

[54] CONTROL FOR VEHICULAR CONCRETE MIXER

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259/170

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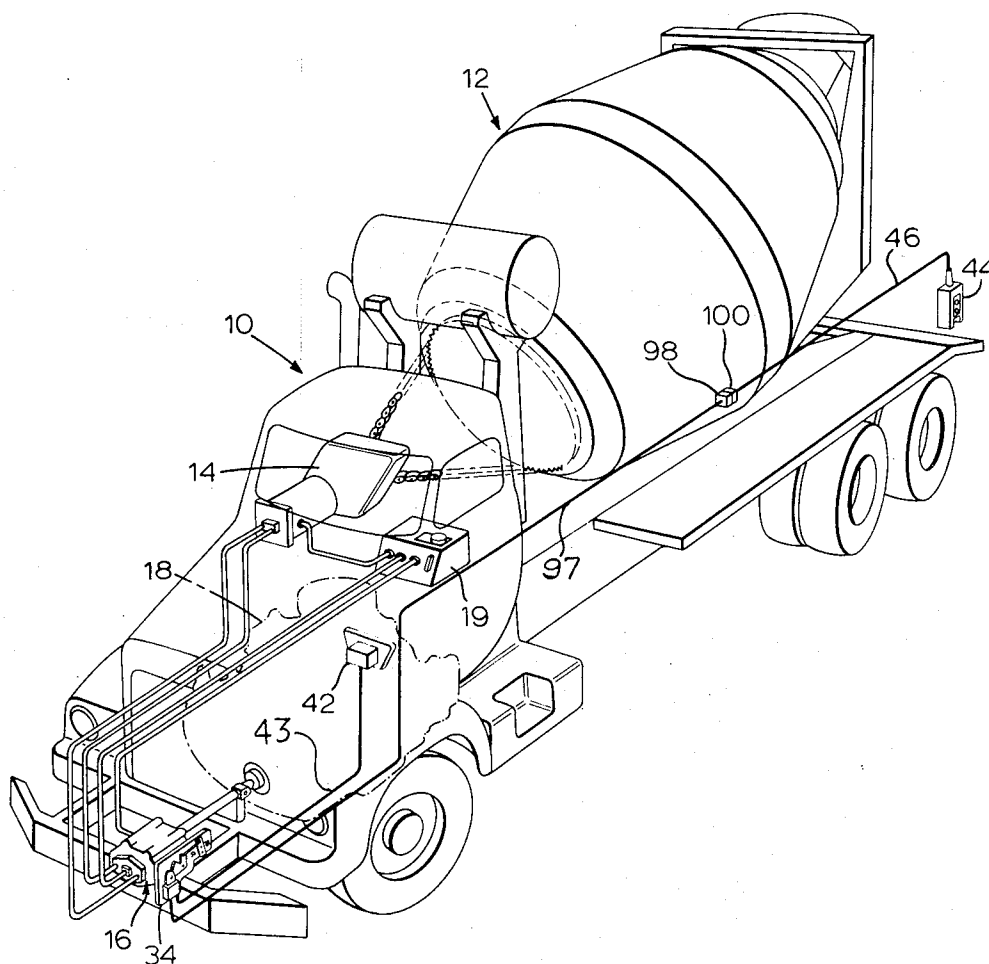
