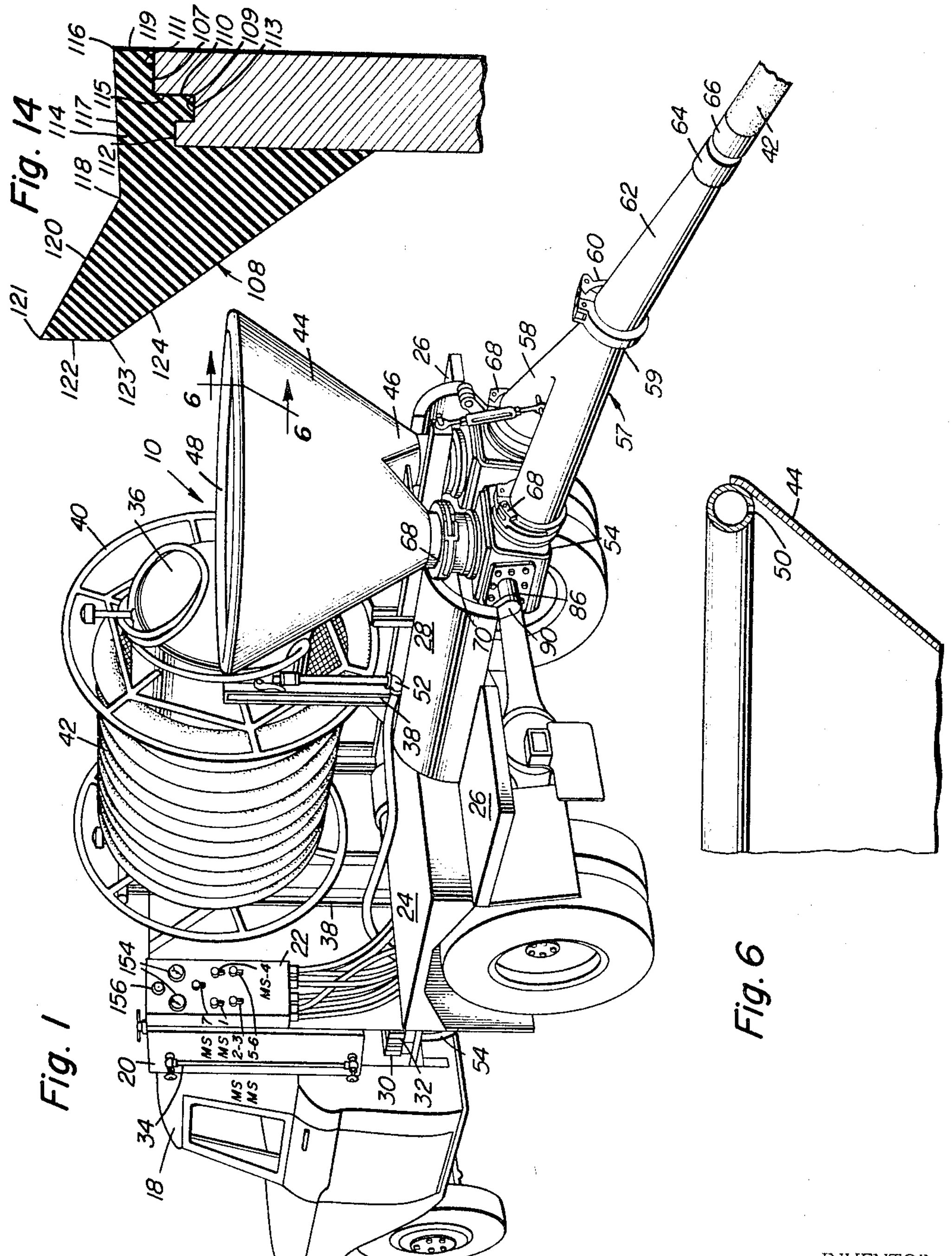
Oct. 18, 1966 M. L. SMITH 3,279,383

HYDRAULIC POWERED MOBILE CONCRETE PUMP ASSEMBLY

Filed Jan. 6, 1965

7 Sheets-Sheet 1

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HYDRAULIC POWERED MOBILE CONCRETE PUMP ASSEMBLY

Filed Jan. 6, 1965 7 Sheets-Sheet 2

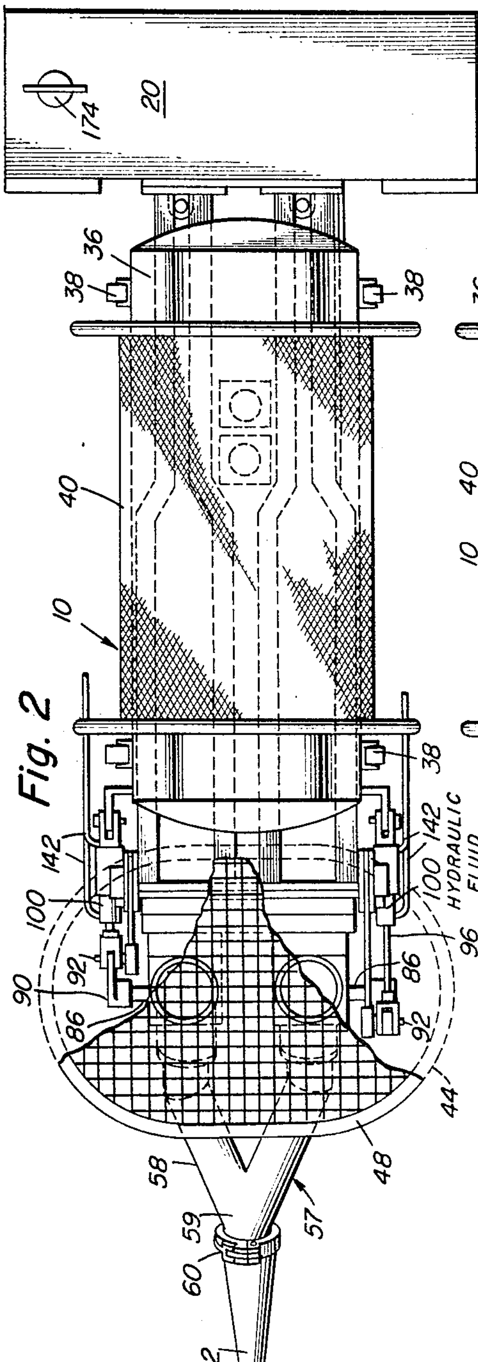
Fig. 2

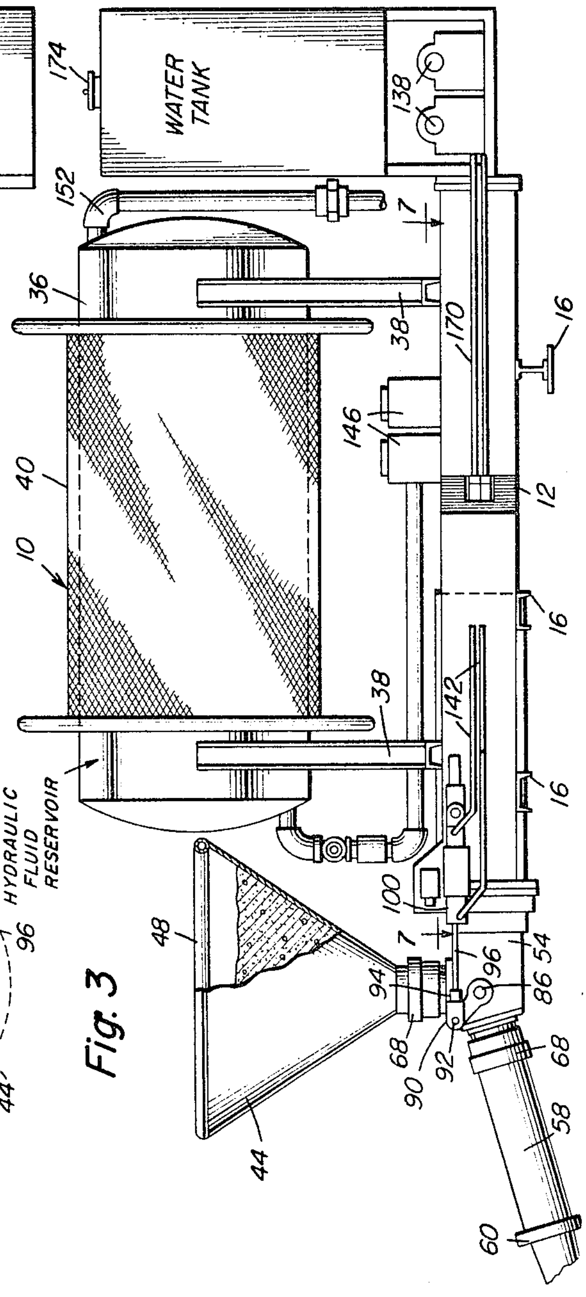

