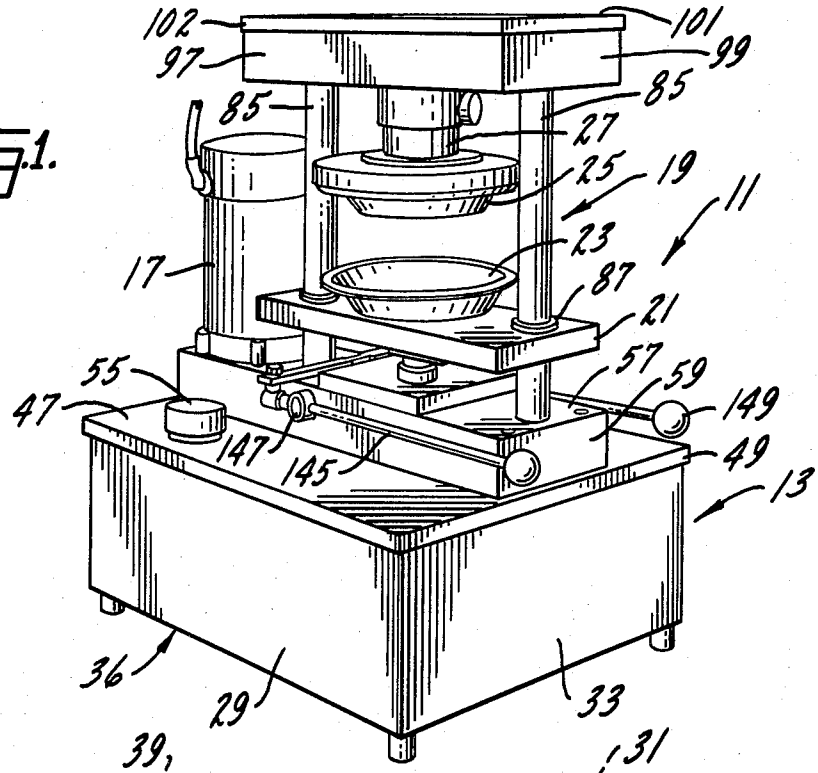
June 13, 1972 A. J. REILLY 3,669,605

HYDRAULIC PRESS

Original Filed July 17, 1969 3 Sheets-Sheet 1

Fig. 1.