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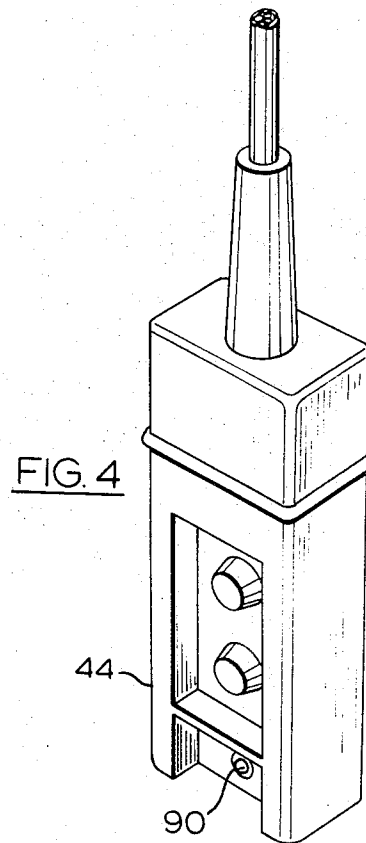
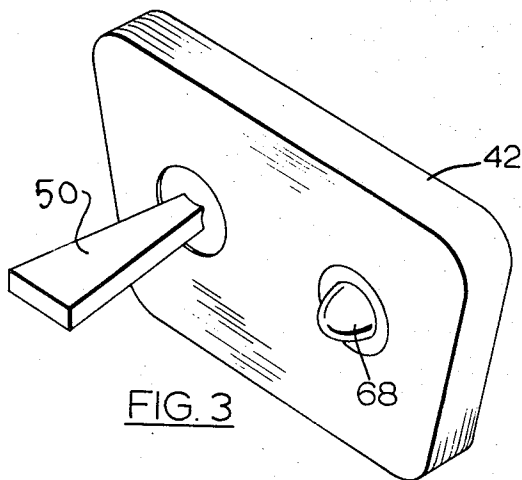
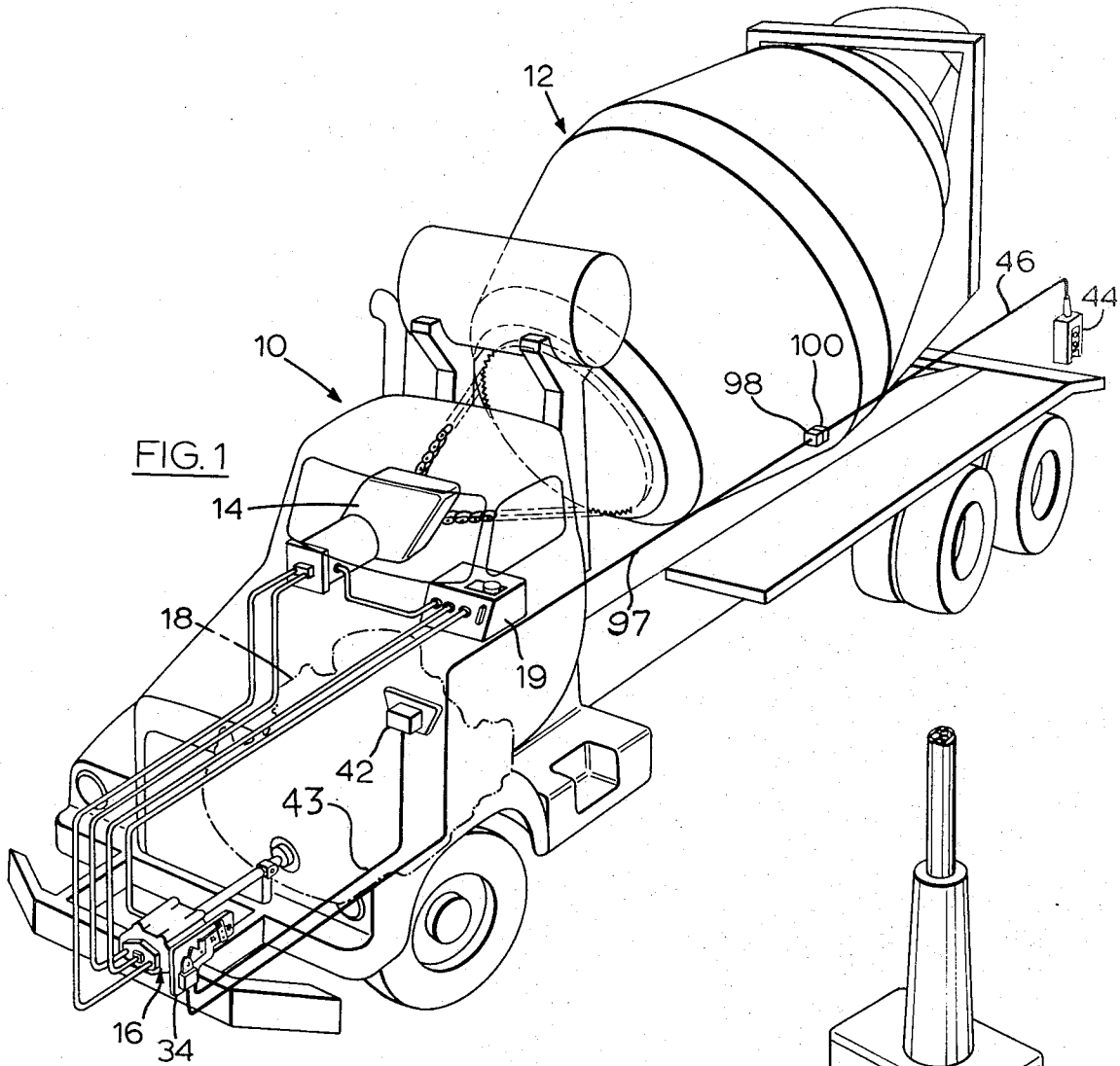
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[57] ABSTRACT

