Sept. 22, 1953 W. A. SHERBONDY 2,652,961

CARTRIDGE FILLING APPARATUS

Filed April 30, 1949 3 Sheets-Sheet 1

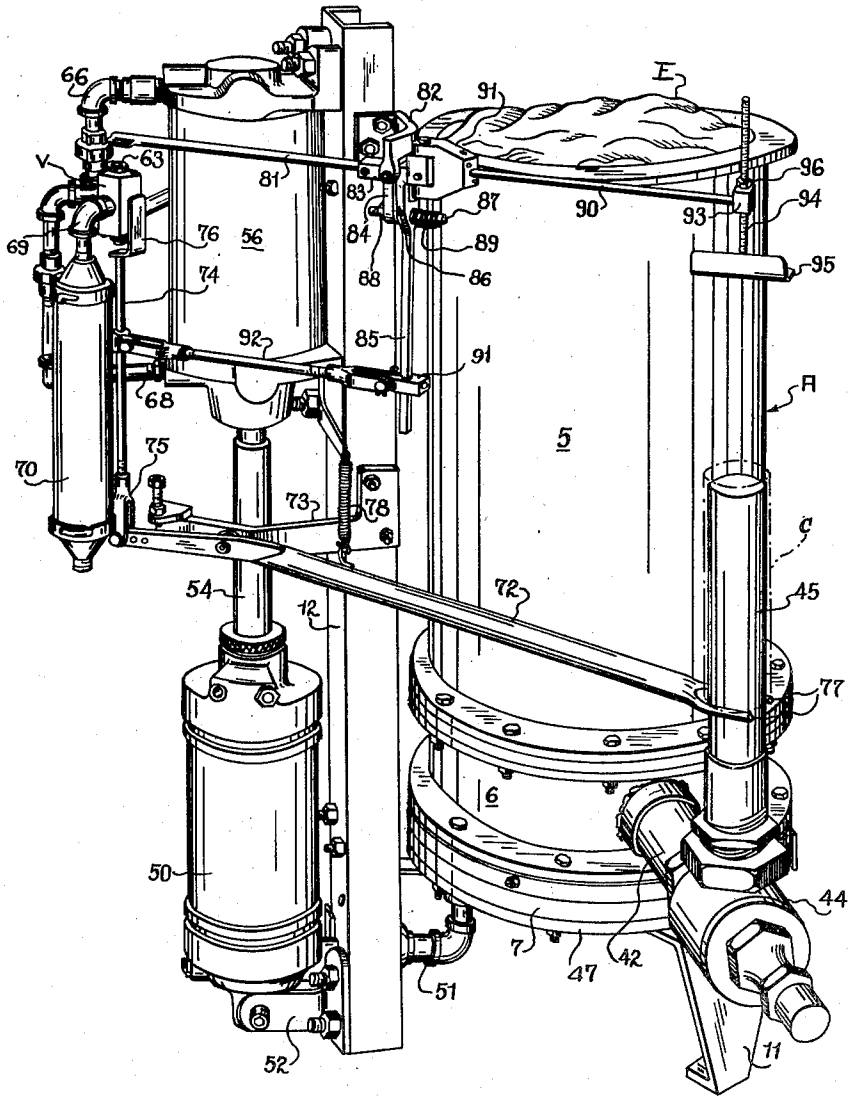

FIG. 1

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Filed April 30, 1949 3 Sheets-Sheet 2

