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2,825,610

FLUID PRESSURE RAM

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FIG. 1

FIG. 5

FIG. 2

FIG. 3

FIG. 4

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Attorneys
This invention relates to a fluid pressure ram, and more especially to a ram assembly wherein an elongated rod is secured to a piston reciprocable within a cylinder by application of fluid pressure thereto.

In double acting ram assemblies a problem has long existed in the art of providing an assembly in which all of the components are maintained in proper alignment, for if accurate alignment is not provided excessive wear sets in rapidly with the result that there is a loss of power through fluid pressure leakage and there is a frequent necessity of replacement of at least certain of the components in order to maintain an effectively operating unit. Though the need for a long lasting, efficient ram assembly exists, a commercially desirable unit satisfying such needs has not heretofore been available.

It is accordingly an object of this invention to provide a structure that overcomes many of the disadvantages present in prior art ram assemblies. Another object of the invention is to provide a double acting cylinder ram assembly in which accurate alignment is provided and maintained between the ram rod and the bearings in which it reciprocates, the ram rod and piston and the piston and cylinder in which it is reciprocable. Still another object is in the provision of such an assembly that is simple structurally and in its operation, that is relatively inexpensive, and that can be assembled quickly and easily and by those that are not highly trained, skilled technicians. Another object of the invention is in providing a ram assembly having the advantages described above, and in which rotation of the ram rod does not disturb its relationship with the reciprocable ram piston, rotation of the ram rod frequently occurring when the rod is connected to external structures and devices. Additional objects and advantages will appear as the specification proceeds.

Embodiments of the invention are illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a cylinder ram assembly embodying the invention; Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a broken transverse sectional view taken along the line 3—3 of Fig. 1; Fig. 4 is a broken perspective view of the piston and ram rod and in which the securing means therefor are shown in spaced-apart relation; and Fig. 5 is a broken longitudinal sectional view showing a modified form of structure.

The cylinder ram assembly illustrated in Fig. 1 is designated generally with the letter A. The assembly A includes a cylinder or cylinder casing 10 equipped with end walls 11 and 12 and defining a cylinder bore 13 in which a piston 14 is mounted for reciprocable movement. The end walls 11 and 12 will be equipped respectively with base flanges 15 and 16, each of which is provided with one or more openings or apertures 17 therethrough that are adapted to receive studs or bolts in rigidly securing the cylinder to a support structure, not shown.

The end walls 11 and 12 are provided respectively with elongated bearing portions 18 and 19 that slidably support an elongated ram rod 20 that is mounted for reciprocable movement within the bearings 18 and 19. Also, as is shown best in Fig. 1, the end walls 11 and 12 are provided with flow ports 21 and 22 through which fluid pressure, such as air under pressure, is admitted to and permitted to escape from the cylinder bore 13.

As is most apparent from Fig. 4, it is seen that the ram rod 20 is provided intermediate thereof with an elongated recess or area of reduced diameter 23, the axial limits of which are defined by shoulders 24 and 25. Spaced from the shoulder 24 axially along the rod 20 is a circumferential groove 26 that mounts a gasket or rubber O-ring 27 therein. A keeper 28 is adapted to be seated within the recess 23 and substantially abuts at each end thereof the shoulders 24 and 25, whereby axial movement of the keeper along the rod 20 is inhibited. Preferably the keeper 28 comprises a split sleeve having sections 29 and 30, each of which is externally threaded and has at one end thereof the heads 31 and 32 respectively. The sections 29 and 30 are substantially semicylindrical, whereby they seat snugly within the cylindrical recess 23 of the ram rod.

The cylinder bore 13 sealingly receives the piston 14 therein for reciprocable movement, and in order to provide a fluid tight seal the piston 14, intermediate thereof, is provided with an annular or circumferential groove that receives a rubber O-ring 33 therein or other packing or seal means that permits slidable movement of the piston within its cylinder while forming substantially a fluid tight seal with the walls of the cylinder. The piston 14 is mounted coaxially upon the ram rod 20 and is formed with a passage or bore 34 extending axially through the center thereof that snugly receives the rod 20 therein. The passage 34 at one end is threaded and threadedly receives the keeper 28, as is shown in Fig. 1. Preferably the piston 14 is equipped at each end thereof with bosses 35 and 36 and if such an arrangement is provided the end walls 11 and 12 respectively are preferably formed with recessed center portions 37 and 38 that are adapted to receive the bosses 35 and 36 therein. As is perhaps most clear from Figs. 2 and 4, the boss 36 provides a chamber 37 therein adapted to receive the nut or head of the keeper 28.

With the structure shown in Figs. 1 through 4 the rod 20 projects outwardly from each side of the piston 14, and is slidably received within bearings 18 and 19 provided by the respective end closures of the cylinder 10. In the modified form of assembly shown in Fig. 5, the cylinder 10a is provided with an end wall 11a having a flange 15a provided with an opening 17a therethrough. A piston 14a is mounted for reciprocable movement within the cylinder and is secured to a ram rod 20a. A keeper 28a secures the ram rod to the piston. This structure is quite similar to that heretofore described, except that the rod 20a does not extend outwardly from both ends of the piston 14a.

