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3,159,955

PACKAGING MACHINE FOR PRODUCTION OF BAGS OF TUBULAR MATERIAL

Filed Jan. 9, 1963

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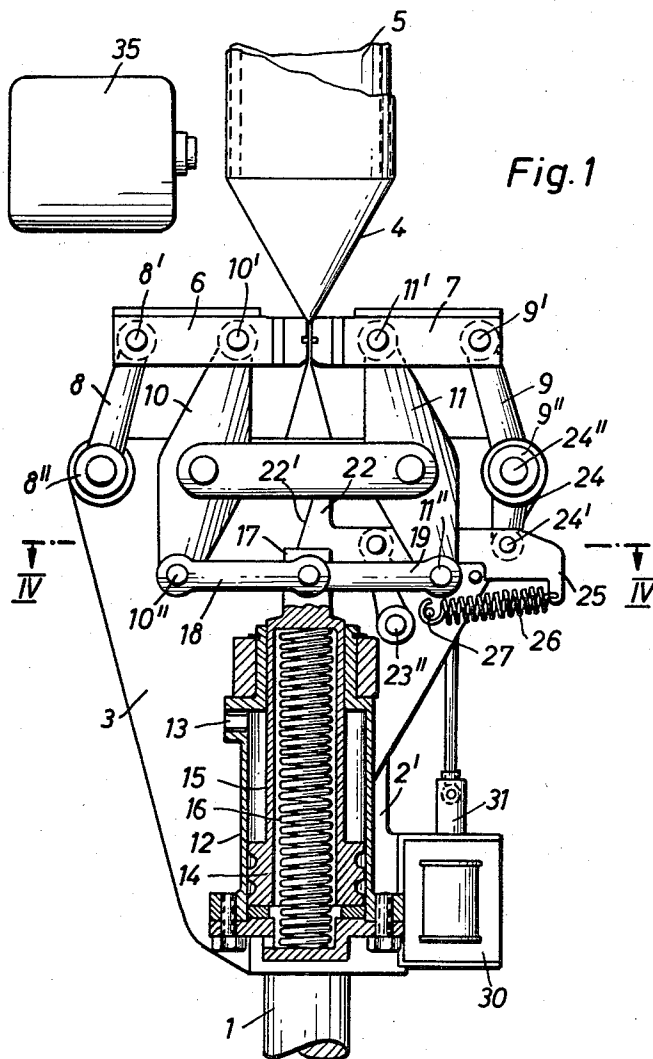


Fig. 1

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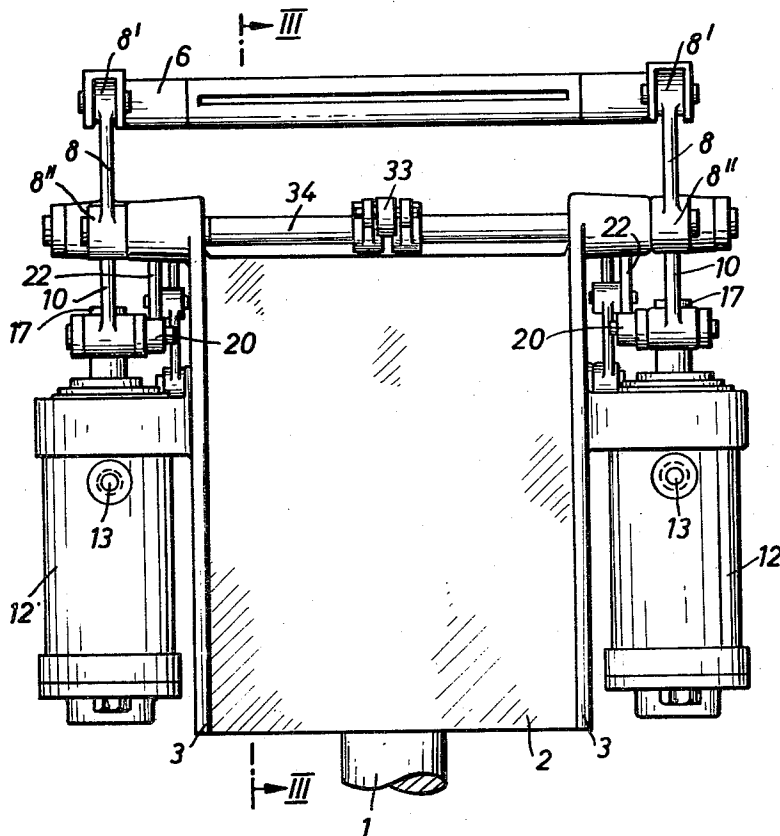
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Fig. 2



