each of these cylinders is provided with a piston connected by a rod 58 to a recessing head 59. A vertical slideway is provided between members 80 and 81 for guiding the slide 82. This slide 82 is secured by an arm 63 and a connecting rod 64 to a piston within one of the driving cylinders 3 and 8 for reciprocating the slide into and out of the leading chamber 55. When the slide 82 is in its upper position, its thin lower end is in alignment with a number of carton ends 66 in a magazine thereof. One of these carton ends 11 and 12 urges a plate 66 by means of the connecting rod 67 against the back of the magazine of carton ends which are in flattened condition during such storage. This pressure against the carton ends is maintained constant regardless of the number of such carton ends in the magazine, as it is dependent on the pressure of the fluid in the cylinders. The shoulder 68 is disposed above the foremost carton end in the magazine when the slide 82 is in its uppermost position. As such, the next downward motion of the slide, it moves the foremost carton end downwardly into the loading chamber 55 where it is disposed in the way of the receding ram or head 55 between such head and one of the apertures 51 and 52. As will appear hereinafter, carton ends may be moved down laterally into the loading chambers 55 on both sides of the press simultaneously, if desired, by means of the slide 82 and after such loading, the slides 82 return to their uppermost position in readiness for the next loading stroke. It will be noted that the apertures 51 and 52 are of the same size as the internal cross-section of chamber 16 but the overall dimensions of the flattened carton ends as disposed in the magazines are considerably larger to the extent of four lateral or peripheral flaps F spaced around the central portion C as shown in Figure 8. Hence, when the receding head 59 moves forward and presses the carton end into one of the apertures 51 and 52, the edge portions are bent backwardly on the outer edges of the ram 53.

The first position of slide 47 in the baling cycle is that aperture 52 (see Figure 4) is in alignment with its loading chamber 55 and aperture 51 is in alignment with the main ram head 28 in casing 15. During or after the insertion of the main wrapper section or carton body 81, the piston in cylinder 4 moves the receding head 59 forward and swings flaps F at a 90° angle to the central area C of the wrapper section or carton end and disposing the folded carton end entirely within aperture 51, the thickness of the slide 47 being at least the width of flaps F. The piston in cylinder 4 then retracts the head 59 and connects the slide 47 so that the folded carton end in aperture 51 is in alignment with the ram head 28 which then pushes the carton end clear through both the tamping chamber and the packaging chamber in which the main carton body has already been inserted until it comes to rest with its main area C against the end gate 33 and its flaps F in contact with the inside wall of the main carton body 41.

After insertion of the one end of the carton, the ram head 28 is returned and cylinder 6 lowers the plate 20 to close off baling chamber 19 from tamping chamber 18.

After the ram head 28 has been returned, the material to be baled, such as staple fiber, or a portion thereof, is fed through hopper 33 into the casing 15. The ram head 28 then moves forward to a position which is spaced from plate 20 a distance corresponding approximately to the length of the package to be made, that is, the distance between plate 20 and end plate 33. In moving to this position, it compresses the material in chamber 18 against the plate 20. A dog 99 fixedly carried on a rod 70 projecting from a collar 71 rigidly attached to the piston rod 29 opens a toggle switch 72 through the finger 73 and this operates electrically to stop the forward motion of the ram head 28 and immediately reverse the ram. If, as is generally the case, more than one such portion of the material is desired in the final package, the ram head 28 returns, a second portion is fed into the casing, this portion is compressed, and so on, until the amount introduced is sufficient for the final package desired. A pressure switch 74 connected to the cylinder 20 serves to control the amount of material to form the package. Means operated by the pressure switch 74 and described hereinafter is provided for rendering switch 72 ineffective after sufficient material is tamped against plate 20 so that the ram head 28 can insert the closing carton end, and after strapping, will complete the stroke to eject the completed bale, and another to introduce the first carton end.

