

Sept. 22, 1959

P. P. NOTREDAME ET AL
MACHINES FOR FILLING CASES, CARTONS OR OTHER
PACKAGES WITH CONTAINERS SUCH AS CANS

2,904,944

Filed Feb. 18, 1955

4 Sheets-Sheet 1

Fig. 1.

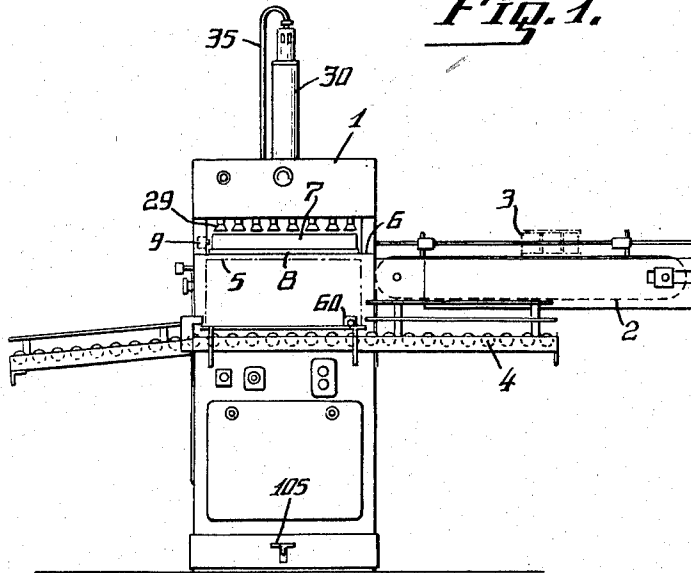
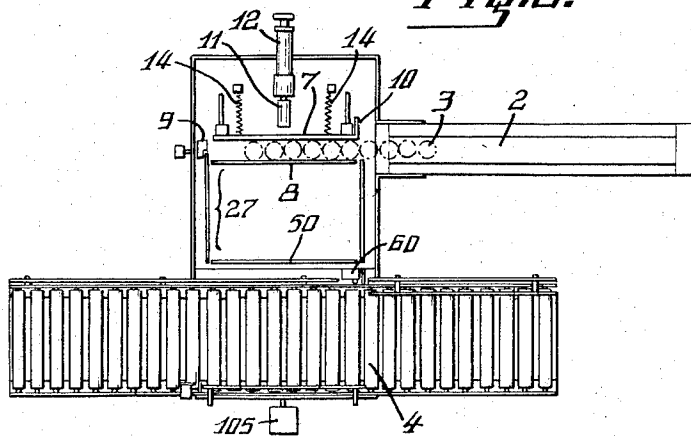


Fig. 2.



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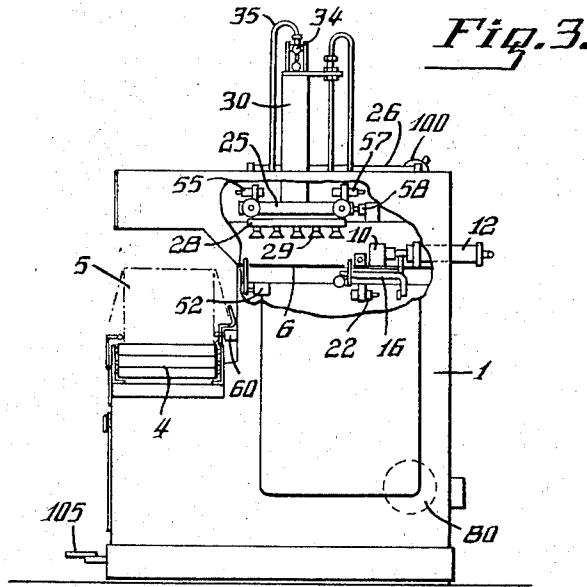


Fig. 3.

