

May 17, 1955

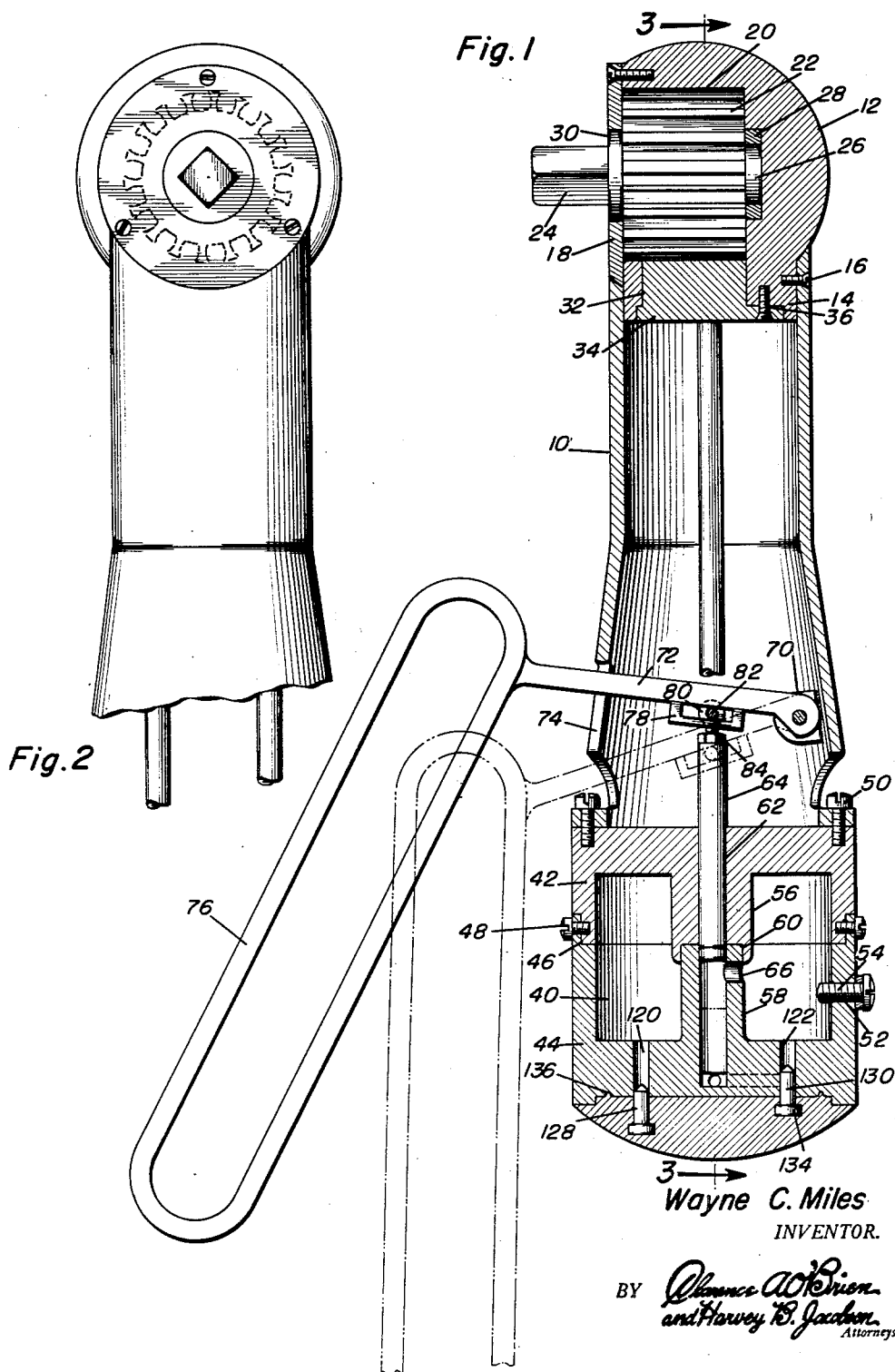
W. C. MILES

2,708,345

SELF-CONTAINED HYDRAULIC PUMP AND MOTOR TOOL

Filed Nov. 23, 1953

3 Sheets-Sheet 1



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SELF-CONTAINED HYDRAULIC PUMP AND MOTOR TOOL

