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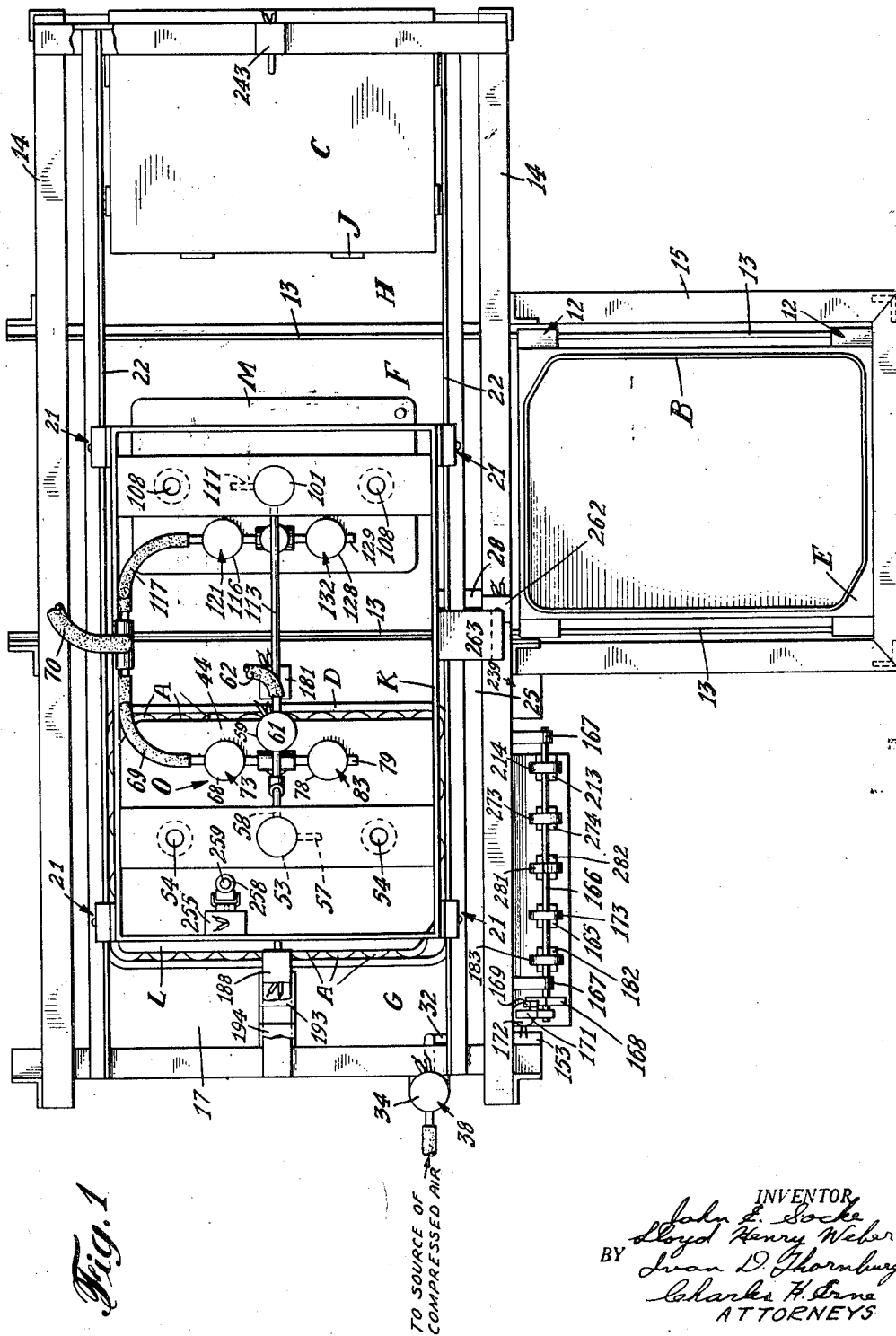
J. E. SOCKE ET AL

2,524,846

BAG FILLING OR PACKING MACHINE

Filed June 30, 1948

9 Sheets-Sheet 1



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BAG FILLING OR PACKING MACHINE

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9 Sheets-Sheet 2

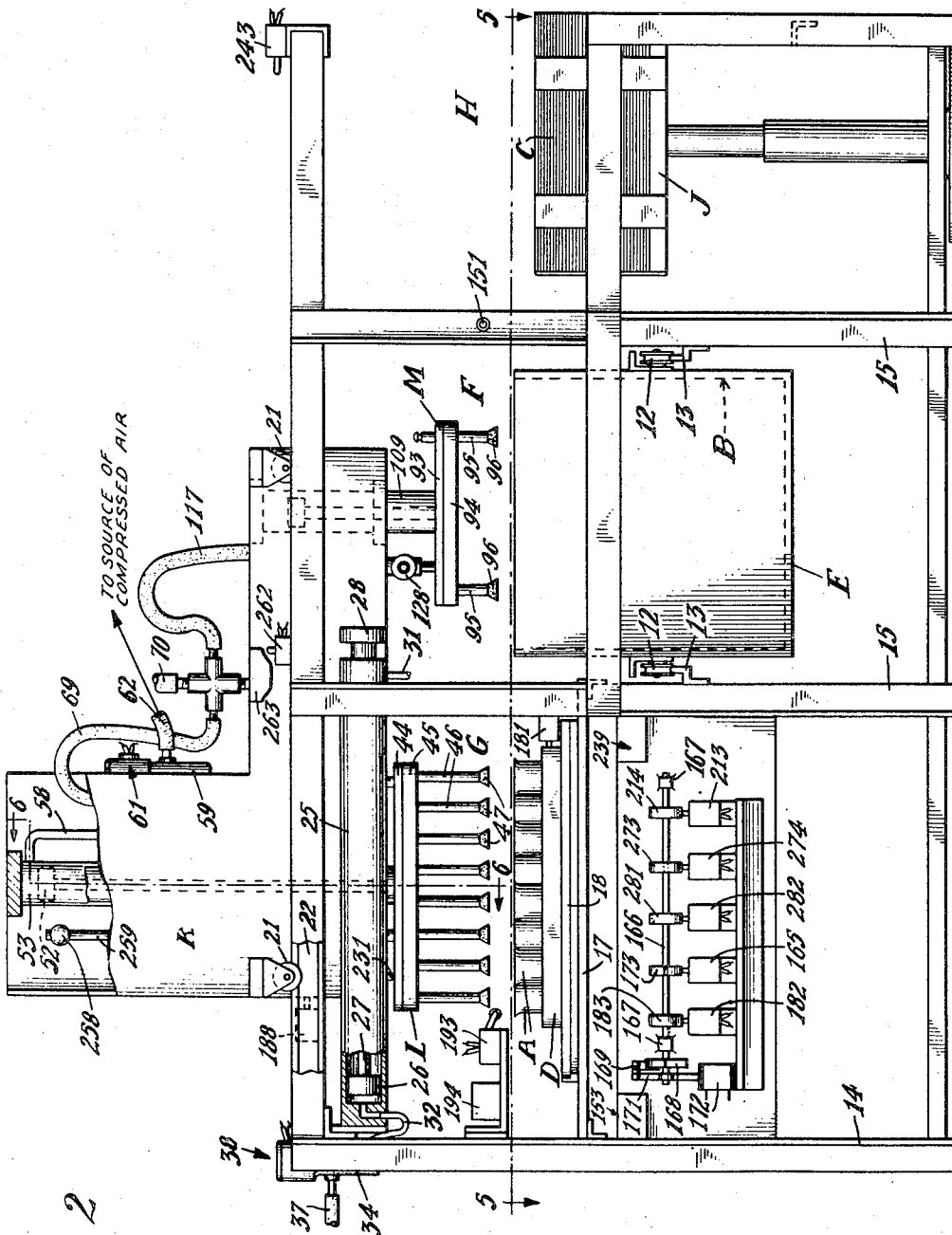


Fig. 2

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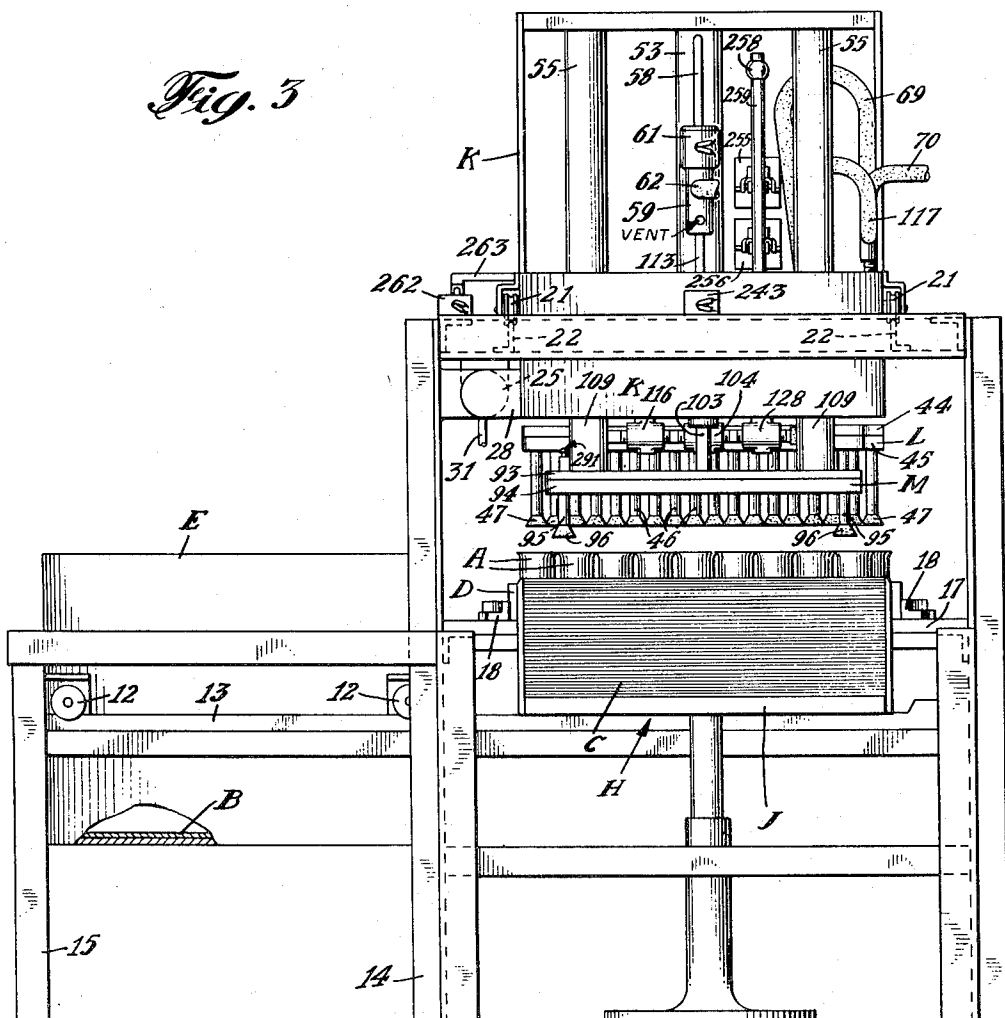
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9 Sheets-Sheet 3