Fig. 3

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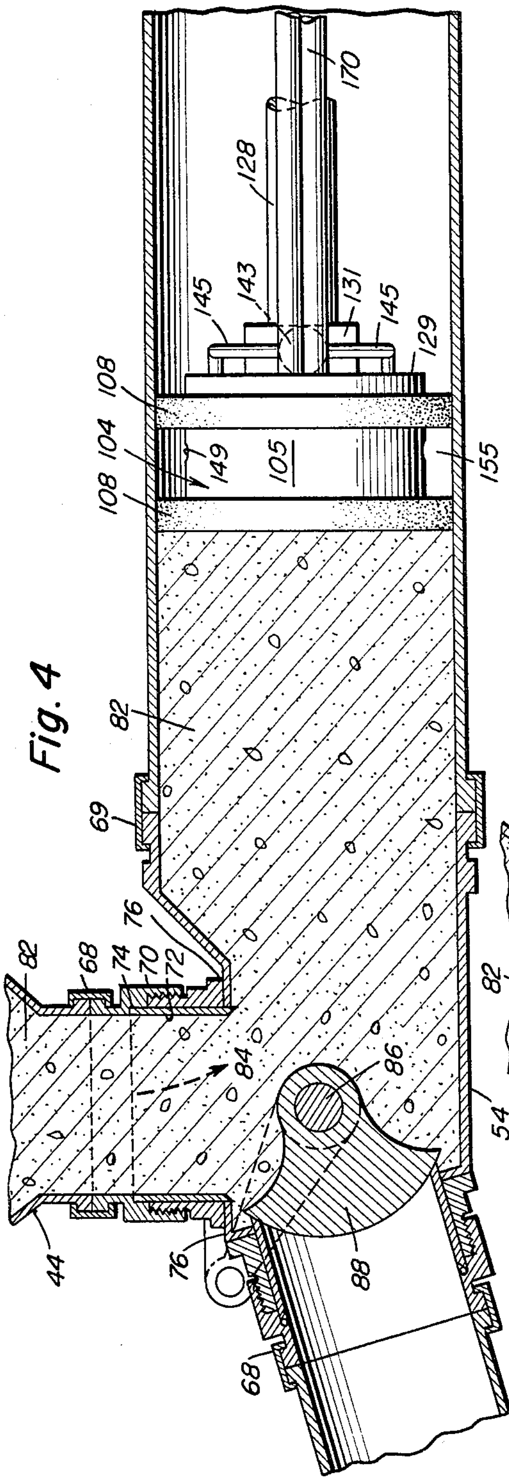


Fig. 4

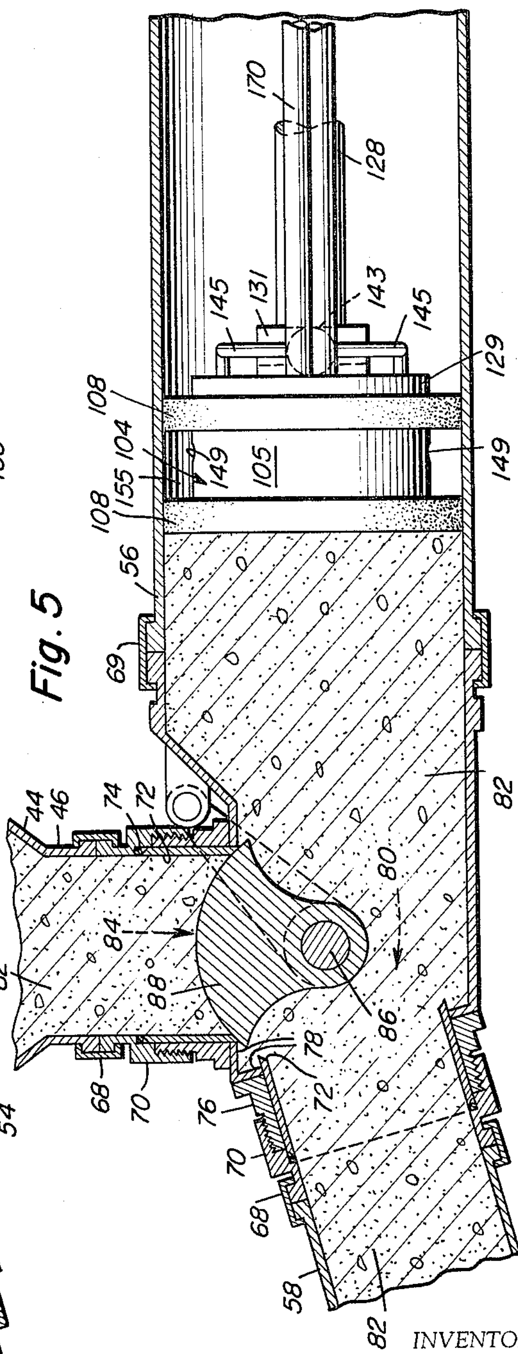


Fig. 5

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HYDRAULIC POWERED MOBILE CONCRETE PUMP ASSEMBLY

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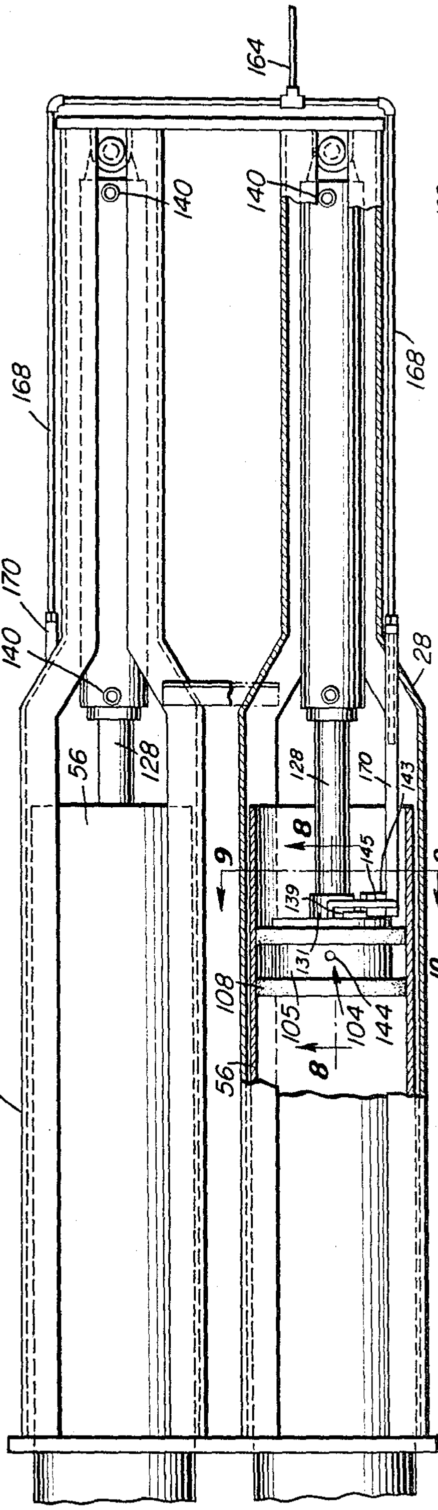