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3 Sheets-Sheet 2

Fig. 4

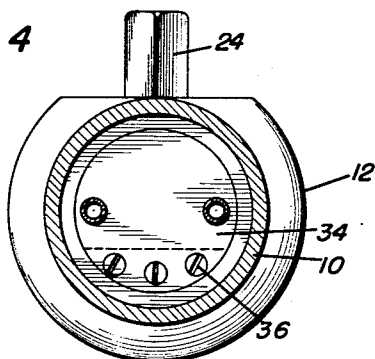


Fig. 5

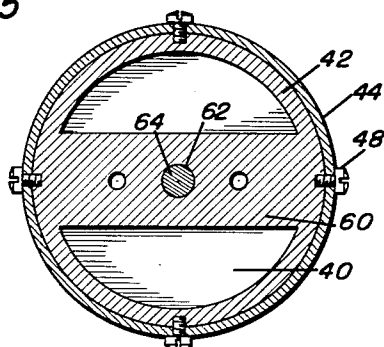


Fig. 6

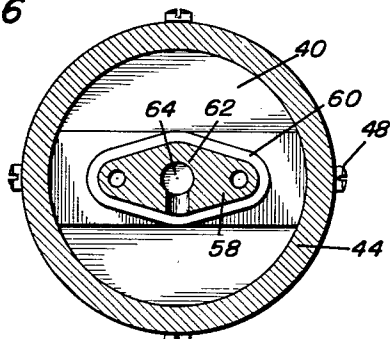


Fig. 7

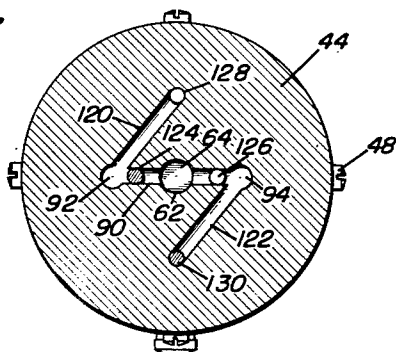
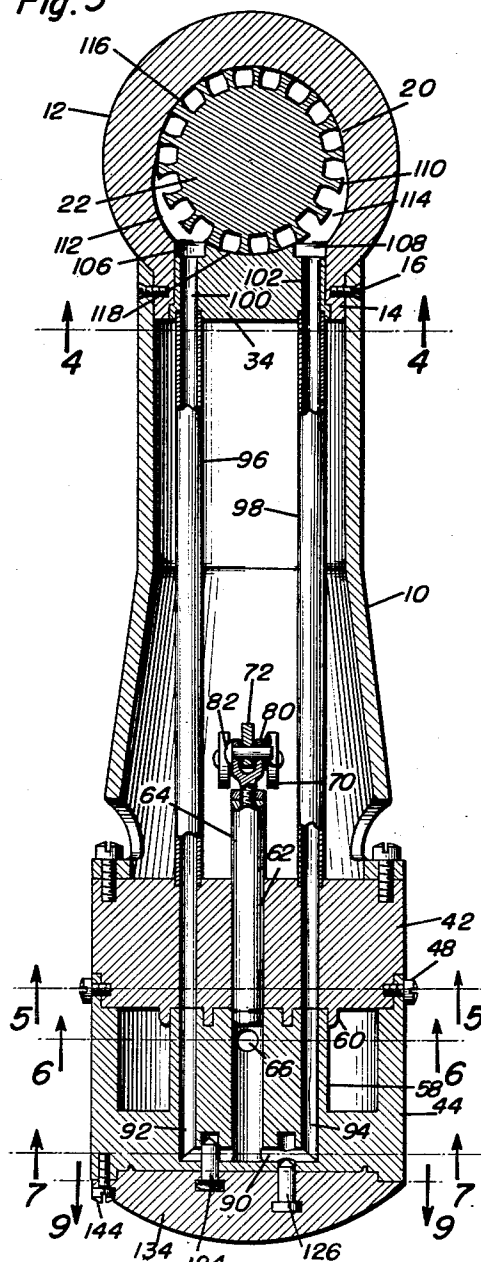