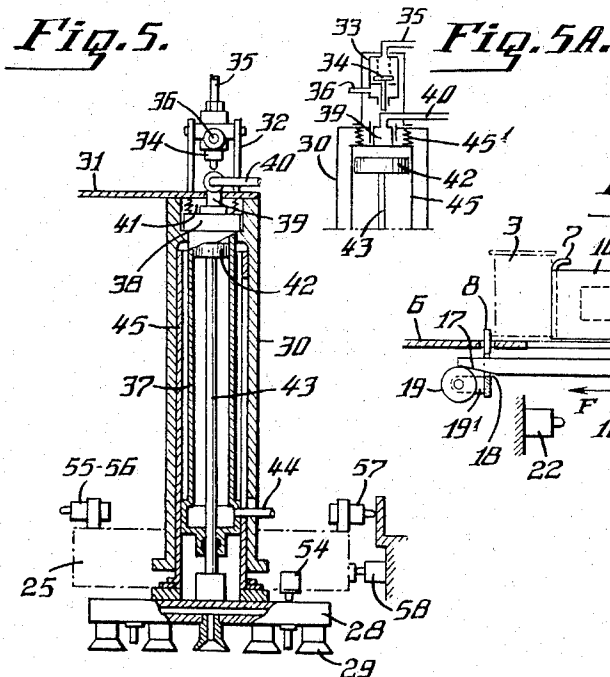


Fig. 5.

Fig. 5A.

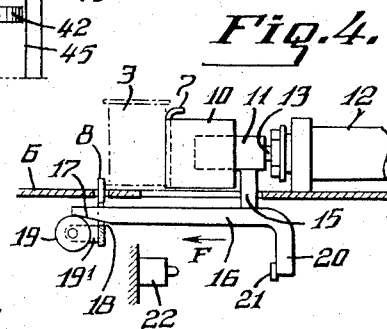


Fig. 4.