Fig. 3



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9 Sheets-Sheet 4

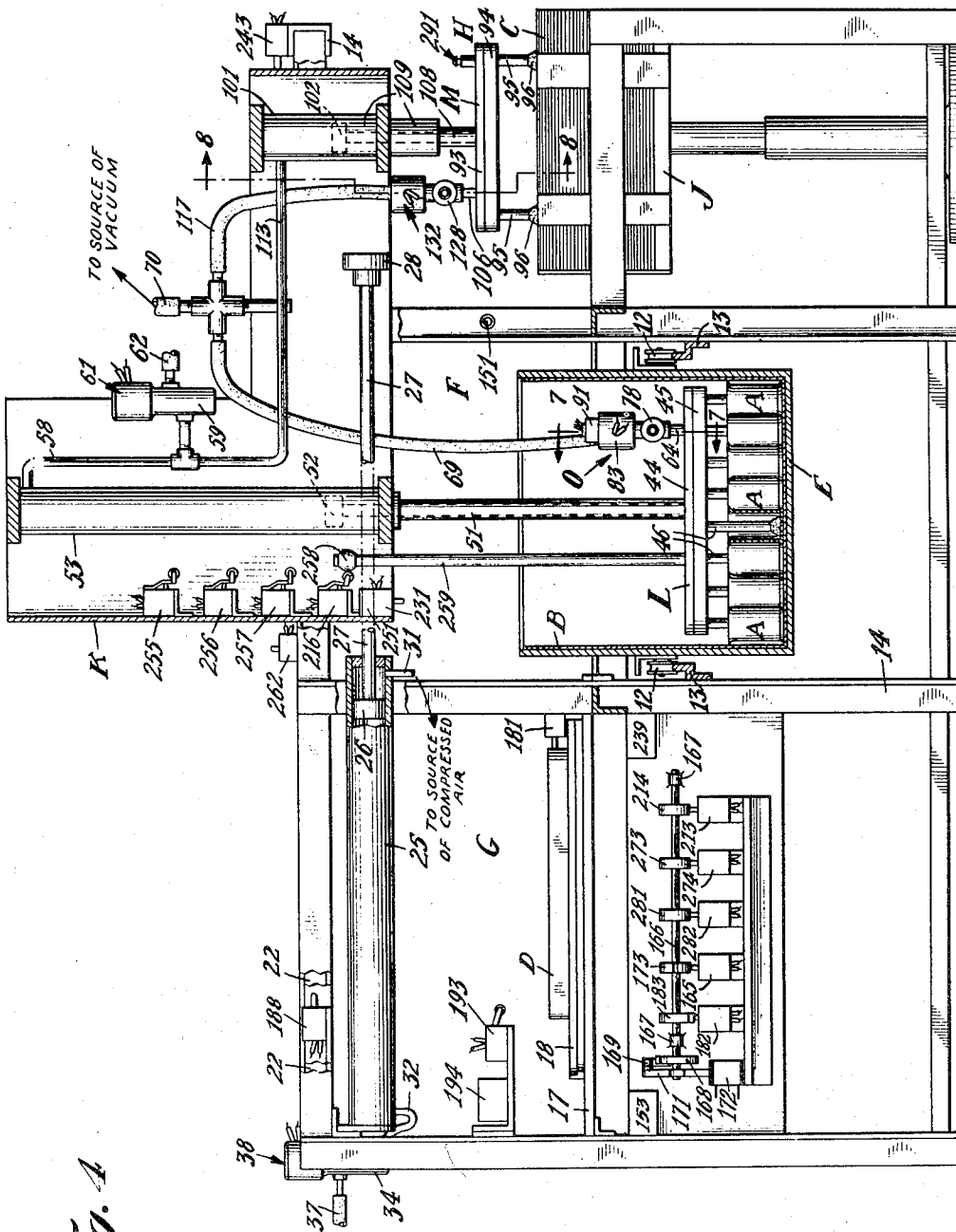


Fig. 1

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BAG FILLING OR PACKING MACHINE

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9 Sheets-Sheet 5

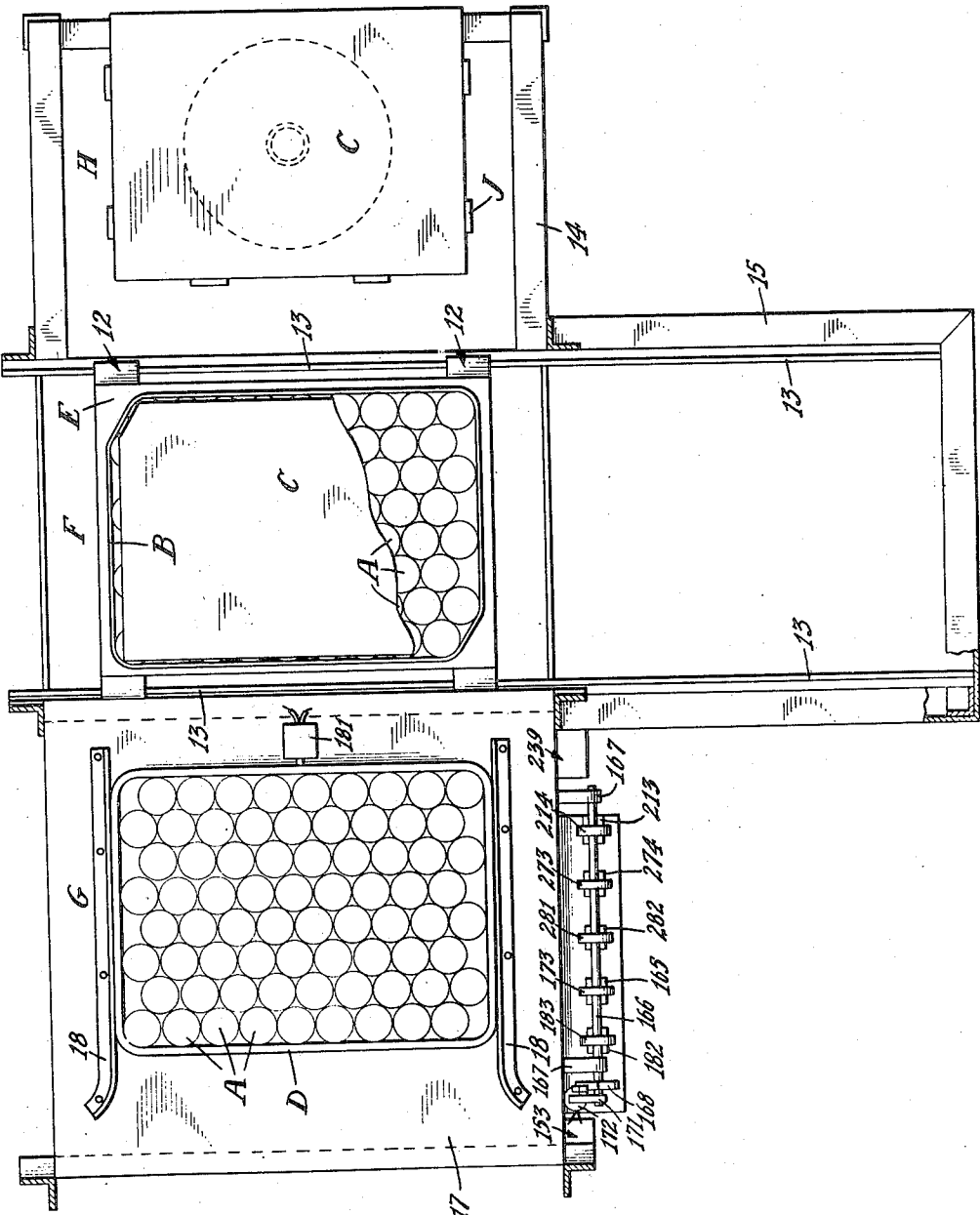


Fig. 5

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BAG FILLING OR PACKING MACHINE

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Fig. 6

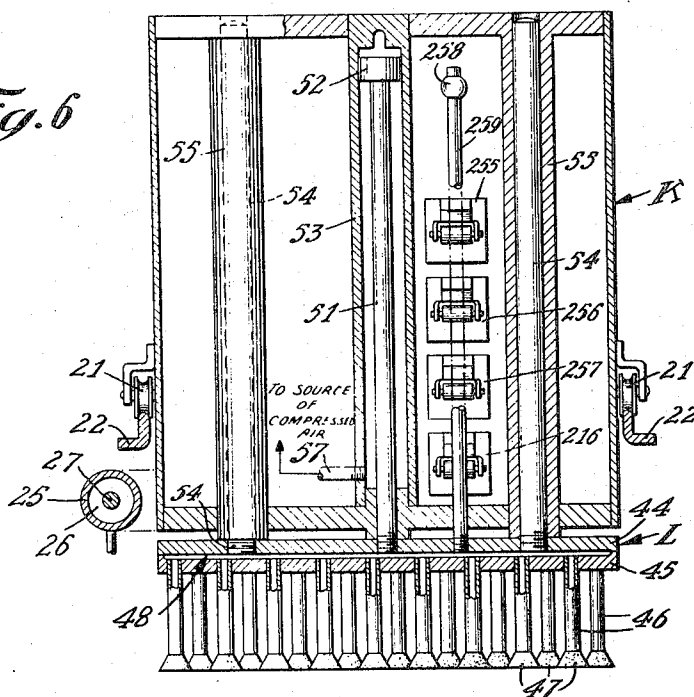
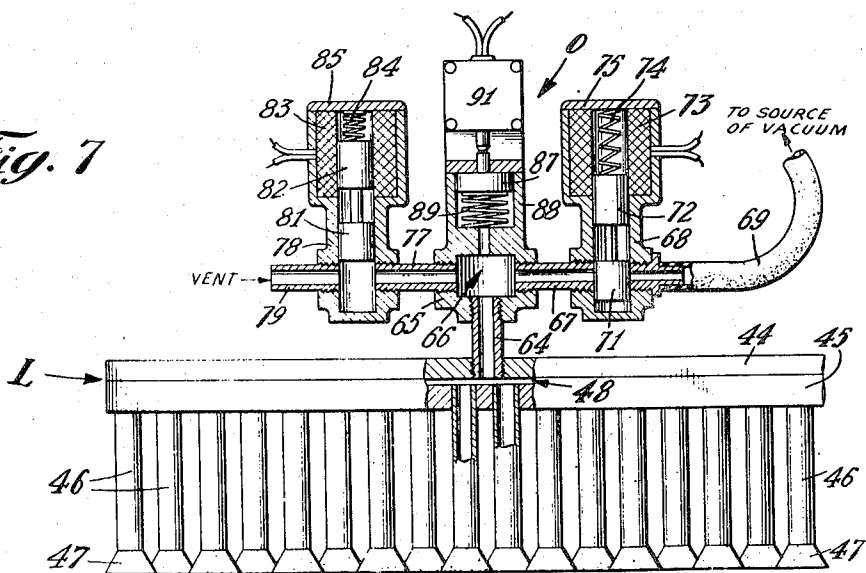


