

April 11, 1961

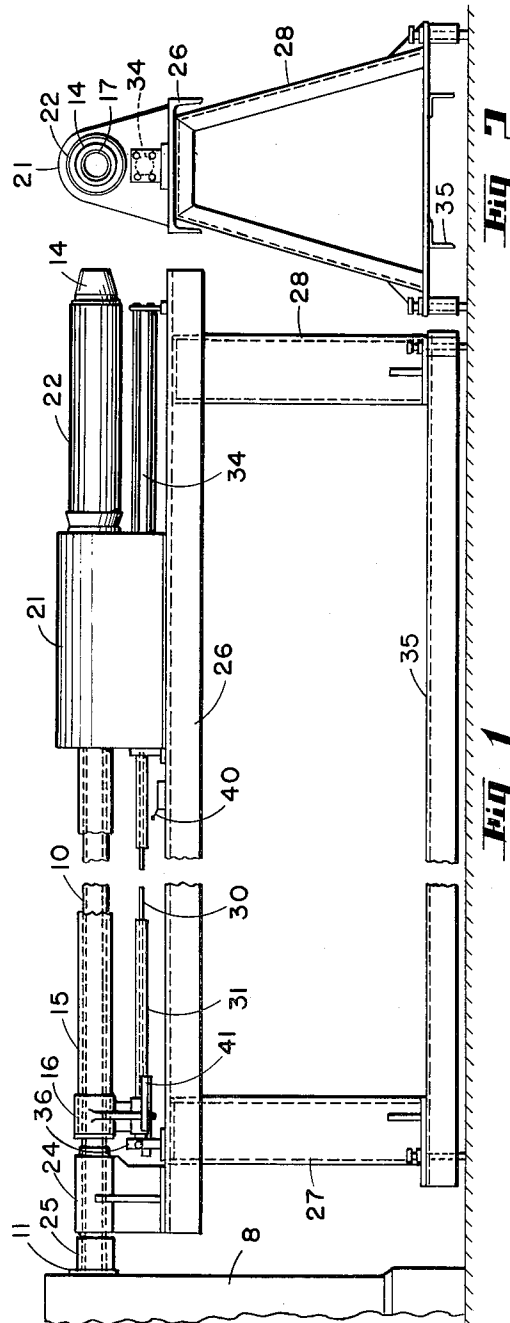
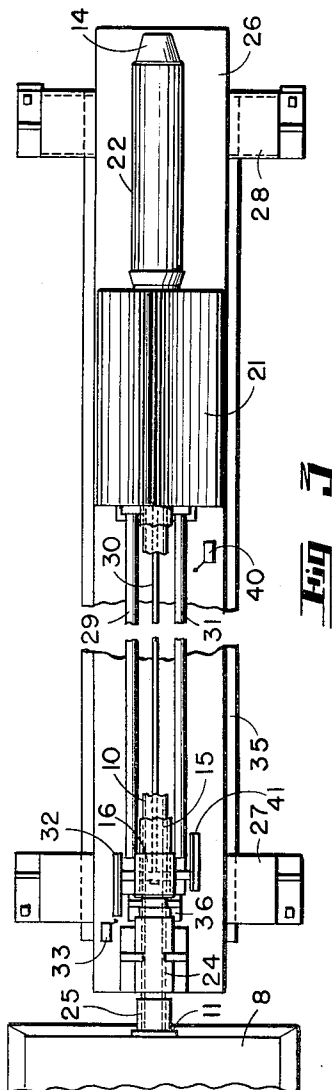
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2,979,086

FILLING MACHINE

Filed May 7, 1959

3 Sheets-Sheet 1



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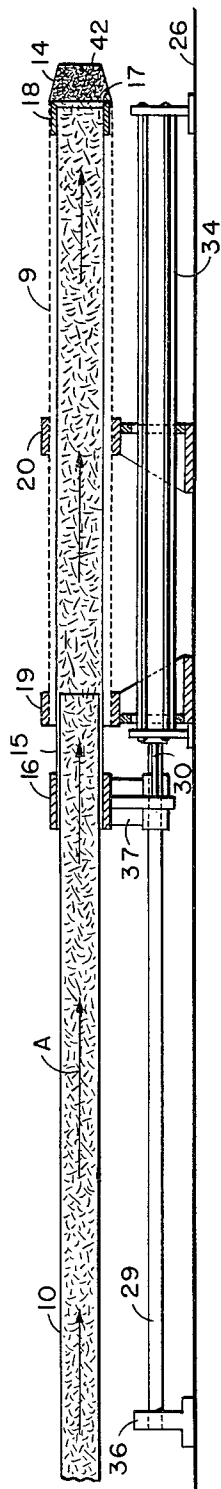