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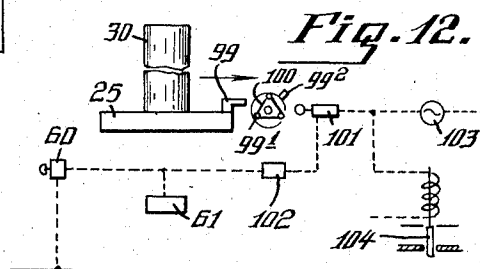
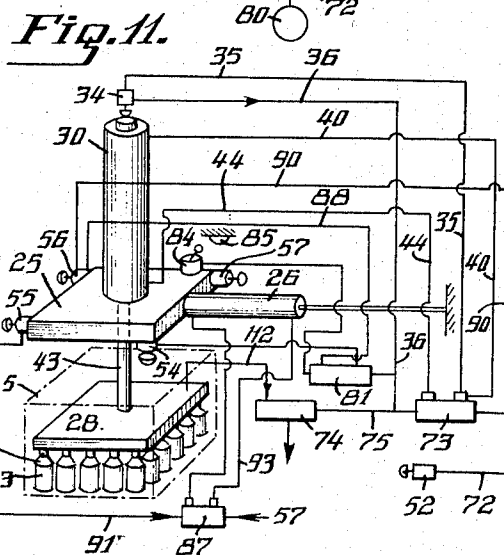
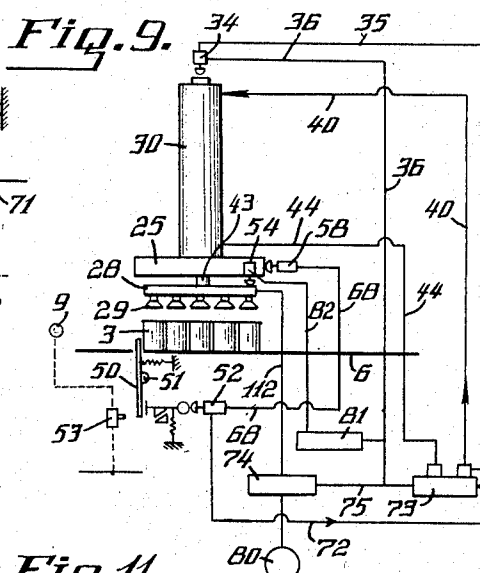
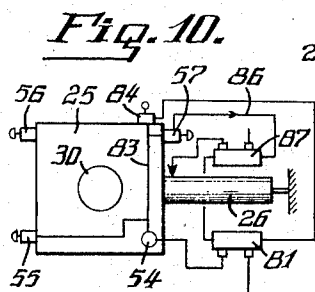
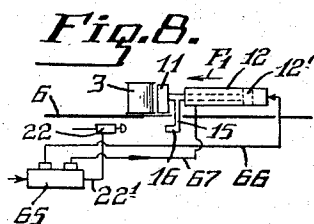
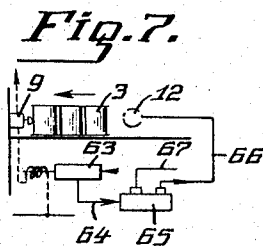
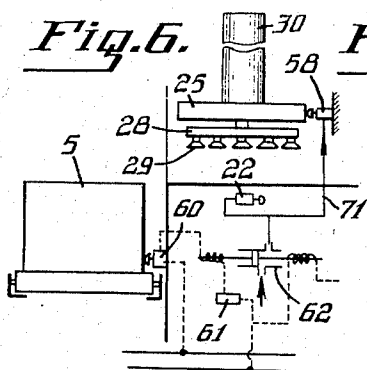
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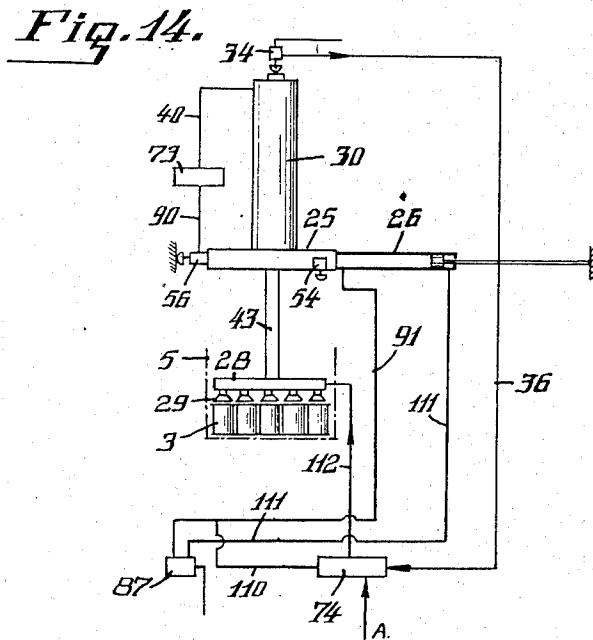
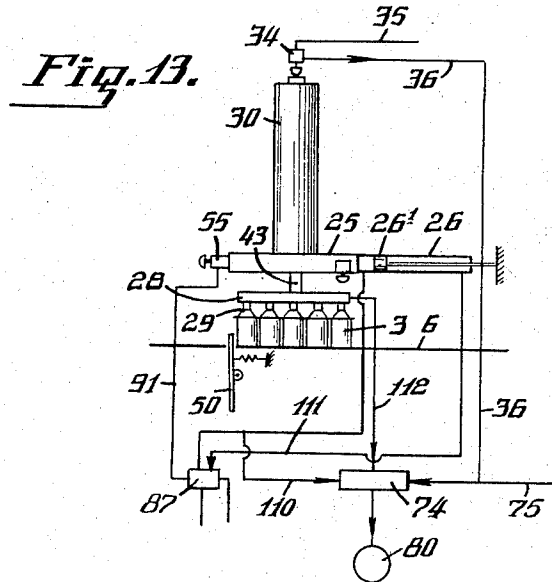
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MACHINES FOR FILLING CASES, CARTONS OR OTHER PACKAGES WITH CONTAINERS SUCH AS CANS

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5 Claims. (Cl. 53—61)

Our present invention relates to a machine used for filling cases or other packages with containers, such as cans or cardboard boxes, bottles, etc.