Fig. 7



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Fig. 8

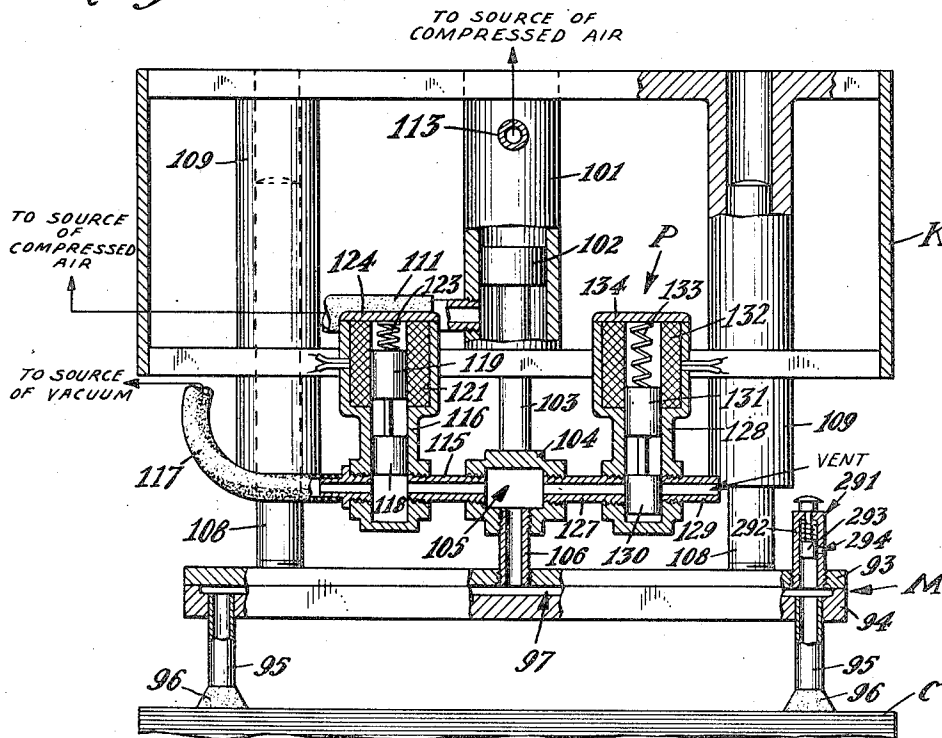
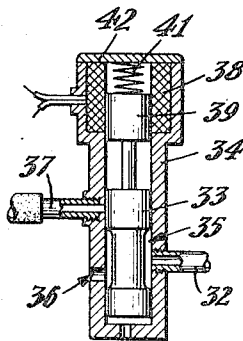


Fig. 9



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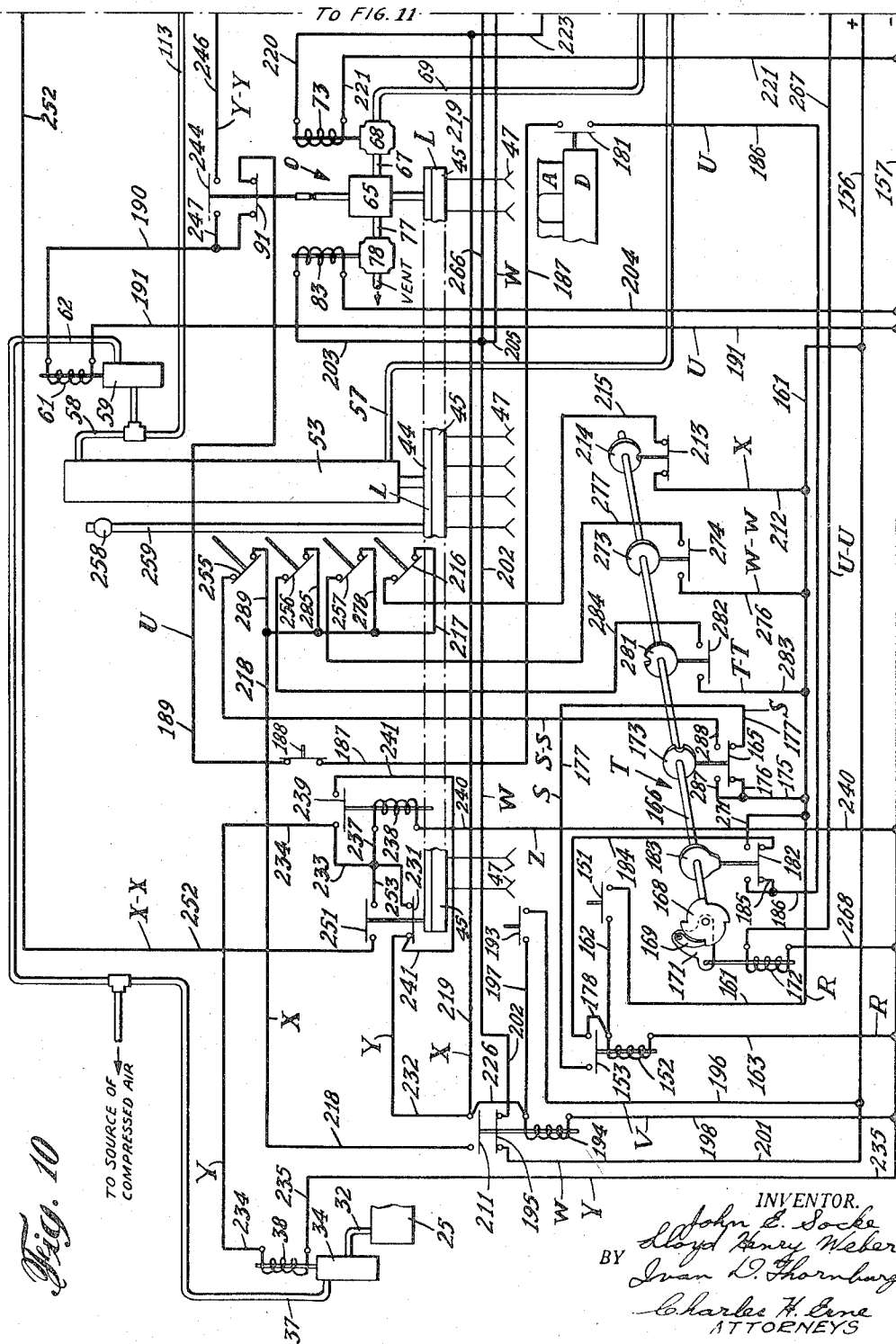
J. E. SOCKE ET AL

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BAG FILLING OR PACKING MACHINE

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9 Sheets-Sheet 8



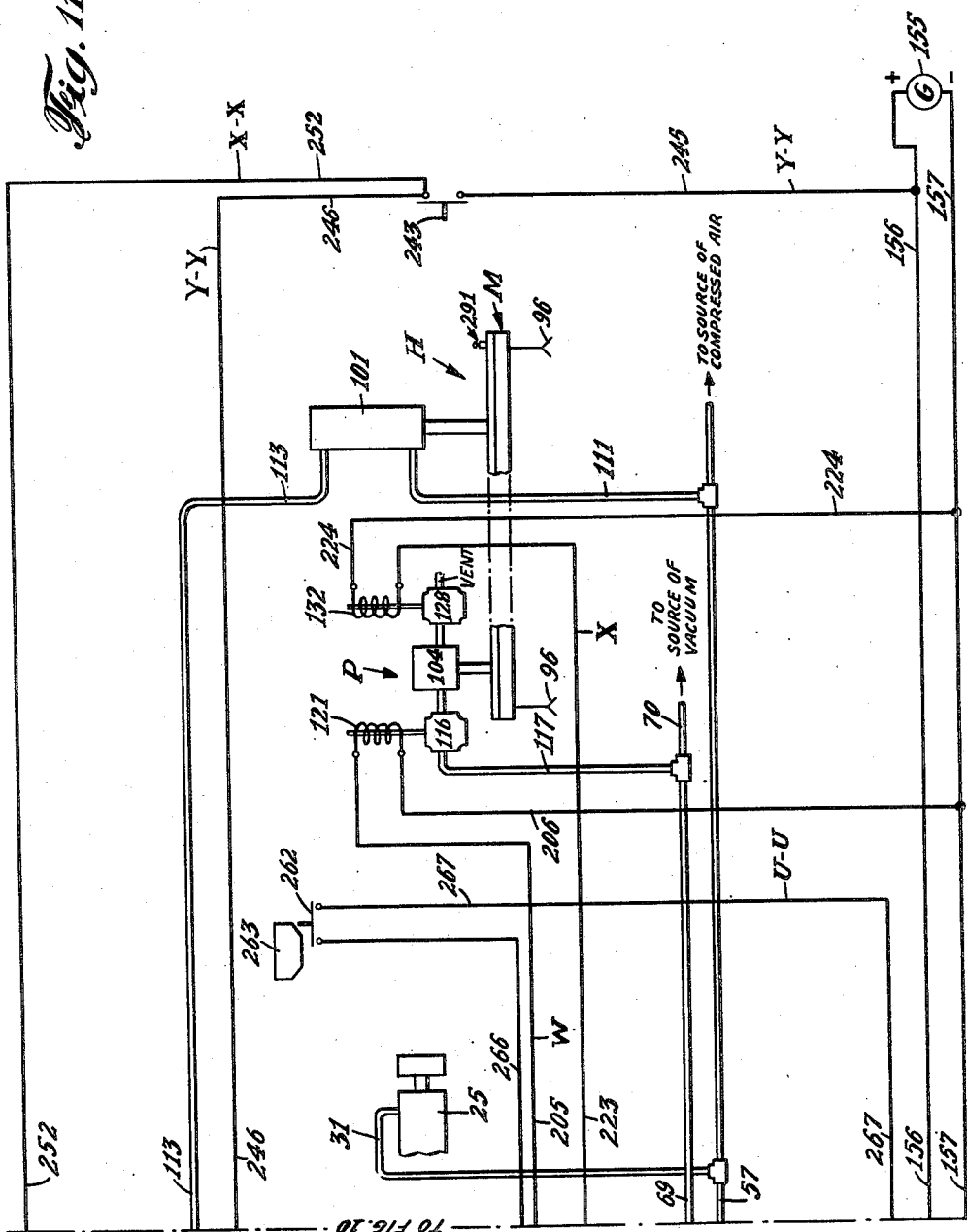
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BAG FILLING OR PACKING MACHINE

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9 Sheets-Sheet 9



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UNITED STATES PATENT OFFICE

2,524,846

BAG-FILLING OR PACKING MACHINE

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Application June 30, 1948, Serial No. 36,176

14 Claims. (Cl. 226—14)

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This invention relates to machines for packing articles such as cans into bags, cartons or other containers for shipment and storage and has particular reference to devices for compactly depositing into each bag, a plurality of individual unit layers of pre-arranged articles, the unit layers being deposited one adjacent the other with a division or separator sheet between each layer, until the bag is filled. This is a companion application to United States patent applications Serial Number 23,926 filed April 29, 1948 on Machine for Feeding and Positioning Containers in a Desired Pattern Arrangement; Serial Number 36,175 filed June 30, 1948 on Machine for Feeding, Transferring and Compacting Articles Into a Unit Layer; and Serial Number 36,177 filed June 30, 1948 on Control Mechanism for Article Transferring Device in the name of John E. Socke.

In the manufacture of cans, it is the usual practice to pack or load the finished cans into large paper bags or other flexible containers for convenience in handling and for protection against contamination during shipment and storage. The cans have heretofore usually been placed in the bags manually, in orderly rows and layers so that a substantially firm and solid package results when the bag is filled and closed.

In such packing of the cans into the bags, it has been found that for best results, the bag should be held in a sidewise or horizontal or slightly inclined position from the horizontal so that the cans may be handled horizontally or substantially so. However, in this horizontal filling position the bag is difficult to close or seal. For this reason, the bag when filled usually is turned into an upright position for sealing. The filled bag is handled manually for effecting these operations.

The instant invention contemplates the provision of a machine for automatically packing or loading individual layers of prearranged cans into a bag preferably disposed in an upright or vertical position for convenience in subsequently sealing the bag, it being understood however that the invention is applicable to the packing of bags in other positions.