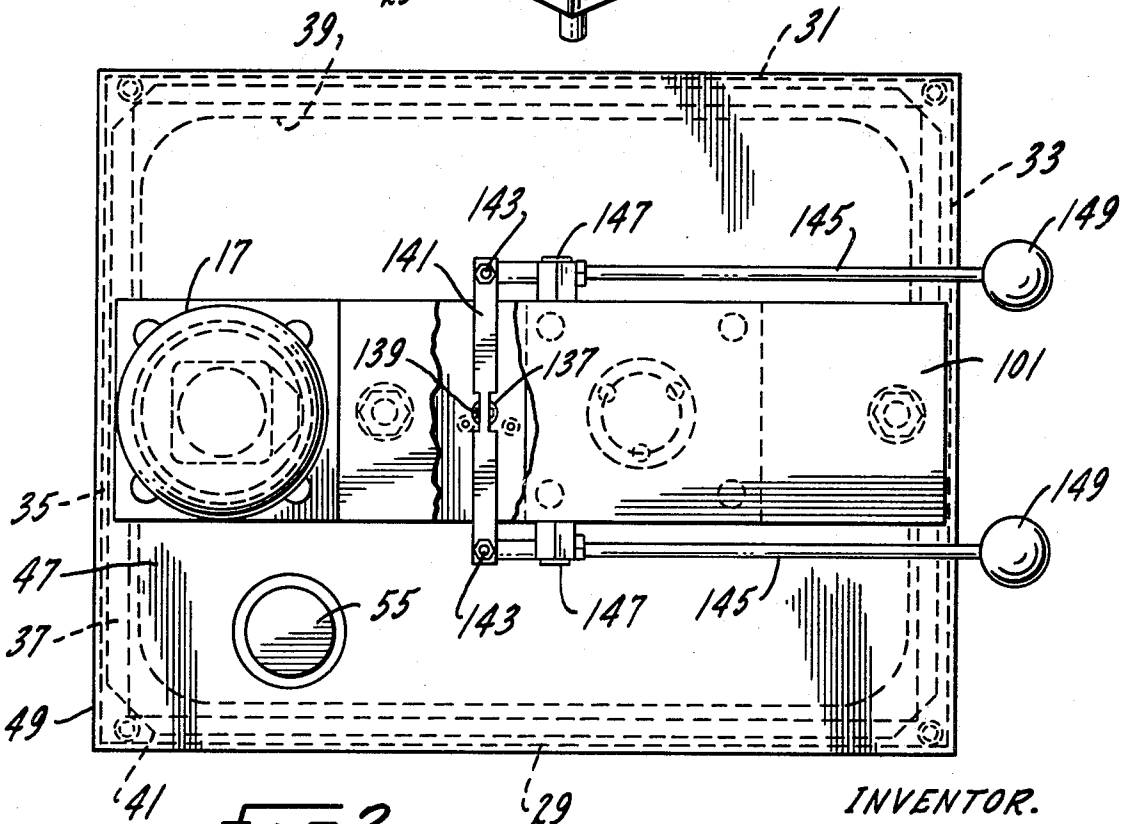


Fig. 2.

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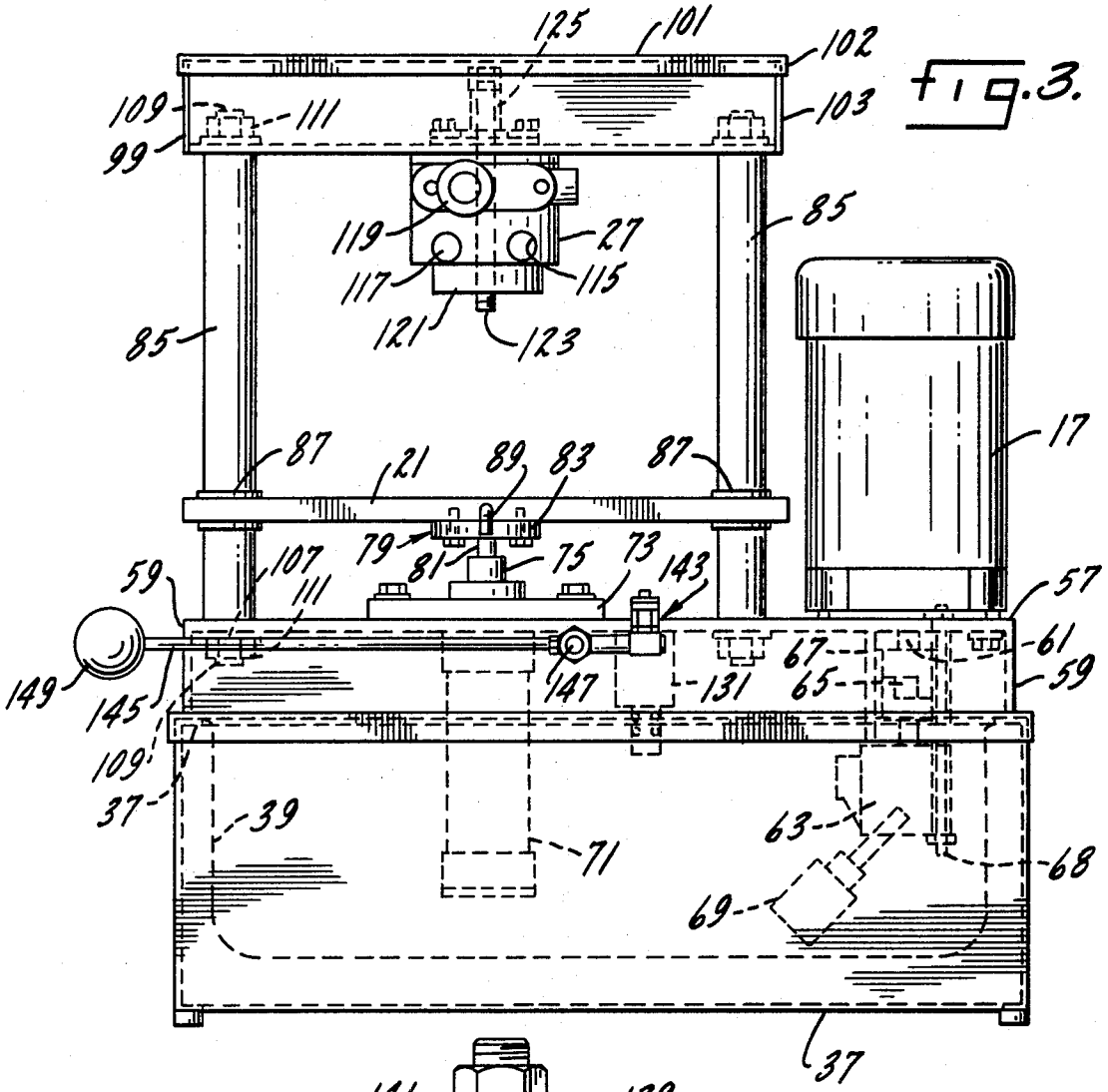