Fig. 7

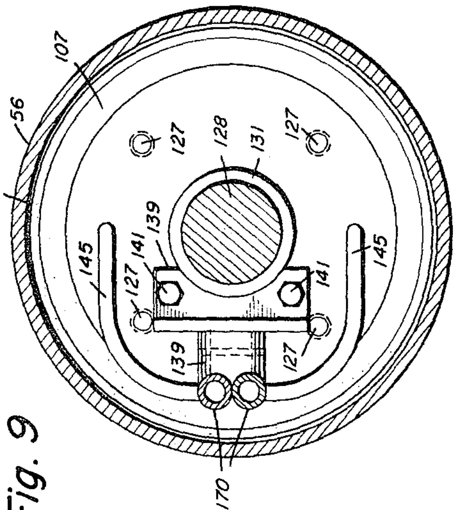

Fig. 9

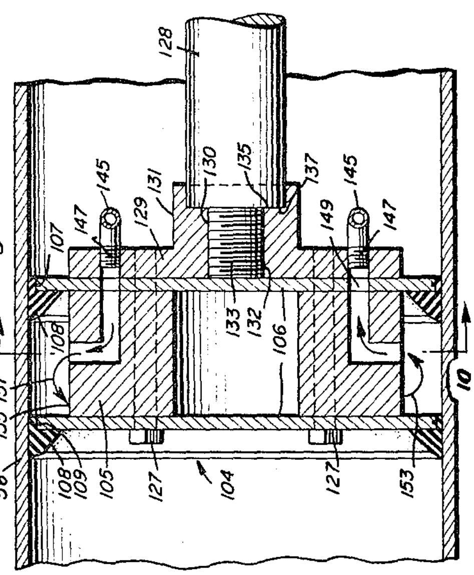

Fig. 8

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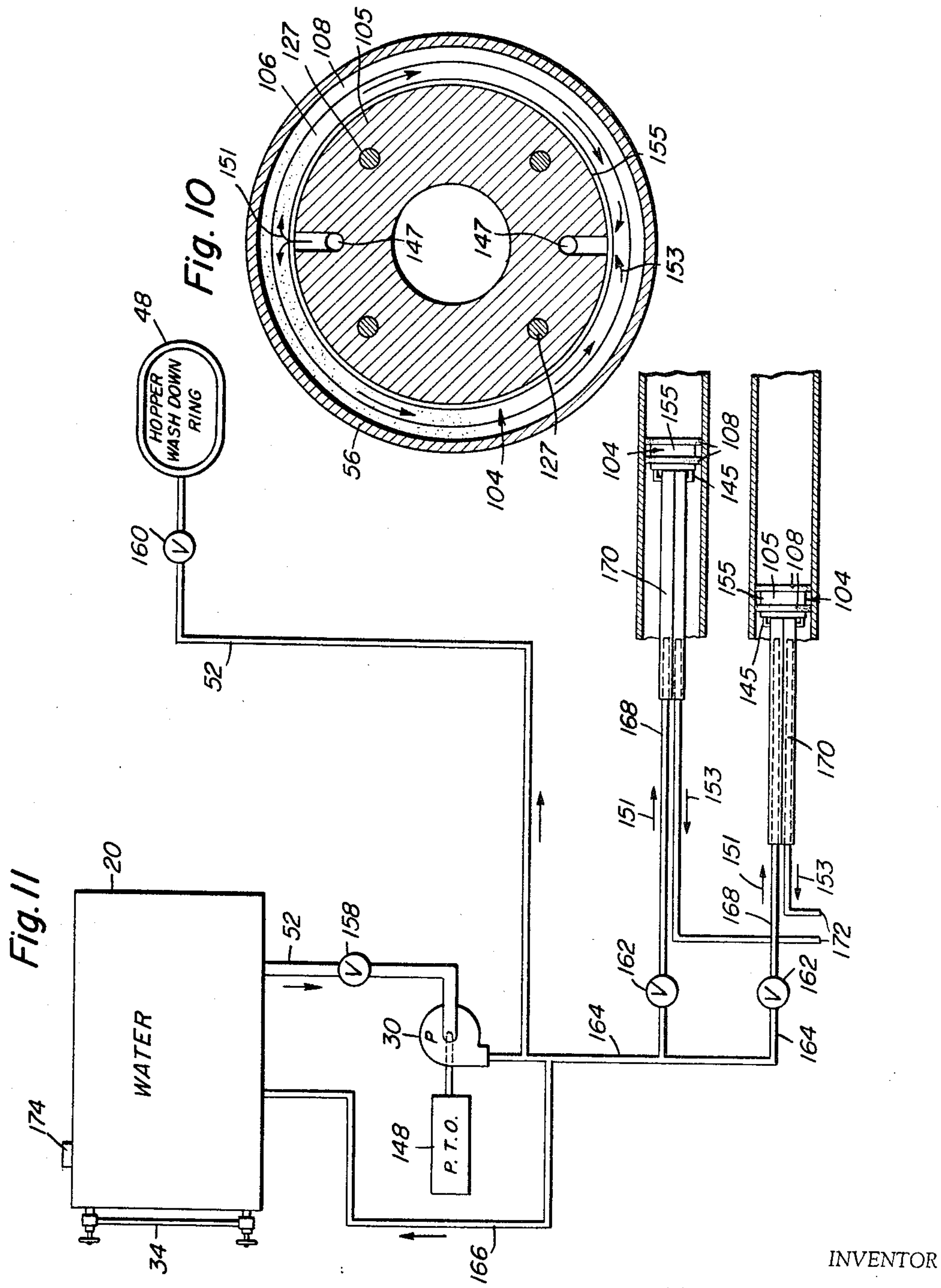