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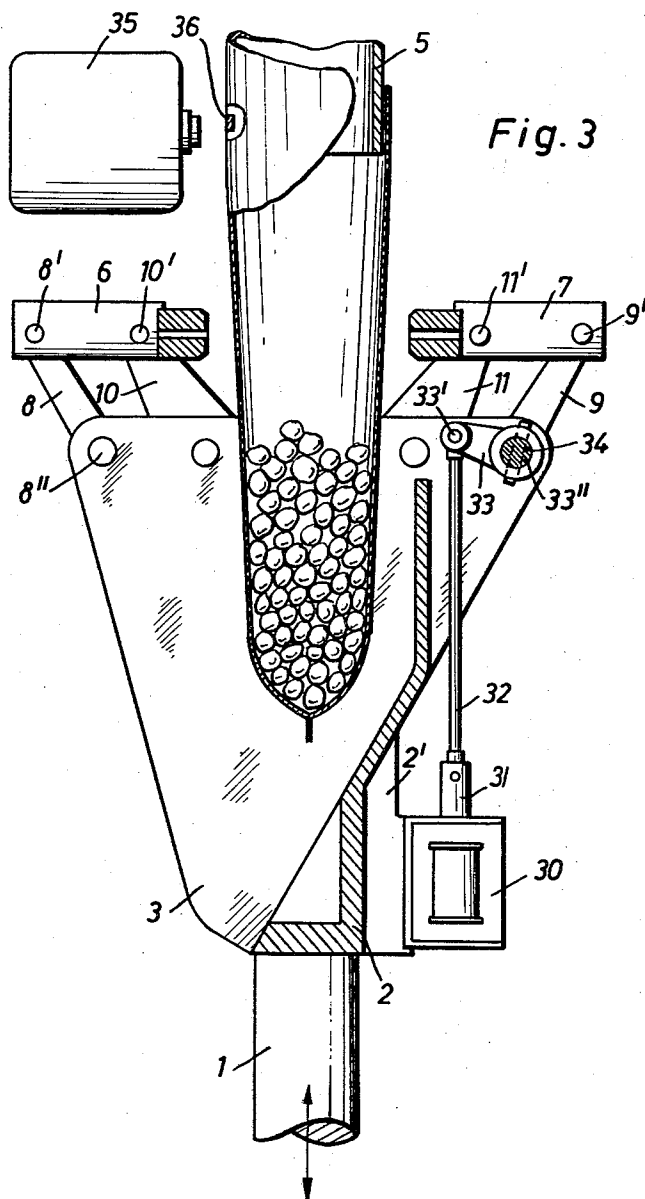
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Fig. 4

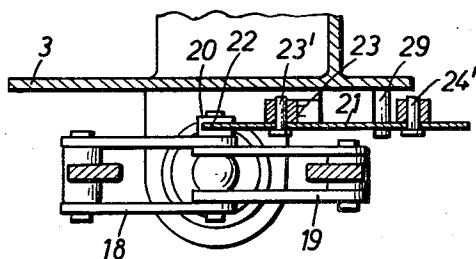


Fig. 5

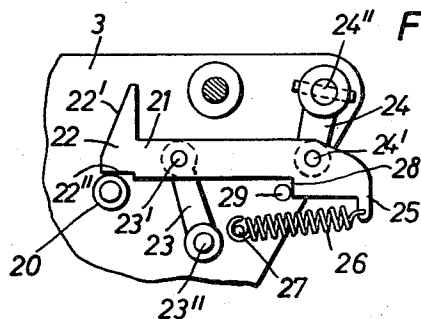
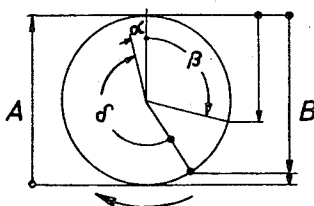


