March 27 1934. A. G. M. MICHELL 1,952,089

CRANKLESS MECHANISM

Filed April 16, 1932

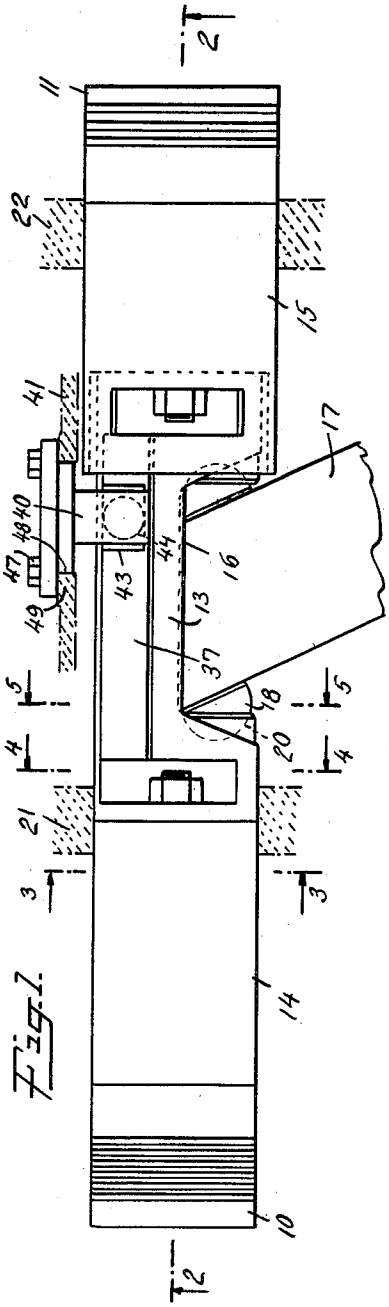


Fig. 1.

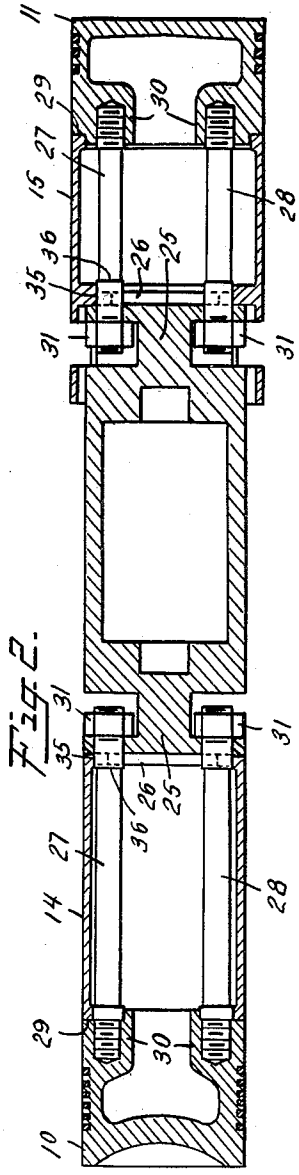


Fig. 2.

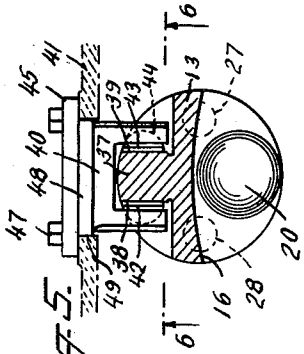


Fig. 5.

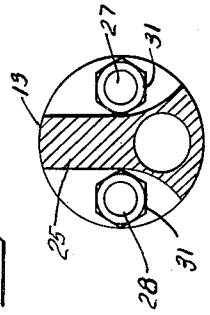


Fig. 4.

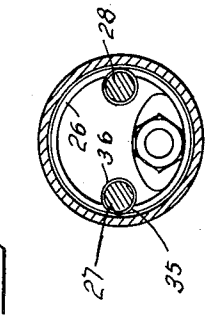


Fig. 3.

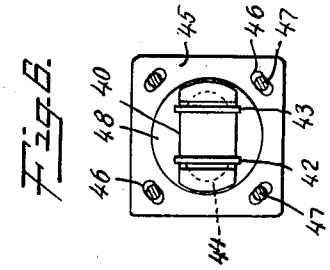


Fig. 6.

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CRANKLESS MECHANISM

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12 Claims. (Cl. 74—14)

This invention relates to crankless mechanisms and particularly to the reciprocating elements thereof.

In crankless engines of the type disclosed in Patents Nos. 1,409,057 and 1,613,116 the reciprocating unit comprises a pair of pistons connected by a bridge member. The bridge has means engaging a swash plate to cause the plate to rotate as the reciprocating unit is reciprocated. It is necessary to guide the unit and to prevent rotation about its longitudinal axis during reciprocation.