This invention relates to a concrete mixer comprising a body; a rotatably mounted mixer on said body; a hydraulic motor for rotating said mixing drum; a reversible pump for supplying hydraulic fluid to said hydraulic motor; a control member for said reversible pump operable in opposite directions from a neutral position in which said pump is inoperable to institute delivery of fluid from said pump in opposite directions at a rate dependent upon the amount of movement from said neutral position; an electric motor operable to give rotational output in both directions; remote control means for said electric motor manually operable to operate said electric motor in either direction of rotation at a desired cumulative amount; a transmission for connecting the rotational output of said motor to said control member for said reversible pump whereby said control member can be operated in both directions through said neutral position to control the rotation of said mixing drum; limit means for limiting the travel of said control member in each direction; and signal means adjacent said remote control means responsive to the location of said control member in its said neutral position to indicate to an operator when said control member is in said neutral position.

5 Claims, 5 Drawing Figures





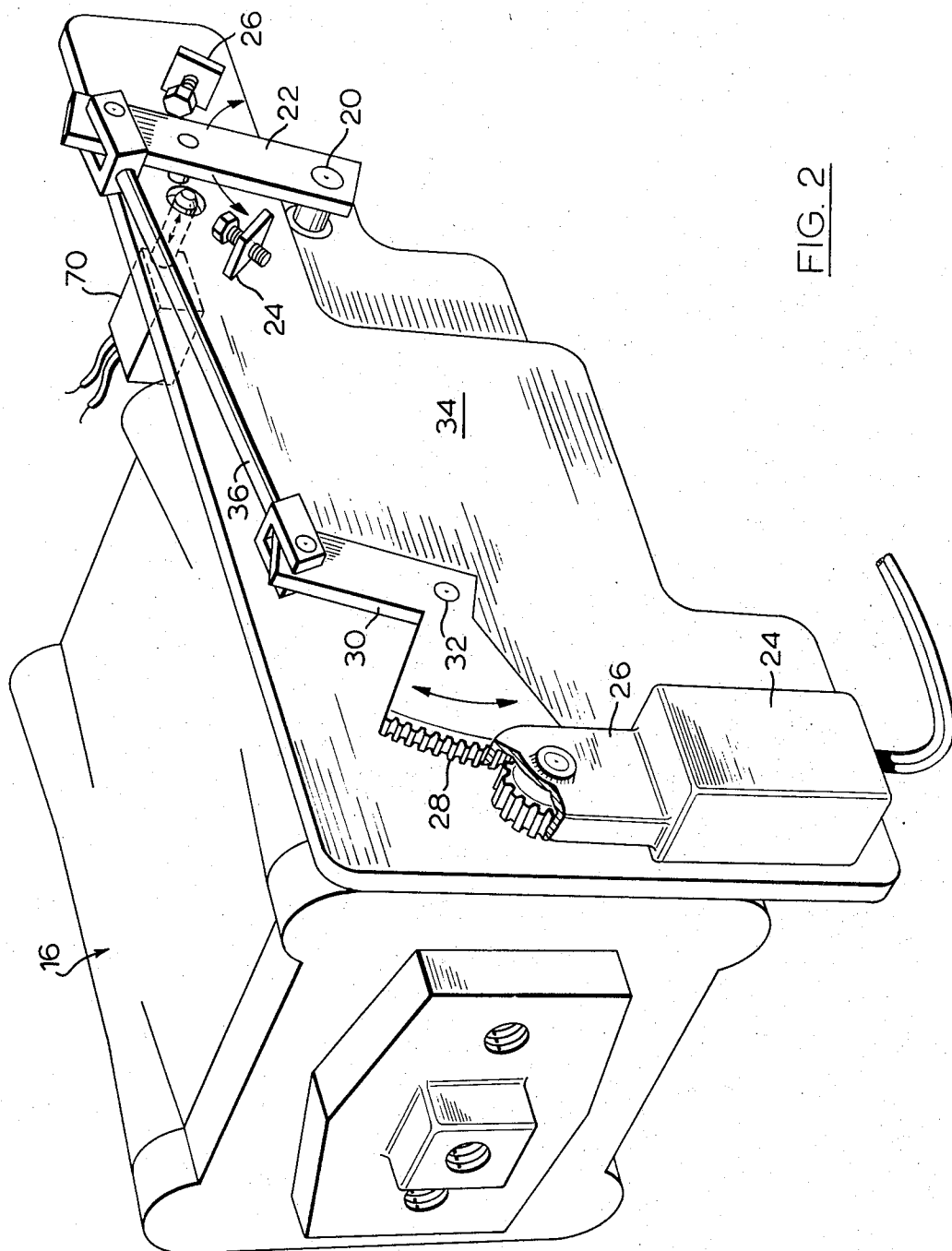


FIG. 2

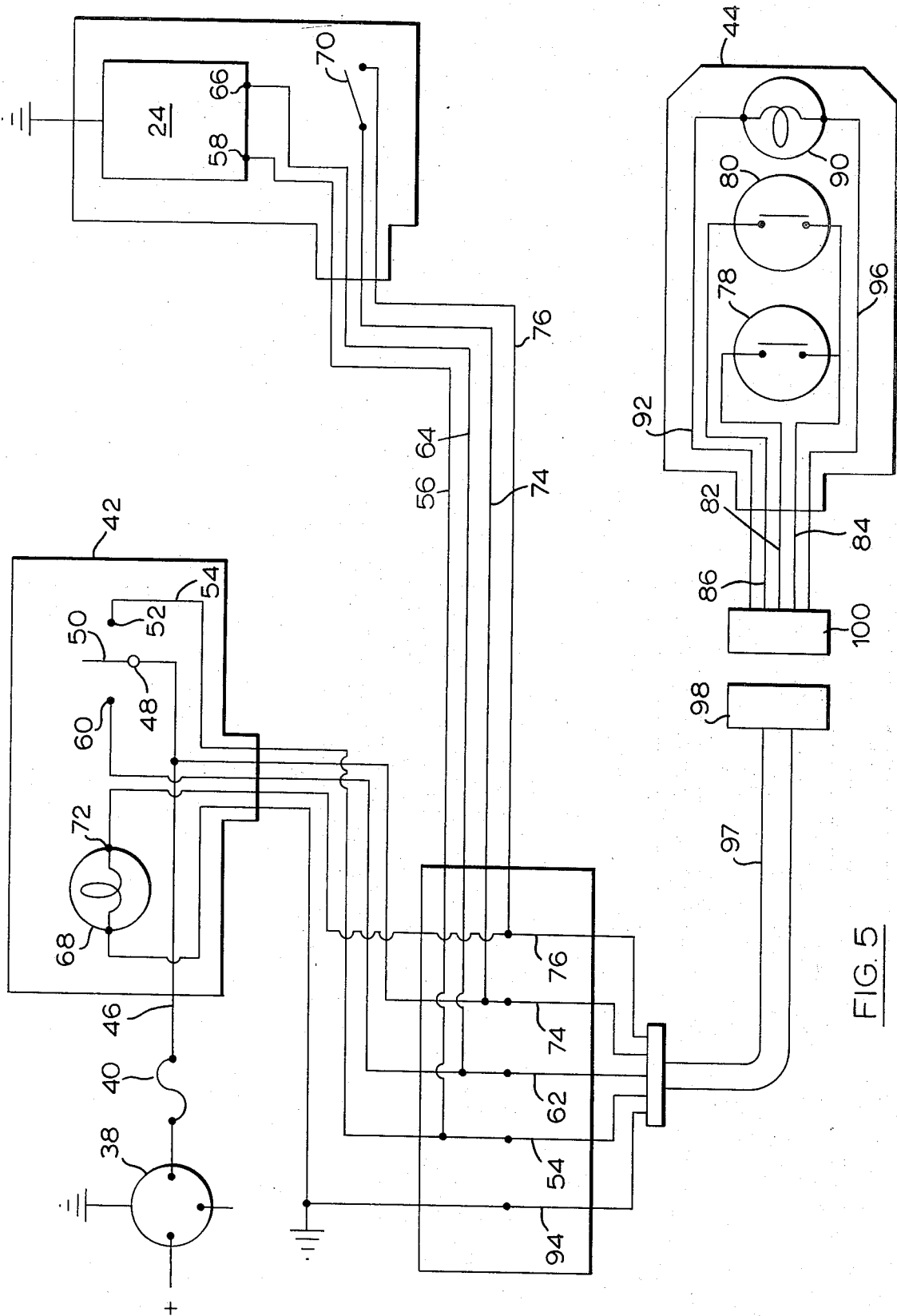


FIG. 5

CONTROL FOR VEHICULAR CONCRETE MIXER

This invention relates generally to concrete mixers of a type that are mounted on concrete delivery trucks and which mix the concrete as they deliver it to the site where it is to be used. More particularly, it relates to a control device for controlling the rotation of the mixing drum on the truck body.