Fig. 6



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3,159,955 PACKAGING MACHINE FOR PRODUCTION OF BAGS OF TUBULAR MATERIAL

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This invention relates to packaging machines which convert tubular, heat-sealable packaging material into filled and sealed bags or packages, and has particular reference to such a machine which is, at least partially, actuated pneumatically.

In machines of the type to which this invention relates, a tube of the plastic packaging material is pulled over a filling pipe through which the merchandise to be packaged is fed, and the machine is provided with sealing jaws, below the filling pipe and on either side of the tube, adapted to open and close in a direction transverse to the tube axis in order to produce a transverse seal in the tube after each charge of merchandise is delivered into it. The jaws are also adapted to move back and forth in a longitudinal direction for the purpose of intermittently advancing the tubular material. Such machines are well known in the art.

A disadvantage of present machines of this type is the fact that the operational speeds attainable by them are insufficient to meet the requirements of modern high-speed techniques.

It is the principal object of this invention to provide a packaging machine of the character referred to, in which the parts alternately subjected to acceleration and deceleration, during the longitudinal and transverse movements of the sealing jaws, are lighter in weight than those heretofore employed. As a result, the maximum speed of operation of the machine is increased and hence a larger number of filled and sealed packages can be produced in a given time.

The invention is predicated upon the discovery that this desirable objective can be achieved in an admirable manner by providing a pneumatic piston-cylinder device for operating the jaw-moving mechanism, especially the mechanism controlling the transverse opening and closing of the jaws. Such an arrangement is particularly useful, and has many advantages, if the air pressure is employed to produce the closing movement of the jaws, against the force of a spring, and a latch is provided for maintaining the spring in stressed condition. As a result, the pressure can be exhausted independently of spring movement, and the opening of the jaws can be brought about in a desirable sudden manner by releasing the latch, thus allowing the spring to bring about the opening of the jaws unhampered by the necessity to work against air under pressure.

An additional special feature of the invention resides in the fact that the piston-cylinder arrangement and its associated linkages, travel with the jaws during the longitudinal movements of the latter.

One way of achieving the objectives of the invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a fragmentary side elevational view of a machine embodying the features of this invention, certain parts being shown in cross-section;

FIG. 2 is a front elevational view of the essential parts shown in FIG. 1;

FIG. 3 is a cross-sectional view substantially along the line III—III of FIG. 2;

FIG. 4 is a fragmentary cross-sectional view along the line IV—IV of FIG. 1;

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FIG. 5 is a view of the latch mechanism shown in FIG. 1, this view being in the same direction as FIG. 1 and showing the mechanism by itself; and

FIG. 6 is a diagram of the cycle of operation of the machine.

A column or post 1 is mounted for reciprocating movement in a vertical direction within a suitable framework (not shown). The motive power and the drive shaft for accomplishing this movement have not been shown, and may be of any conventional character. Above the post 1 and in substantial alignment therewith is a hollow filling pipe 5 over which the tubular packaging material 4 is pulled in a downward direction. The packaging material may be supplied in the form of a continuous web 15 which is drawn around a forming element (not shown) surrounding the filling pipe, whereby it is formed into a tube with its longitudinal edges in overlapping relation. Suitable means (not shown) may be provided for fusing the overlapped longitudinal edges to produce a longitudinal seam.