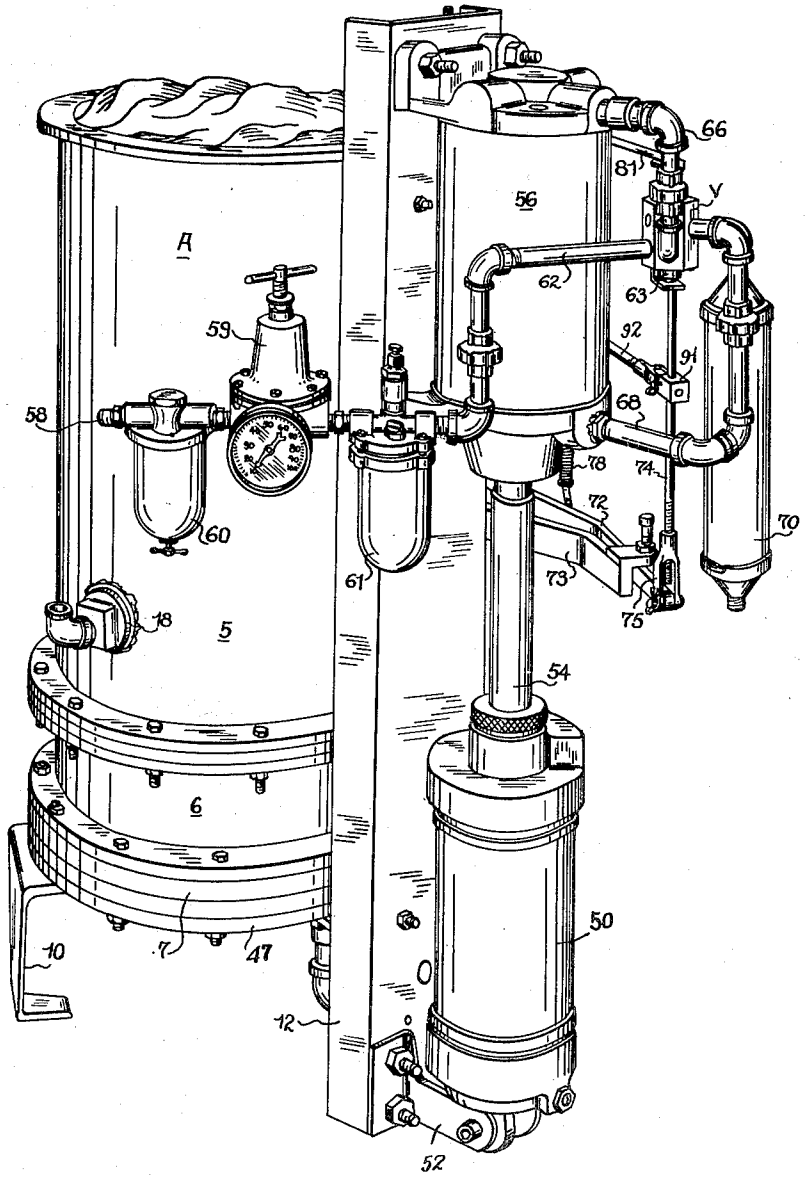

FIG. 2

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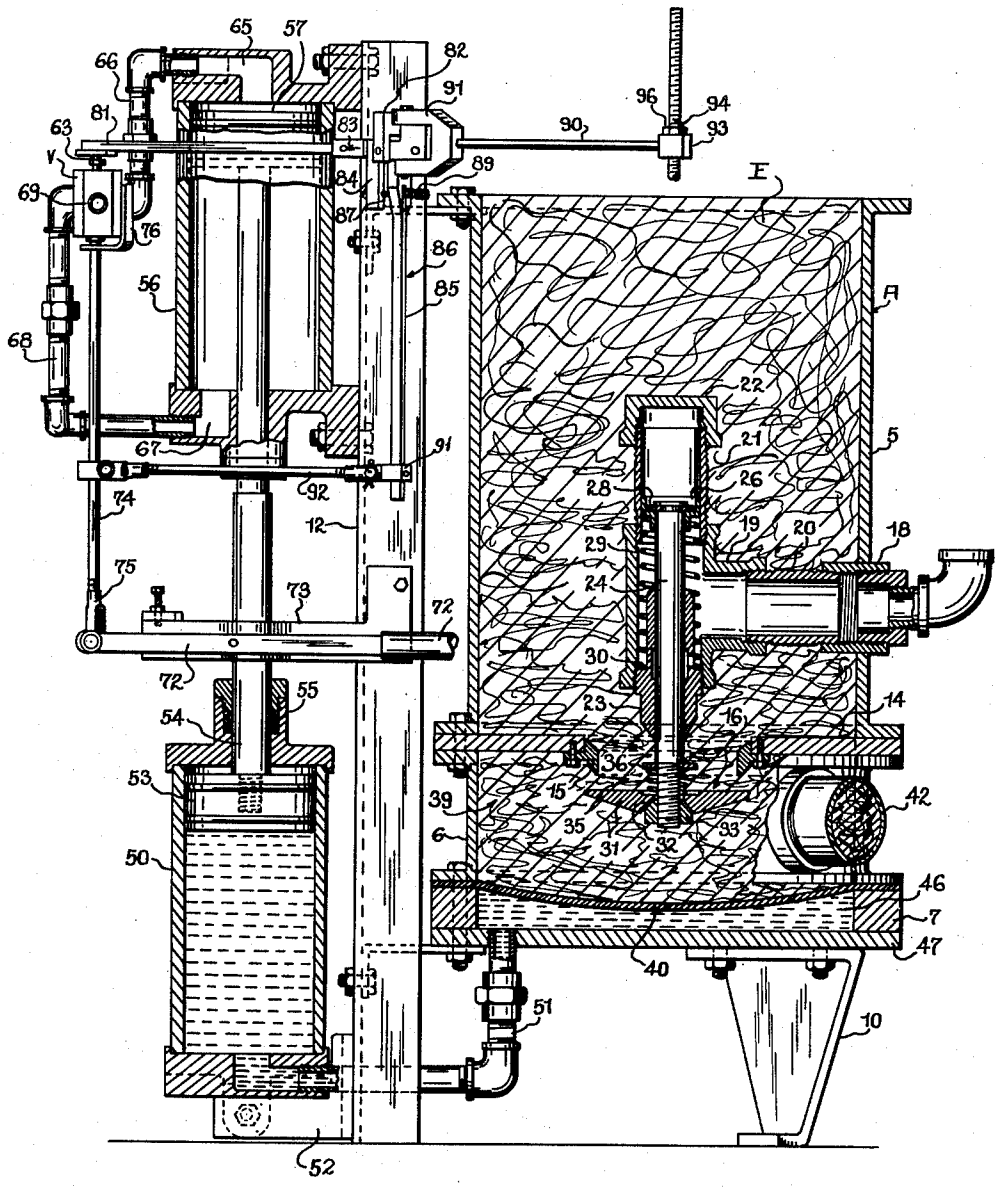

FIG. 3

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UNITED STATES PATENT OFFICE

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CARTRIDGE FILLING APPARATUS

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Application April 30, 1949, Serial No. 90,662

9 Claims. (Cl. 226—23)

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The present invention relates to apparatus for filling tubular cartridges with plastic compound.

A principal object of the invention is the provision of a new and improved apparatus for loading cartridges with caulking compound, or the like, which apparatus comprises a hopper for caulking compound, a tube adapted to receive a cartridge telescoped thereover, power means operable to expel compound from the hopper through the tube, and control mechanism for the power means including a control member positioned adjacent to the tube and movable by one end of the cartridge when the latter is telescoped over the tube, to initiate operation of the power means.

A further object of the invention is the provision of a novel and improved apparatus for loading cartridges with caulking compound, which apparatus comprises a hopper for caulking compound, a tube adapted to receive a cartridge telescoped thereover, power means operable to expel compound from the hopper through the tube, and control mechanism for the power means including a member movable by the cartridge as the latter moves outwardly of the tube to automatically terminate expulsion of compound through the tube when the cartridge has been filled.

