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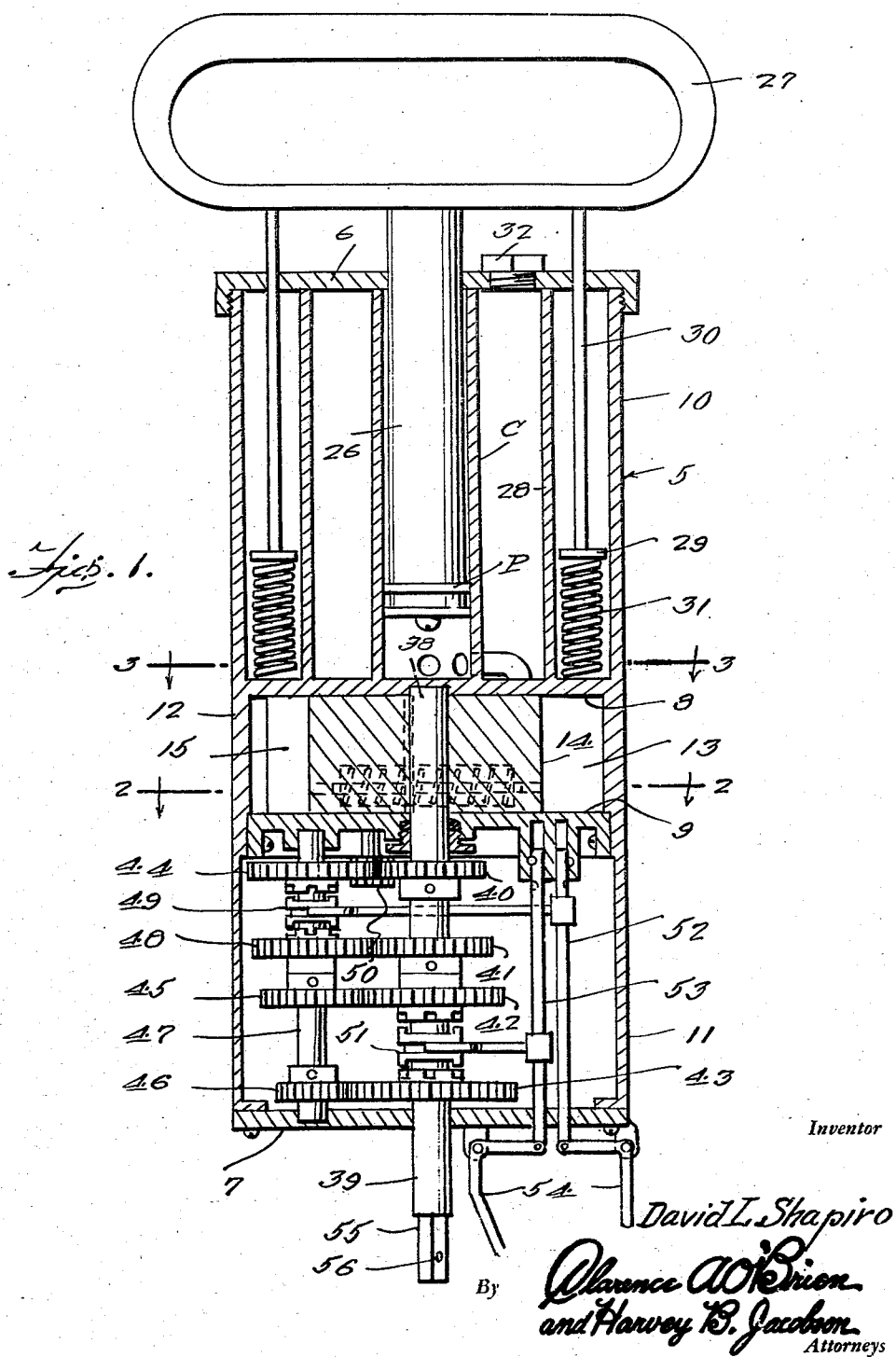
D. L. SHAPIRO