On each return stroke of the head 28, a dog 75 on a rod 76 secured to collar 71 opens the live 17 (normally held closed by an internal spring, which, however, allows a return flow from the top of cylinder 10 during upward motion of the piston therein) by means of the actuating finger 78 and this allows the hydraulic liquid to flow through line 74 connected to line 129 into the top of cylinder 10 to lower a set of fiber-retaining rods 80 connected to a common rod 81 to the piston in cylinder 16. Dog 75 is of sufficient length to assure complete lowering of rods 80 before dog 76 releases finger 78 which then causes valve 77 to close under spring return action. The position of ram head 28 at which the rods 80 are lowered is just after the head 28 has passed under the rods 80 so that such rods serve to prevent the material from re-expanding and following the ram head 28 under the feed entrance 31 to the casing 15. This keeps this entrance clear for a fresh supply of material after every return stroke. Figure 11 shows a modified ram head 28b having vertical slots 30 which permit the insertion of rods 80a which correspond to rods 80 but preferably have a narrower cross-section, as shown. The rear sloped end 79c of dog 73 is set to open valve 77 at or very quickly after the instant during the return stroke of the ram 28 when the plane through the bottoms of slots 30 passes under rods 80a. The rods thus enter the slots back of the fibrous material facing the ram head so that they do not have to force their way against the expanding tendencies of the fibrous mass. Instead of introducing rods 80 or
an additional set of such rods may be provided on the opposite side of the chamber and both sets introduced simultaneously. A dog 82 on rod 10 closes switch 72 which causes the ram to again move forward until switch 74 is again opened by dog 83. This reciprocation occurs until the material tamped creates sufficient resisting pressure to actuate switch 74 which through a relay system described hereinbefore renders the switch inoperative so that dogs 83 and 82 can no longer resect and control the movements of the ram head 28.

After pressure switch 74 thus cuts out switch 72, the ram head 28 returns, the piston in cylinder 9 advances the receding head to insert the closing carton end into aperture 52, and then returns, the piston in cylinder 5 shifts the loaded aperture 52 into the casing 15, and then the ram head 28 advances to press the closing carton end against the tamped material. At the same time plate 20 is raised. Since the aperture 52 is loaded from the side opposite that from which the aperture 51 is loaded, the lateral flaps are bent toward the tamped material and are the first parts of the carton end to engage the material.

When the ram head 28 has advanced to bring the carton end against the material while pressing it to bale size in chamber 19, dog 83 closes a spring-return or spring-release switch 84 by engaging a finger 85. This stops the ram 28 for reasons explained hereinafter in the position shown in Figure 5, and operates a time relay.

This stoppage is followed by insertion of the strip 86 of flexible strapping material, such as of spring steel, by means of the feed rolls 87 and 88. To facilitate the insertion of strip 86, the bottom of the bailing chamber 19 is provided with a shallow groove 89 (Figure 5), the plate 20 is provided with an arcuate-bottomed notch 90, the ram head 28 is provided with a groove 91, the upper edge of the aperture in plate 20 is provided with an arcuate-bottomed notch 92, the top wall of the chamber 19 has a groove 93, and the end plate 33 has a groove 94 terminating with gradually sloped curved edges 95 and 96. A groove 97 in the lower edge of the end plate 33 deflects the upwardly fed strip 86 into the groove 98 and the curved bottom surfaces of notches 99, 92, and the curves 95 and 96 guide the leading end of the strip around the corners, and the flexibility of the strip allows it to be forced to encircle the closed carton and to overlap itself along the bottom wall.

Any suitable means for fastening may be employed, such as spot welding, banding or crimping. A dog 98 allows the insertion of a conventional banding device for tightening and fastening the overlapped ends of the strip together and cutting the fastened strip from that supply.

Figure 6 shows electrical and hydraulic circuits for operating the system automatically in proper sequence. The electrical circuit lines are dotted while the hydraulic or pneumatic circuit lines are solid. Most of the actions in the bailing cycle are controlled by a multiple switch timer operated by a motor 99. The shaft 100 of this motor carries ten cams 101, 102, 103, 104, 105, 106, 107, 108, 109, which may be closely spaced to make a compact unit but in the drawings are shown widely spaced to facilitate illustration. Each cam has a high portion which presses a swingingly mounted switch arm against a fixed contact to close an electric circuit. The time during which the switch remains closed is determined by the arcuate length of the cam rise. The relative times of closing and duration of closing of the several switches by the cams are shown in Figure 7 in which the dark bars represent the rises of the respective cams.

