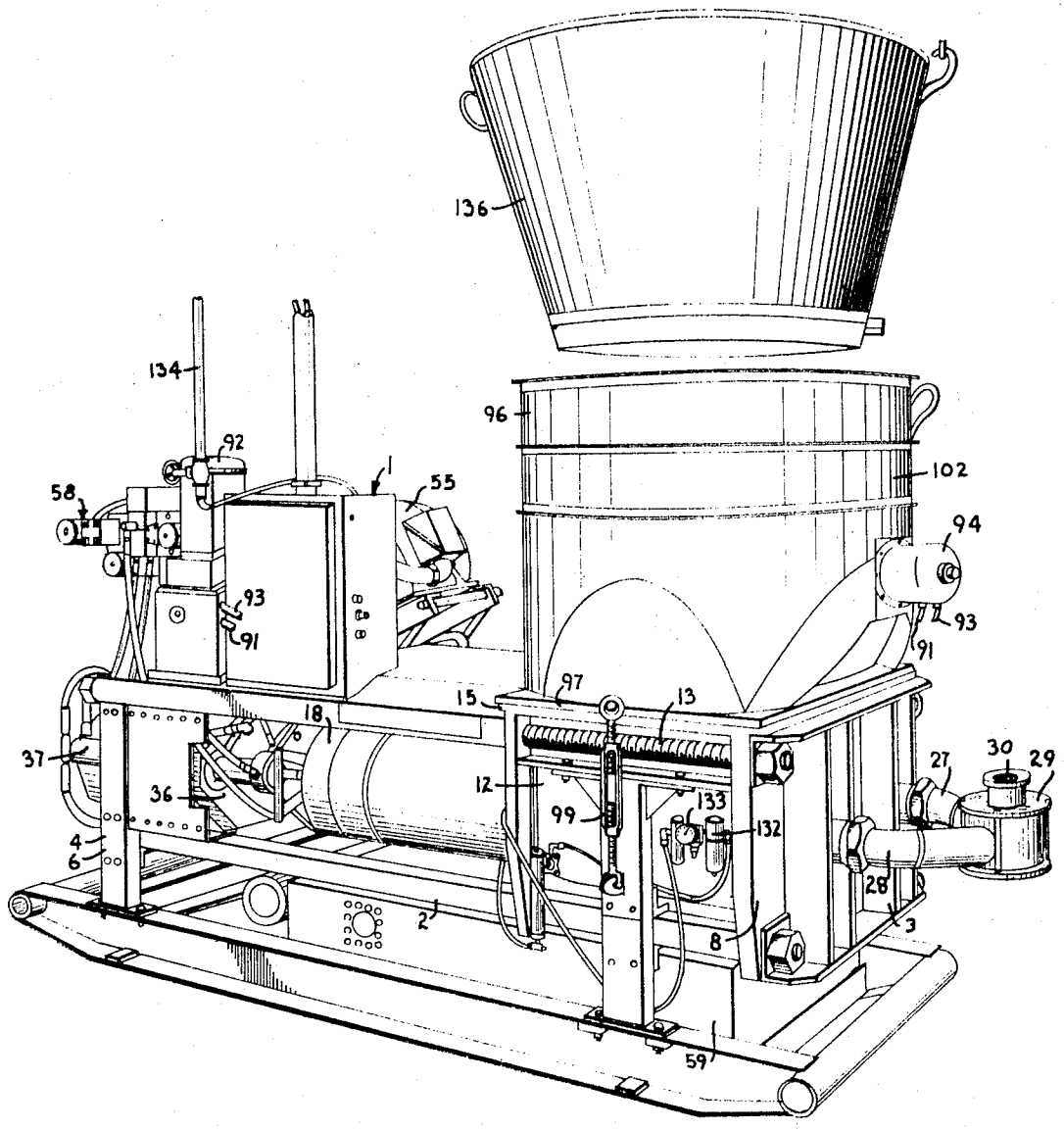
July 22, 1969 J. M. MILLER ET AL 3,456,285

CONTINUOUS HYDRAULIC STUFFER

Filed June 5, 1967 9 Sheets-Sheet 1

Fig. 1.




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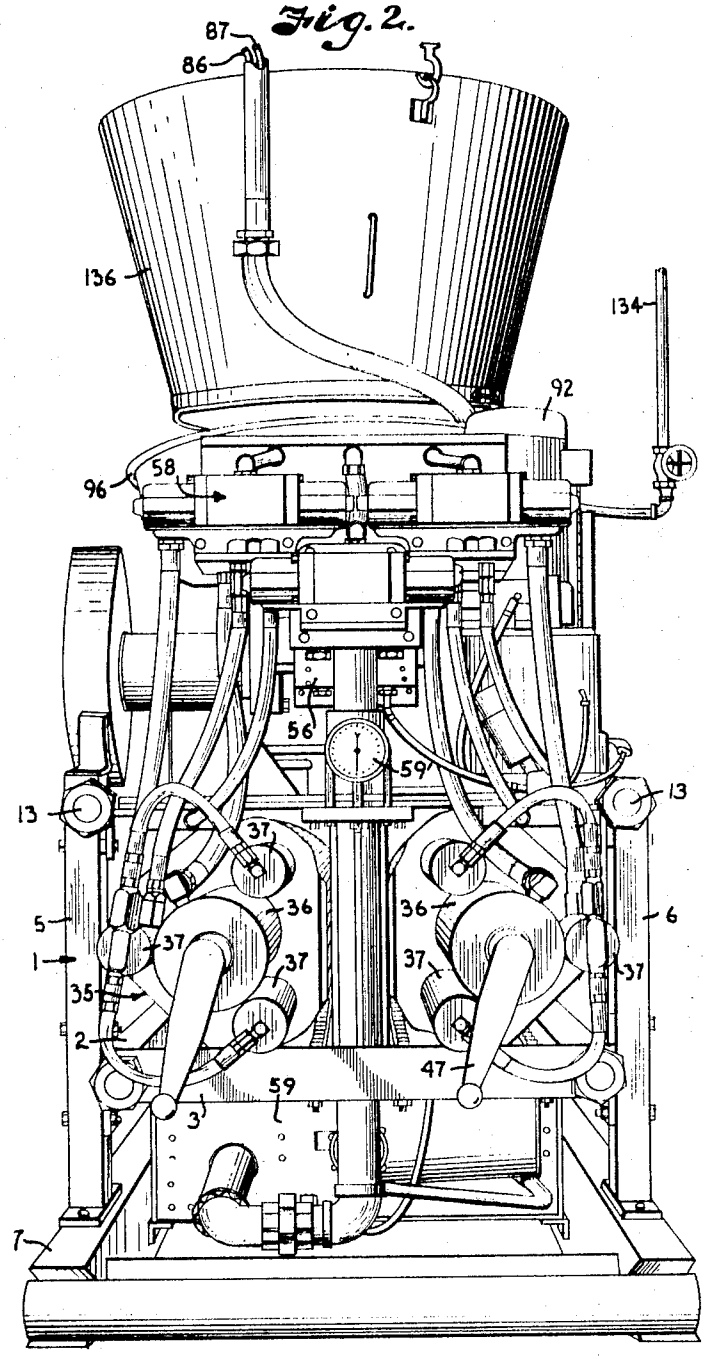
BY Fishburn, Gold & Litman
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July 22, 1969 J. M. MILLER ET AL 3,456,285

CONTINUOUS HYDRAULIC STUFFER

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Fig. 2.