Another object of the invention is the provision of a novel and improved apparatus for loading tubular cartridge shells with caulking compound, or the like, which apparatus comprises a hopper for the compound, a compartment having a movable wall and connected with the hopper by a passageway, a check valve in the passageway adapted to admit compound from the hopper into the compartment, a tube connected with the compartment and adapted to receive a cartridge shell thereover for directing compound into the shell, power means for moving the wall of the compartment to draw compound into the compartment and expel the same through the tube, and control means for the power means including a member adjacent to the tube and adapted to be moved by a cartridge shell over the tube to initiate a compound expelling cycle of operation of apparatus, and a member in alignment with the axis of the tube and adapted to be moved by a substantially filled cartridge to terminate the compound expelling cycle of operation.

The invention resides in certain constructions and combinations and arrangements of parts and further objects and advantages will be apparent to those skilled in the art to which it relates

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from the following description of the preferred embodiment described with reference to the accompanying drawings, forming a part of this specification in which

Fig. 1 is a perspective view of an apparatus for filling cylindrical cartridges with caulking compound;

Fig. 2 is a view similar to Fig. 1 but taken at a different angle; and

Fig. 3 is a longitudinal sectional view of the apparatus shown in Figs. 1 and 2.

One form of manually operable caulking gun now in use comprises a frame adapted to detachably support a cylindrical cartridge, filled with caulking compound, and having a piston rod and piston operable to eject the caulking compound from the cartridge through an applicator nozzle associated with the cartridge. The cartridge generally comprises an inexpensive tube or cylindrical shell which may be disposed of after the compound has been emptied therefrom. The shell is preferably fabricated of a cylindrical tube of inexpensive material, such as cardboard, having a closure plate at one end and an applicator nozzle at the other end. The present invention is directed particularly to apparatus for quickly and economically filling such cartridge shells with caulking compound.

In general, the invention comprises a novel apparatus having a relatively large hopper into which a batch of caulking compound may be loaded, and a compartment having a movable wall and an outlet including a tube, is connected with the hopper through a passageway. Compound is adapted to be drawn into the compartment from the hopper and expelled from the compartment through the tube when the movable wall of the compartment is oscillated. Check valves are positioned in the passageway and tube, respectively, to check the flow of compound from the compartment to the hopper and the flow of material into the compartment through the tube when the wall is oscillated. The tube is adapted to direct the compound expelled therethrough into a cartridge shell telescoped over the end portion thereof, and as the shell is filled, the latter is moved outwardly of the tube. The operation of the power means for oscillating the movable compartment wall may be controlled by members moved by cartridge shells as the latter are positioned for filling and at the termination of the filling operation, respectively, to automatically initiate and terminate the flow of caulking compound through the tube.

Referring to the drawings, a cylindrical struc-

ture is provided comprising sections 5, 6, and 7 supported by legs 10, 11, and a vertical channel member 12. The section 5 forms an open top hopper for the caulking compound, the bottom of which is formed by a plate 14 bolted between adjacent external flanges on the lower and upper ends of sections 5 and 6, respectively. The central portion of the plate 14 has a circular opening in which a valve seat ring 15 is bolted. A check valve, indicated generally at 16, is adapted to close the opening in plate 14, and the valve is supported inside the hopper by a support comprising a pipe coupling 18 welded in an opening of the side wall of the hopper and having a T-fitting 19 attached at the inner end thereof through a nipple 20. A second nipple 21 is threaded into the upper end of the fitting 19 and a cap 22 is threaded on the end of the sleeve. A bushing 23 is threaded into the lower branch of the fitting 19, and the nipple 21 and bushing 23 support a valve rod 24 for reciprocal movement. The upper end of the valve rod 24 has a cup-shaped guide 26 attached thereto which guide slides in the nipple 21. The guide 26 is held on the rod 24 by a spring washer 28 contracted into a groove surrounding the upper end of the rod. A coil spring 29 is positioned between a shoulder 30 of the bushing 23 and the member 26 for normally urging the rod 24 upwardly. A valve plate 31 is carried on the lower end of the valve rod 24 and the underside of the valve plate has a tapered opening 32 into which a tapered nut 33, threaded on the lower end of the rod 24, is received. The valve plate is resiliently urged into engagement with nut 33 by a coil spring 35 which is disposed between the plate and a washer 36 abutting a shoulder on the rod at the terminus of the threaded portion of the rod. The plate 31 is resiliently urged against seat ring 15 by the force of spring 29, but it may be moved from the seat ring by pressure on the upper side thereof.