The object thereof is to produce a rapid action machine, all the movements of which may be effected by compressed air or a similar fluid under compression and in which the containers to be packed may be gripped and moved by means of a vacuum.

This machine is basically distinguished by the feature that the containers, conveyed to the correct position by a conveyor, are conveyed in successive rows on to a table in such a manner that, after one row has been fed, the containers disposed on the feed conveyor are stopped, whilst the row which has just been disposed on the table is urged towards a position where the successive rows are received until a layer is formed which is then engaged by an engaging head supported by a carrier capable of receiving a horizontal displacement movement, due to which the containers are conveyed above the package and are lowered into it.

So that the invention may be clearly understood, an embodiment thereof will be described hereinafter by way of example, and with reference to the attached drawings, in which:

Fig. 1 is a front view of the machine.

Fig. 2 is a plan of the machine of Fig. 1.

Fig. 3 is a side elevation with parts broken away.

Fig. 4 is an enlarged elevation of a portion of the machine shown in Fig. 3.

Fig. 5 is a partial section and partial diagram of the conveying mechanism of the layers of cans.

Fig. 5A is a diagrammatic illustration of the upper end of the mechanism of Fig. 5.

Figs. 6 to 14 are explanatory diagrams.

The machine which is the object of the present invention, mainly comprises a fixed frame 1, a conveyor belt 2 formed, for example, by a double chain, on which are conveyed to the machine the upright containers 3, or other objects which have to be packed, for example, empty, or filled cans, and a conveyor 4 which may, for example, be a roller conveyor and on which the cartons 5 (Fig. 3) or the cases to be filled are moved.

After entering the machine and leaving the belt 2, the cans are received by a table 6 and are moved thereon urging each other between an ejector 7 and the moving transom or wall 8 until the first can in the row strikes the interrupter switch 9.

The ejector 7 is formed by a board disposed edgewise and connected at its end nearest the conveyor 2 to form an arm 10 which, when the ejector 7 is displaced, is disposed in the path of the cans so as to form a stop.

It will thus be seen that a complete row of cans is always urged into the machine and that, whilst waiting to be inserted, the cans arrested by the stop 10 remain on the belt 2 which continues to move.

The displacement of the ejector 7 is produced by a push member 11 (Fig. 2) which projects from the end of the operating cylinder 12 by compressed air, for ex-

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ample, in which a piston 12' (Fig. 8) may be displaced, the rod 13 of which carries the push member 11. The ejector is also under the influence of springs 14.

A rod 15 (Fig. 4), which hangs down and carries a horizontal rail 16, the bevelled end 17 of which passes through a slot 18 in the transom 8 and can act on a roller 19 carried by a projection 19' of the transom 8, is connected with the pusher 11.

The rail 16 is bent at 20 at its other end opposite the bevel and this bend has a switch actuator 21.

As will be easily understood, when, controlled by the cylinder 12, the pusher 11 begins to move in the direction indicated by the arrow F (Fig. 4), acting on the ejector 7, it causes at the same time, by the action of the bevel 17 on the roller 19, the lowering of the transom so that the row of cans may be moved onto the table 6 perpendicularly to the conveying direction without being affected by the transom 8.

When the push member 11 has completed its course, the switch actuator 21 acts on an interrupter switch 22, the object of which will be explained hereinafter (Fig. 4).

By means which will also be explained hereinafter, at the moment when the first can in the row introduced between the ejector 7 and the transom 8 acts on the interrupter 9, the cylinder 12 comes into action, after which the transom 8 is drawn downwardly and the ejector 7 pushes a complete row of cans on to the table 6. When this movement takes place, the cans on the conveying chain 2 are stopped by the bend 10 of the ejector.

The length of the conveying chain determines the force of the push necessary to urge a row of cans on to the table of the machine between the ejector 7 and the transom 8, as also the force required to act on the interrupter switch 9. When a sufficient number of rows of cans has been pushed on to the table 6, the feed is automatically interrupted and the operation of the ejector stopped.