2,390,620

HYDRAULIC DRIVING DEVICE

Filed Sept. 26, 1944

3 Sheets-Sheet 1



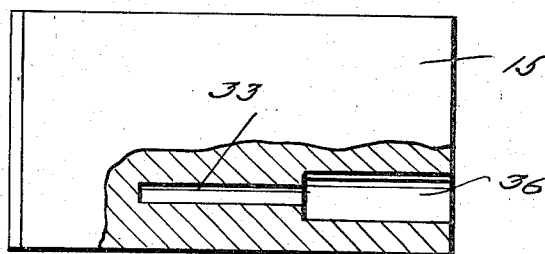
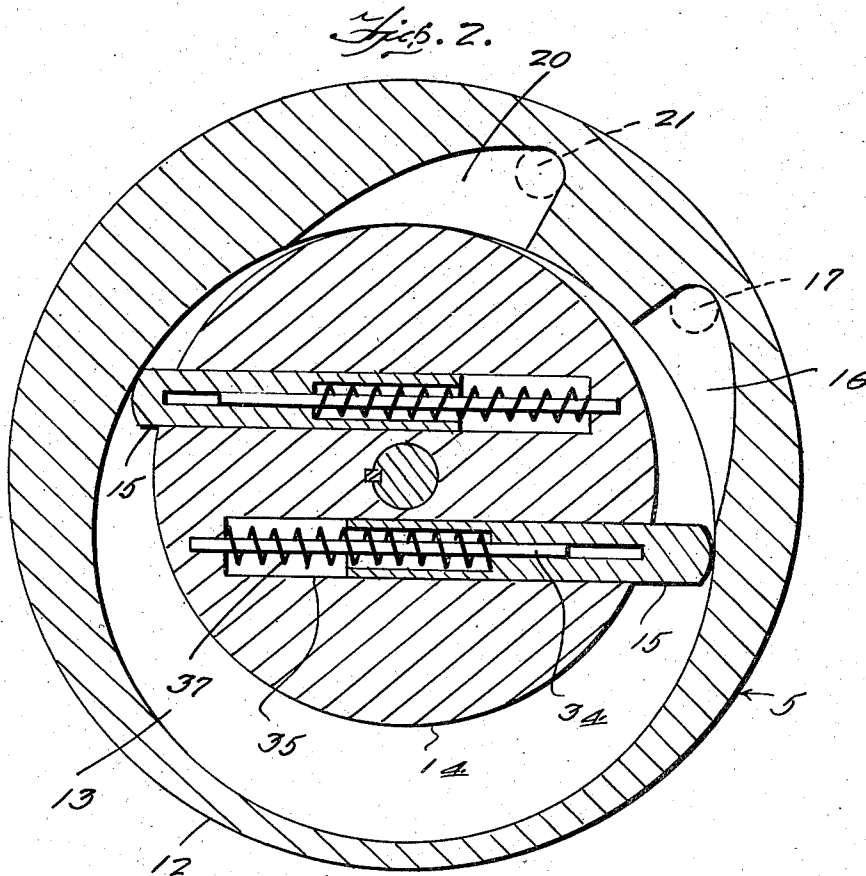
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Inventor

Fig. 4.

David L. Shapiro

By

Alvin A. O'Brien
and Henry B. Jacobson
Attorneys

Dec. 11, 1945.

D. L. SHAPIRO

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Fig. 3.