The post 1 is provided at its upper end with a stepped or platform-like section 2 which carries a pair of spaced vertical wings 3 arranged on opposite sides of the tubular material 4. These wings carry the transverse sealing jaws 6 and 7 and the mechanisms which control the opening and closing of these jaws. These mechanisms include a pair of parallel links 8 articulated to the jaw 6 (see FIG. 2) and another pair of similar parallel links 9 articulated to the jaw 7. The links 8 each have one end 8' pivotally connected to the jaw 6 and the other end 8'' pivotally connected to one of the wings 3. Similarly, the links 9 are pivotally connected at 9' to the jaw 7 and at 9'' to the wings 3. The links 8 and 9 are located outwardly of the wings 3.

Also pivotally mounted on each of the wings 3, outwardly thereof, are two double-armed jaw-actuating levers 10 and 11. As best indicated in FIG. 1, each of the levers 10 and 11 is mounted at about its midpoint, and the lever 10 is pivotally articulated at 10' to the jaw 6, while the corresponding end of the lever 11 is pivotally connected at 11' to the jaw 7.

Each wing 3 also carries on its outward face a pneumatic cylinder 12 provided with an inlet opening 13. Suitable connections (not shown) including appropriate control valves are provided between a source of fluid under pressure and the inlet 13. In each cylinder 12 is a slidable hollow piston 14 formed with a hollow piston rod 15. The piston rod is slidably mounted within the upper end of the cylinder 12. Within the hollowed-out region of the piston 14 and piston rod 15 is a compression spring 16, one end of which rests against the floor of the cylinder 12, and the other end of which presses against the closed upper end of the piston rod. The upper end of the piston rod 15 is formed with a projecting head 17. Pivotally connected to the head 17, and extending in opposite directions therefrom, are connecting links 18 and 19. The outer end of the link 18 is pivotally connected at 18' to the lower end of the lever 10, and similarly, the outer end of the link 19 is pivotally connected at 11'' to the lower end of the lever 11.

Each of the piston heads 17 is provided with a roller 20 (see FIGS. 2, 4 and 5) projecting toward the adjacent wing 3 and arranged with its axis horizontal. Between each head 17 and wing 3, a latch 21 is provided (see FIG. 5) pivotally articulated at 23' to the upper end of a guiding arm 23, the latter being pivoted at 23'' to the wing 3. The latch 21 is also articulated at 24' to an actuating arm 24, the opposite end of the arm 24 being keyed at 24'' to a rocker shaft 34 extending between the wings 3 as best indicated in FIG. 2.

The latch 21 is provided at its end remote from the arm with a nose-like projection 22 whose lower surface 22''

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is adapted to rest upon the roller 20 when the latch 21 is in the position shown in FIG. 5. At its opposite end, the latch 21 is provided with a depending projection 25 to which one end of a tension spring 26 is attached. The other end of the spring is secured to a pin 27 on the wing 3. A shoulder 28 formed on the lower edge of the latch 21 is adapted to cooperate with an abutment 29 provided on the wing 3.

Supported on a bracket 2' provided on the outer face of the section 2 is a solenoid or equivalent electromagnetic device 30 whose armature 31 is secured to the lower end of the rod 32. The rod 32 extends vertically upwardly and its upper end is articulated at 33' to an arm 33. This arm is keyed at its other end 33'' to the rocker shaft 34.

Mounted adjacent to the filling pipe 5 is an electric-eye apparatus 35, of any suitable character, such as a selenium cell, adapted to cooperate in known manner with markings 36 printed at spaced intervals along the tube 4.

The operation of the apparatus is as follows:

Assuming that the machine has its jaws and related mechanisms in the condition shown in FIG. 1: the post 1 is in its uppermost position, the cylinder 12 contains fluid under pressure, the piston 14 is in its lowest position, the spring 16 is compressed, the sealing jaws 6 and 7 are closed, and the downward movement of the post 1 is about to begin.