Immediately below the plate 14 is a compartment 39, the side walls of which are formed by the cylindrical section 6, and the bottom of which comprises an oscillatable wall, which is preferably formed of a relatively heavy rubber-like diaphragm 40 secured between the upper edge of section 5 and lower flanges of section 6. A tubular outlet is provided for the compartment 39 and it includes a pipe 42 connected in an opening through the side of the section 6. The pipe 42 has a suitable check valve 44 connected at the outer end thereof, which valve is adapted to open in response to pressure of material passing outwardly through the pipe and to close when material tends to travel inwardly of the pipe toward the compartment. The details of the valve are not shown, as such valves are well understood by those familiar with the valve art. A vertical tube 45 is attached to the valve 44, and the tube 45 is adapted to receive cylindrical cartridge shells telescoped thereover, one of such shells is indicated at C and shown by broken lines. The clearance between the outside of the tube and inside of the cartridge shell is such that the shell is filled solidly from wall to wall by compound issuing from the tube, and as the compound enters the shell the latter is moved outwardly of the tube.

The diaphragm 40 is adapted to be oscillated vertically by a power mechanism which includes a chamber 46 formed by the cylindrical section 5, a bottom plate 47, the diaphragm 40, and a body of fluid in the chamber. The fluid is preferably oil or other suitable liquid, and the volume of the oil in the chamber may be alternately increased and decreased by pump means which includes a cylinder 50, the lower end of which is connected with the chamber 46 through a pipe 51. The cylinder 50, which is supported on the upright 12 by a bracket 52, has a piston 53 therein, which is adapted to be reciprocated by a piston rod 54. The piston 53 acts directly on the body of oil which fills chamber 46, pipe 51 and the portion of the cylinder below the piston, and oil is transmitted to and from the chamber 46, according to the direction of movement of the piston. The piston rod 54 extends through suitable packing 55 upwardly into a pneumatic cylinder 56 and is attached to a piston 57 which is adapted to be reciprocated in the cylinder 56 by air pressure.

The apparatus may be connected with a suitable source of compressed air, not shown, by a pipe line 58, one end of which is connected with the inlet of a control valve V, which may be of conventional design for the purpose required. The pipe line 58 preferably includes a pressure regulator 59 and suitable traps 60, 61 all of conventional construction. The air valve V includes a vertically reciprocable actuating plunger 63, and the valve is adapted to control the flow of air to and from the cylinder 56 according to the position of the plunger 63. The construction of the valve is such that the plunger 63 remains in either its upper or lower position until it is moved by an actuating mechanism into the opposite position. The upper end of the cylinder 56 is connected with one port of the valve V by way of a passage 65 and a pipe 66, and the opposite end of the cylinder is connected with another port of the valve by way of a passage 67 and a pipe 68. The air valve is adapted to exhaust air from the cylinder through an exhaust pipe 69 and, preferably, a muffler 70 is connected to the exhaust pipe. When the valve plunger 63 is depressed, air from pipe line 58 enters the cylinder 56 through the passage 67 and the cylinder moves upwardly, exhausting air through passage 65. The upward movement of piston 57 moves piston 53 upwardly, creating a vacuum in the cylinder 50 which withdraws the oil support for the diaphragm 40 and, as a result, the caulking compound in the hopper is forced downwardly through the check valve 16 and into the compartment 39. When the plunger 63 is moved upwardly, air is admitted to cylinder 56 from pipe line 58 through the passage 65 and air is exhausted from the opposite end of the cylinder through passage 67 as the piston 57 is moved downwardly. This movement of piston 57 causes the piston 53 to force oil from the cylinder 50 into the chamber 46 and move diaphragm 40 upwardly in the compartment 39. The upward movement of the diaphragm forces the compound in the compartment outwardly through pipe 42, valve 44 and tube 45. The possible volumetric displacement of the diaphragm 40 is in excess of the volume of the cartridge shell so that during one upward movement of the diaphragm 40 enough compound is displaced from compartment 39 to fill a cartridge shell.