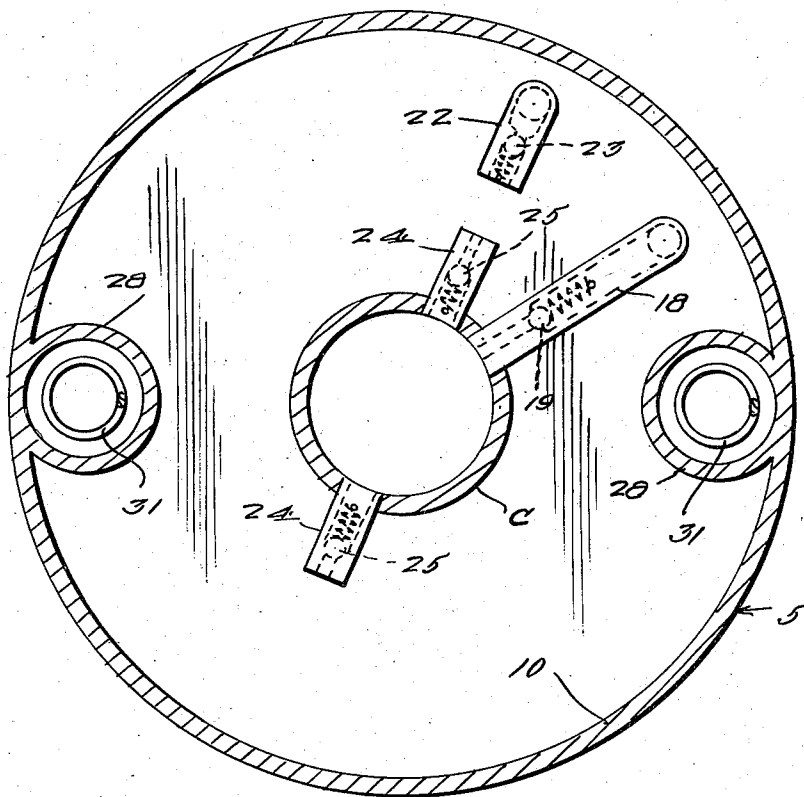


Fig. 5.

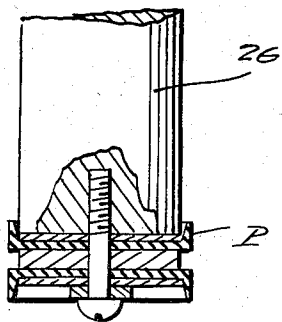
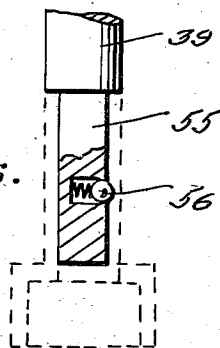


Fig. 6.



Inventor

David L. Shapiro

By

Clarence W. Union
and Harvey B. Jacobson
Attorneys

UNITED STATES PATENT OFFICE

2,390,620

HYDRAULIC DRIVING DEVICE

David L. Shapiro, New York, N. Y.

Application September 26, 1944, Serial No. 555,868

4 Claims. (Cl. 74—189.5)

This invention relates to a hydraulic driving device for turning wrench sockets, screw drivers and other rotatable tools, in cases where the application of considerable power is required to tighten or loosen nuts, etc.

The primary object of the present invention is to provide a portable self-contained driving device of the above kind including a rotary hydraulic motor, a liquid reservoir, a hand pump for forcing the liquid from the reservoir into the motor housing for driving the piston of the motor, and a variable speed and reverse drive transmission mechanism for transmitting motion from the motor piston to the tool to be driven, said transmission mechanism including a driven shaft provided with a holder for the tool.

A further object of the present invention is to provide a hydraulic driving device of the above kind which is comparatively simple in construction, compact, and highly efficient in operation.

More specific objects and features of the invention will become apparent from the following description when considered in connection with the accompanying drawings, and the invention consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the drawings and claimed.

In the drawings, wherein like reference characters indicate corresponding parts throughout the several views:

Figure 1 is a central longitudinal sectional view of a hydraulic driving device constructed in accordance with the present invention.

Figure 2 is an enlarged transverse section taken on line 2—2 of Figure 1.

Figure 3 is an enlarged transverse section taken on line 3—3 of Figure 1.

Figure 4 is an enlarged view, partly in elevation and partly broken away and in section, of one of the vanes of the motor.

Figure 5 is an enlarged fragmentary view, partly in elevation and partly broken away and in section, of the pump piston.

Figure 6 is an enlarged fragmentary view, partly in elevation and partly broken away and in section, of the driven shaft of the transmission mechanism, together with its tool holder.