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HYDRAULIC POWERED MOBILE CONCRETE PUMP ASSEMBLY

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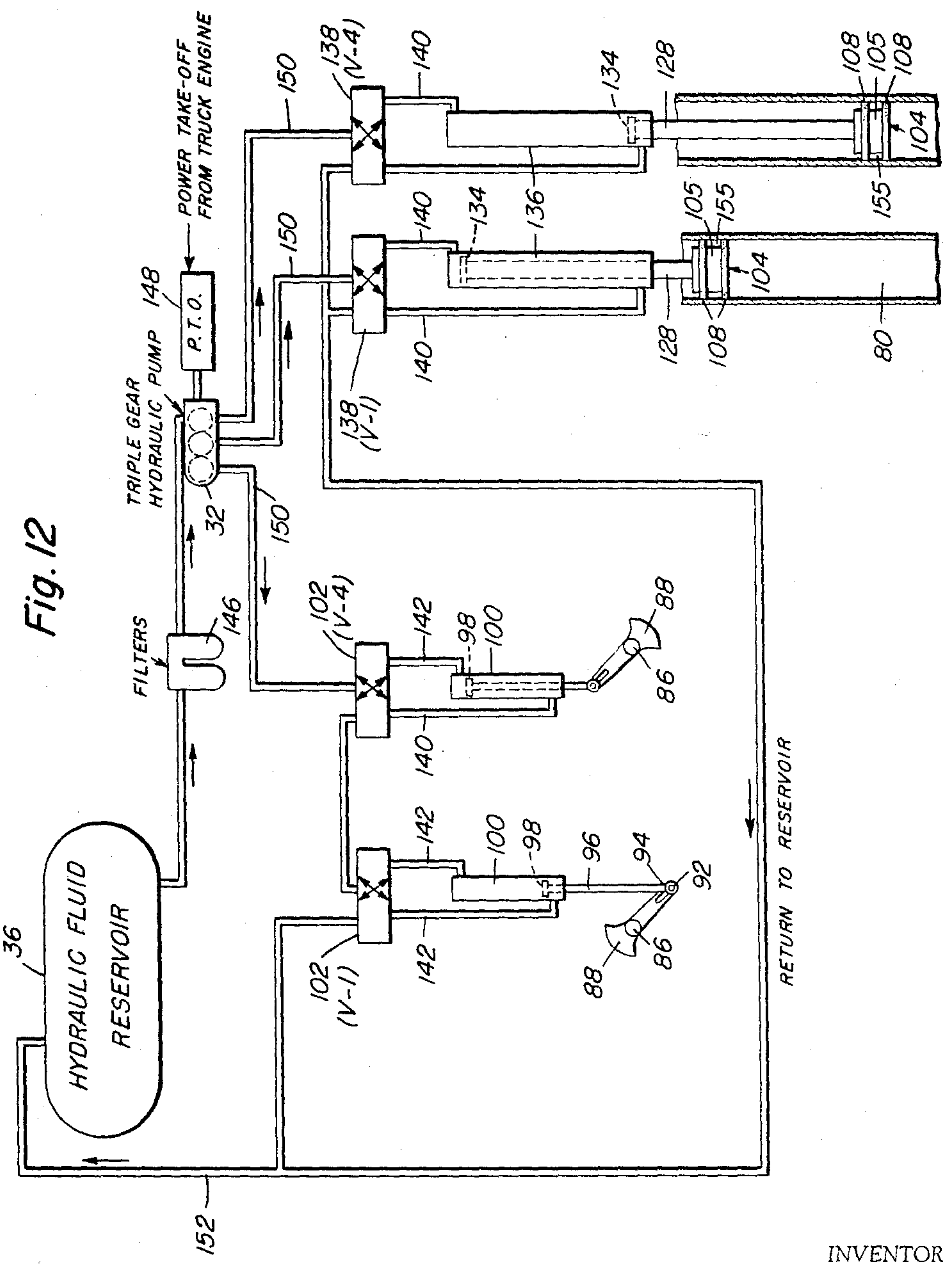


Fig. 12

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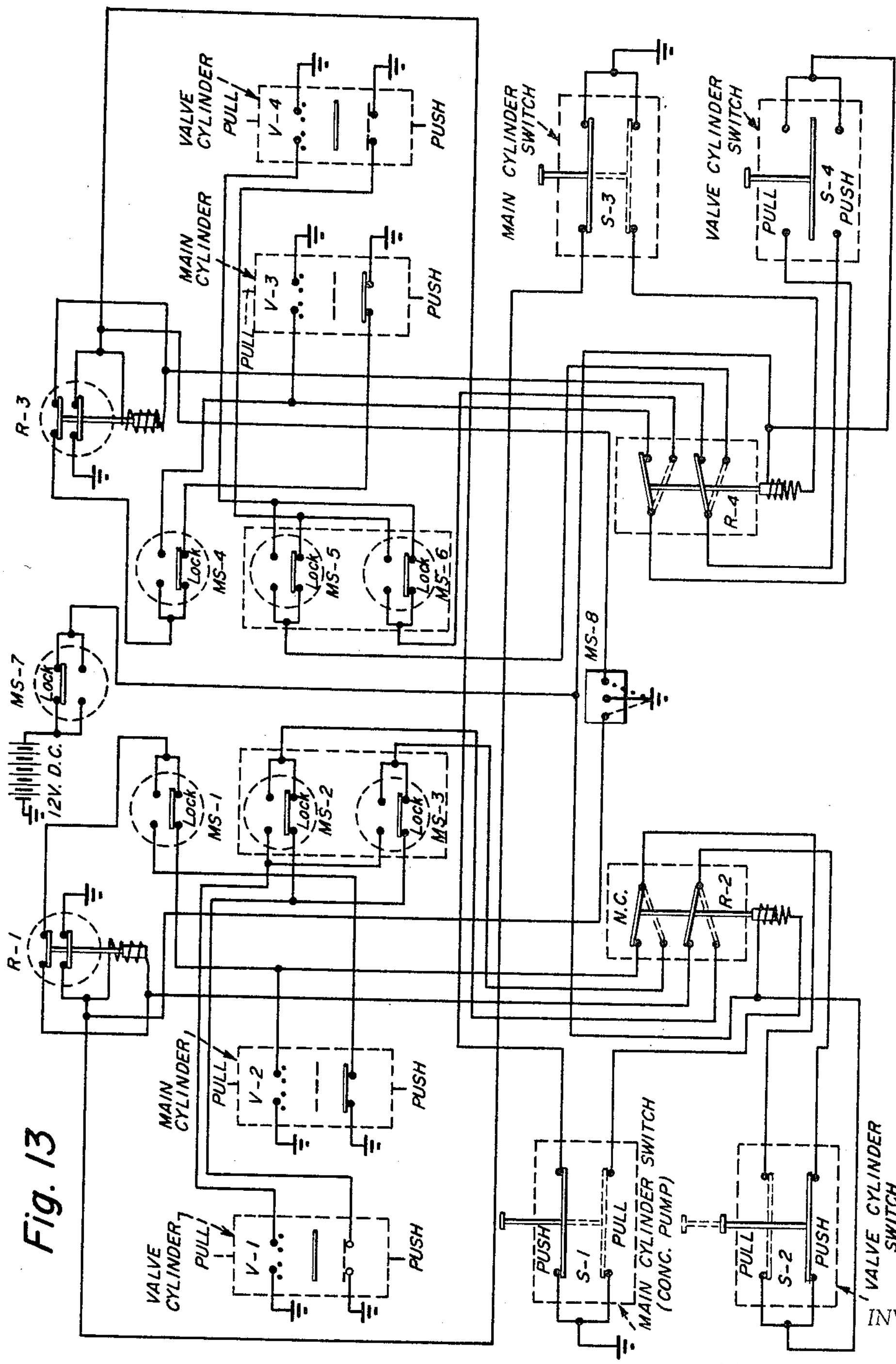


Fig. 13

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United States Patent Office

3,279,383
Patented Oct. 18, 1966

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# 3,279,383
# HYDRAULIC POWERED MOBILE CONCRETE PUMP ASSEMBLY

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Filed Jan. 6, 1965, Ser. No. 423,798
31 Claims. (Cl. 103—49)

This invention relates to a hydraulic powered concrete pump assembly, and has for an object to provide an improved concrete pump assembly which is hydraulic operated and electrically controlled.

A further object of this invention is to provide a mobile hydraulic powered concrete pump wherein the concrete pumping parts are completely hydraulically actuated and wherein the pump is electrically cycled, wherein the hydraulic power is provided by power takeoff means from the power engine of the vehicle, and the vehicle engine battery provides the source of power for cycling the hydraulic action.

A further object of this invention is to provide a hydraulic powered concrete pump wherein the concrete pump piston has water feed means for use while in operation to feed water as a lubricant to the area between the concrete pump piston and its cylinder and as a cleaning means for the piston and cylinder area, as well as built in water spray means for a hopper for feeding the concrete to the concrete pump piston and cylinder.

Yet a further object of this invention is to provide a concrete pump employing the principles used in reciprocating pumps using hydraulic fluid and hydraulic cylinders as the force to move the pistons creating the pumping action on the concrete.