This invention has for its salient object to provide a simple and improved construction of reciprocating unit adapted for manufacture at relatively small cost and furthermore to provide improved and effective guiding means for preventing rotation of the unit during reciprocation thereof.

Another object of the invention is to provide a reciprocating unit of the character described having the parts thereof so constructed and arranged that they can be easily and quickly assembled or disassembled.

Further objects of the invention will appear from the following specification taken in connection with the drawing which forms a part of this application, and in which

Fig. 1 is a longitudinal elevation of a reciprocating unit constructed in accordance with the invention, certain of the coacting parts being shown in section;

Fig. 2 is a longitudinal sectional elevation of the unit shown in Fig. 1, this view being taken at right angles to Fig. 1 and substantially on line 2—2 thereof;

Fig. 3 is a transverse sectional elevation taken substantially on line 3—3 of Fig. 1;

Figs. 4 and 5 are transverse sectional elevations taken substantially on lines 4—4 and 5—5 of Fig. 1; and

Fig. 6 is a plan view partly in section of the guide yoke for guiding the unit during its reciprocation.

The invention briefly described consists of a reciprocating unit for crankless mechanism comprising a pair of pistons and a bridge member connected at its ends to the pistons or to extensions thereof, the bridge member having longitudinal guide surfaces coacting with guide bearings carried by a stationary member. The guide bearings and guide surfaces are preferably located eccentrically with reference to the axis for reciprocation of the unit.

The reciprocating unit comprises further a central member consisting of the bridge which is bolted to extensions which in turn are bolted to the pistons, the securing means and parts connected thereby being so located as to be readily accessible for assembling and disassembling.

Further details of the invention will appear from the following description.

In the particular embodiment of the invention illustrated, the reciprocating unit comprises a pair of pistons 10 and 11 which are located at the ends of the unit, a central member or bridge 13 and tubular members which are secured between the bridge and the pistons and are designated 14 and 15.

The bridge 13 is recessed, as shown at 16, to receive the swash plate 17 and is provided with slippers 18 and 19 which are located eccentrically with reference to the axis of reciprocation of the pistons and are seated in sockets 20 in the bridge and engageable with the swash plate to transmit the reciprocating motion of the unit to the swash plate by which this motion is converted into rotary motion. The pistons reciprocate in cylinders diagrammatically indicated in Fig. 1 at 21 and 22. It is essential that the slipper pads 18 and 19 be eccentrically located, as above described, in order to provide for the bridge guiding means hereinafter described.

Each end of the bridge is provided with or has formed thereon a T-shaped extension 25 which is received in the end of one of the tubular members 14 and 15, as the case may be, and seats against a flange 26 therein. Bolts 27 and 28 secure the T-shaped extension against the flange and also secure the pistons against the outer ends of the tubular members, the pistons being provided with shoulders 29 against which the ends of the tubular members seat. The bolts are threaded into bosses 30 formed in the pistons and nuts 31 engage the other ends of the bolts and secure the bridge, tubular member and piston together.

The flanges 26 are recessed, as shown at 35, and collars 36 are mounted on turned portions of the bolts 27 and are disposed in the recesses.

These interfitting parts are provided to prevent turning of the pistons 10 and 11, or of the tubular members 14 and 15 relative to the bridge about their common axis.

In order to guide the unit and to prevent turning thereof during its reciprocation the bridge 13 is provided with a rib 37 having vertical parallel plane surfaces 38 and 39, the rib being longer than the stroke on the reciprocating unit.

In order to guide the bridge during its reciprocation a bearing yoke 40 is mounted on the stationary frame 41 of the engine and is provided with oppositely facing slippers 42 and 43 which engage the vertical surfaces 38 and 39 of the rib 37. The slippers are provided with spherical surfaces 44 which seat in spherical sockets in the depending portions of the yoke 40. The bearing yoke 40 is preferably cylindrical in form, as shown in Fig. 6, and is carried by a plate 45 having slots 46 through which extend bolts 47 for bolting the plate 45 in position. The slots 46 provide for angular adjustment of the plate and it will be obvious that as the plate is angularly adjusted the depending portions of the yoke will adjust the slippers 42 and 43 toward and away from the vertical bearing surfaces 38 and 39, as the case may be. Intermediate the plate 45 and the yoke 40 is a cylindrical portion 48 which is positioned in the cylindrical opening 49 in the stationary frame 41. By properly adjusting the plate and the yoke carried thereby the working clearance between the rib and the slippers can be determined.