Operation

The description of the operation could start with any stage of the cycle since once the machine is started, the cycle is repeated. As a matter of convenience, the following description starts at the time the tamped material acquires sufficient compactness to close the pressure switch 74 since this starts operation of the control motor 99. At this time, a main carton section 41 and the first carton end are disposed within the bailing chamber 19 and the slide 47 is disposed with the opening 51 in the casing 15 and opening 52 in readiness to receive the other carton end disposed between it and the corresponding receding head 59.

The main switch 110 is closed during the operation of the machine. Lead-lines 111 and 112 then are in circuit with the source of electricity 113, such as 110 volt A. C. The coil of a normally open relay 114 is connected at one end through line 115 to line 112 and at the other side through line 116 to one terminal of switch 74 so that when switch 74 is closed, the contactor of relay 114 closes the circuit through lines 111, 116, motor 99, line 117, and line 112. Pushbutton 118 in line 119 provides an alternate circuit for driving motor 99 under the control of the operator.

Immediately after motor 99 starts, cam 101 closes the switch associated with it, thereby connecting line 115 to motor 99, through leads 101a and 101b. This cam, therefore, acts to provide a holding circuit for the motor 99 cutting off the motor current at the end of the timer sequence as shown in Figure 7. Also, when motor 99 starts, cam 109 closes the switch between lines 120 and 121, the former being connected to line 112 and the latter to the coil of a normally closed relay 122. The other end of this coil is connected through lines 119 to line 114 so that energizing of coil 122 opens its contactor and the circuit from line 111 to line 123 and switch 72 is broken. In addition, the current flow is interrupted from switch 72 through lines 124 and 125 to the coil 126 of the solenoid-operated four-way hydraulic valve 127, moving the receding conventional spool valve well known in the hydraulic power art. This de-energizes the coil and the valve 127 is returned to de-energized position under the influence of a spring. The valve 127 is connected to the ends of the main ram cylinder 130 by pipes 131 and 132 and is connected to the hydraulic power source, such as a pump 130 by means of pipe 131 connected to the common feed line 132. The discharge line 133 connects the valve 127 to the reservoir 134 through a common line 135. When de-energization of coil 126 switches valve 127, the hydraulic fluid is passed through line 129 to return the ram head 28. On each return of the ram 28, dog 75 opens valve 77 which causes cylinder 10 to lower rods 80 immediately after the head 28 passes thereubelow.

Cam 105 closes the circuit through coil 136 by means of lines 137 and 112 on one side and lines 138, 139, 119, and 111 on the other side. This energization of coil 136 shifts valve 140 and causes oil flow from line 141 through line 142 into cylinder 9, thereby moving the receding head 59 against the carton end and forcing the
latter into aperture 52. Cam 105 then opens the circuit to coil 156 which reverses valve 148 and feeds the hydraulic fluid through line 143 to the other end of cylinder 9, thereby retracting the recessing head 59. Then cam 105a closes the circuit to solenoid 145 which shifts valve 145 and causes the hydraulic liquid to flow through line 145a to the cylinder 5 and this causes shifting of the aperture plate 47 to bring aperture 52 into alignment in casing 15.

Then cam 104 closes the circuit between lines 146 and 147. Line 146 is connected through lines 118 to line 111, and line 147 is connected through one of two normally closed contactors of a relay 148 to line 145 and one end of coil 145, the other end of which coil is connected by line 145b and 151 to line 112. This energization of coil 125 shifts valve 127 which elevates rods 80 and advances the ram head 28, forcing the closing contact end into the baling chamber.

At, or shortly after, the beginning of this stroke of the ram head 28, cam 107 closes the circuit through the coil 160 of the solenoid-operated valve 161. This shifts valve 161 to pass the liquid through line 162 into cylinder 6, thereby raising the plate 25 between tamping and baling chambers 18 and 19.