Concrete mixers must have a means for controlling the direction of rotation of the mixing drum. These drums are designed so that they mix the concrete when the drum is rotated in one direction and discharge the concrete from the drum when the drum is rotated in the opposite direction. In the case of truck mounted concrete mixers, the drum is rotated by means of a high pressure hydraulic motor that is supplied with hydraulic fluid by means of a hydraulic pump which is in turn operated by the engine of the vehicle. The pump is provided with a pump control lever which can be actuated to either side of a neutral position. In the neutral position, no fluid is delivered by the pump. When the lever is moved to one side of the neutral position, the fluid is supplied in one direction and when the lever is moved to the other side of the neutral position, fluid is supplied in the other direction. Thus, the motor for the mixing drum can be rotated in either direction by manipulating the position of the control lever on the pump. The speed of the motor and hence the speed of rotation of the mixing drum is controlled by the amount that the control lever is displaced from the neutral position.

It is necessary to control the pump that operates the motor from a remote position and in order to do this, a control is mounted on the vehicle body at the rear where it is accessible by an operator who wants to unload concrete in the drum. A control is also provided in the cab of the truck where it is accessible by the operator of the truck to control the mixing speed during travel.

The controls for the lever arm have, in the past, been mechanical ones and have consisted of a control cable that is actuated by means of a lever at the control location. Controls of this type work well for a limited period of time and under good weather conditions. The difficulty with them has been that under cold and icy conditions, they tend to ice up and jam. They also leave something to be desired from the point of view of convenience because there is a limit to the distance that the control location can be placed from the pump and in any event, the control must be rigidly mounted on the truck or mixer.

It is obvious that an electrically operated control could overcome these difficulties but obvious electrical control devices have proven too costly for adoption for this application.