An object of the invention is the provision of a machine for packing into bags or other suitable shipping containers individual unit layers of cans prearranged in a predetermined pattern, wherein the bag to be filled is preferably held in an upright position for convenience in sealing and into which a plurality of unit layers of the cans are preferably stacked one on top of the

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other with division or separator sheets between each layer so that a compact stack is built up within the bag to facilitate handling of the filled bags after closing and sealing.

Another object is the provision in such a machine of devices for stacking the unit layers of cans into the bags wherein full control of all of the cans within a unit layer is maintained during the stacking operation so that each layer, as the different layers are deposited in the bag at progressively higher levels, is gently deposited on the stack at its proper level and is released without in any way disturbing the prearranged pattern of the cans in the layer to facilitate the formation of a compact uniform stack.

Another object is the provision in such a machine of devices which operate in synchronism with the unit layer can depositing devices for inserting between each layer of cans, a division or separator sheet, to separate and protect the cans of each layer and to facilitate in the building up of a compact stack of cans within the bag.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a machine embodying the present invention, with parts broken away;

Fig. 2 is a side elevational view of the machine shown in Fig. 1, with parts broken away and with parts in section;

Fig. 3 is an end elevational view of the machine as viewed from the right in Figs. 1 and 2; with parts broken away;

Fig. 4 is a view similar to Fig. 2 with certain of the movable parts in a different position, parts being broken away and shown in section;

Fig. 5 is a top plan view taken substantially along the line 5—5 in Fig. 2, with parts broken away;

Fig. 6 is an enlarged sectional view taken substantially along the vertical line 6—6 in Fig. 2 showing details of a can lifting device and of an air cylinder for actuating the same;

Fig. 7 is an enlarged sectional view taken substantially along the vertical line 7—7 in Fig. 4 showing details of the vent and vacuum valves for effecting the pickup and release of the cans;

Fig. 8 is an enlarged sectional view taken substantially along the broken vertical line 8—8 in Fig. 4 showing details of the air, vent and vacuum

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valves effective for the lifting, transfer and release of separator sheets;

Fig. 9 is an enlarged sectional detail of an air valve for actuating the air cylinders shown in Figs. 1 and 2; and

Figs. 10, 11 are schematic views of the mechanical and electrical control parts of the machine and a wiring diagram of the electric equipment used in the machine.

As a preferred and exemplary embodiment of the instant invention the drawings illustrate a machine for stacking unit layers of cans A, into bags or flexible containers B (Figs. 1, 2, 3 and 4), and also inserting a separator or division sheet C preferably of fibre between the layers as they are stacked. The cans A of a unit layer of cans to be packed into a bag B preferably are prearranged, prior to their entrance into the machine, in an upright position and in a predetermined pattern comprising parallel rows, with adjacent cans in each row in staggered relation to provide a compact layer. These cans are placed in the machine in any suitable manner, preferably in a tray D (Fig. 2) although the cans may be received directly from another machine or a runway or conveyor if desired.

The bags B to be loaded with the layers of cans A preferably are made of fibre material and in general are of rectangular configuration. Preparatory to loading a bag, it is placed manually in an upright mold E which is movable into and out of the machine for convenience in placing the empty bag into the mold and for removing the bag when filled. When the bag is properly positioned in the mold, the mold is pushed manually into a loading station F in the machine (Figs. 1 and 4).

In the machine, the loading station F is disposed between a can receiving station G located at the left of the loading station as viewed in Figs. 1, 2 and 4 and a separator sheet station H located at the right of the loading station. At the separator sheet station H a stack of flat horizontally disposed fibre separator sheets C is supported in a magazine J. These sheets are replenished manually as required.

The placing of a tray D of cans A into the can receiving station G, in a predetermined position, starts a cycle of operation in which a horizontally movable carriage K (Fig. 2) carrying a vertically movable can loading device L and a separator sheet inserting device M, operate to load the cans and insert the separator sheets into the bag. During this cycle of operation, the can loading device L, which normally is disposed at the receiving station G, moves down toward the tray D and picks up the unit layer of cans A and lifts them out of the tray.

While the removed cans A are held in suspension by the loading device L the carriage K moves toward the right as viewed in Fig. 2 and thus carries the loading device with its cans into the loading station F and stops the loading device directly over the bag B to be filled. This movement of the carriage K also shifts the separator sheet inserting device M into the separator sheet station H and when the carriage stops, the sheet inserting device is directly above the stack of separator sheets C.

While the carriage K is in this position, the loading device L moves down into the bag B and deposits its unit layer of cans A into the bag and then returns to its up or normal position above the bag (see Fig. 4). At the same time the separator sheet inserting device M moves down onto

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the stack of separator sheets C and picks up the uppermost sheet from the stack and moves up above the stack holding a sheet C in suspension. The carriage then returns to its original position (as shown in Fig. 2).

The return movement of the carriage K shifts the sheet inserting device M with its suspended sheet C into a position directly over the bag B at the loading station F. When the carriage stops moving, the inserting device moves the suspended separator sheet down into the bag and drops it on top of the unit layer of cans A just received in the bag, and then returns to its up or normal position above the bag. Thus one layer of cans A and its separator sheet C are deposited in the bag. This completes a loading cycle of operation.

The loading cycle of operation just explained is repeated until the bag is filled with cans, and the machine then stops operating. At this time the mold E is withdrawn from the loading station F to a position where it is accessible for manually closing and sealing the bag. When the bag is sealed, it is removed from the mold manually, to any suitable place of deposit and is replaced with an empty bag for a repeat cycle of operation. This completes the full cycle of operations of the machine incident to filling and closing the bag for shipment and storage.

A description of the machine elements will now be given. The mold E which is movable transversely of the machine into and out of the loading station F is mounted on four rollers 12 (Figs. 1, 2, 3, 4 and 5) which operate on a pair of spaced and parallel horizontal tracks 13 which extend transversely of the machine. These tracks are supported in an angle iron frame 14 which constitutes the main frame of the machine and in a subframe 15 which is secured to and extends outwardly from the main frame. Thus when the mold is in position in the subframe 15 it is clear of the machine proper and is readily accessible for manually inserting an empty bag and for manually sealing and removing a filled bag. When the mold is pushed into the machine it is in the loading station F. The mold always remains in an upright position.

The trays D of cans A are received one at a time at the receiving station G, on a horizontal platform or table 17 which is secured to the main frame 14 adjacent the loading station F. A pair of spaced and parallel guide rails 18 secured to the top of the table guide a received tray into proper position on the table.

The carriage K is disposed above the table 17 and is movable longitudinally of the machine frame 14, from the can receiving station G, through the loading station F and into the separator sheet station H. This carriage preferably is rectangular in shape and is mounted on four rollers 21 (Figs. 2, 3 and 6) which ride on a pair of spaced and parallel longitudinal tracks 22 which extend the full length of the machine. The tracks are secured at their ends to the machine frame 14. The carriage extends down between the tracks and is long enough to extend over two adjacent stations, the can receiving station G and the loading station F or the loading station F and the sheet station H.

Movement of the carriage K is effected preferably by compressed air which is introduced into a long horizontally disposed closed cylinder 25 mounted on the main frame 14 adjacent the path of travel of the carriage. The cylinder encloses a piston 26 (Figs. 2 and 4) carried on a piston

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rod 27 which extends beyond the inner end of the cylinder and is secured to a bracket 28 which projects from a side of the carriage.

The interior of the cylinder 25 adjacent its inner or rod end communicates with an inlet pipe 31 (Figs. 2 and 4) which leads from any suitable source of air pressure supply. This air exerts a force against the inner face of the piston and thus maintains the carriage K in its normal initial position over the can receiving station G and the loading station F as shown in Fig. 2, during which time a layer of cans is picked up and a sheet is inserted into the bag B as hereinbefore mentioned. The opposite or outer end of the cylinder 25 is connected by a pipe 32 which leads to a carriage control valve 33 (Fig. 9) enclosed in a valve housing 34 bolted to the machine frame 14. The valve 33 preferably is of the slide valve type having an annular channel 35 which normally maintains the pipe 32 in communication with a vent port 36 formed in the valve housing 34. The valve normally closes off the inlet end of a supply pipe 37 which leads from any suitable supply of compressed air. Flow of air through the valve housing into the outer end of the cylinder 25 is effected by a shifting of the valve 33 which is brought about by a normally de-energized electric solenoid 38 enclosed within the valve housing as shown in Fig. 9. This solenoid has a movable core 39 which is connected to the valve 33 and which is maintained under the force of a compression spring 41 interposed between the end of the core and a cap 42 of the housing.

Hence when the solenoid 38 is energized as will be hereinafter explained, the valve 33 is lifted in its housing 34 and this closes the vent port 36 and brings the pipe 32 into communication with the supply pipe 37. Compressed air thus flows through the valve housing into the pipe 32 and cylinder 25 and exerts its force against the outer face of the piston 26. Since this face of the piston is greater in area than that of its inner face by an amount equal to the cross-sectional area of the piston rod, the force on the outer face overcomes that on the inner face and thus forces the piston along the cylinder (toward the right in Fig. 2). This movement of the cylinder shifts the carriage K from its initially normal position over the can receiving station G and loading station F as shown in Fig. 2 to a position over the loading station F and the separator sheet station H as shown in Fig. 4. It is in this position of the carriage that the cans A are loaded into the bag B and a separator sheet C is picked up for later insertion into the bag over the cans as hereinbefore explained. When these operations have been performed, the energized solenoid 38 is de-energized and the valve 33 closes the supply pipe 37 and opens the vent 36. This permits the constant flow of air into the inner end of the cylinder 25 to push the piston 26 back in the cylinder and thereby return the carriage to its original position as shown in Fig. 2.

The can loading device L which picks up a unit layer of cans A from the tray D while the carriage K is over the can receiving station G and which loads them into the waiting bag B at the loading station F, when the carriage shifts into this station as outlined above, depends from the carriage in vertical alignment with the can receiving station when the carriage is in its normal position, and is movable vertically toward and away from the table 17 on which the tray D rests.

This can loading device L comprises a pair of

flat horizontally disposed upper and lower rectangular plates 44, 45 (Figs. 6 and 7) secured together as a unitary structure. The lower plate 45 carries a plurality of depending vacuum tubes 46 terminating at their lower ends in vacuum cups 47 and arranged in spaced and parallel rows and staggered relation in accordance with the number and positions of the cans A in the trays D. There is one vacuum tube and cup for each can. The upper ends of the tubes communicate with interconnected vacuum channels or grooves 48 formed in the top surface of the lower plate 45.

Vertical movement of the can loading device L is effected by compressed air in a manner similar to that used for shifting the carriage K. For this purpose the upper plate 44 of the loading device L is secured to the lower end of a vertical piston rod 51 (Fig. 6) which carries a piston 52 which operates in a vertical closed cylinder 53 mounted in the carriage K. Pilot or guide pins 54 secured in the upper plate 44 of the loading device extend up through sleeves 55 secured in the carriage and guide the loading device against turning during its vertical travel.

Compressed air is continuously introduced into the cylinder 53 adjacent its lower end by an inlet pipe 57 (Fig. 6) which leads from any suitable source of air under pressure. This air exerts its force against the lower face of the piston 52 and normally supports the weight of the loading device L and thus holds it in its uppermost position as shown in Figs. 2, 3 and 6.

Lowering of the loading device is brought about by compressed air which is introduced into the cylinder 53 at its upper end above the piston 52, through a pipe 58 (Figs. 1, 2 and 4) which is connected into the cylinder and into a valve housing 59 which is similar to the valve housing 34 shown in Fig. 9. The valve housing 59 like the valve housing 34 encloses a slide valve which is actuated by a normally de-energized electric solenoid 61, similar to the solenoid 38, and which like the solenoid 38 controls the venting of the cylinder 53 and the flow of compressed air thereinto from a supply pipe 62 connected into the housing. The pipe 62 leads to any suitable source of supply of air under pressure.