Now the apparatus, which will be described hereinafter, comes into action.

A carrier 25 is disposed horizontally above the portion of the table 6 on to which are successively conveyed the various rows of cans which have been introduced into the ejector 7 and the moving transom 8 and is able to move horizontally under the control of a cylinder working by compressed air 26 (Figs. 10 and 11) so as to convey at one, and the same time, over the carton 5 the cans which have been collected at the position shown by 27 (Fig. 2), and then raised to form a layer, by an engaging head 28 fitted with cup-shaped members 29 in which a vacuum prevails at certain moments and against which the cans 3 may be disposed.

The carrier 25 is integral with a vertically arranged cylinder 30 and closed at the top by a metal sheet 31 (Fig. 5) to which is attached a frame 32 in which is disposed a small cylinder 33 (Fig. 5A) containing a valve 34 and where terminate the compressed air pipes 35 and 36.

Inside the cylinder 30 is disposed a cylinder 37 (Fig. 5) which is terminated at the top by a hollow head 38 carrying a member 39 connected with a compressed air supply pipe 40.

The head 38 may effect, in a chamber 41 provided in the cylinder, a short up and down movement in which the inner cylinder 37 takes part.

In the cylinder 37 a piston 42, the rod 43 of which, after traversing the base of the cylinder 37 is connected to the engaging head 28, may move from top to bottom and from bottom to top. The movements of the piston are controlled by the compressed air conveyed through the pipe 40 and a pipe 44 traversing the cylinder 30 slightly above the carrier 25.

Between the cylinders 30 and 37 is provided a sleeve

45 which is connected to the head 28 and which acts as a guide for the movements of the engaging head 28.

Feeding in successive rows on to the space 27 (Fig. 2), proceeds until the last row has been pushed against a terminal tappet 50 mounted so as to oscillate at 51 (Fig. 9) and capable of acting on a control valve 52 and on a micro interrupter switch 53. This actuation of the tappet can only be effected if an entire layer of objects to be packed is disposed on the space 27.

The cylinder 37 to which the engaging head is attached, is freely located in the carrier 25. Two springs 45¹ (Fig. 5A) (or a greater number) of carefully determined force, push the body of the cylinder 37 continually downwardly so that the member 39 does not normally come into contact with the tappet 34.

During the descent of the piston 42, the suction members 29 are disposed on the cans and grip them. At this moment the piston 42 stops and the springs 45¹ are then compressed; the body of the cylinder 37 rises a little and the consequence of this is to push back the tappet 34 which is brought to the open position while the engaging head 28 rises loaded with cans.

The latter acts on an air tappet 54 (Fig. 11) which is carried by the carrier 25 and opened so as to initiate the horizontal displacement movement of the carrier 25 until it is disposed above the carton 5 to be filled. At this moment control tappets 55 and 56 supported by the carrier are pushed in and the carrier is thereby arrested; the engaging head 28 is then lowered until the cans touch the bottom of the carton 5 and the cylinder 37 is slightly raised causing the opening of the valve 34 and the raising of the head. An evacuated pipe which operates to keep the cans attached to the head, is then allowed to communicate with the atmosphere by a special device and the effect of this is immediately to release the cans which are thus placed in the carton.

The engaging head 28 and the carrier 25 are automatically returned to the starting position.

During the course of the work cycle which has just been described, the arrival of the cans from the conveyor 2 and their displacement on to the table 6 is effected in complete rows so that the engagement of the cans by the cup-shaped members 29 may be effected almost immediately when the carrier occupies the correct position above the layer of cans, the effect of the carrier reaching this position is to push in the air operated control tappets 57 and 58 (Fig. 5), one of which 57 is supported by the carrier and the other 58 of which occupies a fixed position.

When the terminal tappet 50 (Fig. 9) has been pushed in by the arrival of the layer of cans the engaging head 28 is again lowered and begins a second working cycle similar to that which has just been described. The operating speed of the various compressed air cylinders must be regulated so that the carrier 25 is in the final position before the terminal tappet 50 is pushed in.