Fig. 4

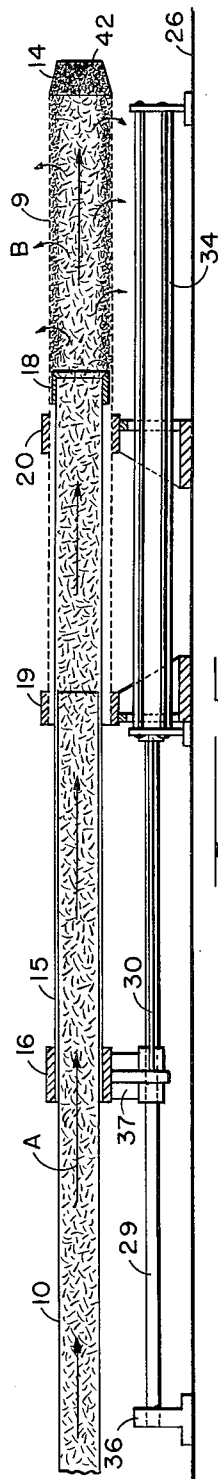


Fig. 5

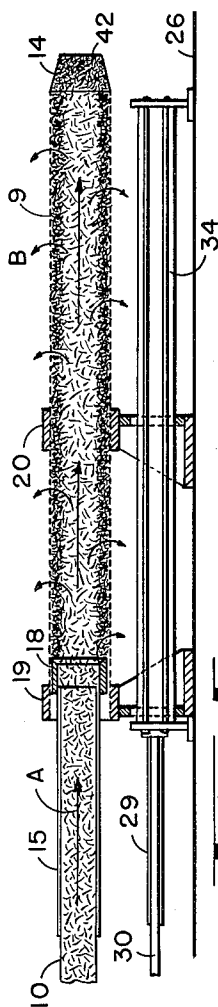


Fig. 6

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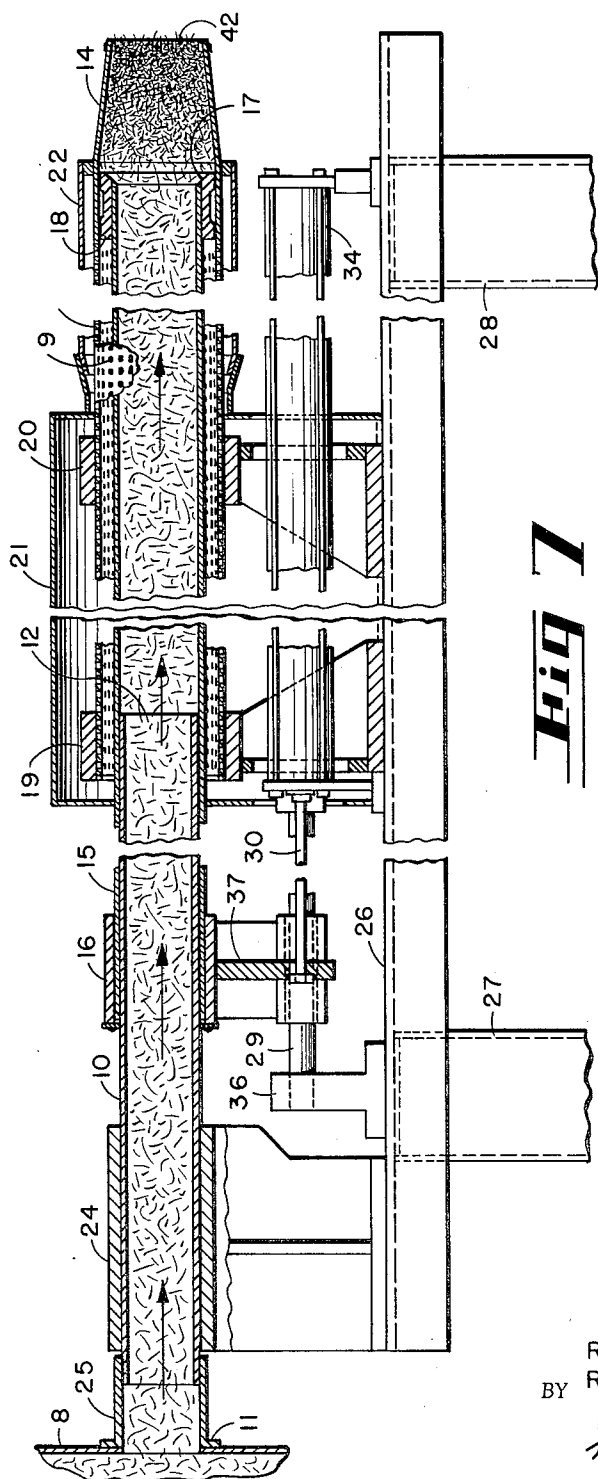