Fig. 3



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Fig. 8

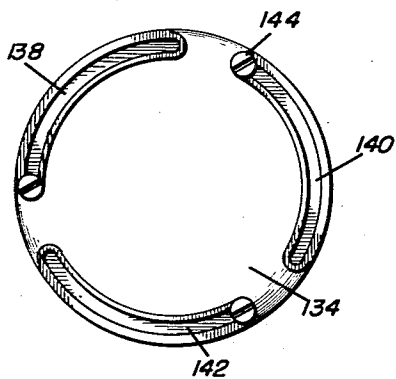


Fig. 9

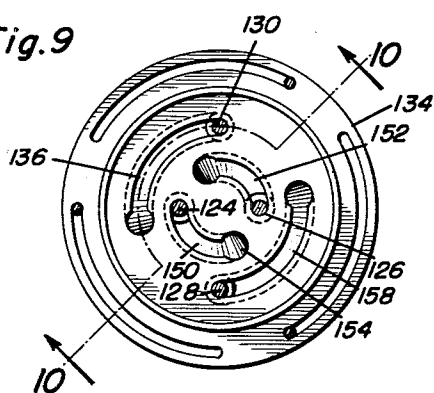


Fig. 10

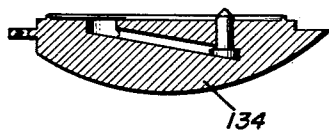


Fig. 11

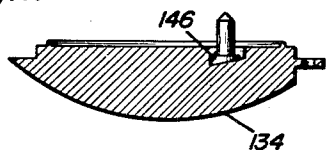


Fig. 12

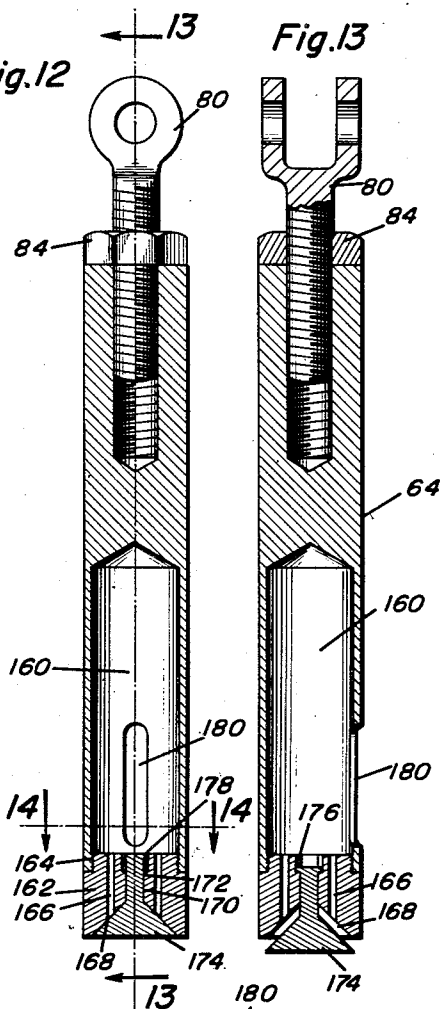


Fig. 13

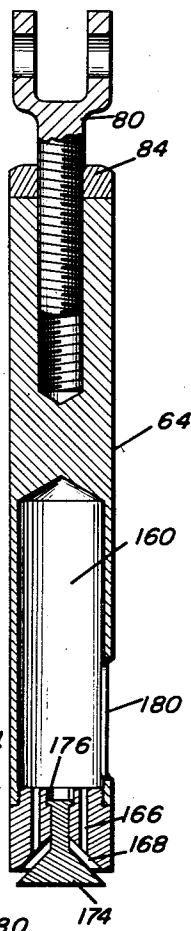
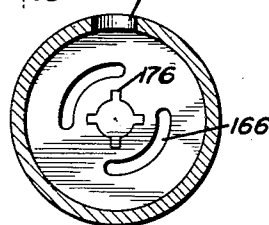


Fig. 14



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2,708,345

SELF-CONTAINED HYDRAULIC PUMP AND MOTOR TOOL

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Application November 23, 1953, Serial No. 393,608

3 Claims. (Cl. 60—54)

This invention relates to a hydraulic wrench and particularly to a hydraulic wrench to be manually controlled without the necessity of external connections.

In the application of wrenches it is frequently desirable to apply a wrench to turn a nut or a stud in a position where there is no room to provide the usually oscillatory motion of the wrench. Heretofore, it has been proposed to utilize hydraulic wrenches in which a supply line from a source of pressure is connected through the wrench handle to a suitable motor mounted in the wrench head so that the wrench may be applied and operated without the necessity of oscillatory motion of the handle.