Still a further object of this invention is to provide two separate concrete pumping assemblies for pumping concrete through a single concrete transport conduit, wherein the two separate assemblies are so tied together than either can be operated independently, or be operated in either in-phase or out-of-phase relation, and maintain perfect coordination.

Yet a further object of this invention is to provide a concrete pumping assembly whose operation is electrically cycled and hydraulically powered.

Yet a further operation of this invention is to provide a concrete pumping assembly that is electrically cycled and controlled, and has manually controllable switch means connectable into its electrical cycling which may be used to reverse the operation in event of a jam in the concrete.

Still a further object of this invention is to provide a pair of separably operable concrete assemblies which are also operable in coordination, and in either case, pump concrete through a common concrete transport conduit.

A further object of this invention is to provide a fully hydraulic pump, using the hydraulic principle and thus have fewer moving parts, fewer breakdowns, fewer delays, than a partly or fully mechanical pump with its geared operating or mechanical cycling elements.

Still a further object of this invention is to provide a mobile hydraulic concrete pump mounted on a vehicle having a transport engine using a power takeoff for providing hydraulic power and using the battery normally present on such vehicle for cycling the hydraulic operation of the pump.

Still a further object of this invention is to provide an improved piston and rubber cup piston rings therefore, with water passages through the piston to and from between the rubber cup piston rings, for pumping the concrete. It will be understood that the term "rubber" refers to any suitable elastic compressible material, such as natural or synthetic rubber, or other suitable plastic material.

In brief, this invention is a portable pump for pumping wet concrete through a flexible hose to a desired location. The pump has two independent concrete sucking and pushing pistons and cylinders, which are hydraulically operated, but electrically cycled for either sequential operation of a common delivery hose, or for simultaneous pumping operation, or for shutting down one pump piston and cylinder while the other may continue in operation, or for reversing the operation when necessary. Furthermore, water is delivered to each pumping piston, for lubricating the piston within the cylinder during the pumping cycle, and for washing the cylinder at the end of the cycle. The pump is preferably mounted on a self-propelled vehicle, such as a specially converted standard one ton truck, and the battery of the truck and the engine of the truck are used for power for electrically cycling the operation as well as for powering the hydraulic operating means for actuating the concrete pump. A readily washable hopper is provided for feeding concrete to the pump and quick detachable means are provided for attaching or detaching a Y connection both to each separate pump and to a common concrete delivery hose. A special improved rubber cup piston ring, in pairs, is provided for a special improved piston for each concrete pump piston, and telescopic sleeves are provided for feeding water through the pistons, while in operation, to the area between two spaced apart piston rings on each piston. A readily replenishable water supply is provided, and a hydraulic fluid supply is also provided also in a tank, and a reel is located about one of the tanks for storing the concrete pumping hose when not in use. Gauges and controls are located in a location convenient for an operator.

With the above and related objects in view, this invention consists in the details of construction and combination of parts, as will be more fully understood from the following description, when read in conjunction with the accompanying drawing, in which:

FIG. 1 is a perspective view of the concrete pump mounted on a truck.

FIG. 2 is a top plan view of the concrete pump per se, certain operating details being omitted for clarity.

FIG. 3 is a side elevational view of FIG. 2.

FIG. 4 is a sectional view on an enlarged scale, through one hopper valve, and associated parts, in pump cylinder filling position.

FIG. 5 is a similar view in concrete pumping position.

FIG. 6 is a sectional view on line **6—6** of FIG. 1, showing the hopper washing pipe.

FIG. 7 is a view of a pair of pumping cylinders, partly broken away, in section, approximately on line **7—7** of FIG. 3, on a medium scale.

FIG. 8 is a sectional view on line **8—8** of FIG. 7, on a more greatly enlarged scale.

FIG. 9 is a sectional view on line **9—9** of FIG. 7, on a similarly enlarged scale.

FIG. 10 is a sectional view on line **10—10** of FIG. 8, likewise on an enlarged scale.

FIG. 11 is a diagrammatic view showing the water circulation.

FIG. 12 is a diagrammatic view showing the circulation of the hydraulic fluid.

FIG. 13 is a diagrammatic view of the electrical circuit for controlling the hydraulic valves.

FIG. 14 is a fragmentary view of one concrete pump piston rubber cup in position on the face plate of the piston before it has been inserted in the concrete pump cylinder, on a larger scale.

There is shown at **10** the hydraulic powered mobile concrete pump of this invention mounted on a standard production one ton truck chassis **12** of a conventionally powered truck **14**, the pump **10** being mounted on four pieces of channel iron **16** placed horizontally so as to form the carrier for the parts of concrete pump **10**. These channel irons **16** are positioned with appropriate mounting lugs so as to set inside the truck chassis frame.

Referring to FIG. 1, behind and close to the truck cabin **18** there is mounted a rectangular water tank **20** of approximately 150 gallons capacity, having a sight glass **34** forming a necessary part of the concrete pump **10**. An electric control box and panel **22** is mounted thereagainst so as to be convenient to an operator who may stand on either an upper level runway **24** or a lower level rear runway **26**, a quarter circular shield **28** being mounted over and concealing some of the operating parts, hereinafter described, the runways **24** and **26** and shield **28**, but not the control box and panel **22**, being duplicated on the opposite side of the truck chassis **12**.

Beneath the water tank **20**, there is mounted on the truck chassis **12** a water pressure pump **30** and a fluid pressure pump **32**. A cylindrical hydraulic fluid reservoir **36** approximately twenty-four inches in diameter with a capacity of approximately 110 gallons, is supported on the upright stanchions **38** of a cradle operatively supported by the truck chassis **12**. Rotatably bearing about this cylindrical reservoir **36** is a reel or spool **40** on which is stored a rubber hose or flexible conduit **42**, approximately three inches in diameter and 150 feet long, for conducting the pumped concrete from the concrete pump **10** to the point where the concrete is being used. The hose **42** is readily unreeled from the reel or spool **40** and connected when it is to be used. Behind the rear cradle stanchions **38**, there is provided a funnel-shaped concrete input hopper **44** having twin feed spouts **46** at the bottom thereof. Around the top of the oval shaped hopper **44** there is provided a water spray pipe **48** having a series of spray holes **50** on three inch centers along its bottom to discharge water on the inside of the hopper **44**, both to wash the hopper **44** at the end of a concrete pumping operation as well as to add more water to the concrete mix, when necessary. The water spray pipe **48** is fed from the water pump **30** and the water tank **20** by a water conduit **52**, as later described and shown in FIG. 11. The water pump **30** and the hydraulic pressure fluid pump **32** are each powered from a power divider or power takeoff **148** from the engine of the truck **14**, and the electrical control box and panel **22** receives its electrical power from the battery, usually 12 volts, normally present on the truck **14** for powering the lights and ignition, if present, of the truck engine, thus eliminating the need for a separate power or electricity source.

Each hopper spout **46** is connected to a valve housing **54** which in turn is connected to both a concrete sucking and pumping cylinder **56** and to one six inch diameter arm **58** of a Y-shaped concrete feed conduit **57**. The common discharge leg **59** of the Y-shaped feed conduit **58** is removably clamped, as by a "Victaulic" quick action clamp **60**, to a tapered spout **62**, tapering from six inches down to three inches. At the three inch end, a coupling **64** is provided for removably securing one end **66** of the concrete flexible hose or conduit **42**.