It has been discovered that it is possible to provide a rugged and inexpensive electrical type of control that overcomes all of the disadvantages of the present mechanical controls and that has additional advantages from the point of view of remoteness of operation. Moreover, the control of this invention can be manufactured for a cost not greater, and in many cases less than, the existing mechanical control.

It is then an object of this invention to provide a rugged, inexpensive, electrically operated control for the pump of a vehicularly mounted mixing drum the performance of which will not be affected by conditions of

adverse weather and dirt and that will give an improved flexibility in control location.

With these and other objects in view a concrete mixer truck according to this invention comprises a body, rotatably mounted mixing drum on said body, a hydraulic motor for rotating said mixing drum, a reversible pump for supplying hydraulic fluid to said hydraulic motor, a control member for said reversible pump operable in opposite directions from a neutral position in which said reversible pump is inoperable to institute delivery fluid from said pump in opposite directions at a rate dependent upon the amount of movement from said neutral position, an electric motor operable to give rotational output in both directions, remote control means for said electric motor operable to operate said electric motor in either direction of rotation a desired cumulative amount, a transmission for connecting the rotational output of said electric motor to said control member for said reversible pump whereby said control member can be operated in both directions through said neutral position to control the rotation of said mixing drum, limit means for limiting the travel of said control member in each direction and signal means adjacent said remote control means responsive to location of said control member in its said neutral position to indicate to an operator when said control member is in said neutral position.