fig. 3.

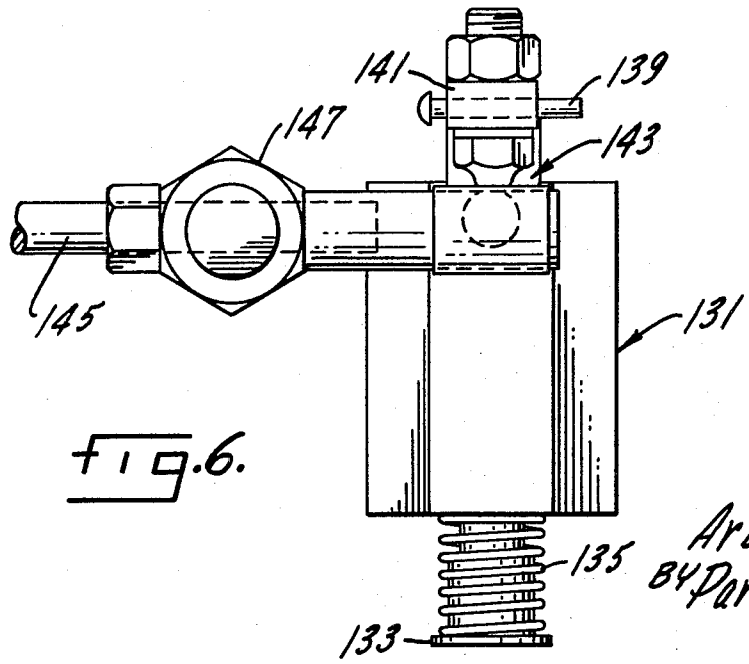

fig. 6.

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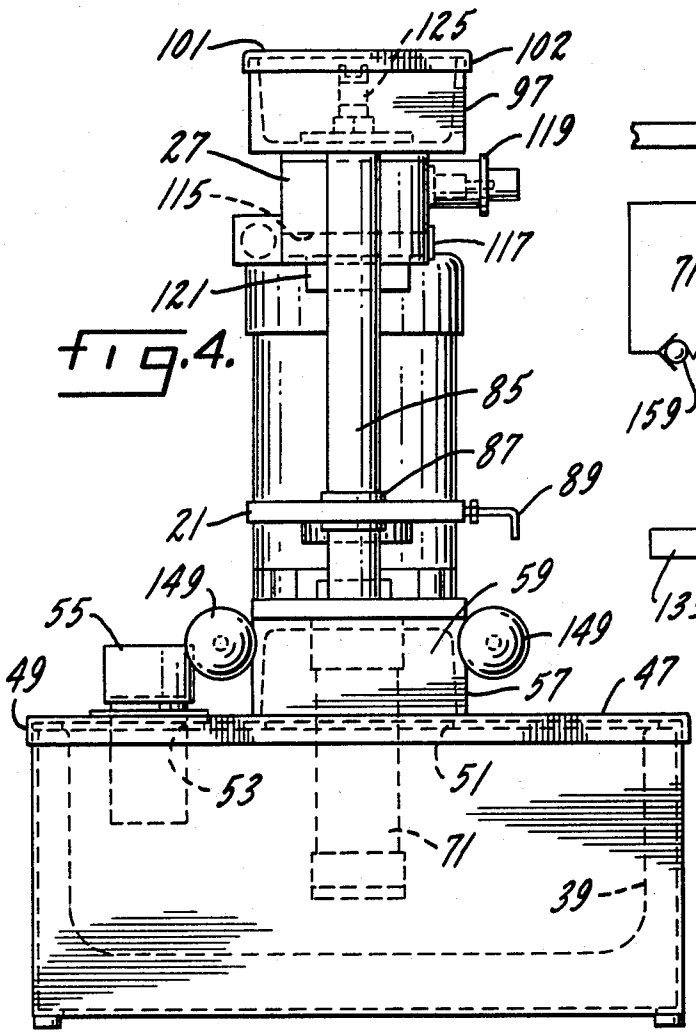

fig.4.