A similar quick action "Victaulic" clamp **68** detachably connects the Y input arm **58** to an adjustable female threaded coupling **70** which also secures a valve seat **72** in position, an O-ring **74** being provided between the valve seat **72** and the coupling **70**, a male threaded coupling **76** being bolted or otherwise secured to a flange **78** of valve housing **54** surrounding an output feed port **80**, through which the concrete mix **82** is fed from the cylinder **56** to the Y feed arm **58**. The spout **46** of hopper **44** is connected in an identical manner to the input port **84** of housing **54**, and hence the same reference numerals are applied to the valve seat and connecting parts. Another "Victaulic" clamp **69**, of appropriate size, connects the valve housing **54** to the concrete sucking and pumping cylinder **56**. This cylinder **56** is of ten-inch inside diameter, thirty-six inches long, and is made of mechanical steel and then hard chrome plated on the inside to provide a long wearing surface. Fixedly secured on a valve control pivot shaft **86** extending through the side of valve housing **54** is a globe valve **88** which is controllably oscillated by the pivot shaft **86**, between a position connecting the input port **84** from the hopper spout **46** through the valve housing **54** to the sucking action of the concrete sucking and pumping cylinder **56** while closing off the output port **80** therefrom, as shown in FIG. 4, and a position closing off the input port **84** from the hopper spout **46** and connecting the output port **80** to the Y feed conduit arm **58**, as shown in FIG. 5.



The globe valve **88** is a half sphere, cast of stainless steel with the pivot shaft **86** being of high alloy steel welded and machined for accuracy, and this globe valve **88** is oscillated in an arc of approximately one-hundred-ten degrees from one valve seat **72** to the other valve seat **72**. The valve housing **54** is fabricated of standard ten inch pipe on which the seat housing or male couplings **76** are bolted.

The globe valve shaft **86** is oscillated between its positions by an arm **90** secured thereto at one end and pivotally connected at **92** at its other end to the end **94** of a piston rod **96** of a hydraulically movable piston **98** within a valve control hydraulic cylinder **100** which, in turn, is cyclically controlled by a solenoid controlled push-pull valve **102**. The electrical circuit for cycling the globe valve **88** in accordance with the movement of the concrete sucking and pumping piston **104** moving within the concrete sucking and pumping cylinder **56** will be described later in connection particularly with FIG. 13.

This concrete moving piston **104** is made of an annular spacer **105**, preferably of aluminum, secured between a pair of steel piston face plates **106**. Mounted on the periphery **107** of each face plate **106** is a rubber cup piston ring **108** shaped, when not inserted in the cylinder **56**, as shown in detail in FIG. 14. When inserted in the cylinder **56**, the rubber cup piston ring assumes the shape shown in FIG. 8.

Each faceplate **106** is provided with a peripheral rectangular channel **109**, whose back wall **110** is preferably exactly half way between the opposite sides of each face plate **106**, and whose back lip **111** is higher than its front lip **112**. When the concrete cylinder **56** is ten inches in inside diameter, the preferred dimensions are as follows: The face plates are five-sixteenths inch thick, with the channel back wall **110** located at five-thirty-seconds inch from both the front and back sides of the steel face plates **106**. The channel **109** is three-thirty-seconds inch wide, and the front lip **112** two-thirty-seconds inch wide. The diameter of the face plate at the bottom **113** of the channel **109** is 9.6875". The diameter of the front lip **112** is 9.75". The diameter of the back lip **111** is 9.8125".

The rubber cup piston ring **108** is held on the periphery **107** of each of the face plates **106** by a rearwardly extending flange **114** whose inner face **115** is complementary in shape and size to that of the face plate channel **109** and back and front lips **111** and **112**. At the rear edge **116** of the rubber cup piston ring **108**, whose diameter is 10.07", the peripheral surface **117** angles inwardly to a diameter of 10.38" at a point **118** located .5" from its annular rear surface **119**, which annular rear surface **119** is in the same plane with the rear surface of the faceplates **106**. Then, from this inward point **118**, the rubber cup piston ring periphery angles outwardly at **120** to a diameter of 10.5" at the outer edge **121** of its annular front surface **122**, which annular front surface **122** is parallel to and located 1" from its rear surface **119**. This annular front surface **122** is .5" in width and parallel to its annular rear surface **119**. The inner edge **123** of this annular front surface **122** thus has a diameter of ten inches. From here, the front surface **124** angles rearwardly to meet an inner edge **125** whose diameter is 8.25". This inner edge **125** is also the inner edge of an annular surface **126** parallel to its rear face **119** and thus to the face of the front plate on which it is mounted. Annular surface **126** has an outer diameter of 9.75", the same as the diameter of the front lip of the face plate, and from here on, as already described, it is complementary to the channel **109** and outer peripheral lips **111** and **112** of of the steel face plate at **106** or **107**, and thus of the same diameters already set forth.

Secured to the rear face of the rear face plate **106** by the same stud bolts **127** which extend through both face plates **106** and the intervening aluminum spacer **105** is a pusher plate **129** into which the four stud bolts **127** are threaded. The aluminum spacer **105** is 3" thick and 8" in diameter, and the pusher plate **129** is of the same 8" diameter. A piston connecting rod **128** is threadedly secured in a counterbore **130** of a center boss **131** on the pusher plate **129**, the inner smaller bore being threaded at **132** to attach to the threaded reduced neck **133** extending from the shoulder end **135** of the piston connecting rod **128**, which shoulder end **135** seats in the counterbore shoulder **137**.

Extending partly about the boss **131** is a water tube anchor plate **139** secured to pusher plate **129** by studs **141**. The outer telescopic tubes or sleeves **170**, later described, are firmly secured, as by welding or the like, to a boss **143** extending from these anchor plates **139**. Tapped at one of their ends into these sleeves **170** are small curved conduits **145** whose other ends **147** are tapped at **147** into water conduit passages **149** through the pusher plate **129**, the rear face plate **106** and the aluminum spacer **105** to the outer periphery **155** of the spacer **105** between the front and rear rubber cup piston rings **108**. The water follows the path shown by the arrows **151** and **153**, entering at arrow **151**, about the periphery **155** of piston spacer **105** in both directions and out at arrows **153**, thus continuously circulating and washing as well as lubricating the inner surface of the concrete pumping cylinder **56**.

The concrete pumping and sucking piston **104** is reciprocated within its cylinder **56** by means of the piston rod **128** threaded into the counterbored boss **131** of the pusher plate **129**. The other end of piston rod **128** is secured to a hydraulically actuated piston **134** within a hydraulic cylinder **136**, and its cycling is controlled by solenoid controlled hydraulic valves **138** by means of pressure fluid conduits **140** leading to opposite ends of the cylinder **136**, the globe valve actuating piston **98** within hydraulic cylinder **100** being likewise connected by fluid pressure conduits **142** leading from its solenoid controlled valve **102** to opposite ends of its hydraulic cylinder **100**.

Referring to FIG. 12, hydraulic power for actuating the globe valve actuating cylinders **100** and the concrete sucking and pumping pistons **104** within cylinders **56** is provided by hydraulic fluid circulating from the hydraulic fluid reservoir **36** of approximately one-hundred-fifty gallons capacity, flowing at the rate of approximately eighty-two gallons per minute, through filters **146** to the triple gear hydraulic pump **32** operated by a power takeoff **148** from the truck engine, through conduits **150** to each of the solenoid controlled valves **102** and **138** and their conduits **140** and **142** to their hydraulic cylinders **100** and **136** and then by the conduits **152** the fluid returns to the reservoir **36**. Hydraulic pressure gauges **154** and a vacuum gauge **156** for indicating the suction on the intake side of the hydraulic pump suitably connected are located on the panel **22** for observation by an operator on either runway **24** or **26**.