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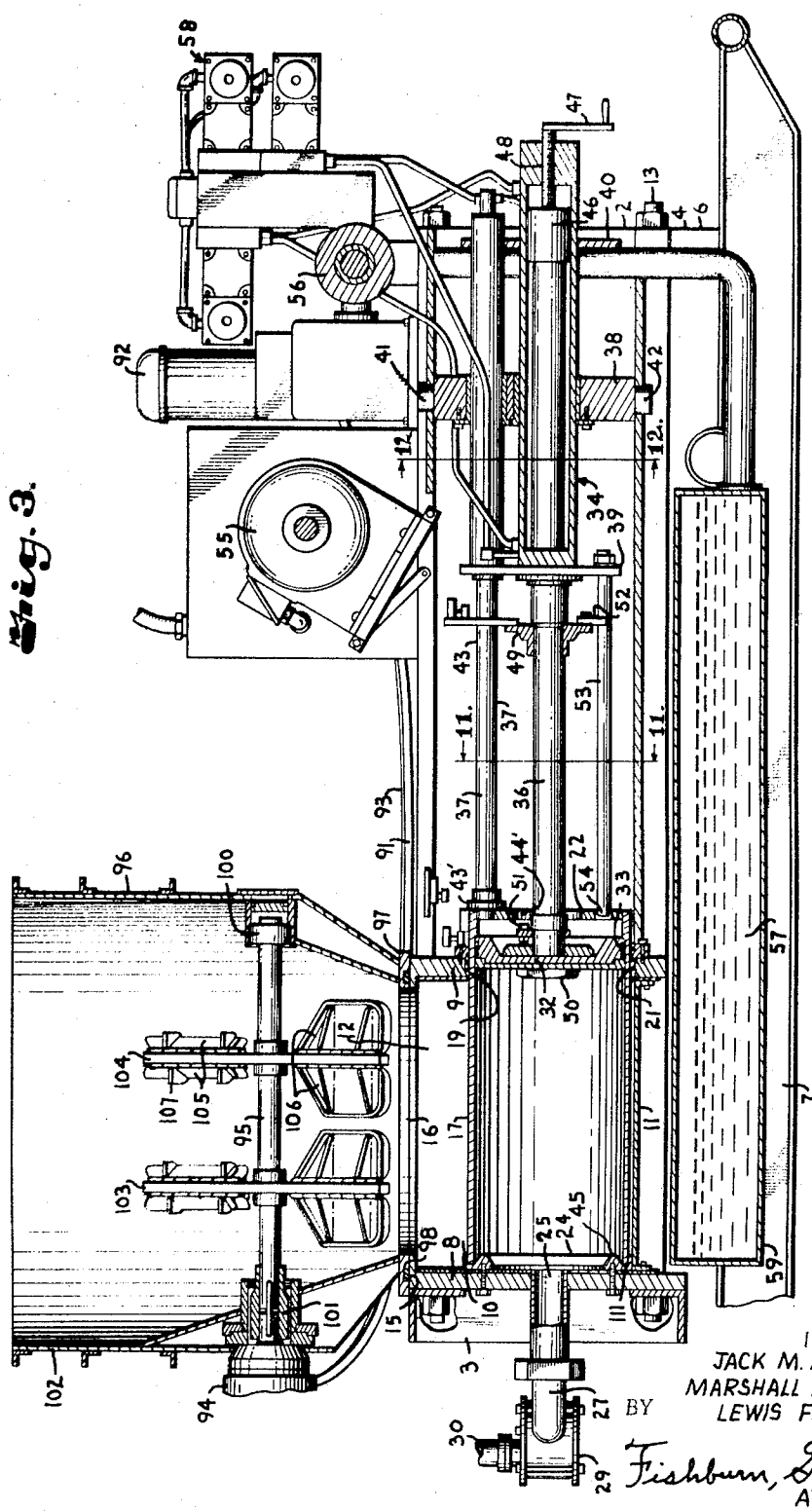
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CONTINUOUS HYDRAULIC STUFFER

Filed June 5, 1967 9 Sheets-Sheet 3

Fig. 3.



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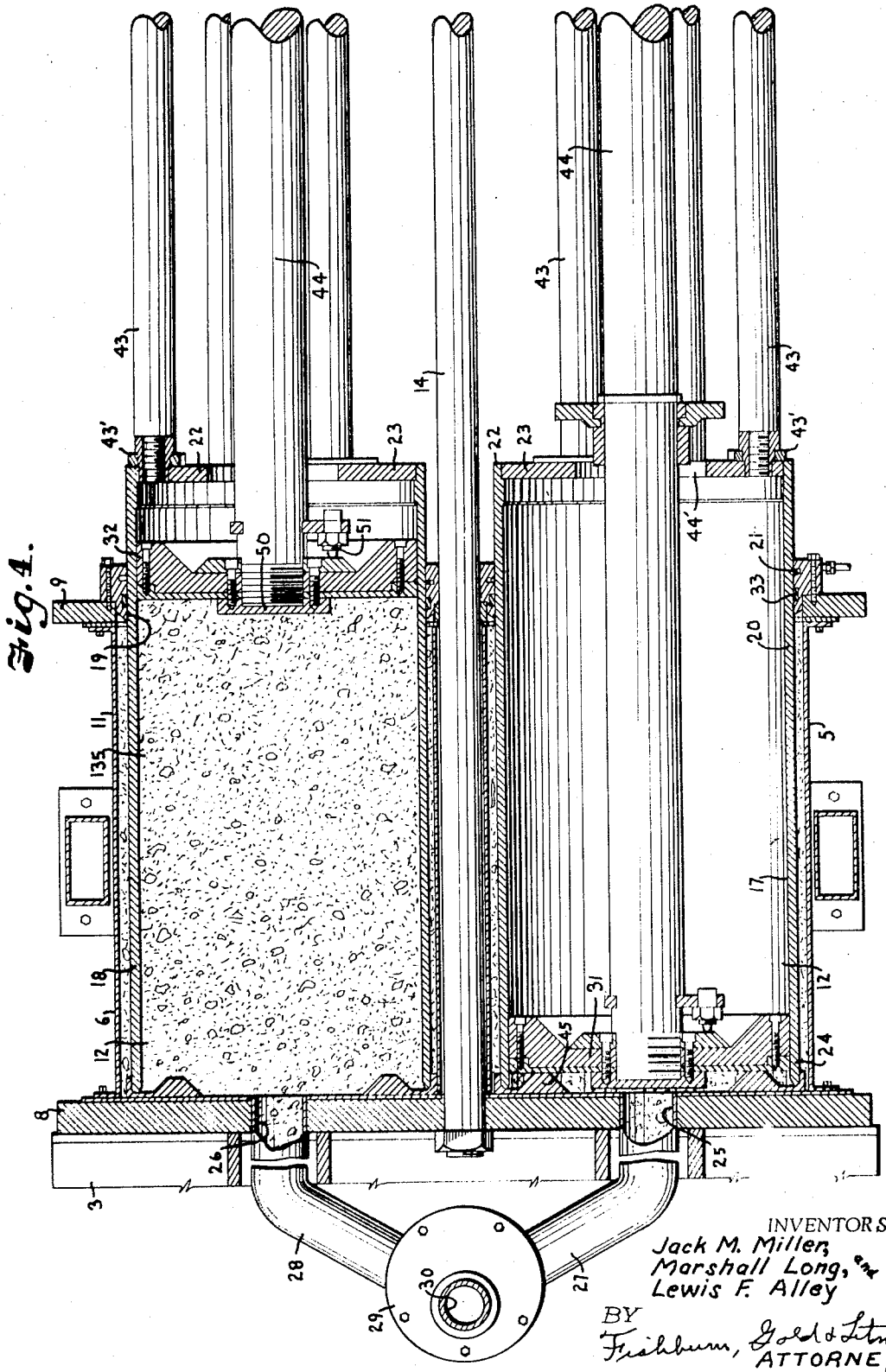
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July 22, 1969 J. M. MILLER ET AL 3,456,285

CONTINUOUS HYDRAULIC STUFFER

Filed June 5, 1967 9 Sheets-Sheet 4

Fig. 4.