The ram head 28 continues to advance and forces the tapped material and closing contact end into the baling chamber. When the position shown in Figure 5 is attained, dog 93 trips switch 84 which energizes a time relay 156 thereby closing its contactor and energizing solenoid 152 which closes valve 153 and stops the ram head 28. The time relay 156 permits the stopping operation hereinafore described and also the lifting of the end gate 33 which is effected by the time relay 156 opening the circuit between lines 163 and 164 and energizing coil 165 which is connected to line 112 by line 166. Coil 165 shifts the valve 166a and causes flow of liquid into the lower end of cylinder 7 through line 167.

When the gate 33 is up, the time relay 156 interrupts the current through coil 152 and opens valve 153, allowing liquid to flow into cylinder 30 to advance the ram head 28 and eject the package.

Instead of using a time relay, the relay 156 may be an ordinary type and an additional relay 325 interrupts the current through coil 335 in series with line 157 and the normally open contacts of relay 156 may be relied upon. The solenoid of relay 326 is connected in series with a normally open switch 336 and lines 111 and 112 by lines 327, 328, and 329. Switch 334 is provided in line 328 which is left open if 153 is a time relay but left closed if 156 is an ordinary relay. The upper contact of switch 330 is fixed and the lower is mounted on a spring arm allowing it to be moved upward against the upper contact when struck by a projection 251 on the bottom of gate 33. As shown in Figure 6, the contacts of switch 330 are mounted in a recess 335 in a stationary cross-member 336 of the machine so that switch 330 is closed when the gate 33 reaches its uppermost position. This energizes the coil of relay 326, opening its contactor 325, thereby de-energizing opening valve 153 so that the ram head 28 moves forward to eject the package.

After the package has been ejected, the dwell of cam 104 then opens its switch which breaks the circuit through lines 147, 148, and the coil 158, causing the valve 172 to shift and return the ram head 28 to fully retracted position. During this return stroke of ram head 28, cam 108 opens its switch, so that coil 159 is de-energized and the gate 33 is lowered.

Then cam 106 closing the circuit between lines 165 and 169 energizing coil 170 connected by line 171 to line 112. This shifts valve 172 and causes liquid to flow from pipe 173 through pipe 174 into the upper end of cylinder 1 for opening and lowering the side wall 56 of the packaging chamber 10. When the wall 56 is completely lowered, sequence valve 175 opens, allowing liquid into the left end of cylinder 2, thereby causing the plate 57 to push a carton body section 61 into place on the bottom and lowered side wall of chamber 10. The sequence valve 175 is of the type allowing free flow in the reverse direction. The so-called "counterbalance valve, directly operated, internal drain" of Vickers, Inc., shown in Figure 13 of that company's catalog copyrighted 1946 and entitled "Vickers Pressure Control, "Hydro-Cushion" Type Valves for Oil Hydraulic Systems," Bulletin 40-34, is an example of the type that may be used.

While liquid flows through pipe 174 it also flows through a branch 176 and branches 177 and 178 therefrom into the upper ends of cylinders 3 and 5 which causes each of the gates 93 to be lowered a carton end down into the loading chambers 55 on either side of the casing 15. When cam 106 opens its switch, the valve 172 shifts and the pistons in cylinders 1, 2, 3 and 5 all return to their former positions. A sequence valve 178 (like 175) assures the return of plate 45 before side wall 36 is closed.

Then cam 102 closes the circuit between lines 159 and 181, energizing coil 182 connected by line 183 to line 112. This shifts valve 184 and feeds liquid from pipe 185 through pipe 186 to cylinder 4, causing the recessing head 89 to insert the first carton end into aperture 61 of the aperture plate. Then the dwell of cam 192 opens the circuit to coil 182, shifting the valve 184 and feeding liquid into the other end of cylinder 4 through pipe 187. After the recessing head is retracted, cam 105a opens the circuit to solenoid 144, allowing spring return of valve 145 which causes flow of hydraulic liquid to the outward end of cylinder 6. This shifts plate 47 and disposes the loaded carton end in aperture 61 in the path of ram head 28 in the main casing and the empty aperture 56 in readiness to receive its carton end previously loaded into the loading chamber as above described.