The valve actuating plunger 63 is adapted to be moved upwardly by a lever 72 which is pivoted on a bracket 73 attached to the upright 12, and which lever has a vertically extending rod 74 attached at one end by a clevis 75. The upper end of the rod 74 is engageable with the plunger 63 to move the latter upwardly when the lever 72 is moved clockwise, as viewed in Fig. 1. An L-shaped plate 76 is attached to the upper end of the rod 74 for engagement with the side of the valve casing to limit movement of the rod 74 counterclockwise. The right hand end of lever

72, as viewed in Fig. 1, is forked and the tines 77 of the fork receive the tube 45 therebetween. A spring 78 is attached to lever 72 to resiliently maintain the same in a position in which the rod 74 is out of engagement with the plunger 63. The forked end of the lever 72 is adapted to be depressed by a cartridge shell telescoped over the tube 45, which causes the opposite end of the lever to move upwardly and raise the valve plunger 63 and initiate the compound expelling cycle of operation of the apparatus. The forked end of the lever 72 is positioned such that it is not engaged by a cartridge shell until the upper end of the latter is adjacent to the opening of tube 45 to insure complete filling of the shell.

The valve plunger 63 is adapted to be depressed by a lever 81 which is pivoted at one end on a bracket 82, attached to the upright 12, by a pin 83. The free end of the lever 81, which has a flat portion thereon, is adapted to engage the top of the valve plunger when the lever is moved counterclockwise, as viewed in Fig. 1. The pivoted end of the lever 81 is provided with a downwardly projecting lug 84 through which the lever is connected with a leg 85 of a crank lever 86, also pivoted to the bracket 82 by the pin 83. The leg 85 of the crank lever and the leg 84 of lever 81 have aligned openings through which a bolt 87 extends. A nut 88 on the bolt engages the leg 84 and urges the latter toward leg 85 by the reaction of a spring 89 interposed between leg 85 and the head of the bolt. By this arrangement, there may be yielding, limited relative movement between lever 81 and crank lever 86 after the lever 81 depresses the plunger 63.

An arm 90 is attached to the horizontal leg of crank lever 86 by a clevis 91 which enables the arm 90 to be swung in a horizontal plane. The arm 90 is positioned substantially horizontally by a link 92 which interconnects the lower end of the crank lever leg 85 with the push rod 74. The weight of arm 90 tends to rotate the crank lever 86 clockwise, but the latter is prevented from so doing by the link 92 which moves rod 74 to a position in which plate 76 engages the casing of valve V. The outer end of the arm 90 is adapted to swing into and out of alignment with the open end of tube 45 and a head 93 is formed thereon which has a vertical extending threaded opening which receives a threaded rod 94. The lower end of the rod 94 carries a curved member 95 which is adapted to form an abutment engageable by the upper end of a cartridge shell as the latter moves upwardly from the tube 45. The vertical position of the member 95 may be adjusted by rotating the rod 94 in one direction or the other in the threaded head 93, and the rod 94 may be set in its adjusted position by a lock nut 96. When the arm 90 is raised, as when a filled cartridge shell moves upwardly against the stop member 95, the lever 81 is moved downwardly and depresses the plunger 63. The resilient connection between crank lever 86 and lever 81, permits some vertical movement of arm 90 after lever 81 has depressed the plunger 63 without distortion of the parts involved. When cartridge shells are to be placed over the tube 45, the arm 90 may be temporarily swung to one side of the axis of the tube and out of the way of the shells as they are telescoped over the tube.