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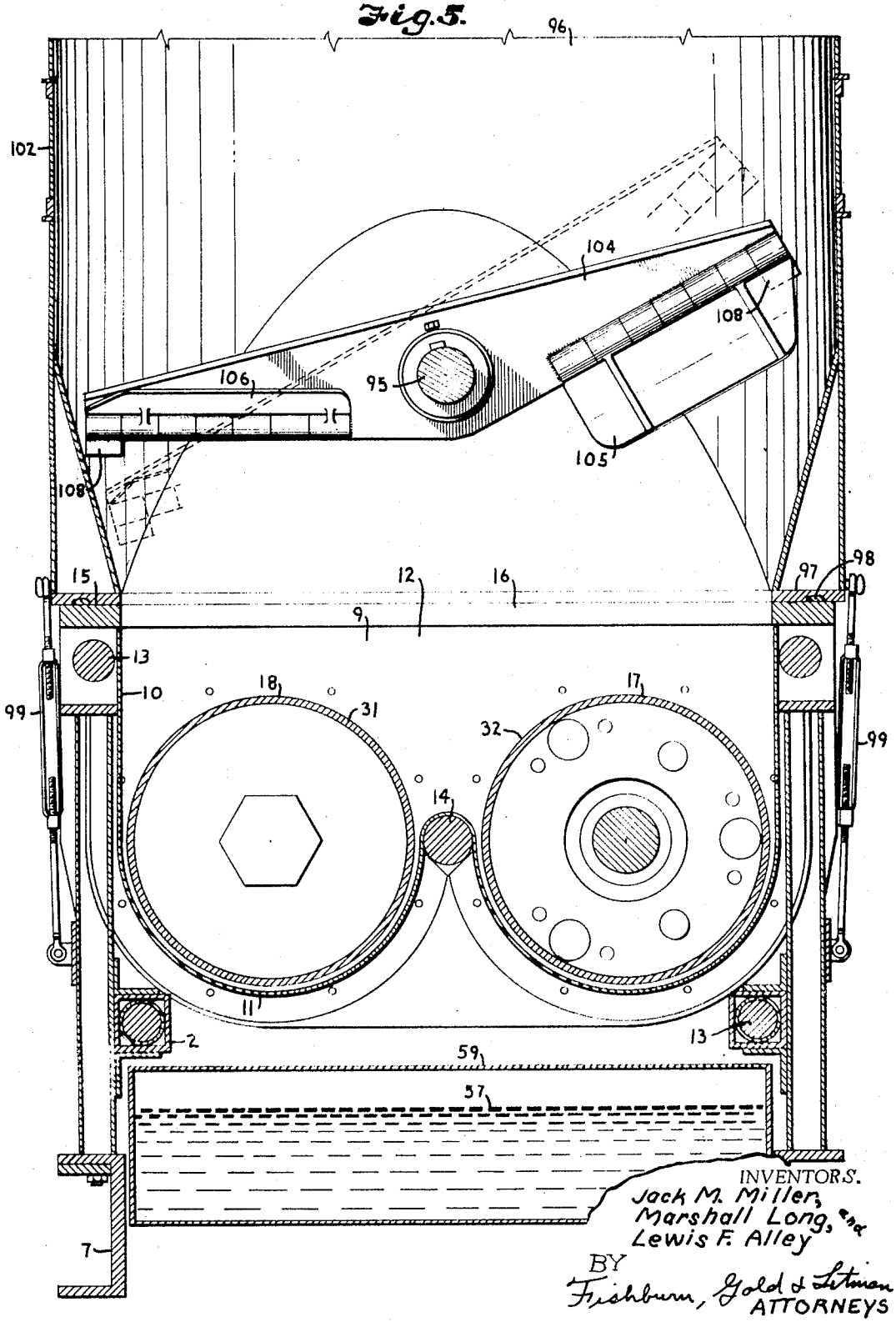
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CONTINUOUS HYDRAULIC STUFFER

Filed June 5, 1967 9 Sheets-Sheet 5

Fig. 5.




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CONTINUOUS HYDRAULIC STUFFER

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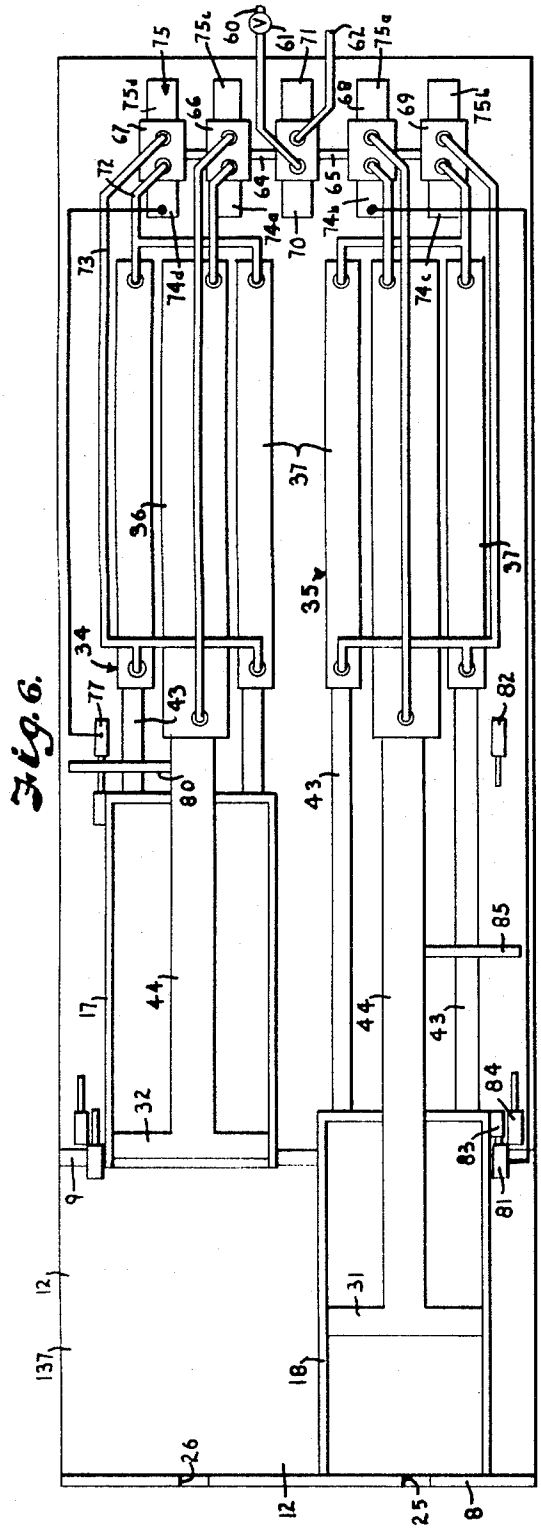


Fig. 6.

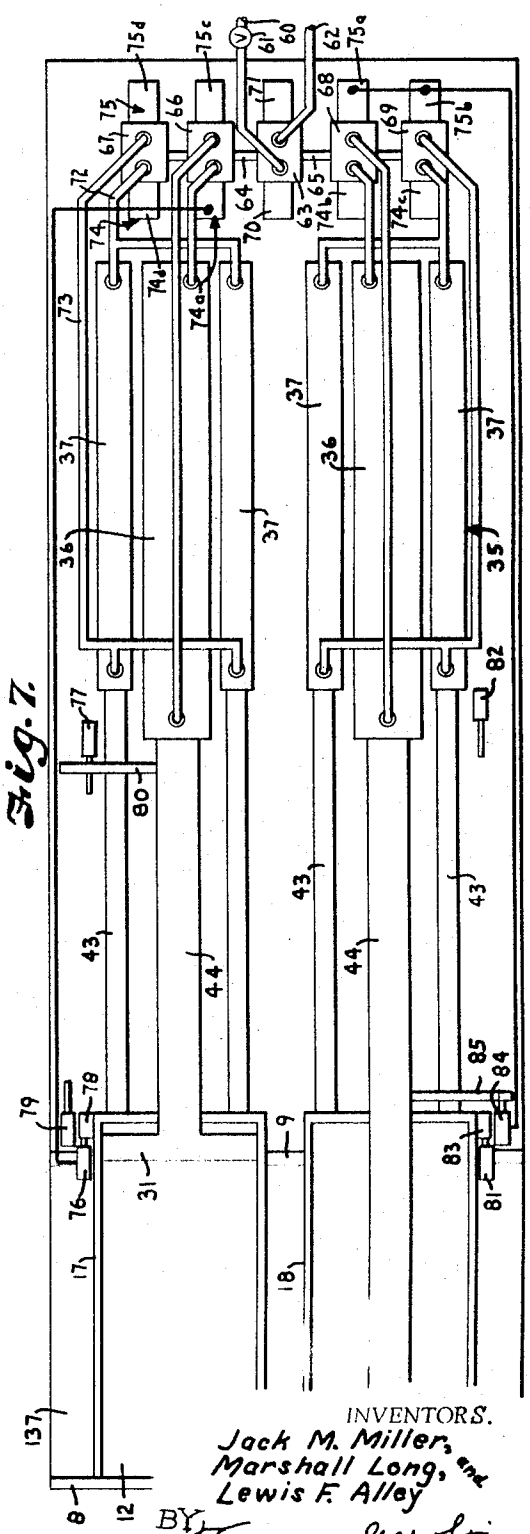


Fig. 7.