When the solenoid 61, like the solenoid 38, is energized it opens its valve in the housing 59 and permits air from the supply pipe 62 to flow through the valve and the pipe 58, into the cylinder 53 above the piston 52 and exert its force against the upper face of the piston. Since this upper face is greater in area than the lower face by an amount equal to the cross-sectional area of the piston rod, the air above the piston pushes the piston down in its cylinder. This action lowers the loading device L and thus moves the vacuum cups 47 down onto the cans A in the tray D on the table 17.

In the instant case, empty cans A are shown in the drawings by way of example of the articles to be loaded into the bag B, although the invention is equally well adapted to filled and sealed cans or to any other articles. In the case of empty cans, the vacuum cups 47 move down into the cans and engage against their bottoms at the bottom of the stroke of loading device L.

As soon as the loading device L reaches the bottom of its stroke, the valve in the housing 59 is closed by a de-energizing of the solenoid 61. This cuts off the flow of compressed air from the supply pipe 62 into the cylinder 53 and opens the vent in the housing. This permits the air from the inlet pipe 57 at the bottom of the cylin-

der to lift the piston 52 and thus return the loading device to its normal raised position as shown in Fig. 2.

Substantially simultaneously with the closing of the valve in the valve housing 59 to return the loading device L, a vacuum is drawn on the vacuum cups 47 for the purpose of gripping the cans A and lifting them bodily with the loading device to remove them from the tray D and to temporarily hold them in suspension while the carriage K moves them into position over the bag B at the loading station F as hereinbefore mentioned. This vacuumizing of the vacuum cups 47 is brought about by a cup venting and vacuumizing mechanism 0 (Figs. 1, 4 and 7) supported on a vertically disposed combination vent and vacuum tube 64 (Fig. 7) projecting up from and movable with the loading device. The lower end of the tube is threadedly secured in the upper plate 44 of the loading device and communicates with the interconnected vacuum channels 48 in the lower plate 45.

The upper end of the vent-vacuum tube 64 supports a casing 65 (Fig. 7) and is in communication with a chamber 66 enclosed by the casing. One side of the chamber is connected by a short pipe 67 to a vacuum valve housing 68 connected by a supply pipe 69 to a main supply pipe 70 which leads to any suitable source of vacuum. This valve housing encloses a normally closed vacuum slide valve 71 which normally cuts off the source of vacuum and which is actuated by an integral core 72 of a normally de-energized electric solenoid 73 mounted in the upper end of the valve housing. The core 72 is maintained under pressure of a compression spring 74 interposed between the upper end of the core and a cover plate 75 of the valve housing.

The opposite side of the chamber 66 is connected by a short pipe 77 (Fig. 7) to a vent valve housing 78 having a vent tube 79 open to the outside atmosphere. This valve housing 78 encloses a normally open vent slide valve 81 which is actuated by an integral core 82 of a normally energized electric solenoid 83 mounted in the upper end of the valve housing. The core 82 is maintained under pressure of a compression spring 84 interposed between the upper end of the core and a cover plate 85 of the valve housing.

The operation of this venting and vacuumizing is as follows. When the loading device L moves down toward the cans A in the tray D and reaches the bottom of its stroke with the vacuum cups 47 engaging against the bottoms of the cans, the vent valve solenoid 83 is immediately de-energized and the vacuum valve solenoid 73 is simultaneously energized. This is effected through electric switches and suitable circuits to be hereinafter explained in connection with the wiring diagram. De-energizing of the vent valve solenoid 83 closes the vent valve 81 and cuts off communication between the outside atmosphere and the chamber 66. Energizing of the vacuum valve solenoid 73 opens the vacuum valve 71 and establishes communication between the vacuum supply pipe 69 and the chamber 66.

Hence the vacuum cups 47, by way of the channels 48 in the loading device L and the vent-vacuum tube 64 connecting with these channels and the chamber 66 are subjected to the vacuum pull in the vacuum supply pipe 69 and are thus vacuumized with the result that they grip and hold the cans A.

When sufficient vacuum is created in the vacuum cups 47 and the parts of the vent-vacuum mechanism 0 connected therewith, to insure

proper gripping and holding of the cans A, the loading device L is permitted to lift the cans as hereinbefore mentioned. This lifting of the loading device is controlled by a piston 87 (Fig. 7) which is located in a short vertical cylinder 88 enclosed in the chamber casing 65 and in communication with the chamber 66. The piston is retained in a normally raised position as shown in Fig. 7 by a compression spring 89 which is interposed between the bottom face of the piston and the lower end of the cylinder. The upper end of the piston engages against a movable element of a normally closed electric switch 91 mounted on the chamber casing 65.

Hence when sufficient vacuum is created in the vent-vacuum mechanism 0 to grip and hold the cans, the piston 87 is drawn down in the cylinder 88 and this permits the switch 91 to open and through suitable electric circuits to be hereinafter explained, connects with and de-energizes the solenoid 61 in the valve housing 59 and thereby controls the lifting of the loading device L.

When the loading device L and its suspended unit layer of cans A are shifted into position over the bag B at the loading station F, the cans are lowered into the bag through a repeat cycle of operation of the valve in the housing 59 (Fig. 4). In this connection provision is made for stopping the loading device at different levels in the bag to gently deposit successive unit layers of cans individually on top of each other in parallel zones or tiers to progressively build up a stack within the bag. This is brought about through a series of electric stop switches which will be hereinafter explained in connection with the wiring diagram.

When the loading device L stops at the level at which it is to discharge the unit layer of cans in the bag as shown in Fig. 4, the vacuum within the vacuum cups 47 is broken and thus the cans are released from the cups so that they will remain in the bag. This breaking of the vacuum is effected by the closing of the vacuum valve 71 (Fig. 7) through the de-energizing of its solenoid 73 and by the simultaneous opening of the vent valve 81 through the energizing of its solenoid 83. The breaking of the vacuum in the vent-vacuum mechanism 0 with the resulting release of the cans A from the vacuum cups 47, also dissipates the vacuum pull on the switch piston 87 (Fig. 7) in the cylinder 88 and thereby permits the spring 89 to raise the piston. This closes the control switch 91 and permits the loading device L to return to its normally elevated position on the carriage K where it is ready for a repeat operation.

The separator sheet inserting device M which picks up the separator sheets C individually from the stack of sheets at the sheet station H and inserts them into the bag B on top of the unit layers of cans A as the latter are deposited in the bag, is similar in construction and operation to the can loading device L. This inserting device M is carried on and depends from the carriage K in a position in advance of the loading device as shown in Fig. 2 by a distance equal to the distance between the can receiving station G and the loading station F so as to obtain accurate co-ordination and location of the devices L and M relative to the stations G, F and H.

The sheet inserting device M, like the can loading device L, includes a pair of flat horizontally disposed upper and lower rectangular plates 93, 94 (Fig. 8) secured together as a uni-

tary structure and which are movable vertically toward and away from the stack of sheets C and the bag B being loaded. The lower plate 94 carries four depending vacuum tubes 95 located at the corners of the plate and terminating in vacuum cups 96. The upper ends of the tubes communicate with vacuum channels or grooves 97 which are formed in the top surface of the lower plate 94 and which connect with all of the tubes.

Like the loading device L, the separator sheet inserting device M is retained normally in a suspended position on the carriage K and is moved vertically by compressed air devices which include a vertical closed cylinder 101 (Fig. 8) supported on and movable with the carriage. The cylinder contains a piston 102 mounted on a piston rod 103 which extends down through the cylinder and is secured to the upper plate 93 of the inserting device M. The upper plate 93 of the inserting device M also supports a housing 104 which encloses a chamber 105 of a venting and vacuum mechanism P and which is secured by a vertical pipe 106 to the plate 93. The pipe 106 communicates with the chamber 105 in the housing 104 and the vacuum channels 97 in the lower plate 94.

Hence when the piston 102 moves in the cylinder 101 it lowers and raises the inserting device M and also the vent-vacuum mechanism P. Pilot or guide pins 108 secured in the upper plate 93 of the inserting device extend up through sleeves 109 formed in the carriage K and guide the inserting device against turning during its vertical travel.

Compressed air is continuously introduced into the cylinder 101 adjacent its lower end, by an inlet pipe 111 (Fig. 8) which leads from any suitable source of air under pressure. This air exerts its force against the lower face of the piston 102 and normally supports the weight of the inserting device M and thus holds it in its uppermost or elevated position as shown in Fig. 2.

Actuation of the inserting device M in a downward direction is effected by compressed air which is introduced into the cylinder 101 at its upper end above the piston 102, through a pipe 113 (Fig. 4) which connects with the pipe 58 leading from the valve housing 59. Thus the valve in the valve housing 59 controls the flow of air into the cylinder 101 while simultaneously controlling the flow of air into the loading device actuating cylinder 53.

The cycle of operation of the inserting device M is the same as that of the loading device L, both devices being lowered and raised simultaneously, the one to pick up and release the separator sheets C and the other to pick up and release the cans A. The inserting device M however is not equipped with control devices for varying the distance it moves down into the bag when placing a separator sheet C on top of the layers of cans deposited in the bag. The inserting device merely moves down to the level of the uppermost layer of cans in the bag regardless of how many layers are in the bag, and releases and drops its separator sheet at this level. The released sheet falls or drops onto the last layer of cans placed in the bag, whether it is the first or bottom layer or the last or top layer or any intermediate layer.

Picking up of a separator sheet C by the vacuum cups 96 from the stack of sheets at the station H is effected in a manner similar to that employed by the loading device L in picking up the cans A. For this purpose one side of the

chamber 105 (Fig. 8) in the casing 104 is connected by a short pipe 115 to a vertical vacuum valve housing 116 connected by a supply pipe 117 which connects with the main supply pipe 10 that leads to the source of vacuum. This valve housing encloses a normally open vacuum slide valve 118 which is actuated by an integral core 119 of a normally energized electric solenoid 121 mounted in the upper end of the valve housing. The core 119 is maintained under pressure of a compression spring 123 interposed between the upper end of the core and a cover plate 124 of the housing.

The opposite side of the chamber 105 is connected by a short pipe 127 (Fig. 8) to a vent valve housing 128 having a vent tube 129 open to the outside atmosphere. This valve housing 128 encloses a normally closed vent slide valve 130 which is actuated by an integral core 131 of a normally de-energized electric solenoid 132 mounted in the upper end of the valve housing. The core 131 is maintained under pressure of a compression spring 133 interposed between the upper end of the core and a cover plate 134 of the valve housing.

The operation of this venting and vacuumizing mechanism P is the same as the venting and vacuumizing device U which controls the venting and the vacuumizing of the vacuum cups 47 of the can loading device L except that they operate in reverse order, the cups 96 being normally vacuumized and becoming de-vacuumized when the cups 47 are vacuumized. When the vacuum cups 47 are vacuumized to pick up a unit layer of articles, the vacuum valve 118 of the vent-vacuum mechanism P, closes and cuts off the supply of vacuum to the cups 96 and the vent valve 130 is opened. The valves remain in this condition until the sheet inserting device M is raised and shifted into the separator sheet station H, in readiness to pick up a sheet C.