In operation of the apparatus, the hopper is filled with caulking compound E, and by actuating the air valve V, the diaphragm 40 is oscillated to cause the compound to be drawn into compartment 39 and forced outwardly through pipe 42, valve 44 and upwardly into the tube 45. When the tube 45 is filled with compound the valve V is operated to cause the piston 53 to be moved to its uppermost position. An empty cartridge shell having one end closed by its cover plate and the opposite end open is then telescoped over the tube 45, and when the closed end is adjacent to the upper end of the tube, the lower end of the cartridge moves lever 72 clockwise which raises the valve plunger 63 and causes the power mechanism to move the diaphragm 40 upwardly and expel compound through the tube into the cartridge. As the compound fills the cartridge it is forced upwardly and engages the member 95 to raise arm 90 and swing lever 81 downwardly to depress plunger 63 and cause the power mechanism to reverse the movement of the diaphragm 40, which movement enables compartment 39 to be replenished. The apparatus is then ready for another operating cycle.

It will be seen that the control of the compound expelling means of the apparatus is substantially automatic and that cartridge shells can be rapidly and accurately filled with a minimum of attention and labor. After the compartment 39, pipe 42 and tube 45 have been initially filled with compound, the apparatus may be operated indefinitely through the control lever 72 and arm 90 and as long as a supply of compound is maintained in the hopper.

While the preferred form of the invention has been described in considerable detail, it will be apparent that the invention is not limited to the construction shown and it is my intention to cover hereby all adaptations, modifications and changes therein which come within the practice of those skilled in the art to which the invention relates and the scope of the appended claims.

Having thus described my invention, I claim:

1. In apparatus of the character described, a hopper for plastic compound; a tube communicating with said hopper and having a discharge end portion adapted to telescopingly receive a tubular cartridge shell; power means operable to expel compound from the hopper through said tube; and control means for said power means comprising, a member adapted to initiate operation of said control means and having a part adjacent to said tube and adapted to be engaged by an empty cartridge shell telescoped over the tube, and a member spaced from the discharge end of said tube adapted to terminate operation of said control means, means for movably supporting said last mentioned member for lateral movement into and out of alignment with the discharge end of said tube and when in alignment with said tube adapted to be engaged by a cartridge shell moving outwardly of said tube.

2. In apparatus of the character described, a hopper for caulking compound; means forming a compartment connected with the hopper by a passageway, said means including a movable wall; a check valve in said passageway adapted to admit compound from said hopper into said compartment; a compound outlet tube leading from said compartment and having its discharge end portion adapted to telescopingly receive a cartridge shell; power means for moving said wall to change the volume of said compartment; and means for controlling said power means and comprising, a member having a part adjacent to said tube and adapted to be moved by a cartridge shell telescoped over said tube, and a member spaced from and alignable with the discharge end of said tube

and adapted to be moved by a cartridge shell moving outwardly of said tube.

3. In apparatus of the character described, a hopper for caulking compound; means forming a compartment connected with the hopper by a passageway, said means including a movable wall; a check valve in said passageway adapted to admit compound from said hopper into said compartment; a compound outlet tube leading from said compartment and having its discharge end portion adapted to telescopingly receive a cartridge shell; power means for moving said wall to change the volume of said compartment, said means including a chamber, said movable wall forming one wall of said chamber, a cylinder connected with the chamber, a piston in the cylinder, a liquid body in the chamber and cylinder and acted upon by said piston, pneumatic means for actuating said piston; and control mechanism for said pneumatic means comprising, a member having a part adjacent to said tube and adapted to be moved by a cartridge shell telescoped over said tube, and a member spaced from and alignable with the discharge end of said tube and adapted to be moved by a cartridge shell moving outwardly of said tube.