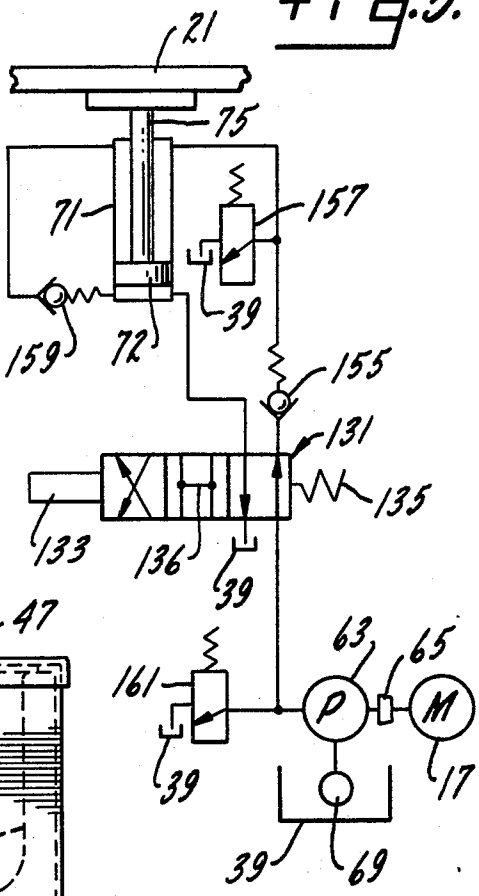

fig.5.

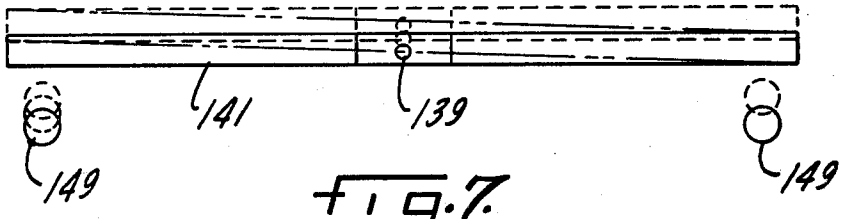

fig.7.

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3,669,605

HYDRAULIC PRESS

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Continuation of abandoned application Ser. No. 842,651, July 17, 1969. This application Mar. 8, 1971, Ser. No. 122,194
Int. Cl. B30b *11/04;* A21c *11/00*
U.S. Cl. 425—398 8 Claims

ABSTRACT OF THE DISCLOSURE

A hydraulically operated pie tart and pastry shell forming press. The hydraulic cylinder, reservoir, pump and hydraulic conduits are located in the base of the press below the forming area to prevent contamination of the pastry by the hydraulic fluid. Fluid flow to and from the hydraulic cylinder is controlled by a valve which is operated by a pair of levers, both of which must be manipulated for proper cycling of the press. The press has a die support plate which is bearing guided on squared columns to insure uniform, accurately formed shells. A replenishing circuit provides high speed cycling of the press with a low pressure return stroke for operator safety. Thermostatically operated, electrical heaters are provided in a fixed die head to heat one of the replaceable dies by conduction.

This is a continuation of my copending application S.N. 842,651, filed July 17, 1969, and now abandoned.

SUMMARY OF THE INVENTION

This invention is concerned with a hydraulically operated pie tart and pastry shell forming press and more particularly with such a press having all of its hydraulic components located below the forming area to eliminate any possibility of contamination of the food product being formed.

An object of this invention is a two lever operated press which does not require the use of the electrical timers, relays, switches, and solenoids usually associated with two-lever safety interlocks.

Another object is a press which eliminates the need for expensive die sets, yet provides accurately formed pastry shells.

Another object is a press having an electrically heated die head with thermostatically controlled, replaceable cartridge heaters.

Another object is a hydraulic press having a high speed operating cycle.