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July 22, 1969 J. M. MILLER ET AL 3,456,285

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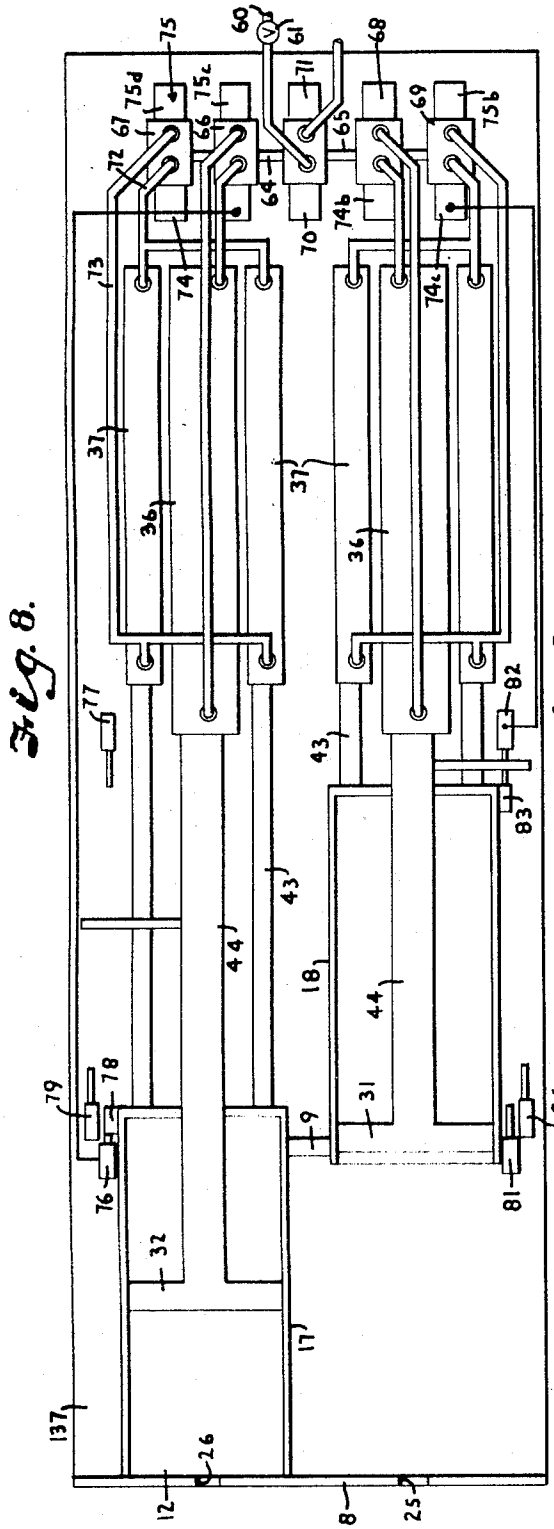


Fig. 8.

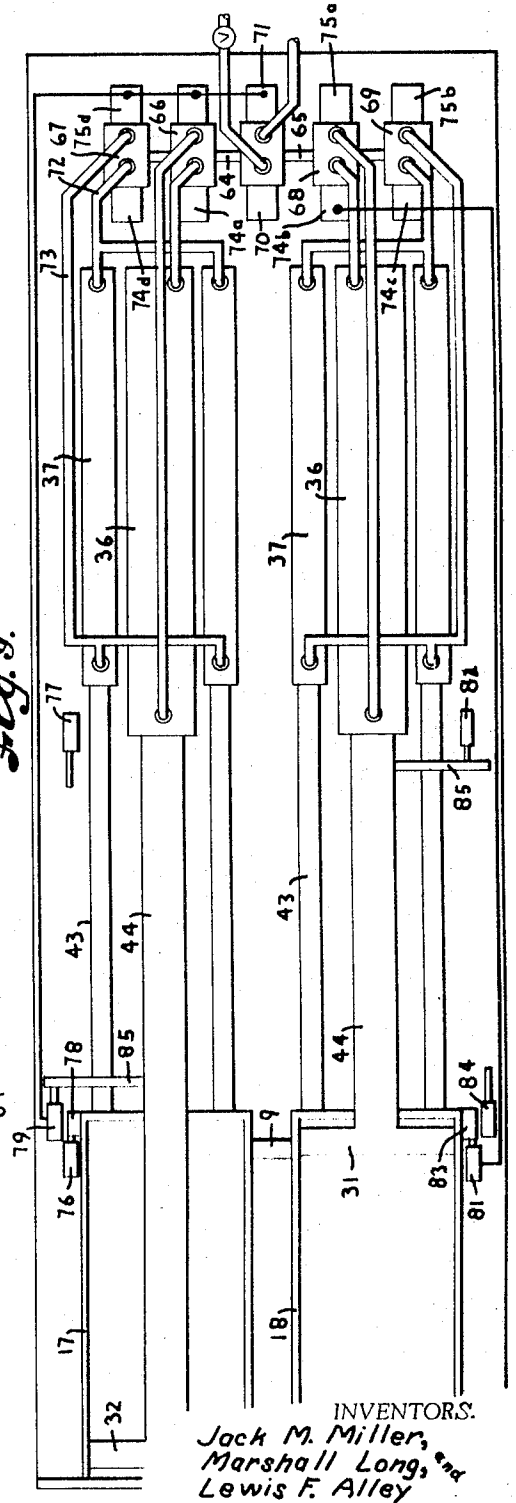


Fig. 9.

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CONTINUOUS HYDRAULIC STUFFER

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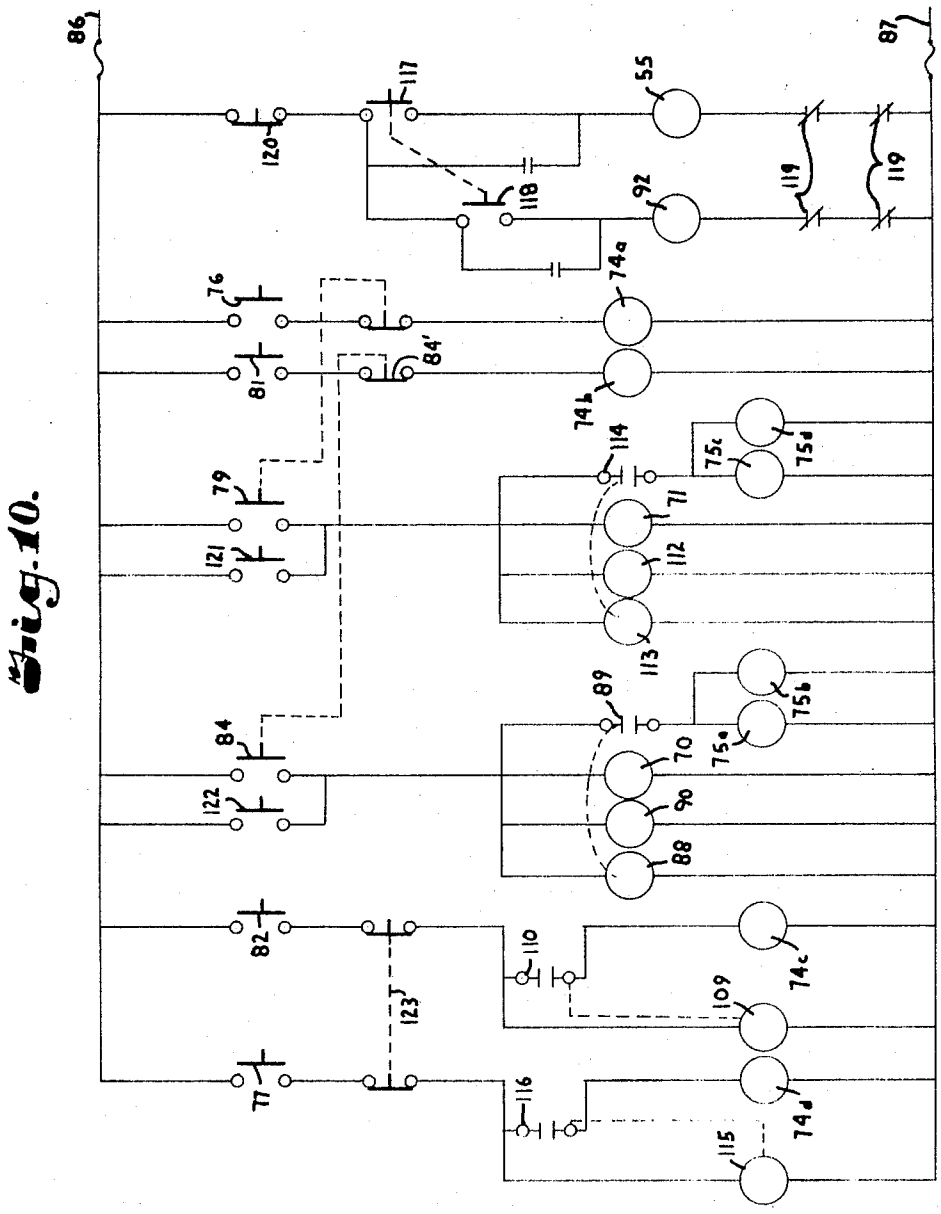



Fig. 10.