Shortly after the downward travel of the parts commences, in order to advance the tubular material 4, a communication is established (by an appropriate valve, not shown) between the connection port 13 of the cylinder 12 and an exhaust outlet, whereby the pressure fluid in the cylinder is allowed to escape. However, notwithstanding this exhausting of the cylinders, the spring 16 remains compressed and hence the jaws 6 and 7 remain closed because the nose 22 of the latch 21 is directly over the roller 20, thus preventing upward movement of the piston rod 15, whereby the parts remain in the condition shown in FIG. 1. During the downward travel of the post 1 and the parts it carries, a charge of material to be packaged is introduced through the filling pipe 5 into the portion of the tube 4 that lies between the pipe 5 and the jaws 6 and 7.

At the conclusion of the downward movement of the post 1, the electric eye 35 becomes effective, as a result of being actuated by an appropriate marking 36 on the material 4, to energize the solenoid 30. The details of the circuitry have not been shown, since the mode of functioning of a triggering device, such as that shown at 35, is known, and the circuits between it and the solenoid 30 can be of any conventional character.

The actuation of the solenoid 30 draws the armature 31 and rod 32 downwardly, whereby the arm 33 swings downwardly, and through the rocker shaft 34, swings the arm 24 toward the right as viewed in FIGS. 1 and 5. Consequently, the latch 21 moves toward the right, against the action of the spring 26, and because of its articulation to the arm 23 the forward region of the latch 21 moves obliquely upward away from the roller 20. As a result, the piston rod 15 is suddenly released, thus permitting the spring 16 to move it and the head 17 upwards suddenly. Upward movement of the head 17 causes the links 18 and 19 to pull the lower ends of the levers 10 and 11 inwardly thus causing the jaws 6 and 7 to separate. Separation of the jaws, of course, also occurs very suddenly.

During the ensuing upward movement of the post 1, the jaws 6 and 7 remain open. Shortly before the uppermost limit of its movement is reached, fluid under pressure is again introduced into the cylinder 12 by means of a valve (not shown). As a result, the piston 14 and the piston rod 15 are forced downwardly and again compress the spring 16 into the condition shown in FIG. 1. During this downward movement of the piston 14 in the cylinder 12 the links 18 and 19 and levers 10 and 11 bring about a closing movement of the jaws 6 and 7. The introduction of the fluid pressure into the cylinder 12 is so timed with respect to the upward movement of the post

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1 that the jaws come together at just about the time when the post 1 has reached its uppermost position. As a result, during the succeeding downward movement, the jaws serve to produce the desired transverse seal on the tubular material 4, in known fashion, and again draw the material 4 downwardly preparatory to the filling and sealing of the next bag to be formed.

During the downward movement of the piston 14, under the action of the fluid pressure in the cylinder 12, the roller 20 carried by the connection head 17 encounters the slanting cam surface 22' on the nose 22 of the latch 21 and momentarily cams the latch 21 aside, against the action of the spring 26. As soon as the roller 20 moves past the nose 22, the latch 21 is immediately urged by the spring 26 back into the position shown in FIGS. 1 and 5, wherein the lower surface 22'' of the nose 22 is directly above the roller 20. This return movement of the latch 21 is limited by the engagement of the shoulder 28 on the latch with the abutment 29 on the wing 3.

As a result of this engagement of the roller 20 and nose 22 of the latch 21, the piston 14 and piston rod 15 are retained in the position shown in FIG. 1. This condition is attained immediately after the downward movement of the post 1 begins, and thereupon the exhausting of the cylinder 12 can be commenced. The significance of this is that the cylinder will have become completely exhausted by the time the post 1 reaches its lowermost position and the spring 16 is again released. Consequently, the spring is never called upon to act against any residual pressure in the cylinder 12, which would serve as a retarding influence, but need work, when released, only against ordinary atmospheric pressure within the cylinder 12.

The cycle of operation of the apparatus is diagrammatically shown in FIG. 6. Arrow A represents the upward movement of the post 1, and the parts it carries, and arrow B represents the downward movement. The angle alpha represents the relatively short period of time during which fluid under pressure is introduced into the cylinder 12. The angle beta represents the period during which the cylinder 12 is exhausted, and the angle delta represents the period during which the sealing jaws are open.