Another object is a hydraulic press having a low pressure return stroke.

Other objects will be found in the following specification, claims, and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated more or less diagrammatically in the following drawings wherein:

FIG. 1 is a perspective view of a press embodying the novel features of this invention,

FIG. 2 is a top plan view of the press,

FIG. 3 is a side elevational view of the press,

FIG. 4 is an end elevational view of the press,

FIG. 5 is a schematic diagram of the hydraulic circuit of the press;

FIG. 6 is an enlarged, partial side elevational view of the directional control valve operating mechanism; and

FIG. 7 is an enlarged partial front elevational view of the directional control valve operating mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A pie tart and pastry shell press **11** embodying the novel features of this invention is shown in perspective in FIG. 1. The press includes a base assembly **13**, a motor **17**, and a die support structure **19**. A die mounting or support plate **21** carries a female die **23**, and a male die **25** is supported on a die block **27**.

The base assembly **13** includes side panels **29** and **31** and end panels **33** and **35** formed into a rectangular box **36** which is open at the top and bottom. The side panels **29** and **31** and the end panel **33** may be formed from a single sheet of metal bent into a three-sided configuration. The end panel **35** is welded to the side panels to form the rectangular box **36**. The top and bottom edges of these panels are bent inwardly to form top and bottom flanges **37**. An open top, sink-like reservoir **39**, preferably made of stainless steel and having a peripheral flange **41** around the top thereof, is placed inside the rectangular box **36** with the flange **41** resting on the top flanges **37** of the side panels. A gasket **43** may be cemented on the top of the flange **41**.

A cover **47** (FIG. 4) having downwardly extending flanges **49** formed around the periphery thereof fits over the top of the rectangular box **36**. A rectangular opening **51** and a circular opening **53** are formed in the cover **47**. A cover fill pipe **55** extends through the circular opening **53** and discharges in the reservoir **39**.

A housing **57**, of inverted, channel-shape cross-section, is positioned over the rectangular opening **51** and is welded to the cover **47**. The ends of this housing are closed by panels **59**. The motor **17** is mounted on the top of this housing. Its drive-shaft **61** extends through an opening in the top of the housing and connects to a pump **63** located in the reservoir through means of a flexible coupling **65**. The drive shaft and coupling are located in a machined pipe spacer **67**. The spacer maintains the pump in alignment with the motor shaft and the opening in the housing. The spacer and pump are supported on the housing **57** by studs **68**. A strainer **69** is connected to the pump intake.

A hydraulic cylinder **71** (FIG. 3) having a piston **72** (FIG. 5) is mounted in the reservoir **39** and is supported on the channel housing **57** by means of a support plate **73**, which plate is bolted to the top surface of the housing. A piston rod **75** extends upwardly out of the cylinder and the upper end of this rod is formed with a threaded socket (not shown). A double, vented seal (not shown) is provided for the piston rod to prevent leakage of fluid. A push rod assembly **79** connects the piston rod **75** and the die support plate **21**. This assembly includes a rod **81** having one end which threads into the threaded socket of the piston rod and another end which connects to a circular plate **83** which is bolted to the die mounting plate **21**. The push rod assembly permits adjustment of the amount of travel of the die support plate **21**.

The die mounting plate **21** is guided for vertical movement on upstanding column guides **85**. The columns extend through stepped bronze bushings **87** fitted in openings (not shown) formed in the die mounting plate. A die positioning hole (not shown) is formed in the die mounting plate and a die locking pin passage (not shown) extends through the side of the die mounting plate to intersect the positioning hole. A die locking pin **89** extends through said passage to engage and lock a die to the die mounting plate.

An upwardly opening channel shaped structure **97** (FIG. 4) is mounted on the upper ends of the column guides **85**. The channel structure has one end closed by an end plate **99**. A top cover **101** has downwardly turned side flanges **102** which fit over the channel structure **97**. An end plate **103** is welded to the top

cover. The electrical wires leading into the channel structure **97** pass through openings in the end plate **103** so that the wiring may be removed upon removal of the cover, however, for clarity of illustration the wiring has been omitted from the drawings.

The column guides **85** (FIG. 3) are formed with stub portions **107** of reduced diamter at each end. The tip **109** of each stub portion is threaded to receive a nut **111**. The base of each stub portion (not shown) is finished to close tolerances to fit tightly into a hole (not shown) in the channel **57** or the channel **97** which is reamed to close tolerances. This construction insures squareness of the column guides **85** and alignment of the die carried by the die mounting plate **21** with the die attached to the die block **27**.