It is also frequently desirable to apply such wrenches in positions where it is substantially impossible to provide the necessary supply lines or in positions where the suitable source of fluid under pressure is not available. The present invention provides a hydraulic wrench having a manually controlled pump therein for supplying fluid under pressure to the wrench head.

In the construction according to the invention the wrench handle is provided with a suitable fluid reservoir and a reciprocating piston type pump is communicated with the reservoir and is provided with valve means so that the pump may be connected through a pair of conduits in either direction to drive a suitable rotary motor so that the wrench may be operated by a simple squeezing motion of the hand so that the pump will operate to drive a pressure fluid to the operating head of the wrench.

It is accordingly an object of the invention to provide an improved hydraulic wrench.

It is a further object of the invention to provide a hydraulic wrench which is completely self-contained.

It is a further object of the invention to provide a manually controlled hydraulic wrench.

It is a further object of the invention to provide a reversible hydraulic wrench.

It is a further object of the invention to provide an improved pump for driving a hydraulic wrench.

Other objects and many of the attendant advantages of the present invention will be apparent from the following detailed description taken in conjunction with the accompanying drawing in which:

Figure 1 is a sectional elevation of a hydraulic wrench according to the invention;

Figure 2 is a plan view of the wrench head of a wrench according to the invention;

Figure 3 is a sectional plan view of the hydraulic wrench taken substantially on the plane indicated by the section line 3—3 of Figure 1;

Figure 4 is a cross section through the wrench taken substantially on the plane indicated by the section line 4—4 of Figure 3;

Figure 5 is a cross section through the wrench taken substantially on the plane indicated by the section line 5—5 of Figure 3;

Figure 6 is a cross section through the wrench taken substantially on the plane indicated by the section line 6—6 of Figure 3;

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Figure 7 is a cross section through the connecting conduits taken substantially on the plane indicated by the section line 7—7 of Figure 3;

Figure 8 is an end elevation view of the valve controller;

Figure 9 is a cross section through the valve controller taken substantially on the plane indicated by the line 9—9 of Figure 3;

Figure 10 is a cross sectional elevation taken substantially on the surface indicated by the section line 10—10 of Figure 9 and showing the cam track for receiving the cam heads of the valves;

Figure 11 is a sectional view similar to Figure 10 but with the controller rotated to close the valve;

Figure 12 is an enlarged sectional elevation of the pump piston according to the invention;

Figure 13 is a similar view of the pump piston but taken on the plane indicated by the section line 13—13 of Figure 12; and

Figure 14 is a cross sectional view of the piston taken substantially on the plane indicated by the section line 14—14 of Figure 12.

In the exemplary embodiment according to the invention the wrench handle 10 is shown as a substantially hollow body having a substantially hemispherical head 12 mounted thereon by any suitable means such as the projection 14 extending into the handle 10 and attached by means of screws or other fasteners 16. A face plate 18 is mounted on the head 12 which is provided with a substantially cylindrical aperture 20 in which is mounted a motor rotor 22 having a projecting stud 24 for the connection of wrench sockets or other such devices. A bearing stud 26 extends rearwardly from the rotor and is mounted in a suitable bearing 28 and preferably a bearing 30 is provided in the face plate 18 so that the rotor 22 and the stud 24 are properly journaled in the head 12. The projection 14 is provided with an aperture 32 in which is placed a control gate 34. It is preferably secured in position by means of suitable fasteners such as the screws 36. The gate 34 is utilized to supply fluid under pressure to the opposite sides of the rotor 22 as will presently be described.

A fluid reservoir 40 is composed of a primary portion 42 and a secondary portion 44 with the portions 42 and 44 being interfitted as shown at 46 and secured together by any suitable fasteners such as the screws 48. The fluid reservoir is preferably connected to and forms a continuation of the handle 10 and may be secured by any suitable means such as the screws 50. An aperture 52 is provided on the reservoir 40 for supplying a suitable fluid therein and a suitable closure member 54 may be applied to the aperture to prevent leakage therefrom.