Fig. 7

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FILLING MACHINE

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7 Claims. (Cl. 141—67)

The present invention relates to apparatus for filling or stuffing plastic bags, pillows, cushions, mattresses and the like with compacted air-buoyant material such as kapok.

Prior art filling machines are characterized by complex valves at the intake end and/or delivery end of the reservoir in which the kapok is compacted. These machines are further complicated by control mechanisms for these valves.

The principal object of the invention is to provide a simplified machine in which such valves are dispensed with.

It is also an object of the invention to provide, in a filling machine, the combination of a perforated material-accumulating cylinder and a piston-like tubular stripper or ram which strips the material from the interior wall of the cylinder and compacts and extrudes such material.

Another object of the invention is to provide a filling machine having a perforated reservoir, formed with an open convergent delivery end, and a reciprocating annular ram or compacting member through which the material is blown on its retraction stroke.

A more specific object of the invention is to provide, in a machine for filling containers with compacted air-buoyant material, the combination of a perforated-wall reservoir having an inlet for filling material at one end and an open convergent delivery end, a complementary tubular sleeve or piston-like ram in slidable relation to the inner surface or bore of said perforated reservoir, means for supplying air-buoyant filling material under pressure to the inlet end of said reservoir, and a means including a reciprocating engine for retracting the sleeve to uncover perforations in the reservoir, whereby filling material is blown through the sleeve and accumulated in the reservoir. The reciprocating engine alternately projects the tubular sleeve in ram-like fashion to compact and eject the filling material through the delivery end.

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the accompanying description of the appended drawings, in which:

Figs. 1, 3 and 2 are, respectively, front elevation, top plan and end elevation views of a preferred embodiment of filling machine in accordance with the invention;

Figs. 4, 5 and 6 are central sectional views of the machine, in schematic and skeleton form, provided for purposes of explaining the operation of the invention, and showing the sleeve or ram in fully projected position, in a partially retracted position, and in completely retracted position; and

Fig. 7 is a central sectional view showing the principal operating parts in greater detail.

Referring now first to Fig. 7, there is shown a machine for extrusion of predetermined quantities of air-buoyant material. This machine is valveless, in the sense that there are no valves at the inlet and outlet ends, and no moving parts other than the ram or tubular sleeve 15

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and its appendages and associated parts. This machine is coupled to a conventional pressure-chamber 8 for supplying air under pressure, containing air-buoyant material such as kapok. This supply means consists of a chamber 8 having an inlet end and pressure blower (not shown) and an outlet pipe 25, connected to the wall of the supply means by a flange 11. The machine further comprises a transfer pipe 10 having an intake end in communication with the supply means 8 and an outlet end 12 projecting into a perforated screen 9 on which the material, after passing through outlet end 12 of the pipe, collects. The tubular screen member 9 is formed as an enlarged cylindrical reservoir extending outwardly beyond the end 12 of the conduit pipe 10. The reservoir 9 terminates in an open convergent end or nozzle 14. The peripheral wall of the cylindrical reservoir 9 is perforated throughout, except for the convergent section 14. The reservoir 9 is secured in place by brackets 19 and 20, formed with upper cylindrical portions, which embrace and rigidly position the cylinder 9, and with feet secured to base 26.

A tubular ram is concentrically disposed in relation to and slidably mounted for reciprocal movement relative to and in the reservoir 9. The ram comprises a tube 15 with end collars 16 and 18. The collar 18 closely slidably fits within screen 9 and ram 15 concentrically slidably fits over pipe 10. The delivery end of collar 18 is divergently beveled as shown at 17.