The die block **27** is formed with a pair of horizontally extending cylindrical passages **115** in which are located cartridge type heaters **117**. Cartridges of different ratings may be used in accordance with operating conditions. A dial adjustment thermostat **119** is positioned against the side of the die block above the heater cartridges to control the temperature of the die block. The die block is formed with an integral cylindrical projection **121** on the lower portion thereof which mates in a suitable recess in the die **25** mounted on the block. A socket head screw **123** extends from the top housing **95** through the die block **27** and the cylindrical projection **121** for attaching the die **25** to the die block. A tubular spacer **125** is provided between the screw head and the channel **97** to hold the socket head near the top of the channel where it is readily accessible.

A directional flow control valve **131**, shown in FIGS. 3 and 5, is interposed between the pump **63** and the hydraulic cylinder **71**. A valve suitable for use is a commercially available four-way, three-position, spool valve, which is shown schematically in FIG. 5. A plunger **133** is attached to the spool and extends outside of the valve. The plunger and spool are normally biased by a spring **135** to the right-hand position shown in FIG. 5. The center position of the valve has a restricted or metered passage **136** connecting the pump and reservoir passages to permit some hydraulic fluid to bypass the cylinder **71**.

A yoke **137** (FIG. 2) is connected to the outer end of the plunger **133** and a horizontally extending pivot pin **139** connects the yoke to the center of a cross-connector bar **141**. The ends of the cross-connector bar are joined by ball-and-socket joints **143** (FIG. 6) to valve operating levers **145**. The levers are each pivotally connected at **147** to the sides of the housing **57**. Knobs **149** are located on the outward ends of the levers to facilitate use by an operator.

FIG. 5 is a schematic diagram of the hydraulic circuitry of the press. A check valve **155** is located in a conduit connecting the directional control flow valve **131** and the piston rod side of the hydraulic cylinder **71**. This check valve is spring-biased to open at approximately 2 p.s.i. pressure. A relief valve **157** is installed on the upstream-side of the check valve **155** and is set to discharge to the reservoir **39** at 135 p.s.i. pressure. A spring-biased check valve **159** is installed in the conduit extending between the rod side and the piston side of the hydraulic cylinder **71**. This check valve is set to open at 65 p.s.i. pressure. A relief valve **161** is located in the hydraulic circuitry adjacent the pump **63** and is set to open at the maximum desired system pressure.

The use, operation and function of this invention are as follows:

The hydraulic press of this invention is specifically adapted for use in forming pastry shells, such as shells for pies, tarts, cookies and the like. For example, FIG. 1 shows dies **23** and **25** used for forming pie crusts. The female die **23** is designed to receive an aluminum pie tin containing the pie dough. Due to its unique design and construction, this press will accurately and rapidly form pastry shells. The accuracy of shell formation is obtained through the use of column guides **85** which are maintained in squareness and alignment relative to each by their positioning to close tolerances in openings formed in the channel structures **57** and **97**. Accuracy is enhanced by die support plate **21** which is guided during movement along the column guides by the bronze bushings **87**. The lower die is held in registry on the die support plate through means of the accurately formed and located die block positioning hole and the die locking pin **89** which extends through the die locking passage in the die support plate. The upper die is held in registry with the lower die by the projecting cylindrical portion **121** of the die block and by the die block retaining screw **123**. The provision of the column guides, die support plate and die block as part of the press permits the interchangeability of dies without the necessity of providing expensive die sets.

The high speed operating cycle of the press is obtained through the use of a piston rod **75** having a large diameter relative to the piston diameter and through the provision of a replenishing circuit between the rod side and the piston side of the cylinder. When the piston **72** is in its retracted position, as shown in FIG. 5, the hydraulic fluid pressure on the rod side of the piston will normally be 65 p.s.i., which is the spring closing pressure of the check valve **159**. Upon delivery of hydraulic fluid from the pump **63** to the under side of the piston, the pressure of the fluid trapped on the rod side of the piston will increase until the check valve **159** opens. At that time, fluid will flow from the rod side of the piston through the check valve **159** to act against the underside of the piston. This replenishingg effect will speed the movement of the piston rod since the pump **63** need supply only enough fluid to make up for the volume of the displaced rod. This arrangement also enables the piston to move freely until the piston rod meets resistance. When this occurs, the pressure on the rod side of the piston builds up until the relief valve **157** opens at 135 p.s.i. Thus, the internal back pressure acting against the piston is limited to the product of 135 p.s.i. times the difference between the area of the piston and the area of the piston rod.