Referring in detail to the drawings, the present driving device includes a casing 5 composed of a body portion having end closures 6 and 7. The casing 5 is divided by transverse partitions 8 and 9 into an end fluid or oil reservoir 10, an end transmission housing 11, and an intermediate motor cylinder 12.

The hydraulic motor has a circular eccentric

piston chamber 13 within which is arranged a circular concentric rotary piston 14 provided with spring-projected, radially movable sliding vanes 15. This is conventional hydraulic motor construction wherein the vanes 15 slidably engage the peripheral wall of the chamber 13. At one side, the motor housing 12 is provided with an intake chamber 16 communicating with an intake port 17 communicating with an intake pipe 18 located within and communicating with a pump cylinder C. The intake pipe 18 has an ordinary spring-seated check valve, as indicated by dotted lines at 19 in Figure 3, so that liquid under pressure from the pump cylinder C may pass into the motor cylinder 12 through pipe 18, but may not pass from said motor cylinder into the pump cylinder through said intake pipe 18. Adjacent the intake chamber 16, the motor cylinder has an exhaust chamber 20 communicating with a port 21 which in turn communicates with an exhaust pipe 22 opening into the liquid reservoir 10. Exhaust pipe 22 is provided with a spring-seated check valve, as indicated by dotted lines at 23 in Figure 3, which valve 23 permits flow of expanded liquid from the motor chamber 13 back into the reservoir 10. The pump cylinder C is provided with a plurality of intake pipes 24 affording communication between the reservoir 10 and said pump cylinder C. The inlet pipes 24 are provided with spring-seated check valves, as at 25, which permit the liquid to be drawn into the pump cylinder upon the outward stroke of the pump piston P, but will prevent passage of the liquid from the pump cylinder into the reservoir 10 upon the inward stroke of piston P. It will be noted that the pipes 18 and 24 communicate with the pump cylinder C at the inner end of the latter. The piston P is provided on the inner end of a piston rod 26 which slidably projects outwardly through the adjacent end closure 6 of the casing 5 and is provided on its outer end with a suitable handle 27. The arrangement is such that the piston P may be manually reciprocated so as to alternately draw liquid from the reservoir 10 into the cylinder C and then force the liquid from the pump cylinder C through the pipe 18 into the piston chamber 13 of the motor cylinder 12. As the liquid under pressure enters the chamber 13, it drives the adjacent vane 15 and causes rotation of piston 14. When this vane reaches a point adjacent the exhaust chamber 20, the expanded liquid passes from the piston chamber 15 of the motor back into the reservoir 10 through the port 21 and pipe 22, being expelled from chamber 13 by the

succeeding vane 15. At the same time, as the said succeeding vane passes the intake chamber 16, another charge of liquid under pressure enters the chamber 13 behind said succeeding vane 15 so as to drive the latter. This cycle of operation is repeated as long as the pump piston P is manually reciprocated, thereby affording a substantially continuous drive for the motor piston 14 as is well known in the hydraulic motor art.

In order to steady and guide the pump piston 10 in its reciprocation, guide cylinders 28 are provided in the reservoir 10 at opposite sides of the pump cylinder C, and slidable in these guide cylinders are plungers 29 carried by the inner ends of guide rods 30 fixed to and projecting inwardly from the handle 27 of the pump piston. Helical compression springs 31 are interposed between the plungers 29 and the inner ends of the cylinders 28 to aid in outward projection of the pump piston P to the start of its inward power stroke. The reservoir 10 may have a suitable filler opening closed by a removable plug 32, so that the supply of oil or other liquid in the reservoir 10 may be replenished from time to time as found necessary. As shown in Figures 2 and 4, the vanes 15 preferably have guide sockets 23 which slidably receive guide pins 34 carried by piston 14 within the slots 35 of said piston 14 in which the vanes are slidable. Also, the sockets 33 are counterbored at 36 to receive the adjacent end portions of compression springs 37 arranged in the inner portions of the slots 35 and by means of which the vanes 15 are projected.