To pick up a sheet C, the vent valve 130 is reclosed by the de-energizing of its solenoid 132 and the vacuum valve 119 is reopened by the energizing of its solenoid 121. Release of a sheet from the vacuum cups 96 to insert the sheet into the bag is effected by the reclosing of the vacuum valve 118 by the de-energizing of its solenoid 121 and the reopening of the vent valve 130 by a re-energizing of its solenoid 132. Energizing and de-energizing of these solenoids is effected by suitable electric switches and circuits to be hereinafter explained in connection with the wiring diagram. This completes a description of the machine elements.

Reference should now be had to the wiring diagram in Figs. 10 and 11 which taken together schematically show electric equipment for controlling and operating the various solenoids and switches hereinbefore mentioned. The cycle of operation of the machine is started manually through the closing of a normally open push button starting switch 151 (at the lower left in Fig. 10) in a starting circuit R which includes a normally de-energized relay solenoid 152 of a normally open relay switch 153. The sole purpose of this starting circuit is to provide for the manual starting of the machine through the closing of the relay switch 153 and the establishment thereby of a holding circuit which will hold the switch closed throughout the cycle of operation of the machine and which when broken at the end of the cycle, will prevent restarting of the machine until again manually effected

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through the reclosing of the push button switch 151 and its circuit R.

The starting circuit R like all the other circuits to be described transmits electric current from a generator 155 (Fig. 11) having a main or generator lead wire 156 and a return lead wire 157. When the push button switch 151 is temporarily closed, electric current passes from the generator lead wire 156 (Fig. 10) along a connecting wire 161, through the closed button switch 151, along a wire 162, through the solenoid 152, returning along a wire 163, to the return wire 157. Current passing along this circuit R energizes the solenoid 152 and closes the relay switch 153.

Closing of the relay switch 153 immediately establishes a cycle holding circuit S which cuts out the push button switch 151 and which includes a normally closed cam actuated switch 165 (lower middle of Fig. 10) of an intermittently actuated indexing device T. The indexing device T comprises a normally stationary cam shaft 166 (see also Figs. 1 and 2) carried at its ends in bearing blocks 167 which project out from the machine frame 14.

The shaft 166 carries a plurality of edge cams controlling switches to be hereinafter explained for stopping the cam loading device L at the proper level when depositing the cans A in a bag B. For this purpose the cam shaft is partially rotated each time a layer of cans is deposited in the bag. This rotation of the shaft is effected by a ratchet wheel 168 which is mounted on the shaft and which is actuated by a pawl 169 carried on a lever arm 171 pivotally mounted on the shaft. The lever arm is moved through the energizing and de-energizing of a solenoid 172. The normally closed switch 165 in the holding circuit S is controlled by a cam 173 on the cam shaft 166.

Hence when the relay switch 153 is closed through the starting circuit R, electric current from the generator lead wire 156 passes along the wire 161, along a connecting wire 175 of circuit S, wire 176, closed switch 165, a wire 177, closed relay switch 153, a by-pass wire 178, through the solenoid 152 of circuit R, returning along wire 163 to the return wire 157. This current maintains the solenoid 152 energized and the relay switch 153 closed after the opening or release of the button switch 151. The stage is now set for the beginning of a cycle of operation of loading a unit layer of cans A into the bag and to place a separator sheet C on top of it.

The loading cycle begins with the entrance of a tray D of cans A into the machine. The tray upon being placed in proper position on the table 17 of the machine engages and closes a normally open tray switch 181 (Fig. 10 at the right) of a loading circuit U which includes the normally de-energized solenoid 61 of the loading device actuating valve 59 and a normally closed switch 182 controlled by a cam 183 of the indexing device T. When the tray switch 181 is closed, electric current from the generator lead wire 156, passes along wire 161 to and along wires 175, 176 of circuit S, through closed switch 165, along wire 177, closed relay switch 153, along a connecting wire 184 to and through closed cam switch 182, a wire 185, wire 186 to and through closed tray switch 181, a wire 187 to and through a closed switch 188 (held normally closed by engagement with the carriage K while at the receiving station G), a wire 189, to and through the normally closed vacuum switch 91, a wire 190 to and through the loading device solenoid 61, returning along a wire 191 to the return wire 157.

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Electric current passing along the circuit U, above outlined, energizes the loading device solenoid 61 and thus opens the valve in the valve housing 59 and permits compressed air to flow into the cylinder 53 as hereinbefore mentioned and thus lowers the can loading device L and its vacuum cups 47 into engagement with the cans in the tray D. It should be remembered that the sheet inserting device M is also controlled by the valve in the housing 59 and when the can loading device L moves down to engage the cans, the sheet inserting device M moves down into the bag to release a sheet C. However at this time in the cycle of operation there is no sheet on the inserting device. Hence no action takes place.

Before the cans A can be lifted from the tray D, sufficient vacuum must be created in the vacuum cups 47 and this vacuum must be maintained until the cans are safely deposited into the bag. For this purpose the can loading device L at the bottom of its downward stroke engages and closes a normally open switch 193 (at the left in Fig. 10) of a relay circuit V which includes a solenoid 194 of a relay switch 195. When the switch 193 is closed, current from the generator lead wire 156 passes along a connecting wire 196, through the closed switch 193, a wire 197, through the solenoid 194, returning along a wire 198 to the return lead wire 157. The establishment of this circuit energizes the solenoid 194 for the purpose of opening the switch 195, and to establish a holding circuit for the solenoid when the switch 193 again opens when the loading device moves up and away from it.

The relay switch 195 is part of a vent-vacuum circuit W which includes the normally energized solenoid 83 of the vent-vacuum mechanism 0 (Fig. 10) and the normally energized solenoid 121 of the vent-vacuum mechanism P (Fig. 11). Electric current for the circuit W normally passes from the generator lead wire 156 along a wire 201 (at the left in Fig. 10), through the closed switch 195, a wire 202, a connecting wire 203 through the energized solenoid 83, returning along a wire 204 to the return lead wire 157. At the wire 203 this current also passes along a connecting wire 205 (see also Fig. 11) to and through the energized solenoid 121, returning along a wire 206 to the return lead wire 157. When the relay switch 195 is opened this circuit is broken and the solenoids 83 and 121 are de-energized. This closes the vent valve 81 (Fig. 7) of the vent-vacuum mechanism 0 and also closes the vacuum valve 118 (Fig. 8) of the vent-vacuum mechanism P.

Simultaneously with the closing of the vent valve 81 (Fig. 7) of the vent-vacuum mechanism 0, the vacuum valve 72 actuated by the normally de-energized solenoid 73 of this mechanism is opened to connect the vacuum cups 47 with the source of vacuum. At the same time the vent valve 130 (Fig. 8) actuated by the normally de-energized solenoid 132 of the vent-vacuum mechanism P is opened to vent the vacuum cups 96 of this mechanism and release a separator sheet C from the cups when a sheet is held thereon. At this time in the cycle of operation there is no sheet on the cups.

This opening of the vacuum valve 72 and the vent valve 130 is effected by the closing of a normally open switch 211 which is integral with the relay switch 195 and moves with it. The closing of the switch 211 establishes a circuit X which includes the normally de-energized vent-vacuum

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solenoids 73 and 132. Electric current for this circuit passes from the generator lead wire 156 along the wire 161 (Fig. 10) along a connecting wire 212 through a normally closed switch 213 controlled by a cam 214 of the indexing device T, along a wire 215 through a normally closed indexing switch 216, wires 217, 218, through the closed switch 211, a wire 219, a connecting wire 220 to and through the solenoid 73 returning along a wire 221 to the return lead wire 157. At the connection of the wires 219 and 220, the current also passes along a wire 223 (see also Fig. 11) to and through the normally de-energized solenoid 132, returning along a wire 224 to the return lead wire 157. Current passing along this circuit X energizes the solenoids 73 and 132.

Energizing of the solenoid 73 opens the vacuum valve 72 (Fig. 7) and exhausts the air from the vacuum cups 47 so that they will grip and hold the cans A in the tray D. In order to maintain the solenoids 73, 132 in this energized condition while the cans are removed from the tray and inserted into the bag, the closing of the relay switch 211, immediately connects the circuit X with the circuit V by way of a by-pass wire 226 which connects the switch 211 with the relay solenoid 194. This by-pass circuit cuts out the switch 193 operated by the loading device L. Current passes from the circuit X through the closed switch 211 along the by-pass wire 226, through the relay solenoid 194 and wire 198 of circuit V to the return wire 157 to keep the solenoid energized and thus keep the switch 211 closed.

When a predetermined degree of vacuum, sufficient to hold the cans on the cups 47, is created in the cups and the vent-vacuum system connected therewith, the loading device L is permitted to rise. With the establishment of this vacuum, the vacuum switch 91 in the circuit U, opens and this breaks the circuit U. Hence the loading device actuating solenoid 61 is de-energized and this closes the air valve in the valve housing 59 and thereby vents the cylinder 53 and permits the continuous supply of air entering the bottom of the cylinder to lift the loading device L and to thus remove the cans A from the tray D and hold them in suspension above the tray. This lifting of the loading device L opens the switch 193. The breaking of the circuit U also breaks the circuits R and S and thus returns these circuits to their normally open condition in readiness for a subsequent manually started machine cycle of operation as hereinbefore mentioned.

When the loading device L reaches the top of its up stroke returning it to its normal elevated position it engages and closes an open switch 231 mounted on the carriage K for the purpose of establishing a transfer circuit Y which actuates the carriage K and thereby shifts the suspended cans A into a position over the bag B. This shifting of the carriage also moves the sheet inserting device M into a position over the stack of sheets C as hereinbefore explained. Circuit Y receives electric current from the closed relay switch 211 of circuit X.

Hence when the switch 231 is closed by the loading device L, current passing through the closed relay switch 211 of circuit X, also passes along a connecting wire 232 of circuit Y, closed switch 231, a wire 233, a connecting wire 234, through the normally de-energized carriage moving solenoid 38 returning along a wire 235 to the return lead wire 157. This current energizes the solenoid 38 and opens the air valve 33 (Fig. 9) and permits compressed air to flow into the long

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cylinder 25 and thus push the carriage K into a position where the suspended cans A on the loading device L are above the bag B at the loading station F. This shifting of the carriage also opens the control switch 188 of circuit U normally held closed by contact with the carriage, and thus the circuit U is prevented from being reestablished by the entrance of the next tray of cans and the closing of the tray switch 181, until the carriage returns to its normal position at the receiving station G.

In order to maintain the carriage K in this advanced position, while the loading device L moves down to deposit the layer of cans A into the bag, a holding circuit Z, forming a part of the circuit Y is established to prevent breaking of the circuit Y when the loading device moves away from and opens the switch 231. For this purpose current from the circuit Y after passing through the closed switch 231 and passing along wire 233, passes along a connecting wire 237, to and through a normally de-energized solenoid 238 of a relay switch 239, returning along a wire 240 to the return lead wire 157. This current energizes the solenoid 238 and closes the relay switch 239. Closing of the switch 239 establishes a by-pass circuit around the closed switch 231 permitting current from the wire 232 of circuit Y to pass along a connecting by-pass wire 241, through the closed switch 239 and passes two ways, along the wire 234 to the solenoid 38 of circuit Y and also along the wires 233, 237 to the solenoid 238 of circuit Z to keep these solenoids 38, 238 energized. This by-pass circuit cuts out the loading device actuated switch 231.