Means is provided for reciprocating the ram between the projected position illustrated in Fig. 7, and a fully retracted position in which the collar 18 registers substantially with bracket 19. For that purpose, collar 16 is connected by link 37 to a connecting rod 30, which in turn is reciprocally driven by a piston (not shown) contained in a conventional reciprocating compressed air or steam engine 34. Link 37 is formed with integral cylindrical bearings slidably fitted over a pair of guide rods 29 and 31. The guide rods are rigidly secured in place between bracket 36 and engine 34. The transfer pipe 10 is rigidly supported in position by a suitable bracket 24.

Referring now to Figs. 1, 2 and 3, it will be seen that the reservoir 9 is provided with suitable hoods 21 and 22, hood 21 being of an inverted U-shaped form and hood 22 being formed as a removable cylindrical cover. The entire machine is mounted on a suitable base 26 which is supported by a leg structure 27, 28, in turn secured to a foundation 35.

As shown in Figs. 1 and 3, push-button type limit switches 33 and 40 are positioned near the ends of the stroke of member 16 and these switches are cyclically actuated by members 32 and 41, secured to collar 16. The ultimate function of switches 33 and 40 is to control the valving and reversal of stroke of the reciprocating engine 34 by purely conventional means. Switch actuator 32 is adjustable to vary the stroke of the ram.

Reference is made to Figs. 4, 5 and 6 in describing the operation of a filling machine in accordance with the invention. The description starts with the assumption that the ram 16, 15, 18 is at its fully projected position, at which enlarged portion 18 is adjacent the convergent end 14. At this stage the nozzle 14 is full of closely packed kapok 42 and the machine has just completed the extrusion of a predetermined amount of kapok, leaving the closely packed material content 42 in the nozzle. The ram is now retracted to and through the position illustrated in Fig. 5. A draft of air-buoyant material continues to be supplied, through members 10 and 15, in the direction indicated by the arrow A, and this draft deposits material along the inner wall of the reservoir 9 and adjacent the end 14, as indicated by the additional reference numerals 42. As the ram continues to be further retracted to the position indicated in Fig. 6, the

accumulation of kapok along an increasing length of interior wall of reservoir 9 is continued, until the reservoir very rapidly fills up. At this point the stroke is reversed and ram 16, 15, 18 is projected into the reservoir 9. Collar 18 of the ram closely slidably fits the interior wall of reservoir 9 and it clears the material that is accumulated along the wall, compressing it toward nozzle 14 and finally extruding it in densely packed form through such nozzle. Again, the ram is retracted and the cycle is repeated.

Attention is directed to certain features of this construction. In the first place, as the ram is retracted, to the successive positions, indicated in Figs. 5 and 6, the draft of air-buoyant material is supplied to the cylindrical reservoir 9 and the high-pressure air filters outwardly through the ports in cylinder 9, as indicated by the arrows B, after leaving the deposits of kapok along its walls. This action is due to the fact that the ram is of hollow tubular form. Thus, the screen performs the function of a valve for releasing air but at the same time filters the air to deposit kapok along the interior reservoir walls. Second, over that period of the cycle from the final stages of completion of an extrusion step until the completion of retraction of the ram, the convergent open end 14 and the deposit of material 42 left therein, serve effectively as a valve or closure against which the accumulation of kapok is built up. Finally, as the ram is projected into the reservoir, the open convergent nozzle 14 to some extent tends to retard flow of kapok and contributes to its compression by the ram.

This operation is cyclical and continues at a rapid rate. Six to twenty production steps per minute is a suitable rate. As the ram is withdrawn the production operator slips a bag or container over nozzle 14. The bag is filled during the compression stroke of the ram. As the ram again retracts, the full bag is removed and a bag is fitted to the mouth 14 of the reservoir. This cycle continues at a productive rate of speed and in a foolproof manner, all without involving gate valves, shutter valves, valve control mechanisms and the like.

While the invention is not limited to specific dimensions and parameters, the following have been used in one successful embodiment of the invention and found to be satisfactory:

Length of stroke	36"
Length of ram tube 15	44 $\frac{5}{8}$ "
Diameter of screen ports in 9	$\frac{1}{8}$ "
Length of cylinder 9	38"
Inside diameter of screen	4"
Slant length of nozzle 14	3 $\frac{1}{8}$ "
Inside diameter of ram	3"
Minimum inside diameter of open delivery throat 14	3 $\frac{13}{32}$ "
Maximum inside diameter of nozzle 14	4"
Number of extrusions per minute	6-20.
Spacing between centers of ports	$\frac{1}{2}$ " average.
Air pressure of supply source of air-buoyant kapok	$\frac{1}{2}$ pound per square inch.