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July 22, 1969 J. M. MILLER ET AL 3,456,285

CONTINUOUS HYDRAULIC STUFFER

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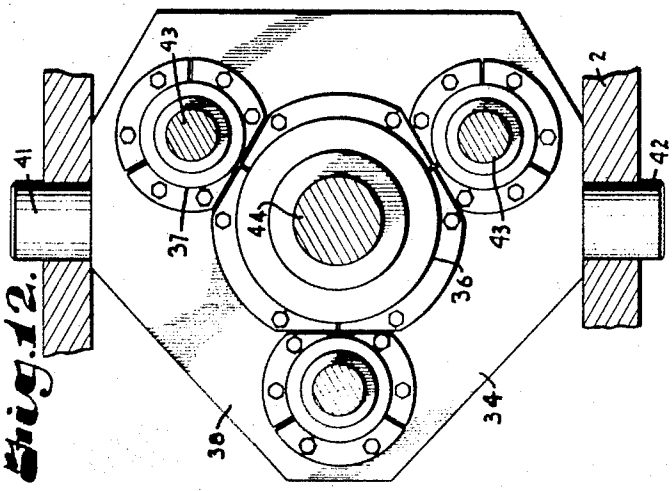


Fig. 12.

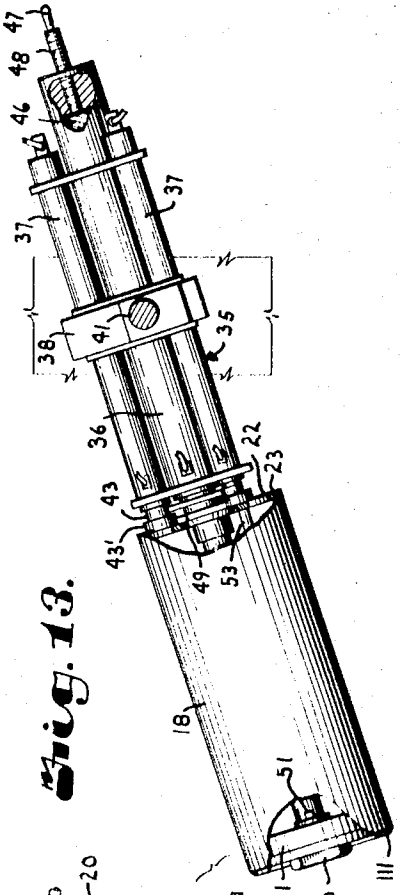


Fig. 13.

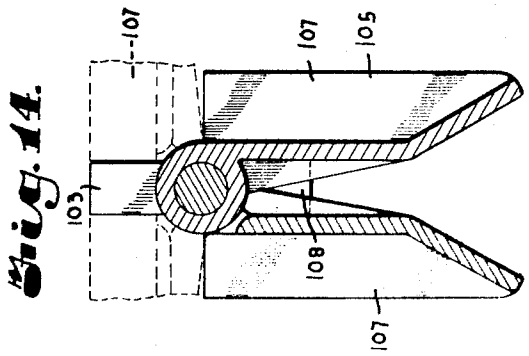


Fig. 14.

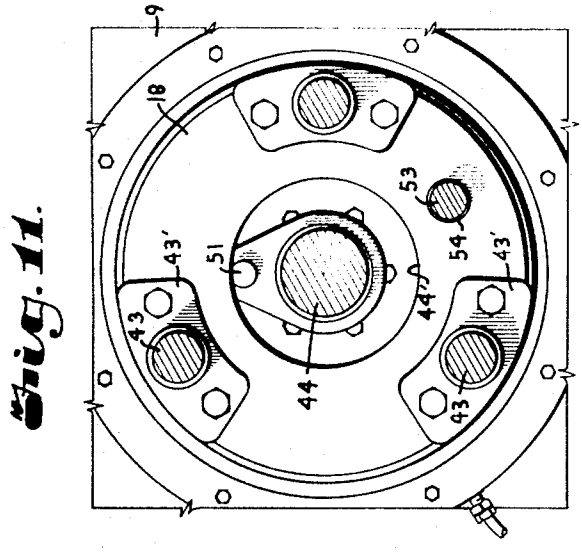


Fig. 11.

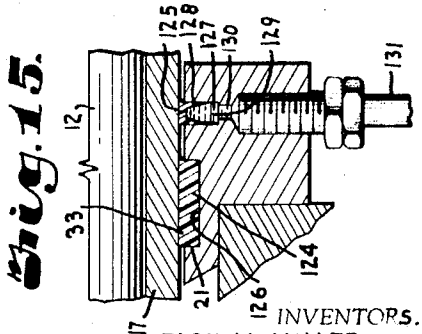


Fig. 15.

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United States Patent Office 3,456,285 Patented July 22, 1969



3,456,285

# CONTINUOUS HYDRAULIC STUFFER

Jack M. Miller, Shawnee Mission, and Marshall Long, Overland Park, Kans., and Lewis F. Alley, Kansas City, Mo., assignors to Marlen Equipment Company, Overland Park, Kans., a corporation of Missouri

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Int. Cl. A22c 11/06
U.S. Cl. 17—39 10 Claims

## ABSTRACT OF THE DISCLOSURE

Apparatus for dispensing plastic food products under pressure includes hydraulic ram clusters moving a pair of open ended cylinders in timed relation through a plastic food product receiving chamber. Sliding pistons are moved in timed relation within the respective cylinders. Vertically reciprocating and laterally pivoting paddles urge the food product into the receiving chamber from a hopper located directly thereabove. The ram clusters are mounted on vertical trunnions and have adjustable backstops to permit selective withdrawal of the cylinders and pistons beyond the chamber whereupon the pistons and ram clusters may be pivoted as a unit, laterally exposing the pistons and cylinders for cleaning.

This invention relates to apparatus for dispensing plastic food products under pressure, such as in stuffing sausage casings and the like, and embodies improvements over apparatus of the type disclosed in United States Patent No. 3,108,318 issued Oct. 29, 1963, entitled, "Machine for Stuffing Sausage and Similar Casings." Through apparatus of this character a continuous supply of food material is made available under pressure although the material is supplied to the apparatus in periodic batches. The material is introduced into a discharge chamber having a pair of piston-cylinder sets alternately relatively movable therein and synchronized so as to envelope and discharge the material continuously under pressure. The apparatus may also function to discharge metered volumes of material under pressure.

This invention embodies improvements over apparatus disclosed in the above noted patent in that better control is achieved through the use of hydraulic ram clusters mounting the respective piston-cylinder sets. Further improvements include the use of a hopper positioned directly above the discharge chamber to allow gravity feed thereinto and incorporating feed paddles into the hopper. The feed paddles reciprocate in an arc toward and away from the discharge chamber synchronously with movement of the piston-cylinder sets and have the ability to greatly increase the area of food material contact upon movement toward the discharge chamber. The paddles effectively fill the volume discharged from the chamber even when operating against very viscous or thick material. Also, the respective hydraulic ram clusters are mounted on trunnions cooperable with adjustable backstops permitting the piston-cylinder assemblies to be withdrawn past a supporting wall of the discharge chamber and swing laterally outwardly, providing easy access for the frequent cleaning operations required in food handling machinery.

It is thus the principal object of this invention to provide improved apparatus to continuously supply plastic food material under pressure. Other and more specific objects of this invention will become apparent from the following description taken in connection with the accompanying drawings, wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a perspective view of apparatus embodying this invention and showing a bottom-dump bucket positioned for discharging a batch of food material into the hopper.

FIG. 2 is an end elevation of the apparatus particularly showing rear ends of the ram-clusters.

FIG. 3 is a cross-sectional side elevation through the apparatus particularly showing hopper paddles and a ram cluster with the associated food handling piston-cylinder set.

FIG 4 is a fragmentary cross-sectional plan view on an enlarged scale showing the receiving chamber and two piston cylinder sets associated therewith in respective filled and discharged conditions.

FIG. 5 is a cross-sectional end elevation through the apparatus, particularly showing the feed hopper paddles and details of the discharge chamber.

FIGS. 6, 7, 8 and 9 are schematic plan views showing various relative positions assumed by the piston-cylinder sets driving the operation of the apparatus.

FIG. 10 is a schematic electrical circuit diagram showing the control relationship between electrically operated parts of the apparatus.

FIG. 11 is a fragmentary cross-sectional view on an enlarged scale taken on the line **11—11**, FIG. 3, showing the rear end of a food material receiving cylinder.

FIG. 12 is a fragmentary cross-sectional view on an enlarged scale taken on the line **12—12**, FIG. 3 showing the face of a ram cluster trunnion.

