ABSTRACT

A driving block is rigidly secured to and reciprocable with a pump piston rod. The driving block has a sliding block reciprocable therein, and a crank of a crankshaft is rotatable in the sliding block to convert rotary motion of the crankshaft into reciprocating movement of the piston rod. The sliding and driving blocks are shaped and arranged so that the rigid connection of the piston rod to the driving block is all that is needed to guide the driving block in its movement.

2 Claims, 5 Drawing Figures
This invention relates to new and useful improvements in mechanisms for converting rotary into reciprocating motion, and particularly the invention concerns itself with a mechanism of this type which is especially suitable for actuating a reciprocating piston pump.

The principal object of the invention is to provide a very simple pump actuating mechanism which utilizes a minimum number of moving parts arranged to operate with a very low coefficient of friction and without undue eccentric forces or lateral stresses. Consequently, the mechanism of the invention eliminates the need for providing massive guides for the moving parts, yet is durable and highly efficient in operation and lends itself to economical manufacture.

With the foregoing more important object and features in view and such other objects and features which may become apparent as this specification proceeds, the invention will be understood from the following description taken in conjunction with the accompanying drawings, in which like characters of reference designate like parts, and wherein:

FIG. 1 is an exploded perspective view, partly in section, showing components of the mechanism of the invention and also showing a driving motor and a pump by dotted lines;

FIG. 2 is a fragmentary horizontal sectional view of the assembled mechanism;

FIG. 3 is a fragmentary vertical sectional view, taken substantially in the plane of the line 3—3 in FIG. 2;

FIG. 4 is an enlarged, fragmentary sectional detail, taken substantially in the plane of the line 4—4 in FIG. 3; and

FIG. 5 is a sectional detail, taken substantially in the plane of the line 5—5 in FIG. 4.

Referring now to the accompanying drawings in detail, the invention concerns itself with a mechanism for converting rotary into reciprocating motion and is particularly suitable for actuating a reciprocating piston pump 10 by a prime mover, such as for example an electric motor 11.

The mechanism of the invention comprises a housing 12 which includes a main housing portion 13 provided with a removable side plate 14. The latter is attached to the housing by suitable screws 15 and a gasket 16 is interposed between the housing and the side plate to prevent leakage of oil which is contained in the housing portion 13 to lubricate the mechanism therein, as will hereinafter described.

The housing 12 also includes an open frame-like extension 17 at one side of the housing portion 13 and a pair of depending leg members 18 for mounting the entire device on suitable supporting structure (not shown), as for example, a floor, a work bench, a vehicle chassis, or the like. Conveniently, the housing components 13, 17 and 18 may be formed integrally as a unitary casting.

The frame-like extension 17 of the housing 12 serves to support the pump 10 so that the pump is mounted at one side of the housing and is supported thereby. In the example shown, the housing extension 17 is provided with an opening 19 which serves as a locating opening for a circular boss 20 at one side of the pump 10, and apertures 21 in the extension 17 receive screws (not shown) which extend into threaded bores 22 in the pump and thus secure the pump to the housing extension 17. The boss 20 of the pump 10 is concentric with a reciprocable piston rod 23 of the pump. The piston rod 23 passes through the housing extension 17 into the closed housing portion 13 through a tubular guide or bearing 24 which is mounted in the side wall of the housing portion 13 adjacent the extension 17, as will be apparent from FIGS. 1, 2 and 3.

The piston rod 23 is reciprocable in the guide 24 in order to actuate the pump 10.

The pump actuating mechanism of the invention comprises a driving block 25 which is rigidly secured to the inner end portion of the piston rod 23 which projects through the guide 24 into the housing chamber or portion 13. For example, the inner end portion of the rod 23 may be screw-threaded into one side of the driving block 25 and secured by a lock nut 26, so that the driving block is rigid with the piston rod and reciprocable therewith. The block 25 is provided with an open-ended bore 27 in which is reciprocable a cylindrical sliding block 28. The length of the block 28 is substantially the same as that of the block 25 and when the block 28 reciprocates in the block 25, the block 28 projects to some extent alternately from the open ends of the bore 27, but a sufficient length of the sliding block 28 always remains in the bore 27 to afford an adequate guiding action by the block 25 for the block 28.

The driving block 25 is provided at one side thereof with a slot 29 which communicates with the bore 27, and a crank 30 of a crankshaft 31 extends through the slot 29 into a bore 32 which is formed in the sliding block 28 at right angles to the longitudinal axis of the latter. The crankshaft 31 is rotatably journaled in a pair of bearings 33 in the housing side plate 14, and after projecting outwardly from the housing through the side plate, the crankshaft carries a combined drive pulley and flywheel 34 which is secured thereto by a set screw 35.