Referring to FIG. 11, water is fed from the tank **20** through a main cutoff valve **158** to the centrifugal water pump **30**, operating at approximately twenty-seven gallons per minute, through a metering valve **160** in conduit **52** to the spray pipe **48** of hopper **44**, and also through two



other metering valves **162** in conduits **164** to the inside of the concrete sucking and pumping pistons **104**, an excess water return line **166** being connected between conduits **164** and the water tank **20**. The centrifugal water pump **30** is also operated by the power takeoff **148**.

The conduits **164** terminate in inner telescopic tubes **168** extending into outer telescopic tubes **170** connected to the water conduits **145** into hollow concrete sucking and pumping pistons **104**. Similar inner and outer telescopic tubes provide for return of waste water from hollow pistons **104** to waste discharge at **172**. The water tank **20** may be replenished from time to time by a water hose from any suitable source during use, through the refill cap **174**, the sight glass **34** serving to alert the operator as to when refill is needed. Water from spray pipe **48** serves to clean the hopper **44** after the concrete pumping is stopped, as well as to add extra water to the concrete mix **80** whenever needed. Water through the concrete piston **104** serves to lubricate the piston in its thirty-six inches of travel through its cylinder **56**, as well as to clean it after pumping is stopped.

The hopper **44** has two feed spouts **46**, feeding through the two cylinders **56** and Y feed pipe **57** to a delivery concrete conduit **42**. Each cylinder **56** and all its details provides a complete concrete delivery system, which is cycled as set forth in the electrical diagram of FIG. 13 for either coordinated operation, whereby each cylinder **56** feeds alternately to its leg **58** of Y feed conduit **57**, so as to provide a substantially continuous stream of concrete flowing through the concrete conduit **42**. However, both cylinders **56** may be cycled to pump simultaneously, as when the concrete must be delivered to a great height, thus delivering the concrete in pulses of greater power. It may also be cycled to stop the operation of either cylinder, while continuing the operation of the other cylinder, or may be cycled to reverse the operation of either cylinder in case the concrete jams the cylinders. This cycling is controlled by the operator through the switches on the control panel **22**, who will know when other than regular automatic alternate pumping cycle is needed from scanning the gauges **154** and **156** on the panel **22**.

All the hydraulic cylinders, valves and pump of the hydraulic system are of standard manufacture and design, and also, all parts used in the electrical control system are also of standard manufacture and design.

*Concrete pump electrical switching system*

This system is unique in that it employs two separate systems so tied together that either can operate independently or be operated as a reciprocating unit, and maintain perfect coordination.

In order to start an explanation of the operation of the electrical systems as related to the pump it is necessary to assume that a certain movement is in progress, one one-half or side of the pumping cycle will be first described.

It is assumed that the main cylinder **56** of the pump is in its push stroke, pushing to the rear and discharging the concrete **82** into the hose **42**.

To illustrate the electrical system so arranged as to be supplying power to the proper valve, reference is made to the schematic diagram in FIG. 13.

The limit switches S–1 and S–2 are snap-action, single-pole, double-throw switches which remain in a closed contact position until a mechanical force moves them to the other closed contact position.

Relay R–1 is a four-pole, single-throw relay while R–2 is a six-pole, double-throw relay.

The manual switches MS–1, MS–2, and MS–3 are double-pole, double-throw switches.

The valves V–1, V–2, V–3 and V–4 are the pilot solenoid valves, which control the flow of hydraulic fluid to the proper hydraulic cylinder, valves V–1 and V–4 being valves **102** for positioning globe valve **88**, and valves V–2 and V–3 being valves **138** for operating hydraulic piston **134** to actuate concrete piston **104**.

The following would be the position of valves and switches to give the movement previously mentioned:

S–1—Closed in push position (in solid outline).

S–2—Closed in push position (in solid outline).

R–1—Closed (or activated) position (in solid outline).

R–2—Closed (normal closed) position (in solid outline).

MS–1, MS–2, MS–3, and MS–7 are in lock position. (The other position on MS–1, MS–2, MS–3 is used only to reverse the operation in event of a jam in the concrete. This is also a unique operation.)

V–1—Neutral position (in solid outline).

V–2—Activated in push position (in solid outline).

MS–8—Grounded to one operational side (in dotted or dash outline).

As the main hydraulic piston **104** in cylinder **56** reaches its limit of travel in the push stroke, it then trips limit switch S–**1** to the pull position (in dash outline). This in turn activates the R–2 relay closing the normally open contacts (as shown in dash outline position). This lets the valve V–**2** go to the neutral position (in dash outline) and activates valve V–**1** from the neutral to the push position (in dash outline). The valve V–**1** in this position moves the concrete globe valve **88** of the concrete pump **56** to the intake position shown in FIG. 4.

As the small hydraulic piston **98** in cylinder **100** on the concrete globe valve **88** reaches the end of its stroke and has moved the concrete globe valve **88** to its intake position, it then trips limits switch S–**2** to the pull position (in dash outline). This action returns V–**1** to its neutral position (in full outline) and activates V–**2** to the pull position (in dotted outline). There is no relay movement at this time.

As the main concrete piston **104** in cylinder **56** completes its movement toward the front of the truck **14** on its intake stroke it then trips limit switch S–**1** to the push position (in full outline). This deactivates R–**2** letting it drop to its normally closed position (in full outline). This returns V–**2** to its neutral position (in dash outline) and activates V–**1** to the pull position (in dotted outline).

As the small hydraulic piston **98** in cylinder **100** on the concrete globe valve **88** has moved the globe valve **88** from the intake position of FIG. 4 to the pump position of FIG. 5, it then trips limit switch S–**2** to the push position (in solid outline). This returns valve V–**1** to the neutral position (in solid outline) and activates valve V–**2** to the push position (in solid outline). This places us back at the point where we started with the pump piston **104** in cylinder **56** in pump or push stroke shown in FIG. 5.

This description of operation covers only one side or half the pumping cycle. To use both sides and coordinate the movement it was necessary to add relays R–**1** and R–**3**. These relays furnish the continuity to operate solenoid valve V–**2** in the push position only when activated by the tripping of the main cylinder switch (S–**1** or S–3) on the opposite side.

Switch MS–**8** controls the single cylinder operations of the machine and is selective as to which side (dash outline or dotted outline) is desired.

Switch MS–**7** is the main power switch into the control panel. All components use a single voltage for operation (normally 12 volt D.C.), usually the battery of the truck **14**.

The operation of the hydraulic powered mobile concrete pump of this invention is believed to be obvious from the above description. As will be apparent, it may use either pumping and sucking piston and cylinder independently of the other, or either one may be reversed in case the concrete **82** should jam, or both pumping and sucking pistons and cylinders may be coordinated to pump alternately and thus provide a substantially continuous flow, or to pump simultaneously, to thus provide much greater pumping power and thus, in start and stop pulses, pump the concrete a greater distance or to a greater height.



Although this invention has been described in considerable detail, such description is intended as being illustrative rather than limiting, since the invention may be variously embodied, and the scope of the invention is to be determined as claimed.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

**1.** A hydraulic powered concrete pump assembly comprising a concrete supply hopper, a concrete pump cylinder, a discharge concrete conduit, a valve seat port connecting said hopper to said concrete pump cylinder, a second valve seat port connecting said concrete pump cylinder to said discharge conduit, a valve operable between positions opening either valve seat port while closing the other valve seat port, a concrete sucking and pumping piston in said concrete pump cylinder, a first hydraulic cylinder, a hydraulically reciprocable piston in said first hydraulic cylinder, a piston rod connecting said first hydraulic cylinder to said concrete sucking and pumping piston, a second hydraulic cylinder and hydraulically reciprocable piston therein, means linking said second hydraulically reciprocable piston to said valve and operating said valve between said valve seat ports, a hydraulic pressure means, a two-way solenoid valve means connecting said hydraulic pressure means to said first hydraulic cylinder and a second two-way valve means connecting said hydraulic pressure means to said second hydraulic cylinder, and limit switch means operatively connected to said concrete sucking and pumping piston and said valve operating hydraulic piston for actuating said solenoid valve means.