FIG. 13 is a fragmentary cross-sectional plan view illustrating a ram cluster pivoted on the trunnion and laterally exposing a cylinder-piston set for cleaning.

FIG. 14 is a fragmentary cross-sectional view on an enlarged scale showing a set of feed paddles, the alternate position thereof being shown in broken lines.

FIG. 15 is a fragmentary cross-sectional view on an enlarged scale showing a cylinder guide ring and bearing with associated pressure seal.

Referring to the drawings in more detail:

The reference numeral **1** generally indicates apparatus for dispensing plastic food products under pressure. The apparatus **1** includes a horizontally elongated frame **2** having a forward portion **3**, a rear portion **4** and side portions **5** and **6**. The frame **2** is supported upon suitable skids **7** providing a rigid substructure. Opposed front and rear spaced apart walls designated **8** and **9** and spaced apart side walls **10** and a bottom wall **11** are mounted on the frame **2** near the forward portion **3** and are connected together forming an upwardly open compartment or chamber **12** for receiving the plastic food material therein. The bottom wall **11** is in the form of two adjacent horizontal semi-cylindrical sections as best shown in FIG. 5.

Suitable tension rods **13** extend longitudinally through the frame **2** at positions respectively located adjacent the upper and lower corners of the chamber **12** and through the peak between the semi-cylindrical sections forming the bottom wall **11** as seen at **14**, FIG. 5. The tension rods **13** supply tensile strength to the frame to resist substantial longitudinal forces exerted therewithin by structure described below.

The front and rear walls **8** and **9** and side walls **10** of the chamber **12** have connected upper edge portions forming a continuous rigid flange **15** defining a mouth **16** which provides access downwardly into the chamber **12**.

A pair of cylinders respectively designated **17** and **18** are horizontally reciprocable in and across the chamber **12** and are normally parallel to each other in adjacent side by side relationship. The cylinders **17** and **18** are normally slideably supported on the rear wall **9** through openings **19** and **20** therethrough. Suitable sealing rings **21**, detailed hereinafter, are mounted on the rear wall **9** surrounding the openings **19** and **20** and provide a sliding

seal and support between the rear wall 9 and the respective cylinders 17 and 18. The cylinders 17 and 18 each have a rear end 22 partially closed by an annular rear end wall 23 and an open front end 24 facing the frame front wall 8. The frame front wall 8 has discharge ports 25 and 26 located axially of the respective cylinders 17 and 18. Discharge tubes 27 and 28 communicate with the discharge ports 25 and 26 and empty into a flapper valve 29 of the known type which permits discharge through a port 30 only from the tube containing material under the higher relative pressure.

Pistons 31 and 32 are reciprocable respectively within the cylinders 17 and 18 and are slidably engaged with the inner surfaces thereof by means of sliding seals 33. A pair of hydraulic ram clusters 34 and 35 each have a central ram 36 and three peripheral rams 37. A trunnion 38 maintains the rams in the respective clustered arrangement and in parallel relation, supplemented by a forward plate 39 and a rear plate 40 engaging the respective central and peripheral rams. The trunnion 38 of each cluster has an upwardly and a downwardly directed stub-shaft respectively designated 41 and 42 which are pivotally mounted on the frame 2 near the frame rear portion 4. The peripheral rams 37 each have a rod 43 connected by a mount 43' to and partially supporting one of the cylinders 17 and 18 at the respective cylinder rear end wall 23, FIG. 11.

The central ram 36 of each of the clusters 34 and 35 has a rod 44 connected to the rear of a piston 31 or 32 and extends through a central opening 44' in the cylinder rear end wall 23. The peripheral rams 37 are aadpted to axially move the cylinders 17 and 18 forwardly to a position wherein the cylinder front end 24 is in sealed relation with the respective discharge ports 25 and 26. A rigid sealing ring 45 is secured against the inner face of the front wall 8 and receives the respective cylinder front end 24 thereagainst to maintain the sealed relation when forward pressure is exerted on the cylinder. The central rams 36 are adapted to axially move the pistons 31 and 32 within the cylinders between positions adjacent the sealing rings 45 to positions near the cylinder rear walls 23, FIG. 4.

The frame side portions 5 and 6 are open or exposed permitting the respective cylinders and pistons to pivot laterally outwardly of the frame on the respective trunnions after withdrawal of the pistons and cylinders rearwardly beyond the chamber rear wall 9. Normally, the respective pistons and cylinders cannot be withdrawn rearwardly beyond the rear wall 9 due to engagement of the central ram rods 44 with a stop 46 contained in the rear end of the respective central rams 36, FIG. 3. The stops 46, however, may be adjusted rearwardly when desired by a hand-crank 47 rotating a threaded shaft 48 engaging the stop 46.

The respective cylinders cannot be withdrawn rearwardly with respect to the pistons contained therein beyond a certain point due to the engagement of the rear end wall 23 with a collar 49 fixed to the central ram rod 44. Thus, by backing the stop 46 rearwardly of its normal position, the peripheral rams 37 may draw the respective cylinder 17 or 18 rearwardly to a point where the rear end wall 23 engages the collar 49 whereupon the respective pistons 31 or 32 travel rearwardly to a point where the cylinder and piston are both clear of the chamber rear wall 9. The cluster may then be pivoted on the stub-shafts 41 and 42 causing the respective piston and cylinder set to swing laterally outwardly of the frame open side portion 5 or 6 exposing same for cleaning, FIG. 13. The respective pistons 31 and 32 are threadedly engaged with the central ram rods 44 and are provided with a hexagonal grasping head 50 by which the piston may be easily removed to provide access into the cylinder and to the rear of the piston. A detent 51 normally engages a depression formed in the rear of the respective piston to prevent unwanted rotation and disengagement of the piston from the ram rod 44 during apparatus operation. The rods 44 are prevented from rotating with respect to the cylinders 17 and 18 by providing a fork member 52 on the collar 49, the member 52 being slidably engaged with a guide rod 53 mounted on the forward plate 39 of the ram cluster. The guide rod 53 telescopes through a suitable opening 54 in the cylinder rear end wall 23 during apparatus operation as described below.

A prime mover, in this example an electric motor 55, drives a double hydraulic pump 56 adapted to simultaneously supply hydraulic fluid 57 at a higher and a lower pressure to suitable solenoid operated valves 58 described below. The hydraulic fluid 57 is contained in a storage tank 59 which may also contain suitable conventional fluid cooling heat exchange members (not shown), if desired. A temperature gage 59' is provided to monitor hydraulic fluid temperature.

The pump 56 directs hydraulic fluid under high pressure into a high pressure input hose or tube 60 having a needle valve 61 therein to control rate of flow therethrough. Low pressure hydraulic fluid is directed from the pump 56 to a low pressure input hose or tube 62. The tubes 60 and 62 provide separate hydraulic fluid inputs to a valve 63 having two output tubes 64 and 65. The output tube 64 directs the fluid to a valve 66, controlling fluid supply to the central ram 36 of the ram cluster 34, and to a valve 67 controlling the flow to the peripheral rams 37 of the cluster 34. The output tube 65 connects to a valve 68 which controls flow to the central ram 36 of the cluster 35, and to a valve 69 which controls flow to the peripheral rams of the cluster 35. The valve 63 has operating solenoids 70 and 71 associated therewith, and respectively operable to switch high pressure flow alternately between the output tubes 64 and 65 while simultaneously providing low pressure flow into the other output tube. The valves 66, 67, 68 and 69 each have a pair of output tubes 72 and 73 connected respectively to the rear and the front of the cylinder or cylinders, and opposed operating solenoids generally designated 74 and 75 which cause the fluid input to flow into one or the other of the output tubes 72 and 73, thus actuating the respective rams in a desired direction. The other output tube 72 or 73 then becomes a return flow conduit for fluid in the other side of the ram, which fluid travels through the valve and back to the storage tank 59 through return lines (not shown).

Control of the valves 63, 66, 67, 68 and 69 is provided through two sets of three switches respectively associated with the clusters 34 and 35. Referring to the cluster 34, switches 76 and 77 are secured to the frame in the path of an actuator 78 fixed to the cylinder 18. Thus, the switch 76 is actuated when the cylinder 18 is in its fully forward position, and the switch 77 is actuated when the cylinder 18 is withdrawn to its normally fully rearward position. A switch 79 is secured to the frame near the switch 76, but is contacted by an actuator 80 mounted on the rod 44 of the central ram of the cluster 34. The switch 79 is actuated when the piston 32 is in its fully forward position. Likewise, with respect to the cluster 35, switches 81 and 82 are respectively contacted by a cylinder mounted actuator 83 upon the cylinder 17 attaining its fully forward position and its normal fully withdrawn position. A switch 84 is contacted by an actuator 85 fixed with respect to the central ram rod of the cluster 35 when the piston 31 attains its fully forward position.