What is claimed is:

1. In a packaging machine of the type in which a series of filled and sealed merchandise packages are formed from a tube of heat-sealable material drawn over a filling pipe through which the merchandise is introduced into the tube:

a pair of heated jaws on opposite sides of the tube and movable toward and away from each other in a direction transverse to the longitudinal axis of the tube between a closed and open position, said jaws when closed forming a transverse seal on said tube, a pneumatic piston-cylinder arrangement for effecting said transverse movement of said jaws, and means for moving said jaws back and forth in a longitudinal direction when said jaws are in closed condition for advancing the tube through the machine, said means including a vertically movable post, a platform mounted on the upper end of said post, a pair of spaced-apart vertical wings carried by said platform, said wings being arranged on opposite sides of the tubular material and each of said wings carrying a pneumatic piston-cylinder device, a pair of levers pivotally mounted intermediate their ends on each of said wings, one end of one of said levers being pivotally connected to one of said jaws and the corresponding end of the other lever being pivotally connected to the other jaw, and a link pivotally connected between the opposite end of each of said levers and said piston-cylinder device, said levers and links being so arranged that upon movement of the piston-cylinder device in one direction said links tend to become aligned and close said jaws and upon move-

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ment of said device in the opposite direction said links move out of alignment and open said jaws.

2. In a packaging machine, the elements defined in claim 1 including an additional guide link pivotally connecting each of said jaws to each of said wings.

3. In a packaging machine of the type in which a series of filled and sealed merchandise packages are formed from a tube of heat-sealable material drawn over a filling pipe through which the merchandise is introduced into the tube:

a pair of heated jaws on opposite sides of the tube and movable toward and away from each other in a direction transverse to the longitudinal axis of the tube between a closed and open position, said jaws when closed forming a transverse seal on said tube, a pneumatic piston-cylinder arrangement for effecting said transverse movement of said jaws, and means for moving said jaws back and forth in a longitudinal direction when said jaws are in closed condition for advancing the tube through the machine, said means including a vertically movable post, a platform mounted on the upper end of said post, a pair of spaced-apart vertical wings carried by said platform, said wings being arranged on opposite sides of the tubular material and each of said wings carrying a pneumatic piston-cylinder device and associated linkages connecting said device to one end of each of said jaws, said piston-cylinder devices being arranged to close said jaws upon introduction of air under pressure into said cylinder, and including a spring in each of said devices for opening said jaws, said spring being stressed during the introduction of air into said cylinder.

4. In a packaging machine, the elements defined in claim 3 including a piston rod connected to said piston, and wherein said piston and piston rod are hollow, said spring being accommodated within the hollowed-out region of said piston and piston rod.

5. In a packaging machine, the elements defined in claim 3 including means for releasably locking the pistons and cylinders of each of said devices against relative move-

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ment under the influence of said spring after said cylinder is exhausted.

6. In a packaging machine, the elements defined in claim 5 wherein said locking means includes a latch movably mounted on each of said wings, resilient means normally maintaining a portion of said latch in the path of movement of said piston-cylinder device, and means operative in timed relation to the operation of the machine as a whole for moving said latch out of the path of said device against the force of said resilient means whereupon said spring is permitted to produce relative movement between said piston and cylinder to effect the opening of said jaws.

7. In a packaging machine, the elements defined in claim 6 wherein said latch-moving means includes an electromagnetic device linked to said latch, and means responsive to markings on said packaging material for actuating said electromagnetic device.

8. In a packaging machine, the elements defined in claim 6 including means carried by each of said piston-cylinder devices for resetting said latch upon opposite relative movement between said piston and cylinder upon introduction of air under pressure into said cylinder.

9. In a packaging machine, the elements defined in claim 8 wherein air under pressure is introduced into each of said cylinders immediately prior to the time said post reaches the end of its movement in the direction opposite to its direction of movement during the advancement of said packaging material, said cylinder being exhausted as soon as said locking means becomes reset.

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