In the reciprocating unit shown in the drawing the pistons 10 and 11 at the opposite ends thereof are designed to operate respectively in an internal combustion engine cylinder and in an air compressor cylinder, the complete machine of which the unit forms a part being a combined prime mover and compressor, such as that shown and described in Patent No. 1,409,057. The two pistons may be of the same diameter as the bridge or, as shown, the compressor piston 11 and the tubular member 15 may be of greater diameter than the engine piston 10 and tubular member 14. As shown in Fig. 2, the tubular member 15 partially encloses one end of the bridge 13 and is provided with openings 50 to give access to the nuts 31.

It is preferable that the pistons have a diameter equal to or greater than the bridge since such a construction permits all of the members of the reciprocating unit to be withdrawn, without disassembling, through the engine cylinders provided that the slant be constructed with a removable segment, as shown in Patent No. 1,813,981. This method of withdrawal of the parts is more convenient than the removal thereof through openings in the slant chamber.

Furthermore, if desired, the tubular members may be formed integral with the bridge or, on the other hand, may be formed integral with the pistons.

It will be understood that both ends of the unit may have working pistons or, as explained in Patent No. 1,409,057, only one of the pistons may constitute a working piston, the other piston serving as a guide.

From the foregoing description it will be clear that a simple, practical and efficient form of reciprocating unit has been designed and that such a construction as that described may be manufactured and assembled economically.

Although one specific embodiment of the invention has been particularly shown and described it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claims.

What I claim is:

1. A reciprocating unit for crankless mechanisms comprising a pair of pistons and a bridge member therebetween and rigidly connected thereto, a pair of oppositely facing slipper bearing pads carried by the bridge member and disposed eccentrically with reference to the axis of reciprocation of the unit, longitudinal guide surfaces on the bridge member, and guide bearings coacting therewith and mounted on a stationary member.

2. A reciprocating unit for crankless mechanisms comprising a pair of reciprocatable elements, a bridge therebetween and rigidly connected thereto, a pair of bearing slippers carried by the bridge and located eccentric to the axis of reciprocation of the unit, a pair of stationary bearings, and longitudinal guide surfaces on the bridge coacting with said bearings to prevent rotation of the unit about its axis.

3. A reciprocating unit for crankless mechanisms comprising a pair of pistons, a bridge, a tubular member between the bridge and each piston, and means connecting said bridge, tubular member and each piston, said means extending through the tubular member.

4. A reciprocating unit for crankless mechanisms comprising a pair of pistons, a bridge, a tubular member between the bridge and each piston, and a pair of bolts at each end of the bridge connecting the bridge, tubular member and piston.

5. A reciprocating unit for crankless mechanisms comprising a pair of pistons, a bridge therebetween and connected thereto having longitudinal guide surfaces, and pivoted adjustable bearing members carried by a stationary part and coacting with the guide surfaces to prevent turning of the unit during reciprocation thereof.

6. In combination, an engine frame, a pair of pivoted bearings carried thereby and adjustable toward and away from each other, a pair of pistons, and a bridge connected thereto and disposed therebetween, said bridge having longitudinal bearing surfaces disposed between and coacting with said bearings.

7. A reciprocating member for crankless mechanisms comprising a piston, a bridge, a separable tubular member between the bridge and the piston, and means connecting said bridge and piston, said means extending through said tubular member.

8. In combination, an engine frame, a pair of oppositely facing pivoted bearings carried thereby and having plane bearing surfaces adjustable toward and away from each other, and a reciprocating member comprising a bridge having a pair of longitudinal bearing surfaces each of which coacts with one of said bearings.

9. In combination, an engine frame, a bearing yoke mounted therein, a pair of oppositely facing bearings articulated in said bearing yoke, and a reciprocating unit comprising a bridge disposed between said bearings, said bridge having a pair of longitudinal bearing surfaces each of which coacts with one of said bearings.

10. In combination, an engine frame, a reciprocating unit comprising a bridge having a pair of longitudinal bearing surfaces, a rotatably ad-

justable bearing yoke mounted on said engine frame, and a pair of bearings carried by said bearing yoke, each of said bearings coacting with one of said bearing surfaces and being adjustable towards or away from such bearing surface by rotatably adjusting said bearing yoke.

11. In combination, an engine frame, a pair of oppositely facing bearings carried thereby and qua-qua-versally articulated with respect thereto, and a reciprocating unit comprising a bridge having a pair of longitudinal bearing surfaces. each of which coact with one of said bearings.

12. In combination, an engine frame, a pair of bearings carried thereby and qua-qua-versally articulated with respect thereto, a reciprocating unit comprising a bridge having a pair of longitudinal bearing surfaces, each of which coacts with one of said bearings, and means for adjusting said bearings towards or away from said bearing surfaces.

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