The invention will be clearly understood after reference to the following detailed specification read in conjunction with the drawings.

In the drawings:

FIG. 1 is a schematic illustration of a concrete mixer of the type to which this invention relates;

FIG. 2 is a detailed illustration of the reversible pump, the control member for the pump and the electric motor that operates the control member;

FIG. 3 is an illustration of the manual control for the remote control means for the reversible pump that is located in the cab of the vehicle;

FIG. 4 is an illustration of the manually operable device of the remote control means that can be used at a location remote from the vehicle; and

FIG. 5 is a wiring diagram of the remote control system for the electric motor.

Referring to the drawings and at first in a general way to FIG. 1, numeral 10 generally refers to a truck upon which is rotatably mounted a mixing drum 12 of a concrete mixer. The mixing drum 12 is rotatable in either direction by means of a hydraulic motor 14. Hydraulic motor 14 is driven by high pressure fluid delivered from the pump 16 which is in turn driven by a power take off from the engine 18 of the truck vehicle upon which the whole is mounted. A hydraulic fluid reservoir is shown at 19.

As is well known in the art, rotation of the mixing drum in one direction mixes the concrete mixture within the drum and rotation in the opposite direction discharges the concrete from the back end of the drum. It is therefore, necessary that the motor 14 be capable of driving the drum 12 in either direction and this control is achieved by controlling the direction of the flow of hydraulic fluid from the pump 16 to the motor 14.

Pump 16 has a control shaft 20. A control lever 22 is attached to the free end of the control shaft 20.

The shaft 20 and the lever 22 form part of the presently common control means for the pump 16. When the pump control lever 22 is in a vertical position, the

pump is inoperative and does not deliver hydraulic fluid to the motor 14. When the lever is moved to the right of the neutral position to turn the shaft 20 in a clockwise direction, fluid is supplied in one direction to the motor 14 and when the lever 22 is moved to the left from the neutral position to turn the shaft in a counterclockwise direction, hydraulic fluid is supplied to the motor 14 in the opposite direction. Thus, movement of the pump control lever to the right operates the motor in one direction and movement of the pump control lever to the left operates the motor 14 in the opposite direction. The rate of fluid supplied to the motor is controlled by the amount of movement of the lever from the vertical or neutral position. The rate of fluid delivery increases as the distance from the neutral position increases. Thus, it is possible to control the speed of rotation as well as the direction of rotation of the mixing drum 12. Numerals 24 and 26 are stop means which limit the movement of pump control lever in either direction from the neutral position. The pump 16 and motor 14 and their connection and operation are well known in the art and are not dealt with in detail in this application.

As has been indicated in the preamble to this specification, it has been common to operate lever 22 by means of a mechanical control cable. These control cables have for a long time been a source of trouble in the operation of the equipment. This invention overcomes the difficulties of the prior art and provides an inexpensive and reliable means for controlling the pump that is more flexible.

The reversible pump 16 is controlled by means of an electric motor 24, the rotational output of which is applied through the worm and wheel reduction unit 26 to operate a gear segment 28 of a crank arm 30, which is in turn pivotally mounted as at 32 on the plate 34. Plate 34 is mounted on the side of the pump 16. An adjustable control rod 36 connects the crank arm 30 with a free end of the pump control lever 22.

It will be readily apparent that operation of the motor 24 in one direction will turn the lever 22 and its shaft 20 to the right and movement of the motor in the other direction will turn the lever 22 and shaft 20 to the left. Motor 24 is operable to give rotational output in both directions.

Remote control means are provided for the motor 24 to operate it in either direction of rotation any desired amount so that one can, from a remote location, operate the control lever 22 in both directions through the neutral position to control the direction and delivery rate of hydraulic fluid delivered by the pump to the motor 14 and hence control the direction and rate of speed of rotation of the mixing drum 12. A signal device operable by switch 70 is provided adjacent the remote control means which is responsive to the location of the control lever in a position that corresponds to the neutral position where no fluid is delivered by the pump.