4. In apparatus of the character described, a hopper for caulking compound; means forming a compartment connected with the hopper by a passageway, said means including a flexible wall; a check valve in said passageway adapted to admit compound from said hopper into said compartment; a compound outlet tube leading from said campartment and having its discharge end portion adapted to telescopingly receive a cartridge shell; means forming a chamber on the side of said flexible wall opposite said compartment; means for directing fluid to and from said chamber; and control mechanism for the last-mentioned means, said mechanism comprising, a member having a part adjacent to said tube and adapted to be moved by a cartridge shell telescoped over said tube, and a member spaced from and alignable with the discharge end of said tube and adapted to be moved by a cartridge shell moving outwardly of said tube.

5. In apparatus of the character described, a hopper for caulking compound; means forming a compartment connected with the hopper by a passageway, said means including a flexible wall; a check valve in said passageway adapted to admit compound from said hopper into said compartment; an outlet tube leading from said compartment and having its discharge end portion adapted to telescopingly receive a cartridge shell; means forming a chamber on the side of said flexible wall opposite said compartment; means for directing liquid to and from said chamber; and control mechanism for the last-mentioned means, said mechanism comprising, a member having a part adjacent to said tube and adapted to be moved by a cartridge shell telescoped over said tube, and a member spaced from and alignable with the discharge end of said tube and adapted to be moved by a cartridge shell moving outwardly of said tube.

6. In apparatus of the character described a hopper for caulking compound; means forming a compartment connected with the hopper by a passageway, said means including a flexible wall; a check valve in said passageway adapted to admit compound from said hopper into said compartment; an outlet tube leading from said compartment and having its discharge end portion adapted to telescopingly receive a cartridge shell;

means forming a chamber on the side of said flexible wall opposite said compartment; means for directing liquid to and from said chamber, the last-mentioned means including, a cylinder, a piston movable in the cylinder, and pneumatic means for actuating said piston; and control mechanism for said pneumatic means, said control mechanism comprising, a member having a part adjacent to said tube and adapted to be moved by a cartridge shell telescoped over said tube, and a member spaced from and alignable with the discharge end of said tube and adapted to be moved by a cartridge shell moving outwardly of said tube.

7. In apparatus of the character referred to, a tubular structure; a rigid partition in said structure intermediate the ends thereof, said partition and sides of said structure forming a hopper, said partition having an opening therein; a check valve in said opening adapted to prevent movement of material through said opening into said hopper; a movable wall extending transversely of said structure, said movable wall being spaced from said partition and being movable toward and from said partition; an outlet tube connected to said structure and having an opening therein intermediate said partition and movable wall; a rigid wall extending transversely of said structure and cooperating with wall portions of said structure to form a chamber having said movable wall at one side thereof; and means for alternately directing fluid to and from said chamber.

8. In apparatus of the character referred to, a tubular structure; a rigid partition in said structure intermediate the ends thereof, said partition and sides of said structure forming a hopper, said partition having an opening therein; a check valve in said opening adapted to prevent movement of material through said opening into said hopper; a movable wall extending transversely of said structure, said movable wall being spaced from said partition and being movable toward and from said partition; an outlet tube connected to said structure and having an opening therein intermediate said partition and movable wall; a rigid wall extending transversely of said structure and cooperating with wall portions of said structure to form a chamber having said movable wall at one side thereof; and pump means for alternately directing liquid to and from said chamber.

9. In apparatus of the character referred to, a tubular structure; a rigid partition in said structure intermediate the ends thereof, said partition and sides of said structure forming a hopper, said partition having an opening therein; a check valve in said opening adapted to prevent movement of material through said opening into said hopper; a movable wall extending transversely of said structure, said movable wall being spaced from said partition and being movable toward and from said partition; an outlet tube connected to said structure and having an opening therein intermediate said partition and movable wall; a rigid wall extending transversely of said structure and cooperating with wall portions of said structure to form a chamber having said movable wall at one side thereof; and pneumatically actuated pump means for alternately directing liquid to and from said chamber.

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