In the transmission housing 11, I provide a suitable transmission mechanism which may be of the type disclosed in the U. S. patent to Arthur N. Manross, No. 838,259, dated December 11, 1906. The essential requirements of this transmission mechanism is that it has a driving shaft 38 that projects into the motor housing 12 and has the power piston 15 keyed thereon, a driven shaft 39 projecting outwardly through the closure 7 and provided with tool-holding means, and manually controlled variable speed and reverse drive gearing between the shafts 38 and 39. In the construction shown, gears 40 and 41 are keyed on shaft 38, while gear 42 is loose thereon. Gear 43 is fixed on shaft 39, and gears 45 and 46 are secured on a counter-shaft 47. Gears 44 and 48 are loose on counter-shaft 47, and a clutch 49 may be used to selectively connect gears 44 and 48 to counter-shaft 47. A pinion is located between the gears 40 and 44, as at 50, while a clutch 51 is used to selectively clutch the gear 42 to shaft 38 or to connect shafts 38 and 39. Shifter rods 52 and 53 are provided for the clutches 49 and 51, each having an operating handle 54. The tool holder of shaft 39 consists of a reduced squared outer end portion 55 of said shaft and a spring-projected ball or detent 56 carried by the portion 55 of shaft 39. The portion 55 of shaft 39 is adapted for driving reception in the driving socket of a wrench socket or other tool to be driven, the detent 56 releasably holding the tool on the shaft portion 55 in a manner well known in the wrench art.

From the foregoing description, it is believed that the construction and operation, as well as the advantages, of the present invention will be

readily understood and appreciated by those skilled in the art. Briefly described, the operation is as follows:

Piston P is manually reciprocated so as to drive the motor piston 14 in the manner previously set forth. Rotation of piston 14 is transmitted to shaft 38, and by proper manipulation of the transmission mechanism in housing 11, the shaft 39 may be driven in one direction at any one of three different speeds or in the other direction at a given speed. This rotation is imparted to the tool carried by shaft 39 so that said tool is driven in the desired direction and at the desired speed for performing the work at hand.

What I claim is:

1. A hydraulic driving device of the character described, comprising a casing affording a liquid reservoir, a transmission housing, and a motor cylinder between said reservoir and said housing, a rotary power piston in said motor cylinder, a hand pump associated with said reservoir for forcing fluid from the latter into the motor cylinder for driving said power piston, exhaust means for returning the expanded liquid from the motor cylinder to the reservoir, and a manually controlled variable speed and reverse drive gearing in said transmission housing, said gearing including a driving shaft projecting into the motor cylinder and carrying the power piston, and a driven shaft projecting from the transmission housing and provided with tool-holding and driving means.

2. The construction defined in claim 1, wherein said pump includes a cylinder disposed in the reservoir coaxial with the driving and driven shafts of the gearing, and a piston in said pump cylinder having a piston rod projecting from the reservoir and equipped with an operating handle on its outer end.

3. The construction defined in claim 1, wherein said pump includes a cylinder disposed in the reservoir coaxial with the driving and driven shafts of the gearing, and a piston in said pump cylinder having a piston rod projecting from the reservoir and equipped with an operating handle on its outer end, guide cylinders in said reservoir at opposite sides of the pump cylinder, spring-projected plungers in said guide cylinders, and guide rods carrying said plungers and attached to and projecting inwardly from the handle on the piston rod of the pump piston.

4. A hydraulic driving device of the character described, comprising a transmission housing, a motor cylinder at one end of said transmission housing, a rotary piston in said motor cylinder, a liquid reservoir carried by the motor cylinder, a hand pump carried by said reservoir and operable for forcing liquid under pressure into the motor cylinder for driving said piston, exhaust means for returning the expanded liquid from the motor cylinder to the reservoir, and a variable speed and reverse drive gearing in said transmission housing, said gearing including a driving shaft having the motor piston secured thereon, and a driven shaft projecting from the transmission housing and provided with tool-holding and driving means.

DAVID L. SHAPIRO.