Referring particularly to the schematic electrical circuit shown in FIG. 10, the relationship between the respective switches and valve solenoids is illustrated. The switch 76 is normally open and connected to complete a circuit between one side 86 and the other side 87 of a suitable electrical power source through the solenoid 74*a* which partially controls the valve 66. The actuation of the solenoid 74*a* causes flow through the output tube 64 into the rear of the central ram 36 of the cluster 34, urging the piston

32 forwardly. High pressure hydraulic fluid from the high pressure input hose **60** is fed into the output tube **64** due to actuation of the solenoid **70** caused by the actuator **85** (cluster **35**) engaging the switch **84**, which occurs when the piston **31** reaches its fully forward position. The switch **84** has a second set of contacts designated **84'** which are normally closed but open as a result of switch contact by the actuator **85**. The opening of the contacts **84'** interrupts current flow through the solenoid **74***b* to prepare the valve **68** for later actuation by the solenoid **75***a* which will result in withdrawing the piston **31** rearwardly. A solenoid coil **88** is fed current with the solenoid **70** and actuates a time delay relay **89**. The time delay relay **89** delays a short period, for example, two or three seconds, and then closes, sending current through solenoids **75***a* and **75***b*, respectively actuating the valves **68** and **69** to urge the piston **31** and cylinder **17** of the cluster **35** rearwardly. The actuation of the solenoid **70** through the switch **84** (which shifts the valve **63** to a position for directing high pressure fluid into the output tube **64**) also causes low pressure fluid to be directed from the low pressure input hose **62** into the output tube **65**; thus, the piston and cylinder of the cluster **35** are withdrawn under low pressure.

The flow rates for rod withdrawal in the clusters is adjusted so that the rearward motion of the respective cylinder tends to pull the piston rearwardly through contact between the collar **49** and the rear end wall **23** rather than the piston withdrawing within the cylinder during the rearward travel of the combination. This avoids the formation of a vacuum within the cylinder during withdrawal which may tend to induce air pockets in the food material. During the time delay before current is applied to the solenoids **75***a* and **75***b*, a solenoid **90** is actuated and remains actuated during the withdrawal of the cylinder and piston of the cluster **35**. The solenoid **90** controls a valve (not shown) which directs hydraulic flow into a hose **91** from a separate hydraulic pump system **92**. The hose **91** and a return hose **93** communicate with an hydraulic motor **94** which slowly drives a shaft **95** clockwise or counterclockwise within a predetermined arc, the direction being determined by the direction of flow through the respective hoses **91** and **93**.

The shaft **95** is rotatably mounted within and extending across a hopper **96**, positioned directly above the compartment or chamber **12**, and having a downwardly directed lip **97** engaging the upwardly directed flange **15** surrounding the chamber mouth. A seal **98** produces air tight contact between the lip **97** and flange **15** to prevent air from being sucked in at the junction, the seal **98** being maintained under compression through use of suitable turnbuckles **99** secured at opposite ends thereof to the frame **2** and the hopper **96**.

The shaft **95** extends horizontally within the hopper and is mounted on the hopper side wall by means of opposed sealed bearings **100** and **101**. The hydraulic motor **94** is mounted externally on the hopper side wall **102** and engages the shaft **95** through a suitable coupling. The hydraulic motor **94** is adapted to reciprocate the shaft **95**, in this example, through an angle of about 140° within the hopper, that is, from about 70° above to about 70° below a horizontal plane. A pair of rigid rocker arms **103** and **104** are located within the hopper **96** and are fixed in spaced apart relation to the shaft **95** and extend transversely thereof substantially to opposed parts of the hopper side wall **102**. The arms **103** and **104** each have two pairs of paddles **105** and **106** hingedly mounted thereon. The paddles in each of the pairs of paddles are opposed and freely swingable on the arms **103** and **104** from a downwardly directed position in face to face relation to a laterally directed position substantially aligned in a plane parallel to the shaft.

The arms **103** and **104** are engaged by wings **107** on the respective paddles, to limit the upward pivotal movement beyond the open position illustrated by the broken lines in FIG. 14. A stop **108** at the outer ends of the rocker arms **103** and **104** (FIG. 5) maintains the paddles in respective generally face to face parallel relation when the paddles are folded together, as illustrated by the solid lines, FIG. 14. Thus, the reciprocation of the shaft **95** by the motor **94** causes the paddles to close together on the upstroke and spread apart on the downstroke, urging the plastic food material contained in the hopper downwardly through the mouth **16**. The actuation of the solenoid **90** and the corresponding solenoid which controls the valve directing the fluid into the motor **94**, synchronizes the downstroke of a set of paddles with the withdrawal of a piston and cylinder on one side of the apparatus, whereby the paddles urge the material into the void created by the withdrawal of the piston and cylinder. This supplements suction and gravity in filling the chamber and helps avoid unwanted air pockets.

When the piston and cylinder of the cluster **35** withdraws to the fully rearward position, the actuator **83** engages the switch **82** directing current through a solenoid, **109** which, in this example, begins the operation of a time delay relay **110**. After a predetermined time period to insure a fully filled chamber on the side of the apparatus corresponding to the cluster **35**, the relay **110** actuates the solenoid **74***c*, causing the valve **69** to permit low pressure fluid into the rear portion of the peripheral branch **37** of the cluster **35**. This causes the cylinder **17** to cut a cylindrical measure of food material and trap the same therewithin when the leading edge **111** of the open front end **24** engages the sealing ring **45**.

The piston **32** is urged forwardly under high pressure, as described above, forcing the food material therein through the discharge port **26**, discharge tube **28**, and flapper valve **29**. The discharge pressure at the flapper valve port **30** is controlled by suitably controlling the hydraulic pressure input to the high pressure input hose **60**, and the rate of material flow is controlled by adjusting the needle valve **61**, controlling hydraulic fluid flow. When the cylinder **18** is substantially exhausted of food material, the actuator **80** contacts the switch **79**, which directs current through the solenoid **71**, thus shifting high pressure flow into the output tube **65** for driving the piston **31** forwardly under high pressure and also placing high pressure into the peripheral rams of the cluster **35** to produce a high pressure sealing engagement between the cylinder **17** and the respective sealing ring **45**. The actuation of the solenoid **71** occurs simultaneously with the actuation of a solenoid **112** which opposes the solenoid **90** controlling the paddle motor. The direction of the solenoid **112** reverses rotation of the paddle shaft **95**. Also, solenoid **113** is actuated with the solenoid **71**, initiating a time delay relay **114**. Upon timing out, e.g., after two or three seconds, the time delay relay **114** causes actuation of solenoids **75***c* and **75***b* which respectively cause the piston **32** and cylinder **18** to be withdrawn as the paddles on the side of the chamber corresponding to the cylinder **18** cause the food material to fill the cavity created. Upon the cylinder **18** being withdrawn, (with the piston **32**) to a position where the actuator **78** contacts the switch **77**, the solenoid **74***d* is actuated after a time delay caused through actuation of solenoid **115**, operating time delay relay **116**. This results in the cylinder **18** moving forwardly again, cutting through the food material and filling with a measured quantity thereof for later discharge. The attaining of a fully forward position by the cylinder **18** causes actuation of the switch **76**, thus starting the piston **32** forward under low pressure until such time as the switch **84** is actuated on the cluster **35**, signalling exhaustion of the cylinder **17** and switching high pressure again to the cluster **34** for discharge. It is noted that the resistance exerted by the food material and the trapping of oil in the front portion of the central ram prevents the respective piston from moving forward when the cylinder moves forward to cut through the food material and seal against the respective sealing ring **45**.

Additional electrical components depicted in the schematic diagram of FIG. 10 include motor starting switches **117** and **118** to respectively drive the main hydraulic pump motor **55** and paddle pump system **92**, suitable automatic overload switches **119**, a stop switch **120**, manual over-ride switches **121** and **122** to over-ride and reverse the normal cycle sequence when desired, and a circuit breaking double switch **123** connected to prevent actuation of the switches **77** and **82**. The switch **123** permits the cylinders and pistons to be withdrawn rearwardly beyond the chamber rear wall **9** when the stop **46** is moved to "clean out" position, allowing the cylinders and pistons to be swung or pivoted laterally of the apparatus.