When the carriage K, in shifting into its advanced position, reaches the end of its stroke, it engages and closes a normally open control switch 243 (at the right in Fig. 11) of an auxiliary loading device lowering circuit Y—Y which permits the loading device L to move down into the bag to deposit its cans. The sheet inserting device M also moves down to pick up a separator sheet C. This circuit Y—Y includes a normally open auxiliary vacuum switch 244 (at the upper right in Fig. 10) which is integral with the normally closed vacuum switch 91. At this point in the loading cycle the switch 91 is open because vacuum is being maintained in the vacuum cups 47 to hold the cans and under these conditions the auxiliary switch 244 is closed. Hence as soon as the control switch 243 is closed by the carriage K, current from the generator lead wire 156 passes along a connecting wire 245 (right in Fig. 11), through the closed switch 243, along a wire 246, through the closed switch 244, along a wire 247 to and along wire 190, through the de-energized solenoid 61, returning along wire 191 to the return lead wire 157. This current re-energizes the de-energized solenoid 61 and opens the air valve in the valve housing 59 and thereby permits air to enter the two cylinders 53 and 101 of the can loading device L and the sheet inserting device M respectively. This air entering the cylinders pushes the loading device L and its suspended cans A down into the bag and also lowers the sheet inserting device M down onto the top sheet C of the stack of sheets at the station H.

As the loading device L moves down its moves away from and opens the control switch 231 of circuit Y. It also closes an integral control switch 251 and thereby establishes a circuit X—X connecting with circuit Z to maintain the solenoid 238 of this latter circuit energized. This current is received from the wire 245 (right in

Fig. 11) of circuit Y—Y and after passing through the closed switch 243, passes along a wire 252, through the closed switch 251, along a wire 253, wire 237, solenoid 238, returning along wire 240 to the return lead wire 257. This current maintains the solenoid 238 in an energized condition.

Since the unit layer of cans A being lowered into the bag is the first or initial layer of a plurality of layers to be stacked one on top of the other in the bag, the loading device L moves all the way down into the bag until the cans rest on the bottom thereof. The distance the loading device moves down into the bag is controlled electrically through a series of normally closed depth control or stop switches 255, 256, 257 and the stop switch 216 (Fig. 10) which are included in circuits controlled by the indexing device T hereinbefore mentioned. These stop switches 255, 256, 257, 216 are actuated by a switch actuating element 258 mounted on a vertical rod 259 which extends up from the upper plate 44 of the loading device L.

In the instant case, where the unit layer of cans is to be placed on the bottom of the bag the switch actuating element 258 as it moves down with the loading device L engages and opens all of the switches 255, 256, 257 successively without effect since their connecting circuits are normally open. When the switch actuating element 258 engages and opens the stop switch 216, it immediately breaks the established circuits X, Y and V.

In breaking the circuit X the vacuum solenoid 73 of the vent-vacuum mechanism O (Fig. 10) is de-energized and this closes the vacuum valve 72 (Fig. 7) and cuts off the supply of vacuum from the cups 47 of the can loading device L. It also de-energizes the vent solenoid 132 of the vent-vacuum mechanism P (Fig. 11) and this closes the vent valve 130 and cuts off the outside atmosphere from the vacuum cups 96 of the sheet inserting device M.

The breaking of circuit X, V through the bypass wire 226 (at the left in Fig. 10) de-energizes the solenoid 194 and this permits the relay switch 195 to close and its integral auxiliary relay switch 211 to open. The closing of this relay switch 195 re-establishes the circuit W which includes and which re-energizes the vent solenoid 83 of the vent-vacuum mechanism O (Fig. 10) and this opens the vent valve 81 (Fig. 7) of this mechanism to the atmosphere and thus dissipates the vacuum within the vacuum cups 47 of the loading device L.

This dissipation of the vacuum recloses the vacuum switch 91 and opens the auxiliary vacuum switch 244 and thereby breaks the circuit Y—Y which thus de-energizes the solenoid 61 and closes the loading device actuating valve in the valve housing 59. The opening of the switch 91 which is in the circuit U, has no effect on this circuit at this time since it is maintained in an open condition by the open control switch 188 actuated by the carriage K.

This action takes place rapidly and thus the layer of cans A held by the cups are released therefrom and the travel of the loading device is arrested almost simultaneously. The released cans are supported on the bottom of the bag. The re-establishment of the circuit W also re-energizes the vacuum solenoid 121 of the vent-vacuum mechanism P (Fig. 11) and this opens the vacuum valve 118 of this mechanism to the source of vacuum and thus creates a vacuum in

the vacuum cups 96 of this mechanism to grip and hold the uppermost separator sheet C on the stack of sheets at the station H.

However the opening of the auxiliary vacuum switch 244 breaks the circuit Y—Y which includes the energized loading device actuating solenoid 61 and thus this solenoid is de-energized. This closes the air valve in the valve housing 59 and cuts off the flow of air into the upper ends of the two air cylinders 53, 101 of the can loading device L and the sheet inserting device M respectively. Thus the air entering the bottoms of these cylinders lifts the loading device and the sheet inserting device, the cans being left in the bag while the sheet C is picked up and held in suspension by the inserting device. The carriage K is now ready to return to its normal position (at the left as viewed in Fig. 10) to shift the empty loading device L into the can receiving station G and to locate the sheet inserting device M with its suspended sheet into a position above the bag at the loading station F.

The suspended sheet C remains in position over the bag B until, on the next loading cycle, the vacuum cups 47 of the loading device L are vacuumized to pick up another layer of cans. At this time the vacuum in the vacuum cups 96 of the sheet inserting device M is broken and the suspended sheet drops into the bag and falls into place on top of the inserted layer of cans A in readiness for the reception of the next layer of cans.

The return of the carriage K is brought about by a breaking of the circuit X—X, Y (at the left in Fig. 10) and this is effected by the opening of the switch 251 when the loading device L reaches the top of its upward return travel after depositing the cans in the bag. Breaking of the circuit X—X, Y de-energizes the solenoid 38 and this permits the air valve 33 in the valve housing 34 to close and thereby vent and cut off the flow of air into the outer end of the carriage actuating cylinder 25. The air entering the opposite end of the cylinder thereby acts to draw the carriage back into its original position. As soon as the carriage starts to move it opens the control switch 243 (at the right in Fig. 11) and thereby breaks the circuits X—X, and Y—Y in readiness for a repeat operation. In like manner, when the carriage returns to its normal position it engages and opens the control switch 188 (middle at Fig. 10) and thus partially closes the circuit U for a repeat operation.

During the return movement of the carriage K to its normal position, the indexing device T is actuated to reset it for the establishment of a new circuit which stops the loading device L at the second level in the bag, when the device subsequently enters the bag for the deposit of the second unit layer of cans. This actuation of the indexing device T is effected by the closing, on the return movement of the carriage, of a normally open switch 262 (Fig. 11) in a circuit U—U which includes the ratchet wheel solenoid 172 (Fig. 10) and which is an extension of the reclosed circuit W. The switch 262 is closed by a depending cam 263 mounted on the carriage K. The switch actually is closed twice, once on the forward stroke of the carriage and once on the return stroke. However the closing of the switch is effective only on the return stroke since it is then that the relay switch 195 in circuit W (at the left in Fig. 10) is closed. On the forward stroke of the carriage the switch 195 and the circuit connected therewith is open.

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When the switch 262 is momentarily closed on the return stroke of carriage K electric current is received from the re-established circuit W (at the left in Fig. 10), the current passing from the generator lead wire 156, along the wire 201, through the reclosed relay switch 195, wire 202 to and along a connecting wire 266, through the closed switch 262 (Fig. 11), along a wire 267 to and through the ratchet wheel solenoid 172 (Fig. 10) returning along a wire 268 to the return lead wire 157. This current momentarily energizes the solenoid 172 and this locks the ratchet wheel 168 and its cam shaft 166 through an angle of 90 degrees, constituting one step of rotation of the cam shaft in the cycle of operation of filling the bag.

By way of illustration four layers of cans A are to be packed in the bag B and hence the indexing device T and its cooperating switches and circuits are shown to accomplish this result. However any number of layers may be packed into the bag by increasing or decreasing the number of cams and switches and employing a ratchet wheel of the proper number of teeth.

In the instant case, the partial rotation of the cam shaft 166 and the cams mounted thereon opens the indexing switch 213 controlled by cam 214 and renders ineffective that portion of circuit X which includes the normally closed indexing switch 216 so that this portion of the circuit cannot be used for stopping the descent of the loading device L on its second loading operation. During this same rotation of the cam shaft, the cam 183 opens the switch 182 and discontinues the use of that portion of the starting circuit R which includes the starting switch 151. The opening of this switch also closes it against auxiliary contacts which connect wire 186 of circuit U with a wire 271 which connects with the wire 161, thus partially resetting the circuit U for automatic reestablishment after each loading cycle for the remaining portion of the full cycle of operation of the machine.

The rotation of the cam shaft 166 also causes a cam 273 to close a normally open control switch 274 of a circuit W—W which includes the indexing switch 257. The closing of the control switch 274 closes the normally open circuit W—W and transfers the control of the vacuum valve 71 (Fig. 7) operated by the normally de-energized solenoid 73 of mechanism O (Fig. 10) and the vent valve 130 (Fig. 8) operated by the normally de-energized solenoid 132 of mechanism P (Fig. 11), from the indexing switch 216 to the indexing switch 257 for the next or second loading cycle of operation. Current for this circuit passes from the wire 161 (bottom of Fig. 10) along a wire 276, closed switch 274, a wire 277 to and through the closed stop switch 257, along a wire 278 to and along wires 217, 218 and the remaining portion of circuit X.

The establishment of this circuit W—W, as yet unused, completes the first or initial loading cycle as an incident in loading the bag B.

The second loading cycle follows immediately after the first, providing a tray D of cans C are in place against and closing the tray switch 181 at the can receiving station G. With this switch 181 held closed by the tray D, the second loading cycle is started as soon as the carriage K on its return stroke engages and closes the control switch 188 in the circuit U. This completes the circuit U and immediately effects a repetition of the operations hereinbefore explained. During this repeat loading cycle, the initial separator sheet C still held in suspension on the vacuum

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cups 96 of the inserting device M, is released and dropped into the bag on top of the initial layer of cans in readiness for the reception of the second layer of cans.

When the second layer of cans is picked up from the tray D and moved into position into the bag B for deposit therein on top of the separator sheet C, the descending switch actuating element 258 of the loading device L, when it engages and opens the stop switch 257, breaks the control circuit W—W which is an extension of circuit X and thereby breaks the circuits X, Y and V in the same manner as hereinbefore explained in connection with the loading of the initial layer of cans. The vacuum cups 47 are de-vacuumized simultaneously with the closing of the loading device actuating valve in the housing 59 (Fig. 10) and the loading device L is thus stopped at the proper level in the bag to deposit the cans on top of the separator sheet C resting on the first layer of cans.

In a similar manner, the third and fourth layers of cans A are deposited in the bag at the proper level by the breaking of successively closed circuits T—T and S—S established by the indexing device T. When this indexing device is partially rotated after deposit of the second layer of cans in the bag, the cam 273 (Fig. 10) on the cam shaft 166 breaks circuit W—W and an adjacent cam 281 closes a normally open switch 282 which establishes the circuit T—T. Current passes along this circuit from the wire 161, along a wire 283, the closed switch 282, a wire 284 to and through the closed stop switch 256, a wire 285 connecting with wires 217, 218 of circuit X and thence along the remaining portion of circuit X. Thus when the stop switch 256 is opened by the descending loading device L, the circuit T—T—X is broken and the loading device stops at the level for releasing the cans A into the bag, which in this case is the third level.