While there has been shown and described what is at present considered to be the preferred embodiment of the invention, it will be understood by those skilled in the art that various changes and modifications may be made therein without departing from the true scope of the invention as defined in the appended claims:

We claim:

1. A valveless machine for extrusion of predetermined quantities of air-buoyant material comprising, in combination: means for supplying air under pressure and containing the material in suspension, stationary conduit means having an intake end in communication with said supply means and a perforated screen on which said material collects and an open convergent delivery end, a hollow tubular ram member concentrically disposed in

relation to and mounted for reciprocal movement relative to and in said screen, and means for projecting said ram into said screen to eject said material and retracting said ram to permit said material to collect on said screen and at said delivery end, said ram member being formed to define a passage through which material is blown from the supply means to the conduit means.

2. A valveless machine for extrusion of predetermined quantities of gas-buoyant material comprising, in combination: means for supplying gas under pressure and containing the material in suspension, stationary conduit means having an intake end in communication with said supply means and a perforated screen and an open delivery end, a hollow tubular ram member concentrically disposed in relation to said conduit means and mounted for axial reciprocal movement relative to and within said screen, and means for projecting said ram into said screen to eject said material and retracting said ram to permit said material to collect adjacent said delivery end, said ram member being formed to define a passage through which material is blown from the supply means to the conduit means.

3. A machine for extrusion of predetermined quantities of air-buoyant material comprising, in combination: pressure-chamber means for supplying a draft of air containing the material in suspension, a stationary transfer pipe having an intake end in communication with said supply means and an outlet end, a perforated cylindrical stationary screen member mounted in concentric relation to and of larger diameter than said pipe and extending beyond said outlet end, said screen having an open convergent delivery end, a hollow tubular sleeve member concentrically disposed on said pipe and formed and mounted for reciprocal movement relative to and in said screen, and means for projecting said sleeve member to eject said material and retracting said sleeve member to permit said material to collect on said screen and at said delivery end, said sleeve member being formed to define a passage through which material is blown from said transfer pipe to said screen.

4. In a filling machine for filling containers with substantially air-buoyant material, the combination of a stationary perforated-walled cylindrical reservoir having an inlet for filling material at one end and an open convergent delivery end, a concentric tubular sleeve in axial slidable relation to the inner surface of said reservoir, means for supplying air-buoyant filling material under pressure to said inlet end of said reservoir, and reciprocating means for retracting said sleeve to uncover perforations in said reservoir, whereby filling material is permitted to be deposited within said reservoir in densely packed form, said reciprocating means projecting said sleeve to eject said filling material through said delivery end, said sleeve being formed to define a passage through which material is blown into said reservoir.

5. In a filling machine for filling containers with substantially air-buoyant material, the combination of a stationary perforated-walled reservoir having an inlet for filling material at one end and an open convergent delivery end, a complementary tubular sleeve in slidable relation to a surface of said perforated reservoir, means for supplying air-buoyant filling material under pressure to said inlet end of said reservoir, and reciprocating means for retracting said sleeve to uncover perforations in said reservoir, whereby filling material is permitted to be deposited on said reservoir in densely packed form, said reciprocating means projecting said sleeve to eject said filling material through said delivery end, said sleeve being formed to define a passage through which material is blown into said reservoir.

6. A machine for compacting and extruding predetermined quantities of gas-borne fibrous material comprising, in combination: means for supplying such material in suspension, stationary perforated screen means forming an open-throated chamber for collecting said material,

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and wiper-sleeve means for alternately scavenging said screen means to eject said material through the open throat of said chamber and clearing said screen means to permit collection of said material, said wiper-sleeve means being formed to define a material passageway from the supply means to said chamber.

7. A valveless machine for compacting and extruding predetermined quantities of gas-borne fibrous material comprising, in combination: means for supplying such material in suspension, means, including a stationary perforated screen, forming a convergent open-throated chamber for collecting said material, and wiper means in concentric relation to the passageway for said material for alternately scavenging said screen to eject said

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material through the open throat of said chamber and clearing said screen means to permit collection of said material, said wiper means being formed to define a material passageway from the supply means to said chamber.

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