Then cam 103 closes the circuit between lines 190 and 191, energizing coil 192 of relay 148, opening the two normally closed contactors and closing the normally open contactor 193. The contactor 193 energizes coil 125 through lines 124 and 125, 195, 191, and 112 on the one hand and lines 111, 119, 190, and 181 on the other. This shifts valve 121 causing the main ram head 28 to move forward and push the carton end through to the end of the packaging chamber. Since the closing of the switch associated with cam 103 shifts the contactor of the relay 148, the middle contactor element thereof opens the circuit between lines 157 and 154 so that there is a dead circuit through switch 84 and hence when the dog 83 trips the finger 93, nothing will stop the forward motion of the ram head 28, and the carton end is pushed through to the very end of the packaging chamber.

As cam 123 comes to the end of its rise, its corresponding switch is opened and the coil 125 of relay 148 is de-energized. The shifting of con-
tactor 193 opens the circuit through the solenoid 126 so that valve 127 shifts and the ram head 28 starts to return. At the end of this return stroke, cam 194 opens the circuit through solenoid 150 which causes shifting of the valve 151 and the lowering of the middle slide gate 20 by virtue of the descent of the piston in cylinder 6. At about the same time, cam 109 opens the circuit between lines 126 and 121, de-energizing the solenoid of relay 122. This closes the circuit from line 111 through lines 125, 154, switch 72, lines 124, 125, solenoid 126, lines 150, 151 and 112. As a result of the closing of this circuit and of the closing of switch 72 by dog 82 at the end of the return stroke of the ram head 28, solenoid 126 is energized and shifts valve 127, causing the ram 28 to advance and when the foremost slope 765 of dogs 75 opens valve 77, which occurs before the ram head reaches the rods, the rods 85 or 86a are caused to be lifted. This forward motion of the ram presses the fiber or other material introduced through the hopper into the tamping chamber 18 and the forward motion of the ram is limited by dog 69 which opens the switch 72 through the finger 73. Opening of this switch reverses volume of liquid in line 212, causing the flow of liquid in line 212 to close the other end of cylinder 30. As the ram 28 is thus returned, the dog 75 opens valve 77 through finger 78, the rearmost end 75c of such dog being set upon the rod 76 in such a position that the valve 77 is opened just after the ram 28 passes the rods 80 or, when the slotted ram head 280 of Figure 11 is used, just after the plane containing the bottoms of slots 301 passes rods 80c. Opening of valve 77 causes the liquid to flow through line 19 into the provable of cylinder 16, thereby lowering rods 85 or 86a to hold the fiber or other material and to keep it from following with the ram 28. When the ram returns, dog 82 closes switch 72 causing the ram to again move forward, pressing the staple or other material into the tamping chamber. This reciprocation of the ram and the retaining rods 80 or 86a occurs until sufficient material has been tamped in the chamber 18 to actuate the pressure switch 74, at which time the sequence of operations hereinafter described is repeated.

A fluid line 203 branches off line 132 and leads to a valve 204, the spool of which is actuable by the hand lever 205. Normally, the valve is set to direct the liquid through line 204 to the closed ends of cylinders 11 and 12, thereby urging plates 66 against the carton ends in the magazine. To release the plates 66, lever 205 is shifted to direct the liquid through line 207. The valve 204 is provided with discharge pipe 208.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the present invention as described in the appended claims.

I claim:

1. Apparatus for packaging material in bulk comprising a casing, a removable transverse partition for dividing the interior of the casing into two chambers spaced endwise of each other, a removable plate at one end of the casing, a reciprocable ram in the casing, means extending through the other end of the casing for reciprocating the ram, walls defining an opening near the latter end of the casing for feeding bulk material into the casing in the path of the ram, means for limiting the extent of forward motion of the ram whereby the compressed mass is brought to a definite volume within the casing between the ram and the partition, material-retaining means movable into and out of the casing at a position adjacent the material feeding in the casing and between the partition, means for reciprocating said last-named retaining means, means responsive to the position of the ram head for controlling the actuating of the latter reciprocating means to insert the retaining means into the casing after the ram passes said retaining means on its return stroke, and to retract the retaining means on the forward stroke of the ram.