When the directional control flow valve **131** is moved to the return position for the piston **72**, the pressure build up on the rod side of the piston is limited by the settings of the relief valve **157** and the check valve **159**. Also, the effective area of the rod side of the piston is small because of the large diameter of the rod. Consequently, the return stroke of the piston is essentially a low pressure return. Further, since the rod diameter is large, the volume of the cylinder to be filled on the return stroke is relatively small, and therefore a rapid return stroke is obtained even though the return pressure is low. Of course, the low pressure return stroke is a safety feature of this press. The low pressure return stroke is feasible because of the squareness of the column guides **85** and the provision of bronze bearings **87** to guide the die support plate **21**.

The directional control valve **131** is moved between its extreme positions in which it directs hydraulic fluid to the cylinder **71** for extension of the piston rod **75** and in which it directs hyrdraulic fluid to the cylinder for retraction of the piston rod by a pair of operating levers **145**. The valve **131** is biased to the piston retracted position shown in FIG. 5 by the spring **135**. With the valve in this position, the cross-connector bar **141** will be located in its lowered position, shown in solid lines in FIG. 7. When the levers **145** are both fully depressed, the directional control valve spool will be moved all the way to the right as viewed in FIG. 5 to direct hydraulic fluid to the cylinder to move the piston rod **75** to its extended position. Depression of the operating levers **145** lifts the cross-connector bar **141** to the upper position shown by dashed lines in FIG. 7. The length of travel of the directional control valve spool between extreme positions is approximately one quarter of an inch.

The foregoing arrangement of operating levers **145**, cross-connector bar **141** and horizontal pivot pin **139** provides a safety feature which is intended to discourage the press operator from tying down one of the operating levers **145**. If one of the levers is tied down, depression of the other lever will move the valve spool to its extreme right position, as viewed in FIG. 5, bringing about a normal expansion stroke of the piston rod. However, upon release of the free operating lever, the cross-connector bar **141** will move to the tilted position shown in broken lines in FIG. 7. When the cross-connector bar is tilted, the spool will move to the intermediate position in which a portion of the hydraulic fluid from the pump, which would normally be directed to the hydraulic cylinder to return the piston rod, will be diverted through the metered passage **136** to the reservoir, resulting in a much slower cycle of operation of the press. Thus, the operator is discouraged from bypassing the two-hand operation of the press.

The placement of the heating elements in the die block **27** permits the use of simpler dies with the die block heating the replaceable die by conduction. Also, cleaning of the dies is facilitated because of their simple construction due to the lack of heating elements. The cartridge-type heaters **117** are replaceable to provide greater flexibility in the use of the press as well as providing easy replacement in the event of burn out or malfunction. All of the wires leading into the top channel **97** except the wires to the motor extend through the end plate **103** of the top cover **101** so that removal of the cover will bring about removal of all of the wires.

Whereas, I have shown and described one form of the invention, it should be understood that many modifications, changes and adjustment may be made to this press without departing from the teachings of my invention. Therefore, the scope of the invention should not be limited to the exact embodiment shown and described herein.

What is claimed is:

1. A hydraulic press including:
- a fixed die mounting means,
- at least one movable die mounting means,
- a hydraulic cylinder having a piston and a piston rod operatively connected to said movable die mounting means,
- a source of hydraulic fluid,
- a pump supplied from said source of hydraulic fluid,
- conduits extending between said pump, said source of hydraulic fluid, and the rod and piston sides of said hydraulic cylinder,
- a replenishing conduit connecting the rod side and the piston side of said hydraulic cylinder, and
- a check valve located in said replenishing conduit and arranged to permit the flow of hydraulic fluid from the rod side to the piston side of said cylinder while preventing the flow of hydraulic fluid from the piston side to the rod side of said hydraulic cylinder,
- said check valve being biased to remain closed until the pressure differential acting to open said valve reaches a predetermined quantity.