FIG. 5 is a wiring diagram which explains the remote control means. The motor 24 is operated from the 12 volt storage battery 38 of the engine of the truck. The fuse 40 limits the power to the motor. The motor also has built-in over load protection.

The manually operable device of the remote control means illustrated in the drawings comprises a control centre 42 which is mounted in the cab of the truck for the use of the cab driver in controlling the mixing func-

tion of the mixer drum 12 in transit and a control box 44 which is located at the end of a cable 46 for use by an operator at or near the truck to control discharge from the mixing drum. Either control centre is capable of controlling the operation of the drum in either direction and also in a stopped condition.

The high voltage side of the battery 38 is connected by means of cable 46 to the central contact 48 of a toggle switch on control centre 42. If toggle switch element 50 of the toggle switch is moved to the right to engage contact 52, the high voltage side of the battery is connected through cable 54 and cable 56 to motor contact 58 to operate motor 24 in one direction. If toggle switch element 50 is moved to the left to engage contact 60, the high voltage side of the battery is connected through cable 62 and cable 64 to the terminal 66 of motor 24 to rotate the motor in the opposite direction. Rotation in the direction controlled by motor input terminal 58 is rotation that tends to discharge contents from the mixing drum while rotation that results in the supply of power through terminal 66 tends to rotate the drum in a direction that will mix the contents of the mixing drum.

Thus, in order to operate the mixing drum 12 of the mixer at as fast a rate as possible, one would move lever 50 to the left to engage contact 60 and supply power to the motor 24 through terminal 58. The direction of rotation of the motor would be such that it would operate crank 30 in a counterclockwise direction to move the pump control lever 22 to the left up to the limit of the stop member 24. When lever 22 strikes stop member 24, the motor 24 will slip or stall. The design of the motor is such that the operator can maintain switch element 50 closed against contact 60 a reasonable period of time without burning the motor. Fuse 40 is designed to break if the operator holds switch 50 against contact 60 after the pump control lever has been moved against the stop member for an unduly long period of time.

In normal operation, the operator should release switch 50 after he has achieved the degree of movement of the pump control lever that gives him the desired speed of operation. He can move the control lever against the stop member which will give him maximum mixing speed. He may achieve mixing speeds anywhere between maximum speed and no speed by moving the control lever varying distances from its neutral position illustrated in FIG. 2.

If the operator desires to discharge contents from the drum while it is mixing, he would move the lever 50 to the right to engage contact 52. This would connect the power of the battery 38 to the contact 66 of the motor 24 and rotate the motor in the opposite direction to move the control lever 22 to the right through the neutral position and over to a position that will force hydraulic fluid through the pump in the opposite direction. As he performs this operation, the mixing speed will decrease, go through zero and then increase in the opposite direction. Stop member 26 limits the throw of the pump control lever and hence the speed of discharge.

The lever 50 is spring loaded to assume the neutral position illustrated in FIG. 5 when released by the operator.

It is important that the operator at the control station 42 should know when the pump control lever is in a neutral position because it is from the neutral position that he achieves either discharge or mix. Moreover, he

can judge the extent of the mixing and the discharge by the location of the neutral position.

In this respect, the control station 42 incorporates a light signal 68 which is responsive to the location of the control lever 22 in a neutral position. When the lever 22 is in a neutral position and no fluid is being delivered by the pump, a light 68 is illuminated. This is achieved by the operation of the micro switch 70 when the lever 22 assumes a neutral position. Closure of the micro switch electrically connects the side 72 of the bulb 68 to the high voltage side of the battery. The low voltage side is grounded, all as apparent in the wiring diagram. It will be noted that lever 22 has a button on it that is designed to engage and close switch 70 when the switch is in a neutral position.

Wires 54, 62, 74 and 76 are bundled in a single sheath 43 to extend from the control box 42 in the cab of the truck to the location of the motor 16 at the front end of the truck vehicle.