The sealing rings **21** are shown in greater detail in FIG. 15, and include a wear strip **124** of suitable low-friction plastic material, and a seal **125**. The wear strip **124** is received in an annular groove **126** formed in the sealing ring **21** and slidably supports the respective cylinder **17** or **18** out of metal-to-metal contact with the sealing ring. The seal **125** is received in a suitable radial groove **127** adjacent the wear strip groove **126**, and has tapered legs **128** slidably engaging the side walls of the groove **127**. A cavity **129** is formed within the groove **127** and seal **125** and contains grease under pressure for urging the seal **125** against the moving cylinder **17** or **18** to provide a positive sliding seal thereagainst. The pressure of the grease in the chamber **129** also maintains the tapered legs **128** in sealing contact with the side walls of the groove **127** to prevent grease leakage. Grease is maintained under pressure within the cavity **129** through a passageway **130** communicating with a suitable connector and hose **131**, which in turn connects to a grease containing cylinder **132** (FIG. 1). The grease containing chamber **132** has a piston therein separating the grease filled portion thereof from an air filled portion fed by compressed air through a regulator filter **133**, which receives compressed air through a source **134**, such as typical plant compressed air supply. The pressure of air on one side of the piston in the cylinder **132** maintains pressure on the grease, which in turn is reflected within the cavity **129** to maintain the seal in sliding pressure contact with the cylinder **17** or **18**.

In FIGS. 6, 7, 8 and 9, the sequence of operation is depicted schematically with switches under actuation being indicated by a line leading from the switch to the respective solenoid controlled thereby. In operation, the plastic food material **135** is supplied to the hopper **96** through any suitable means, in the illustrated example, a bottom dump bucket **136**. The paddles **105** and **106** force the material downwardly through the chamber mouth **16** into the side of the chamber corresponding to the side where the corresponding piston and cylinder are being withdrawn. Referring to FIG. 6, the food material will be urged by gravity and the respective paddles into the area **137** as the piston **32** and cylinder **18** are withdrawn. While this is occurring, the cylinder **17** is in sealing relation with the chamber front wall **8** and the piston **31** is moving forwardly, urging the food material out of the corresponding discharge port **25**. When the cylinder **18** is fully withdrawn with the piston **32**, the corresponding switch **77** is actuated, causing the cylinder **18** to move forwardly to the position illustrated in FIG. 7. Meanwhile, the piston **31** continues its forward stroke until the corresponding switch **84** is actuated, causing the piston **31** and cylinder **17** to move rearwardly as the paddles reciprocate in the opposite direction to fill the space created at **138**, FIG. 8. The actuation of the switch **84** also causes high pressure to be exerted on the cylinder **18**, further increasing the sealing contact pressure with respect to the wall **8** and high pressure to be exerted on the piston **32**. This immediately produces sufficient pressure on the food material trapped within the cylinder **18** to cause the flapper valve **29** to seal the discharge tube **27** and permit the food material to be discharged through the tube **28** and out the port **30**, FIG. 8. Upon the cylinder **17** attaining its fully rearward position, the switch **82** is actuated, causing the cylinder **17** to move forwardly, cutting through the food material, while the piston **31** remains in position. Upon the piston **32** attaining its fully forward position, the switch **79** is actuated, beginning the cycle again by switching high pressure to the cylinder **17** and piston **31** (FIG. 9) and inducing withdrawal of the cylinder **18** and piston **32**.

Thus, a continuous supply of material under relatively constant pressure is made available at the flapper valve port **30** by suitably controlling the hydraulic fluid pressure. Due to the use of cylinders and pistons with known strokes, the apparatus also may be used to supply a measured quantity of food material simply by monitoring the number of piston strokes.

It is to be understood that although one form of this invention has been illustrated and described, it is not to be limited thereto except insofar as such limitations are included in the following claims.

What we claim and desire to secure by Letters Patent is:

**1.** Apparatus for dispensing plastic material under pressure, including:

(a) a frame, connected walls on said frame forming a chamber for receiving the plastic material therein, first and second cylinders reciprocable in said chamber, said cylinders each being slidable on and through one of said walls and each having a rear end outside of said chamber and an open front end normally inside said chamber, means forming chamber discharge ports aligned with said cylinder front ends,

(b) a piston slidably reciprocable in each of said cylinders, a pair of ram clusters, said clusters each including a plurality of hydraulic rams, and means mounting said clusters on said frame, at least a first ram of each cluster having a rod connected to one of said cylinder rear ends, a second ram of each cluster having a rod extending through said respective cylinder rear end and connected to said piston,

(c) an hydraulic fluid pressure source for said cluster rams, said first rams being adapted to axially reciprocally move said cylinders in said chamber to a position wherein said cylinder front end is in sealing relation with said respective discharge port, said second rams being adapted to reciprocally axially move said pistons relative to said cylinders and within said chamber.

**2.** The apparatus as set forth in claim **1**, wherein:

(a) said frame walls form an upwardly open chamber and have connected upper edge portions forming a continuous flange defining a mouth providing access into said chamber,

(b) a hopper for receiving and dispensing the plastic material, said hopper having a side wall with lower edges defining an open bottom, said hopper lower edges forming a continuous rigid flange corresponding to said chamber flange, a seal between said hopper flange and said chamber flange, and means engaged between said frame and said hopper and adapted to urge said hopper flange into sealing engagement with said chamber flange, whereupon said hopper opens into said mouth.

**3.** The apparatus as set forth in claim **2**, wherein:

(a) said hopper has opposed bearings mounted on said side wall, a horizontal shaft pivotally mounted on said bearings and extending across said hopper, motive means engaging said shaft, said motive means being adapted to rotatably reciprocate said shaft through an angle extending above and below the horizontal within said hopper, and

(b) a pair of rigid rocker arms in said hopper and rotatably fixed to said shaft and extending transversely thereof, said arms each having two pairs of paddles hingedly mounted thereon at opposed arms ends, the paddles in each of said pairs of paddles being opposed and swingable on said arms from downwardly di-

rected positions in substantially face to face relation to laterally directed positions generally aligned in a plane parallel to said shaft,

(c) the rotational reciprocation of said shaft by said motive means causing said paddles to close together on the upstroke and spread apart on the downstroke to urge the plastic material downwardly through said mouth.

4. The apparatus as set forth in claim 1, wherein:

(a) said cluster second rams are central rams and said first rams are peripheral rams located around said central rams.

5. The apparatus as set forth in claim 1, wherein:

(a) said means mounting said clusters on said frame comprise a trunnion for each cluster, said trunnions being adapted to maintain said rams in said respective clusters in adjacent relation,

(b) said trunnions having an upwardly and a downwardly directed stub shaft pivotally mounted to said frame, said frame having open side portions permitting said cylinders and pistons to pivot laterally outwardly of said frame on said trunnions upon disengagement with said one chamber wall.

6. The apparatus as set forth in claim 4, including:

(a) means on said central ram rods engageable with means on said cylinder rear ends to prevent the rearward movement of said cylinders with respect to said pistons beyond a position where said pistons are located forwardly of said cylinders.

7. The apparatus as set forth in claim 5, wherein:

(a) said central rams each have a rear stop member restricting the rearward movement of the central ram rod, and

(b) adjusting means on said central ram and adapted to selectively position said stop member between a position whereat the cylinder engages said one wall and a position whereat the cylinder is free of said one wall when the central ram rod is withdrawn against said stop member, said latter position permitting said lateral pivoting.

8. The apparatus as set forth in claim 1, wherein:

(a) said pressure source includes a high pressure and a low pressure hydraulic fluid source, solenoid operated valve means adapted to direct hydraulic fluid from said high pressure and low pressure sources into said rams, and control means for operating said valves, said control means including a set of first, second and third switches operably associated with each of said clusters,

(b) said first switch being positioned for actuation when the cylinder achieves sealing relation with respect to said discharge port and causing the piston therein to be urged forwardly under low pressure,

(c) said second switch being positioned for actuation when the piston achieves a fully forward position and causing the piston and cylinder to retract, the actuation of said second switch also causing the other piston to be urged forwardly under high pressure,

(d) said third switch being positioned for actuation when the cylinder is fully retracted and causing the cylinder to move forwardly under low pressure.

9. The apparatus as set forth in claim 8, including:

(a) time delay means in said control means and adapted to delay the retraction of the piston and cylinder after actuation of the second switch until the other piston has started forwardly under high pressure.

10. The apparatus as set forth in claim 8, including:

(a) power feed means for driving plastic material into said chamber, and

(b) time delay means in said control means and adapted to delay the forward motion of the cylinder after actuation of the third switch until said power feed means fills the chamber in the path of the cylinder.



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