The stopping of the loading device L at the fourth and in this case the last level, is effected by the opening of the switch 165 controlled by the cam 173 of the indexing device T. When the cam shaft 166 is rotated after deposit of the third layer of cans, it rotates the cam 173 so as to open the switch 165 in circuit S and reclose it against auxiliary contacts of a circuit S—S. The cam 281 is also rotated to open switch 282 and break circuit T—T. In the circuit S—S current passes from the wire 161, along wire 175, a connecting wire 287 to and through the switch 165 now connecting this wire with a wire 288 leading to the closed stop switch 255, through the switch and along a wire 289, and wire 218 along the remaining portion of circuit X. Thus when the stop switch 255 is opened by the descending loading device L, the circuit S—S—X is broken and the loading device stops at the level for releasing the cans into the bag.

When the cam shaft 166 of the indexing device T is rotated by the return movement of the carriage K for the four layers of cans, the cams 173, 183, 214, 273, 281 on the cam shaft return their switches to their normal condition as shown in Fig. 10 thus resetting all the circuits for a repeat machine cycle. This terminates the machine cycle.

At the termination of the machine cycle the fourth or last separator sheet C when moved into position over the bag B is not released because under normal operations the sheet is released simultaneously with the picking up of a layer of cans by the loading device L. Since the next

layer of cans to be picked up will be for the next bag which requires a new cycle of operation, the sheet adheres to the inserting device M. This last sheet is removed manually through a manual venting of the vacuum cups 96. For this purpose the upper plate 93 (Fig. 8) of the sheet inserting device M is provided with a vent valve 291 comprising a hollow tube 292 which communicates with the vacuum channels 97 in the lower plate 94. This tube is provided with a spring pressed valve 293 which normally covers a vent port 294 formed in the tube.

When the valve 293 is lifted manually it uncovers the vent port 294 and admits outside air into the vacuum channels 97 and thus dissipates the vacuum in the cups 96. This releases the separator sheet C from the inserting device and permits it to fall into the bag on top of the uppermost layer of cans in the bag.

The mold holding the filled bag B is then withdrawn from the machine and is sealed as hereinbefore explained.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

We claim:

1. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support for holding a bag in an open position, a loading device having a plurality of vacuum cups movable into a bag on said bag support for gripping and depositing unit layers of articles into the bag individually and successively and in parallel zones until the bag is filled, vacuum and venting valve means controlling the vacuumizing of said vacuum cups, air actuated cylinder means connecting with said loading device for actuating said device, air valve means connecting with said cylinder means for controlling the actuation of said cylinder means, and control switches arranged in successive zones for governing the operation of said air valve means, said switches successively stopping said loading device at successive zones within said bag thereby providing successive layers of articles to properly locate the articles in a compact mass within the bag, said control switches also governing the operation of said vacuum and venting valve means for releasing the articles from said cups at the proper zone.

2. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support, a loading device having a plurality of vacuum cups movable into a bag on said support for gripping and depositing unit layers of articles into the bag individually and successively and in parallel zones until the bag is filled, electrically operated vacuum and venting valve means controlling the vacuumizing of said vacuum cups, air actuated cylinder means connecting with said loading device for actuating said device, electrically operated air valve means connecting with said cylinder means for controlling the actuation of said loading device, and electric control means governing the operation of said air valve means for stopping said loading device at successive zones within said bag for successive layers of articles to properly locate the articles in a compact mass

within the bag, said control means also governing the operation of said vacuum and venting valve means for releasing the articles from said cups at the proper zone.

3. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a horizontally disposed bag support, an article support located adjacent said bag support for holding a unit layer of arranged articles in horizontal position, a magazine also located adjacent said bag support for holding a supply of separator sheets in horizontal position, a loading device movable between said supports for receiving unit layers of articles from said article support and for carrying them individually and in horizontal position into said bag and for depositing them in superimposed relation, a separator sheet inserting device for picking up separator sheets individually from said magazine and for inserting them in said bag in horizontal position between the layers of articles as they are deposited in said bag, and actuating means for operating said loading device and said separator sheet inserting device in timed relation for loading the layers of articles and the separator sheets alternately into the bag until the bag is filled.

4. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a horizontally positioned bag support for holding a bag with its open end at the top, an article support located adjacent said bag support for receiving a unit layer of horizontally arranged articles, a magazine also located adjacent said bag support for holding a stack of horizontally disposed separator sheets, a loading device movable horizontally between said supports and having means for engaging and lifting unit layers of articles from said article support and for depositing them individually by a lowering action into the open end of said held bag, means operating on said loading device and varying the amount of its descent for stopping said device at different levels in the bag to deposit said layers of articles in superimposed relation, a separator sheet inserting device located adjacent said bag support for picking up separator sheets individually from said magazine and for inserting them into the open end of said bag between the layers of articles as they are deposited in said bag, and actuating means for operating said loading device and said separator sheet inserting device in timed relation for loading the layers of articles and the separator sheets alternately into the bag until the bag is filled.

5. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support, an article support located at one side of said bag support for holding a unit layer of articles, a magazine located at the opposite side of said bag support for holding a supply of separator sheets, a transfer carriage movable horizontally above said supports and said magazine, a loading device carried on said carriage and movable vertically therein, a sheet inserting device also carried on said carriage and movable vertically therein, carriage actuating means for shifting said carriage into an article receiving position where said loading device is located above said article support and said inserting device is over said bag support and for shifting said carriage into a loading position where said loading device is over said bag support and said inserting device is over said magazine, and actuating means for operating

said loading device and said inserting device for picking up a unit layer of articles from said article support and for inserting a separator sheet into said bag when said carriage is in its article receiving position and for depositing the picked up layer of articles into the bag and for picking up a sheet from said magazine when said carriage is in its loading position.

6. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support, an article support located at one side of said bag support for holding a unit layer of articles, a magazine located at the opposite side of said bag support for holding a supply of separator sheets, a transfer carriage movable horizontally above said supports and said magazine, a loading device carried on said carriage and movable vertically therein, a sheet inserting device also carried on said carriage and movable vertically therein, carriage actuating means for shifting said carriage into an article receiving position where said loading device is located above said article support and said inserting device is over said bag support and for shifting said carriage into a loading position where said loading device is over said bag support and said inserting device is over said magazine, device actuating means for operating said loading device and said inserting device simultaneously for picking up a unit layer of articles from said article support and for inserting a separator sheet into said bag when said carriage is in its article receiving position and for depositing the picked up layer of articles into the bag and for picking up a sheet from said magazine when said carriage is in its loading position, and control means operable by said loading device and governing the actuation of said loading device independently of said inserting device for stopping said loading device at different levels in the bag for each layer of articles deposited therein for depositing the layers in superimposed relation until the bag is filled.

7. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support, an article support located at one side of said bag support for holding a unit layer of articles, a magazine located at the opposite side of said bag support for holding a supply of separator sheets, a transfer carriage movable horizontally above said supports and said magazine, a loading device carried on said carriage and movable vertically therein, a sheet inserting device also carried on said carriage and movable vertically therein, carriage actuating means for intermittently shifting said carriage between said supports and said magazine, device actuating means for moving said loading device relative to said carriage for picking up layers of articles from said article support and for depositing them individually into the bag in said bag support, said device actuating means also moving said inserting device relative to said carriage for picking up separator sheets from said magazine and for inserting them into said bag between the layers of articles deposited therein, and electric control means interconnecting said device actuating means and said carriage actuating means and operating said actuating devices through a plurality of repeat cycles for loading the layers of articles into the bag and for terminating the operation of said actuating devices when the bag is filled.

8. In a packing machine for loading bags or other containers with unit layers of arranged

articles, the combination of a bag support, an article support adjacent said bag support for holding a layer of articles, a loading device movable between said supports, a plurality of vacuum cups carried on said loading device for picking up the layer of articles on said article support and for depositing it in said bag, an air operated cylinder for actuating said loading device, a vacuum control device connecting with said vacuum cups and with said air operated cylinder, said vacuum control device having means sensitive to the degree of vacuum in said cups for delaying the actuation of said loading device until a sufficient vacuum is created in said cups to insure the gripping and holding of the articles on said cups during transfer into said bag, and control means operable by said loading device for breaking the vacuum in said cups when the layer of articles are in position in said bag for releasing the articles from said cups.

9. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support for retaining a bag in an open position with the open end at the top, an article support located at one side of said bag support for holding a unit layer of arranged articles, loading means movable from said article support to said bag support for depositing unit layers of articles into the bag individually and successively, a magazine located at one side of said bag support for holding a stack of separator sheets, sheet inserting means movable from said magazine to said bag support for carrying separator sheets into the bag individually and successively, and means for operating said loading device and said inserting device in timed relation for inserting a separator sheet into said bag between each layer of articles deposited therein until the bag is filled.

10. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support for holding the bag with its open end at the top, loading means movable to a position above said bag support for depositing unit layers of articles into a bag on said support individually and successively as horizontal layers, a magazine disposed adjacent said bag support for holding a stack of horizontally disposed separator sheets, sheet inserting means movable above and between said bag support and said magazine for picking up separator sheets individually and successively from the top of the stack of sheets in said magazine and for depositing them into said bag individually and successively and in horizontal position, and means for operating said loading device and said inserting device in timed relation by alternately moving said inserting and said loading devices over the open end of said bag for inserting a separator sheet into said bag between each layer of articles deposited therein until the bag is filled.

11. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of a bag support, loading means movable relative to said bag support for depositing unit layers of articles into a bag on said support individually and successively, a magazine disposed adjacent said bag support for holding a stack of separator sheets, sheet inserting means movable between said bag support and said magazine, said sheet inserting means including vacuum cups connecting with a source of vacuum, control means for vacuumizing said cups for picking up separator sheets individually from

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said magazine and for devacuimizing said cups for releasing said picked up sheets into the bag, and means for operating said loading device and said inserting device in timed relation for inserting a separator sheet into said bag between each layer of articles deposited therein until the bag is filled.

12. In a packing machine for loading bags or other containers with unit layers of horizontally arranged articles, the combination of means movable into a loading station for supporting an empty bag in a position for filling and movable out of and clear of said loading station so that a filled bag may be removed from said supporting means, loading means movable relative to said loading station for depositing unit layers of horizontally disposed articles into the bag individually and successively, sheet inserting means also movable relative to said loading station for carrying horizontally disposed separator sheets into the bag individually and successively, and means for operating said loading means and said inserting means in timed relation for inserting a separator sheet into said bag in a horizontal position between each layer of horizontally arranged articles deposited therein until the bag is filled.

13. In a packing machine for loading bags or other containers with unit layers of arranged articles, the combination of means for supporting a bag in an open position, a loading device movable relative to said means for depositing unit layers of articles into the bag individually and successively and in parallel zones until the bag is filled, and control means including a plurality of electric switches arranged in the order of the different zones in said bag and operable by said loading device as it enters said zones and

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governing the movement of said loading device as each unit layer of articles is individually inserted into the bag, said control means stopping the device at the proper zone within the bag to deposit a unit layer of articles at said zone.

14. In a packing machine for loading bags or other containers with articles, the combination of a horizontally positioned article support disposed at a receiving station for presenting horizontally arranged articles to be loaded into a bag, a horizontally positioned bag support disposed at a loading station located alongside of said receiving station for supporting a bag in article receiving position, a horizontally positioned separator sheet support disposed at a sheet supporting station located on the opposite side of said loading station and in alignment with said receiving and loading stations for providing a supply of horizontally disposed separator sheets, and transfer means movable horizontally between said stations and transferring articles and separator sheets alternately from their respective supports at said receiving and said sheet support stations into said bag at said loading station while maintaining the horizontal positions of both articles and sheets.

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