2. The structure of claim **1** further characterized in that a check valve is positioned in the conduit leading to the rod side of said hydraulic cylinder and is arranged to permit the flow of fluid into the rod side of said cylinder, and
- a relief valve is located in said conduit between said cylinder and said check valve and is arranged to discharge to said source of hydraulic fluid at a preselected pressure.

3. A hydraulic press including:
- a fixed die support,
- at elast one movable die support,
- a hydraulic cylinder having a piston connected to said movable die support through means of a piston rod,
- a source of hydraulic fluid,
- a pump connected to said source of hydraulic fluid,

- conduits leading between said pump, said source of hydraulic fluid and the piston and piston rod sides of said hydraulic cylinder,
- a directional control valve located in said conduits between said hydraulic cylinder, and said pump and said source of hydraulic fluid,
- said directional control valve having a plunger movable between a first position in which said valve connects said pump with the piston side of said cylinder, a second position in which the rod side of said cylinder is connected to said pump, and a third intermediate position in which a metered portion of the output of said pump is diverted to said source of hydraulic fluid, and
- a pair of actuating levers operatively connected to said plunger and arranged to move said plunger to said first and second positions upon coordinated movement of said levers between actuating and non-actuating positions and to move said plunger to said third intermediate position upon movement of only one of said levers.

4. The structure of claim **3** further characterized in that said plunger is pivotally connected to a cross-connection bar and the opposite ends of said cross-connection bar are each pivotally connected to one of said actuating levers.

5. A hydraulic press including:
- a base assembly comprising a reservoir, an open box-like structure supporting said reservior, a cover positioned on said reservoir and supporting structure, and a downwardly opening channel shaped member supported and attached to said cover,
- a hydraulic cylinder and piston supported on said channel shaped member and extending therethrough into said reservoir,
- a piston rod extending from said cylinder and adapted to move upwardly from said channel shaped member,
- a pair of upstanding column guides mounted on said downwardly opening channel shaped structure on opposite sides of said piston rod,
- an upwardly opening channel shaped member supported on and attached to the upper ends of said column guides and aligned with said lower downwardly opening channel shaped member,
- a die mounting plate connected to said piston rod and guided for movement along said column guides,
- a die supporting opening formed in said die mounting plate in a predetermined spaced relation to said column guides,
- a die head mounted on said upwarly opening channel in alignment with and facing said die mounting hole on said die mounting plate, and
- means to selectively actuate said hydraulic cylinder to move said piston rod and attached die mounting plate towards and away from said die head.

6. The structure of claim **5** further characterized in that attached to said column guides are upwardly and downwardly opening channel members in precise alignment with each other and said die mounting plate is mounted on said column guides by means of sleeve bearings to provide precise alignment of its die mounting opening with said die head.

7. A self-contained hydraulic press including:
- a housing forming a base,
- an open top reservoir located in said housing,
- an upper die mounting means,
- a lower die mounting means guided for movement towards and away from said upper die mounting means,
- a hydraulic cylinder positioned in said housing above said reservoir and adapted, upon actuation, to move said lower die mounting means towards and away from said upper die mounting means,
- means located in said housing above said reservoir to selectively supply hydraulic fluid under pressure to

said cylinder to move said lower die mounting means towards and away from said upper die mounting means including a pump, a directional control valve, conduits, at least one check valve and at least one relief valve, and

means located outside of said housing to selectively operate said directional control valve and connected to the directional control valve inside said housing.

8. The hydraulic press of claim 7 further characterized in that said means to selectively operate the directional control valve includes:

a plunger in said directional control valve movable between a first position in which said directional control valve connects said pump with the piston side of said cylinder, a second position in which the rod side of said cylinder is connected to said pump and a third intermediate position in which a metered portion of the output of said pump is diverted to said source of hydraulic fluid, and

a pair of actuating levers operatively connected to said plunger and arranged to move said plunger to said first and second positions upon coordinated movement of said levers between actuating and non-actuating positions and to move said plunger to said third intermediate position upon movement of only one of said levers.

References Cited

UNITED STATES PATENTS

1,742,470	1/1930	Harris	100—113
3,124,083	3/1964	Atwood	107—15 B
3,307,502	3/1967	Armour	107—15 B
3,491,867	1/1970	Alexander	100—53 X

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U.S. Cl. X.R.

100—53; 425—143, 193