Control centre 44 is designed to be operated by an operator at a location remote from the truck vehicle. It consists of two switches 78 and 80 which can be manually depressed at will to rotate the motor 24 in one or the other direction. If the operator selects switch 78, he connects the high voltage side of the battery to terminal 58. In this connection, electricity conducting cable 82 electrically connects with cable 62 and electricity conducting cable 84 electrically connects with electricity conducting cable 74. If the operator selects switch 80, the high voltage side of the battery is connected to terminal 66 to rotate the motor in the opposite direction. In this connection, cable 86 electrically connects with cable 54, thus motor 24 can be rotated in either direction by depressing one or other of the switches 78 or 80. Switches 78 and 80 are normally urged to the open position as indicated in the drawings.

It is also necessary to have a light which will indicate to the operator when the mixing drum is in a neutral position and in this connection light 90 is provided. It is operated in a similar fashion to light 72. Cable 92 connects with cable 94 and cable 96 connects with cable 76, so that when micro switch 70 is closed by the location of the lever arm 22 in the neutral position, power is supplied to the signal light 90 to illuminate it. Signal light 90 could be replaced by a buzzer or the like.

Cables 94, 54, 62, 84 and 76 are also contained in a single sheath 97 which extends from a terminal box at the location of the motor 24 to one terminal 98 of a plug type connector at the rear of the truck. A mating terminal 100 is provided at the free end of a sheathed cable 46 that extends to the control device 44 and contains cables 86, 92, 82, 84 and 96. The sheathed cable that extends beyond the mating connectors 98 and 100 can be any desired length and will permit the operator to control the discharge from the mixing drum at a location remote from the truck. Thus, the operator can be at the location of delivery of concrete through a chute that extends to the truck and control the speed of delivery by operation of the remote control centre 44. This is a control feature not obtainable with the mechanical devices that have been used in the past.

With the previous mechanical controls for the pump 16, the control centre was of necessity, rigidly mounted on the truck body at about the location of the terminals 98 or 100. One can rigidly mount a control centre similar to the control centre 44 at this location if desired.

The mechanical detail for this will be apparent. The electrical detail is the same as for the centre 90.

Modifications to the embodiment of the invention illustrated will be apparent to those skilled in the art. It is not necessary, for example, that the shaft 20 be manipulated by means of a lever. It would be acceptable to provide an appropriate gear reduction device connecting the motor shaft and the shaft 20. Moreover, the invention which consists of a means for controlling the movement of the mixer drum has application beyond a mixer drum on a wheeled truck body.

I claim:

1. A concrete mixer comprising a body;
a rotatably mounted mixing drum on said body;
a hydraulic motor for rotating said mixing drum;
a reversible pump for supplying hydraulic fluid to said hydraulic motor;
a control member for said reversible pump operable in opposite directions from a neutral position in which said pump is inoperable to institute delivery of fluid from said pump in opposite directions at a rate dependent upon the amount of movement from said neutral position;
an electric motor operable to give rotational output in both directions;
remote control means for said electric motor manually operable to operate said electric motor in either direction of rotation at a desired cumulative amount;
a transmission for connecting the rotational output of said motor to said control member for said reversible pump whereby said control member can be operated in both directions through said neutral position to control the rotation of said mixing drum;
limit means for limiting the travel of said control member in each direction;
and signal means adjacent said remote control means responsive to the location of said control member in its said neutral position to indicate to an operator when said control member is in said neutral position.
2. A concrete mixer as claimed in claim 1 in which said control member comprises a rotatable shaft;
said remote control means includes a pump control lever secured at one end to said rotatable shaft;
a crank arm in driven engagement with said electric motor and link means connecting said pump control lever and said crank arm.
3. A concrete mixer as claimed in claim 1 in which said remote control means includes a plug-in terminal;
electric control cable from said electric motor to said plug-in terminal;
a manually operable control box;
an electric control cable connected to said control box;
said control cable having a plug at an end thereof connectable to said plug-in terminal.
4. A concrete mixer as claimed in claim 1 in which said body is a wheeled truck body.
5. A concrete mixer as claimed in claim 1 in which said control member comprises a rotatable shaft;
said remote control means includes a pump control lever secured at one end to said rotatable shaft;
a crank arm having a gear segment in driven engagement with said electric motor and link means connecting said pump control lever and said crank arm.

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