Bodies 42 and 44 are provided with a central cylinder member comprising a top portion 56 and a bottom portion 58, the top portion 56 having a counterbore 60 to receive the end of the member 58 and a continuous bore 62 extends through the members 56 and 58 with the bore 62 opening through the outer surface of the member 42 and terminating adjacent the outer surface of the member 44. Piston 64 is reciprocal in the bore 62 and a passage 66 communicates the reservoir 40 with the interior of the cylinder 64. A bracket 70 is provided on the interior of the handle 10 and a lever 72 is pivotally connected thereto and extends outwardly through a slot 74 in the side of the handle 10. A suitable hand engaging loop 76 is connected rigidly on the lever 72 and extends in normally angular relation with respect to the reservoir 40. The lever 72 is provided with a longitudinal extending guideway 78 and the piston 64 is provided with an I-bolt 80 through which a pin 82 extends to slide within the guideway 78. A lock nut 84 is provided to lock the I-bolt 80 in firm engagement with the piston 64. A transverse

passageway 90 is provided in the body 44 adjacent the end of the bore 62 which is separated from the end of the body 44. A pair of longitudinally extending conduits 92 and 94 communicate with the opposite ends of the transverse passage 90 and extend in parallel relation to the bore 62 through the members 58 and 60 of the portions 44 and 42, respectively and are connected to longitudinally extending conduits 96 and 98 which extend longitudinally through the handle member 10 and are connected to passages 100 and 102 in the gate member 34 which communicates with enlarged pressure or suction chambers 106 and 108. The rotor 22 is provided with a plurality of peripheral teeth 110 and the bore 20 is provided with cut-out portions 112 and 114 which extend substantially to the transverse center line of the rotor 22 and the bore is provided with a clearance 116 so that fluid under pressure may escape past the ends of the teeth 110 and flow from either of the chambers 106 and 108 to the other as may be desired. Preferably the portion 118 of the head gate valve member 34 is in fluid tight relation with the edges of the teeth 110 so that no fluid may flow reversely between the chambers 106 and 108. A second pair of passages 120 and 122 are connected to the ends of the transverse passage 90 and extend inwardly into the reservoir 40.

A first pair of valves 124 and 126 are provided in the transverse passage 90 between the bore 62 and the ends communicating with the longitudinal passages 92 and 94 respectively. Also a second pair of valves 128 and 130 are provided in the passages 120 and 122, respectively, so that the end of the passages 92 and 94 may be connected to either the bore 62 or the reservoir 40.

In order to control the connections of the valves and the flow of fluid through the passages 96 and 98 and consequently the rotation of the rotor 22, the valve controller comprises a control knob 134 which is interfitted on the end of the member 44 and preferably is provided with guide ridges 136 which interfit with suitable grooves in the end of the member 44 and is also provided with a plurality of longitudinally extending slots 138, 140 and 142 through which extend suitable fasteners 144 herein shown as set screws for maintaining the member 134 on the member 40. The valves 124, 126, 128 and 130 are provided with cam heads 146 and the control head 134 is provided with a first pair of cam tracks 150 and 152 which engage the cam heads 146 of the valves 124 and 126. It will be noted that the cam tracks 150 and 152 are inversely and oppositely disposed and are substantially spiral in nature so that when valve 124 is closed, valve 126 will be open, and conversely when the valve 126 is closed the valve 124 will be opened. The cam tracks 150 and 152 are each provided with enlarged head 154 so that the cam heads may be readily engaged therewith. The second pair of cam tracks 156 and 158 is provided and they likewise are inversely inclined spirals and engage the cam heads 146 of the valves 128 and 130. The cam tracks 156 and 158 are so arranged that when the valve 124 is closed the valve 128 will be open and conversely when the valve 126 is open the valve 130 will be closed. Also when they are rotated so that valve 124 is open valve 128 will be closed and when valve 126 is closed valve 130 will be open.

In order to prevent reverse current flow or suction by action of the pump piston the piston is provided with a longitudinally extending bore 160 which communicates with the end of the piston opposite to the I-bolt 80 and is provided with a valve body 162 which may be secured thereto in any suitable means such as the threaded connection 164. The valve body 162 is provided with a plurality of longitudinally extending openings 166 and a conical valve seat 168. The conical valve seat 168 terminates in a central guide bore 170 through which extends the reciprocating shank 172 of a conical valve 174. The guide bore 170 is provided with key ways 176 and the guide stem 172 is provided with keys 178 which associate therewith to prevent rotary motion of the conical valve

174. A longitudinally laterally positioned slot 180 is positioned in the side of the piston 64 and is arranged to communicate with the passage 66 so that as the piston is being drawn outward the fluid will flow through the passage 66 and slot 180 and the passages 166 into the lower end of the bore 62 to prevent the creation of a suction pressure in the pump.