The working cycle consisting of the gripping and placing in the position of the layer is repeated until the carton is full, which automatically involves the partial stoppage of the machine.

This latter operation will be described in detail at the same time as the operation in principle of the electric and pneumatic part with reference to Figs. 6-12 which are diagrams:

Figs. 6, 7 and 8 illustrating the operation of the machine by the placing of a carbon in position;

Fig. 9 showing a layer of cans ready to be gripped by the head 28;

Fig. 10 showing the start of the loaded carrier toward the container to be filled;

Fig. 11 illustrating the cans ready to be detached;

Fig. 12 showing a mechanism for counting the rows of cans.

By placing the carton to be filled in the machine a micro interrupter switch 60 is pressed in (Figs. 3 and 6);

this gives a signal (current impulse) by means of a time switch 61 to an electro-magnetic valve 62 after which the latter is operated and allows the compressed air to flow to the control valve 58 which puts the machine into operation.

When an entire row of cans on the table of the machine pushes against the micro interrupter switch 9 an electro-magnetic valve 63 comes into operation (Fig. 7).

This valve 63 allows the passage of compressed air into a pipe 64. A remotely controlled guide valve 65, is operated and the compressed air can flow to the cylinder 12 through the pipe 66.

The piston 12¹ of the cylinder 12 is displaced in the direction of the arrow F₁ (Fig. 8) and causes the displacement of an entire row of cans on to the table 6 of the machine until the moment when the control tappet 22 is pushed back by the member 15-16 (Figs. 4 and 8). The tappet 22 allows the compressed air to flow through the pipe 22¹ towards the guide valve 65. The latter is operated and the compressed air passes through the pipe 67 towards the cylinder 12, the piston 12¹ of which effects a return movement.

This process is repeated several times until the control valve 52 and the micro-interrupter switch 53 have been pushed in by the arrival of the row of cans.

The micro-interrupter switch 53 which is connected in series with the interrupter switch 9 interrupts the current with the result that the entire feeding system is immediately stopped, that is to say, that the piston 12¹ of the cylinder 12 moves in the opposite direction and stops so as to permit the arrival of a complete row of cans.

The valve 52 receives compressed air through the pipe 68 (Fig. 9) only when the control valve 58 is pushed in, that is to say, when the carrier 25 is in the correct position and when the electro-magnetic valve 62 is in a position which permits air to flow through the pipe 71 towards this valve 58 (Fig. 6). When an empty carton 5 is placed in position in the machine, the micro interrupter switch 60 is pushed in and the latter gives a current impulse to the time switch 61 operating the electro-magnetic double valve 62 and permitting the feed of the control valve 58 with compressed air through the pipe 71.

When the control valve 52 is pushed in, the compressed air passing through the pipe 72 switches on a guide valve 73 after which the compressed air arrives in the cylinder 37 through the pipe 40.

The piston 42 (Fig. 5) provided with the engaging head 28 is lowered so that the suction cup-shaped members 29 are disposed on the cans.

But the cylinder 37 is freely mounted in the carrier 25 on springs and when the piston 42 encounters a predetermined resistance the cylinder 37 is raised and the head 38 executes its brief movement in the chamber 41 so that the valve 34 is actuated and the compressed air flows through the pipe 36.

A special remotely controlled pneumatic valve 74 (Fig. 9) now receives the compressed air through the pipe 75, but it cannot operate because it is connected by a pipe 110 (Figs. 13-14) to a guide valve 87, itself connected with the cylinder 26 through a pipe 111 (Fig. 13) and that, owing to the position of the piston 26¹, the pipe 110 is under pressure. In this condition the evacuated pipe 112, connected with the suction cup-shaped members, is not interrupted, but is connected to the pneumatic pump 80 so that the cans are gripped as soon as they come into contact with the suction cup-shaped members.