2. Apparatus in accordance with claim 1 comprising means for rendering the limiting means and the controlling means inoperative when a predetermined pressure is reached in compressing the material with the ram, and means for removing the transverse partition after the predetermined pressure is reached.

3. Apparatus in accordance with claim 2 comprising a loading chamber at one side of the casing between the feed opening and the adjacent end of the casing, and an apertured slide reciprocable transversely of the casing and loading chamber.

4. Apparatus in accordance with claim 3 comprising a magazine for storing carton ends adjacent the loading chamber, and means for transferring a carton end from the magazine to the loading chamber.

5. Apparatus in accordance with claim 4 comprising a plunger reciprocable in the loading chamber perpendicularly of the plane of the slide for pressing a carton end into an aperture of the slide, and means for moving the aperture slide to shift the loaded aperture into alignment with the ram in the casing.

6. Apparatus in accordance with claim 5 in which there are two loading chambers with plungers therein on opposite sides of the casing, the slide has two apertures spaced apart so that when one of the apertures is in alignment with the casing, the other is in alignment with the plunger in one of the loading chambers, a magazine is associated with each loading chamber and the carton end-transferring means places the carton ends on opposite sides of the plane of the apertured slide, and the plungers in the respective loading chambers are on the same sides of the plane of the slide as the carton ends therein.

7. Apparatus in accordance with claim 6 in which a side wall of the chamber defined between the partition and the end plate is swingably mounted, and means is provided for swinging the side wall to open the chamber.

8. Apparatus in accordance with claim 7 comprising a receptacle for main carton body sections adjacent the swingable side wall, and means for transferring a body section from the receptacle into the chamber.

9. Apparatus for supplying carton ends to a packaging system comprising a casing adapted to serve as a conduit for movement of the carton ends to the packaging stations, two loading chambers on opposite sides of the casing, and a slide reciprocable transversely of the casing and loading chambers, said slide having two laterally spaced apertures for receiving the carton ends, one of said apertures being in alignment with one of the loading chambers when the other is in alignment with the casing.

10. Apparatus for supplying articles to an operation stage comprising a casing to receive the article supplied, two loading chambers having reciprocable plungers therein, the chambers be-
ing in opposite sides of the casing, a slide having two laterally spaced apertures reciprocable transversely of the casing and loading chambers, the apertures being spaced apart so that when one of the apertures is in alignment with the casing, the other is in alignment with the plunger in one of the loading chambers, a magazine for carton end sections associated with each loading chamber, means for transferring a carton end from each of the magazines respectively to opposite sides of the plane of the apertured slide in the associated loading chambers, the plunger in each chamber being disposed on the same side of the slide as that to which the carton ends are transferred, and means for selectively reciprocating the plungers to press the respective carton ends into the apertures of the slide when each is disposed in its respective loading chamber.

11. A baling chamber having removable end walls and a swingable side wall, a magazine for main carton body sections adjacent the swingable side wall, and means for transferring a body section into the chamber through the side wall.

12. Apparatus for supplying articles to an operation stage comprising a casing to receive the article supplied, two loading chambers having reciprocable plungers therein, the chambers being in opposite sides of the casing, a slide having two laterally spaced apertures reciprocable transversely of the casing and loading chambers, the apertures being spaced apart so that when one of the apertures is in alignment with the casing, the other is in alignment with the plunger in one of the loading chambers, a magazine for a plurality of the articles associated with each loading chamber, means for transferring an article from each of the magazines respectively to opposite sides of the plane of the apertured slide in the associated loading chambers, the plunger in each chamber being disposed on the same side of the slide as that to which the articles are transferred, and means for selectively reciprocating the plungers to press the respective articles into the apertures of the slide when each is disposed in its respective loading chamber.

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