It will be apparent that when the crankshaft 31 is rotated by the pulley 34, the crank 30 will cause the sliding block 28 to reciprocate vertically in the bore 27 of the driving block 25 as indicated at 36 in FIG. 3, and the driving block 25 with the sliding block 28 therein will be reciprocated horizontally as indicated at 37. The horizontal reciprocation of the driving block 25 will be accompanied by reciprocation of the piston rod 23 to actuate the pump 10.

It is particularly significant to note that the oil bath in the housing portion or chamber 13 enables the crank 30 to rotate in the bore 32 of the sliding block 28 and the block 28 to slide in the bore 27 of the driving block 25 with a very low coefficient of friction. This is further enhanced by the cylindrical shape of the sliding block 28 and of the bore 27 in the driving block 25. Moreover, since the block 28 at the ends of its reciprocating stroke protrudes from the open ends of the bore 27 in the block 25, it is possible to make the length of the blocks 25 and 28 substantially the same, relatively small in proportion to the stroke of the block 28. The relatively small blocks are thus light in weight and generate only very low centrifugal forces and lateral stresses during their movement. Consequently, the rigid connection of the piston rod 23 to the driving block 25 is all that is necessary to effectively guide the driving block 25 in its movement. This eliminates the need for separate guides which are needed in conventional mechanisms, and by eliminating such separate guides, the mechanisms of the invention is not only simpler and more economical in construction, but also more efficient in operation in that it eliminates friction at the separate guides and thus facilitates more power to be used for actuation of the pump.

It is to be also noted that the arrangement of the invention makes it possible to quickly and easily dis-assemble the mechanism for purposes of inspection or repair. All that is necessary is to remove the bolts 15 which hold the housing side plate 14 in place, whereupon the side plate 14 with the crankshaft 31 and pulley 34 may be bodily separated from the housing 12 while the pulley 34 still remains attached to the crankshaft. As this separation occurs, the crank 30 of the crankshaft is simply withdrawn from the bore 32 in the sliding block 28 through the slot 29 in the driving block 25. The block 28 may then be easily slipped out of the bore 27 in the block 25 and the block 25 itself readily removed by unscrewing the same from the end of the piston rod 23 after the lock nut 26 is loosened. Manifestly, the components may be re-assembled with equal ease and expediency.

Referring again to FIG. 1, in addition to supporting the pump 10, the housing 12 also supports the drive motor 11. In this regard, the motor is provided at one side thereof with a base member 36 which is pivotally attached to a pair of upstanding lugs 37 or on top of the housing extension 17. A base member 38 at the other side of the motor is equipped with an adjustable screw 39 which bears against the top of the housing 12. The motor armature 40 carries a pulley 41 which drives the pulley 34 through the medium of an endless belt 42, the
latter being pre-tensioned or pre-adjusted as to tension by adjustment of the screw 39 in the conventional manner.

It will be apparent from the foregoing that the motion converting mechanism of the invention, with its housing which also serves to mount the drive motor and the pump, is a very simple and highly compact entity which efficiently fulfills its intended purpose and may be conveniently serviced when necessary.

While in the foregoing there has been shown and described the preferred embodiment of the invention, various modifications and equivalents may be resorted to within the spirit and scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows.

1. In a reciprocating piston pump actuating mechanism, the combination of a housing, a pump piston rod linearly reciprocable in said housing, a driving block rigidly secured to said piston rod and linearly reciprocable therewith, said driving block being provided with an open-ended cylindrical bore having its axis at right angles to the line of reciprocation of the driving block and also being provided in one side thereof with a slot parallel to and communicating with said bore, a cylindrical sliding block reciprocable in said bore of the driving block, a crankshaft journaled in said housing for rotation about an axis normal to said piston rod, said crankshaft having a crank extending through said slot in the driving block and rotatably engaging said sliding block, and means for rotating said crankshaft, the rigid connection of said driving block to said piston rod constituting sole means for guiding the reciprocating movement of the driving block and the driving block constituting sole means for retaining the sliding block assembled on said crank.

2. The mechanism as defined in claim 1 which is further characterized in that said driving block and said sliding block are of substantially the same length, whereby the sliding block projects outwardly from said bore in the driving block at the ends of its reciprocating movement in said bore.