After the opening of the valve 34, a guide valve 81 (Fig. 9) is also operated and this results in the feeding of the control valve 54 with compressed air through the pipe 82. At the same time, the valve 34 also admits compressed air to the guide valve 73, operating the latter, and causing compressed air to flow through the pipe 44 into the cylinder 37, thus causing a movement in the

opposite direction of the piston 42 (Fig. 5) and raising the cans from the table 6 of the machine.

In its higher position the engaging head 28, moved by the cylinder 37 pushes against the control tappet 54.

This operation results in compressed air reaching the pipe 83 (Fig. 10) and involves the feeding of the valves 55, 84 and 57 with compressed air. The control valve 84, which is moved by a cam 85 (Fig. 11), is closed at this moment, as also the valve 55. Only the valve 57 is open owing to the fact that it is in a pushed in position as a result of the position of the carrier and this causes compressed air to flow through the pipe 86 towards the guide valve 87 (Fig. 10). The latter is operated and compressed air is admitted into the cylinder 26 through the pipe 111 (Fig. 13). The result is that the carrier 25 returns to the left.

At the end of its course, the two control valves 55 and 56 which are attached to the carrier are pushed in. At this moment the control valve 55 is not fed with compressed air, for the carrier to which the valve 84 is attached passes by the side of a small cam 85 with the result that the latter is pushed in and the guide valve 81 operated, involving the interruption of the compressed air feed through the valve 54.

The valve 56 which now receives compressed air through the operated guide valve (pipe 88—Fig. 11) allows compressed air to flow through the pipe 90 (the valve 52 being closed) and operates the guide valve 73 and thus results in feeding the cylinder 37 from above through the pipe 40 so that the piston 42 is lowered (Fig. 5). At the end of its course the cylinder 37 is again somewhat raised so that the control valve 34 opens and allows compressed air to flow effecting the feeding of compressed air to the valves 74, 81, 73.

The valve 74 is now operated and closes the circuit under vacuum.

This is now possible owing to the position of the piston in the cylinder 26 (Fig. 14), with the result that the evacuated pipe line 112 is subjected to atmospheric pressure (2) and the cans disposed against the suction cup-shaped members detached.

The valve 34 allows compressed air to flow to the valve 81 and operates the latter to feed the valve 54 with compressed air again.

The guide valve 73 is also operated and causes the rising of the piston 42 of the cylinder 37. When the engaging head 28 now pushes in the control valve 54, the valve 57 is closed this time and the valve 55 is open and thus compressed air is allowed to flow through the pipe 91 (Fig. 11) to the guide valve 87 and operates the latter.

Compressed air can now reach the cylinder 26 through a throttle valve, attached at 87, flowing through the pipe 91 which returns the carrier again to its starting position so that the control valves 57 and 58 are pushed in.

Upon the return of the carrier, the valve 84 is pushed in by the cam 85 and this involves the operation of the guide valve 81 and returns the whole system again to its starting position.

On the return of the carrier, which takes place for each layer of cans which is placed in the carton, a cam 100 (Fig. 12) is turned at a given angle by a push 99 on the carrier. This cam 100, which is partly constructed as an interrupter device, carries fingers 99¹, the number of which corresponds to the number of layers to be formed. With each return movement of the carrier, the push 99 advances by a few degrees one of the fingers 99¹ whilst the latter, which are disposed against the push, are pushed in. The braking of the cam is effected by a small ball under resilient pressure which is pressed into a hole when the cam is in the correct position.

When the carton is filled with the number of layers of cans in the carton, a small adjustable finger 99² actuates a micro interrupter switch 101 which switches the electro-magnetic valve 102 towards the time switch 61

and interrupts the arrival of compressed air to the control valve 58 so that the machine automatically stops when the carton is filled.

A red lamp 103 lights up and a bolt 104 which is mounted on the apparatus gripping the carton opens so that it is possible to remove the filled carton.

When an empty carton is placed on the machine, the micro interrupter switch 60 is pushed in and this gives a current impulse to the electro-magnetic valve 102 by means of the time switch 61 and supplies compressed air to the valve 58; the packing mechanism is then ready to continue its work.