In the operation of the device according to the invention the reservoir will be filled with fluid and the same pumped into the conduits to fill the same so that the reservoir and the conduits will be completely full after which the plug 54 will be tightly inserted. To determine the direction of rotation of the stud 24 the member 134 will be rotated to cause the valves 124 to 130 to assume the desired relation after which the operator will place the desired fixture on the stud 24 and apply it to the bolt to be operated after which a simple reciprocation of the plunger 64 by means of the handle 72 and the finger-grip 76 will cause a fluid pressure to be exerted on the rotor 22 and cause the rotation thereof. The conical valve member 174 will close the passages 166 in the end of the piston 64 so that on the downward or pressure stroke of the pump there will be no reverse fluid flow but the flow of fluid will necessarily be through one of the conduits 96 or 98 depending upon the setting of the controller. Upon the back stroke of the piston 64 the fluid will flow from the reservoir 40 through the passage 66 in the slot 180 and through the passages 166 to open the conical valve 174 and flow into the end of the cylinder adjacent the transverse passage 90 so that there will be no reverse pressure exerted on the motor rotor 22. To reverse the direction of rotation of the motor it is simply necessary to reverse the position of the controller 134 which opens and closes valves to provide the necessary connections to control the direction of fluid flow.

It will thus be apparent that the present invention has provided a self contained hydraulic wrench which may be readily operated by the hand of the operator without the connection with any fluid passages thereto.

For purpose of exemplification a particular embodiment of the invention has been shown and described according to the best present understanding thereof. However, it will be apparent to those skilled in the art that various changes and modifications may be made in the construction and arrangement of the parts thereof without departing from the true spirit and scope of the invention.

What is claimed as new is as follows:

1. A hydraulic wrench comprising a handle member, a fluid motor mounted on said handle, a fluid reservoir mounted on said handle member, a cylinder mounted on said handle, a piston reciprocable in said cylinder, an actuating lever pivoted on said handle and operatively engaging said piston, a passage communicating said reservoir with said cylinder at a point intermediate the ends of the latter, a transverse passage communicating with one end of said cylinder, a first pair of conduits communicating the ends of said transverse passage with said fluid motor, a second pair of conduits communicating the ends of said transverse passage with said reservoir, a first pair of valves disposed in said transverse passage and arranged between said cylinder and the opposite ends of said transverse passage, a second pair of valves disposed in said second pair of conduits, and valve operating means operative to determine the direction of fluid flow through said first pair of conduits.

2. A hydraulic wrench comprising a handle member, a fluid motor mounted on said handle, a fluid reservoir mounted on said handle member, a cylinder mounted on said handle, a piston reciprocable in said cylinder, an actuating lever pivoted on said handle and operatively engaging said piston, a passage communicating said reservoir with said cylinder at a point intermediate the ends of the latter, a transverse passage communicating with one end of said cylinder, a first pair of conduits com-

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municating the ends of said transverse passage with said fluid motor, a second pair of conduits communicating the ends of said transverse passage with said reservoir, a first pair of valves disposed in said transverse passage and arranged between said cylinder and the opposite ends of said transverse passage, a second pair of valves disposed in said second pair of conduits, and valve operating means operative to determine the direction of fluid flow through said first pair of conduits, said piston having a longitudinal bore therein, one end of said bore communicating with the interior of said cylinder, a check valve in said bore, said piston having a longitudinal slot communicating said bore with said first mentioned passage.

3. A hydraulic wrench comprising a handle member, a fluid motor mounted on said handle, a fluid reservoir mounted on said handle member, a cylinder mounted on said handle, a piston reciprocable in said cylinder, an actuating lever pivoted on said handle and operatively engaging said piston, a passage communicating said reservoir with said cylinder at a point intermediate the ends of the latter, a transverse passage communicating with

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one end of said cylinder, a first pair of conduits communicating the ends of said transverse passage with said fluid motor, a second pair of conduits communicating the ends of said transverse passage with said reservoir, a first pair of valves disposed in said transverse passage and arranged between said cylinder and the opposite ends of said transverse passage, a second pair of valves disposed in said second pair of conduits, and valve operating means operative to determine the direction of fluid flow through said first pair of conduits, said valve operating means including a spiral cam track for each of said valves, and cam heads on said valves engaged in said cam tracks.

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