**2.** The assembly of claim **1**, said valve being a globe valve.

**3.** The assembly of claim **1**, and water lubricating and cleaning means comprising a water supply means, water feed means connecting said water supply means to said reciprocable concrete sucking and pumping piston, a plurality of piston rings on said concrete sucking and pumping piston bearing against the inner surface of said pump cylinder, said concrete sucking and pumping piston having water conduit means connecting said water feed means to the areas between said piston rings thereon.

**4.** The assembly of claim **3**, said water feed means including water pressure means and flow control valve means.

**5.** The assembly of claim **3**, and a wash down water spray pipe on said hopper, said water feed means being connected to said hopper spray pipe.

**6.** The assembly of claim **3**, said water feed means including telescoping water feed tube means connecting to said concrete sucking and pumping piston.

**7.** The assembly of claim **3**, and water discharge means connected to said piston conduit means.

**8.** The assembly of claim **4**, said water feed means including an excess water return conduit connected thereto between said water pressure means and said concrete sucking and pumping piston.

**9.** The assembly of claim **6**, and telescoping water discharge tubes connected to said piston water conduit means.

**10.** The assembly of claim **1**, said hydraulic pressure means including a hydraulic fluid reservoir, fluid conduit means connecting said fluid reservoir through said solenoid valve means to said hydraulic cylinders and back to said reservoir, and fluid pressure creating pump means in said fluid conduit means between said reservoir and solenoid valve means.

**11.** The assembly of claim **10**, said fluid pressure creating pump means including one gear hydraulic pump for said solenoid valve means to said concrete sucking and pumping piston hydraulic cylinder, and a second gear pump for said solenoid valve means to said valve operating hydraulic cylinder.

12. The assembly of claim 1, and a second similar assembly, and electrical control means connected to said solenoid valve means actuating both said assemblies in out-of-phase relation.

13. The assembly of claim 1, and a second similar assembly, and electrical control means connected to said solenoid valve means actuating both said assemblies in in-phase relation.

14. The assembly of claim 1, and a second similar assembly, and electrical control means connected to said solenoid valve means for selectively actuating either assembly alone.

15. The assembly of claim 1, and a second similar assembly, and electrical control means connected to said solenoid valve means for selectively actuating either assembly alone, or both assemblies in either in-phase or out-of-phase relation.

16. The assemblies of claim 15, and water lubricating and cleaning means comprising a water supply means, water feed means connecting said water supply means to said reciprocable concrete sucking and pumping pistons, a plurality of piston rings on said concrete sucking and pumping pistons bearing against the inner surfaces of said pump cylinders, said concrete sucking and pumping pistons having water conduit means connecting said water feed means to the areas between said piston rings thereon.

17. The assemblies of claim 16, said water feed means including water pressure means and flow control valve means.

18. The assemblies of claim 17, said water feed means in cluding an excess water return conduit connected thereto between said water pressure means and said concrete sucking and pumping piston.

19. The assemblies of claim 18, said water feed means including telescoping water feed tubes connected to said concrete sucking and pumping piston, and telescoping water discharge tubes connected to said piston water conduit means.

20. The assemblies of claim 1, said hydraulic pressure means including a hydraulic fluid reservoir, fluid conduit means connecting said fluid reservoir through said solenoid valve means to said hydraulic cylinders and back to said reservoir, and fluid pressure creating pump means in said fluid conduit means between said reservoir and solenoid valve means.

21. The assemblies of claim 20, said fluid pressure creating pump means including three gear hydraulic pumps, there being one gear hydraulic pump for each said solenoid valve means to said concrete sucking and pumping piston hydraulic cylinder of each assembly, and a third gear pump for both said solenoid valve means to said valve operating hydraulic cylinders of both assemblies.

22. The assembly of claim 1, and manual switch means between said limit switch means and said solenoid valve means for controlling said solenoid valves to stop or reverse actuation of said concrete sucking and pumping piston.

23. The assemblies of claim 15, said electrical control means including manual control means between said limit switch means and said solenoid valve means for controlling said solenoid valve means to selectively stop either assembly while operating the other assembly, or stop either assembly and reverse the other assembly, or reverse both assemblies.

24. The assembly of claim 11, and a powered mobile vehicle on which said assembly is mounted, a power engine and electricity source on said vehicle for transporting said vehicle, and power takeoff means connected to said power engine to operate said hydraulic pressure means and said gear hydraulic pumps, and a circuit connecting said vehicle electricity source to said solenoid valve means and electrical control means therefor.

25. The assemblies of claim 15, said hopper having a double feed spout at the bottom thereof, one spout being connected to said concrete pump cylinder of one assembly and the other spout being connected to said concrete pump cylinder of said other assembly, and a Y-shaped concrete transport conduit having one concrete receiving arm thereof connected to each said pump cylinder and a common concrete feed leg, and a transport conduit means detachably connected to said Y concrete feed leg.

26. The assemblies of claim 25, a cylindrical tank providing one of said fluid supply means, cradle means supporting said cylindrical fluid tank at its ends, said concrete transport conduit means comprising a flexible hose, and a reel rotatably mounted about said cylindrical tank for receiving and storing said flexible concrete transport hose thereon.

27. In a concrete sucking and pushing pump, a pump cylinder and a piston movable therewithin, said piston comprising a front face plate, a spacer, a rear face plate, a pusher plate at the rear of said rear face plate, and stud securing means extending through said front face plate, said spacer, said rear face plate and said pusher plate holding said piston in assembled position, the diameter of said face plates being less than the internal diameter of said pump cylinder but substantially greater than the external diameter of said spacer and said pusher plate thereby providing a channel of substantial depth about said spacer between said face plates, and a forwardly facing rubber cup piston ring mounted on the periphery of each face plate, the uncompressed diameter of each rubber cup piston ring being greater than said internal diameter of said pump cylinder, and water circulating means extending through said piston to the channel about said spacer between said rubber cup piston rings and the inside of said pump cylinder.

28. In the pump of claim 27, said water circulating means comprising water passages extending through said rear face plate and said spacer to the periphery of said spacer.

29. In the pump of claim 28, and water conduits connected to said water passages, a piston connecting rod secured to said pusher plate, hydraulic means for reciprocating said piston connecting rod, and telescopic inner and outer sleeves connecting a water source to said water conduits.

30. In the pump of claim 27, each said face plate periphery having a channel dividing said periphery into front and back lips, each said rubber cup piston ring comprising a rearwardly extending flange internally complementary said channel and lips of the face plate periphery, and a forwardly extending cup portion overlapping an annular portion of the forward face of its face plate and extending outwardly, in uncompressed position, to a diameter greater than said internal diameter of said pump cylinder.

31. In the pump of claim 30, the diameter of said rear face plate lip being greater than that of said front lip, said rearwardly extending flange of said rubber cup piston ring having an annular rear surface in the plane of the rear face of said face plate, the outer periphery of said rubber cup piston ring, in uncompressed position, extending inwardly and forwardly at slightly less than a right angle from said rear annular surface to a diameter still slightly greater than said internal diameter of said pump cylinder at a point forward of said face plate forward face, thence outwardly and forwardly to form an acute angle with a forward annular surface parallel to said rear annular surface, the inner edge of said forward annular surface being substantially equal in diameter to said internal diameter of said pump cylinder, and thence extending inwardly and rearwardly at an acute angle to the

forward face of said face plate at a point substantially inward of the face plate periphery, and thence outwardly in contact with said face plate forward face to said rearwardly extending flange.


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