At the moment when the lamp 103 lights up, the operator depresses a pedal 105; the filled carton is thereby freed and pushed on to the conveyor 4 under the effect of an empty carton.

When the empty carton being placed in position, the pedal 105 is released and the carton is pushed into the correct place.

The machine may then begin a new cycle of filling.

The removal of the filled cartons and placing the fibre in position may be very rapidly effected, seeing that the latter does not need to be handled and that a displacement on the conveyor 4 is sufficient.

The machine is fitted with a small vacuum pump operated by an electric motor which thus ensures the operation of the conveyor feeding the cans.

The compressed air (pressure: 6-8 Kgr.) is supplied by a special compressor or by a central installation. The machine comprises in general a compressed air reservoir which regulates the pressure to the various apparatus.

The operation of the machine is protected from any carelessness on the part of the operator and, provided the feeding is normal, it can operate more or less without interruption.

The use of compressed air and a vacuum permits very important technical advantages to be obtained relative to existing machinery.

These advantages are mainly shown by economy in labour, the precision of the machine, the handling of the products to be packed and, finally, the adaptation thereof to various products.

Such a machine is perfectly adapted to large scale production and is entirely automatic.

Another advantage is that the containers which are labelled are not damaged during the actual packing, nor is there any risk of the edges being dented.

We claim:

1. In a container loading machine, an article support table, a support structure mounted above said table, a vertical cylinder mounted for vertical sliding movement in said structure, a piston in said cylinder, a suction head carried by said piston below said structure, conduit means connected to a supply of fluid under pressure, a switching valve in said conduit means and arranged to be moved between positions for selectively directing pressurized fluid into said cylinder above or below said piston, a first control member mounted above said movable cylinder in a position to be actuated thereby and operatively associated with said switching valve so that upon actuation of said first control member said switching valve is moved to a position for directing fluid to said cylinder below said piston, a second control member mounted in a position to be actuated by articles reaching a predetermined position on said table directly beneath said suction head and operatively associated with said switching valve so that upon actuation of said second control member said switching valve is moved to a position for directing pressurized fluid to said cylinder above said piston, and means for moving articles to said predetermined position on said table to actuate said second control member and cause the downward movement of said piston to bring said suction head into contact with the articles on said table and to thereafter cause said cylinder

der to slide upwardly in said support structure to engage and actuate said first control member whereby said switching valve is moved to a position for directing pressurized fluid to said cylinder below said piston to effect the elevation of said suction head.

2. A machine according to claim 1 wherein spring means are disposed between said support structure and said cylinder and arranged to be compressed during upward movement of said cylinder in said support structure.

3. A machine according to claim 1 wherein power-actuated means mount said support structure for movement laterally of said table, and control means are arranged to be actuated by said upwardly moving suction head and operatively associated with said power-actuated means to energize the same upon being actuated by said suction head.

4. A machine according to claim 1 wherein a conduit is connected between said suction head and a supply of fluid at a negative pressure, and a valve is disposed in the path of upward movement of said cylinder and arranged to the actuated thereby, said valve being associated with said conduit and arranged upon being actuated to communicate said suction head with said supply of fluid at a negative pressure.

5. Apparatus for the handling of articles, comprising an article support table, a support structure mounted above said table, a vertical cylinder mounted for vertical sliding movement in said structure, a piston in said cylinder, article engaging means carried by said piston below

said structure, conduit means connected to a supply of fluid under pressure, a switching valve in said conduit means and arranged to be moved between positions for selectively directing pressurized fluid into said cylinder above or below said piston, first control means mounted in a position to be actuated by said movable cylinder during vertical sliding movement thereof in response to the arrest of movement of said article engaging means, said first control means being operatively associated with said switching valve so that upon actuation of said first control means said switching valve is moved to a position for directing fluid to said cylinder below said piston, and second control means adapted to be actuated by articles reaching a predetermined position on said table directly beneath said article engaging means and operatively associated with said switching valve so that upon actuation of said second control means said switching valve is moved to a position for directing pressurized fluid to said cylinder above said piston.

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