In operation of the apparatus the ram rod, piston and cylinder are all assembled, as is shown in Fig. 1, and the piston is then ready for reciprocable movement within the cylinder 10 and carries with it in its cyclic movement from end to end of the cylinder the ram rod 20. In order to move the piston to the right, as viewed in Fig. 1,
fluid under pressure is admitted into the cylinder bore 13 through the passage 21, while the passage 22 at the opposite end of the cylinder is connected to atmosphere or is otherwise exhausted. Thus, the pressure differential on opposite sides of the piston within the cylinder causes the piston and the ram rod 20, to which it is secured, to move toward the right. To bring about the reverse movement of the fluid pressure is admitted through the passage 22, while the passage 21 is exhausted, and the pressure differential then causes the piston to move toward the left, as viewed in Fig. 1. It will be appreciated that the assembly A will be connected to a suitable source of fluid pressure through appropriate valve means, all of which is well known in the art, and that will function to bring forth reciprocatory movement of the piston within the cylinder. In operation of the modified form of assembly shown in Fig. 5, the same procedure is carried out.

When the assembly is in use, the ram rod 20 or ram rod 26a will be connected to devices that are adapted to be mounted upon a portion of the ram rod. Ordinarily the ram rod is connected to such devices by screw connectors, and during the connection of the ram rod 20 with devices controlled thereby, the ram rod is often inadvertently rotated relative to its bearings 18 and 19. Any such rotation of the ram rod in the construction considered does not disturbe the relationship of the ram rod with the piston 14, as will be brought out more fully hereinafter.

In assembling the structure, the ram rod 20 is equipped with the sealing ring 27, and the two sections of the keeper 28 are seated within the recess 23 of the rod 20. The piston 14 is then slipped onto the shaft 20 and by rotating it relative to the keeper 28 the keeper is threaded into the threaded end portion of the passage 34 in the piston and securely mounts and positively orients the piston on the rod 20. It is apparent that the head of the keeper 28 is hexagonal so as to receive a wrench useful in securely threading the keeper into the piston 14. Axial movement of the keeper is prevented by the terminal edges of the recess 23 so that when the piston is secured to the keeper its axial position along the ram rod 20 is predetermined. While the keeper is snugly received within the recess 23, if sufficient resisting force is applied to the piston 14, the ram rod 20 can be rotated relative to the keeper 28, and piston 14 because of the frictional resistance between the keeper and the rod is smaller than the frictional resistance afforded between the threaded portions of the keeper and threaded portions of the piston 14. Thus, if in securing the ram rod 20 to external structures, the ram rod is rotated, the rotation will be transferred to the piston 14. When the piston and ram rod are assembled, the piston is inserted into the cylinder bore 13 and the end walls 11 and 12 of the cylinder are mounted thereon and about the ram rod 20, as is shown in Fig. 1. In the Fig. 5 embodiment of the invention, the same assembly procedure is adapted to the ram rod 20a mounted on the ram rod 20b.

Proper alignment of the components is initially afforded and accurately maintained because the ram rod 20 initially is an elongated or continuous cylindrical metal shaft. Therefore, the recess 23 may be formed therein, as for example, by turning it down on a lathe, so that the circumferential surface of the recess is concentric with the circumferential surface of the rod 20. Therefore, in forming the ram rod it is not distorted and the openings through the bearings 18 and 19, since they are in axial alignment, readily receive the ram rod for slidible movement therein. In addition, the bore or passage 34 through the piston 14 may be formed concentrically with the circumferential surface thereof, and, as a result, when the piston is mounted upon the shaft 20 it is concentric therewith. The piston, then, will be accurately positioned within the cylinder bore 13, and will be properly aligned therewith as well as with the bearings 18 and 19. Since accurate alignment is afforded between the ram rod 20 and its bearings 18 and 19, between the ram rod 20 and piston 14, which in turn assures alignment of the piston with the bearings, and proper positioning and alignment of the piston within its cylinder, use of the apparatus does not cause excessive and rapid wearing of the components, and the assembly can be used for long periods without maintenance and without replacement of any of the parts. Further, there is no loss of power of the assembly, for the accurate alignment of the piston within the cylinder prevents the leakage of pressure fluid from the side of one side of the piston, even through the assembly be used for long periods, and all of the fluid pressure then is utilized in reciprocating the piston.

While in the foregoing specification embodiments of the invention have been set forth in substantial detail for purposes of adequately illustrating and describing the invention and to enable one skilled in the art to practice the invention, it will be apparent to those skilled in the art that numerous changes may be made in these details without departing from the spirit and principles of the invention.

I claim:

1. In a ram assembly, a cylinder provided with a piston reciprocable therein, and a ram rod reciprocable through an end of said cylinder, said ram rod having a recessed area defined axially by spaced apart end shoulders adapted to seat an externally threaded keeper therein, and said piston having a threaded bore therein for threadedly receiving such keeper to secure the piston to the ram, said ram rod being rotatable with respect to said keeper and piston.

2. In a ram assembly of the character described, a cylinder having an end closure wall and being provided with a piston mounted for reciprocable movement thereupon, and a ram rod, integral from end to end thereof, and slidable extending through an end closure wall of said cylinder, said piston being mounted concentrically on said ram rod, and means for securing said piston in a predetermined position axially along said ram rod and for preventing axial movement therebetween while uninhibiting rotational movement of the rod.

3. In a ram assembly of the character described, a cylinder providing a cylinder bore therein and being equipped at opposite ends with closure walls, a piston mounted for reciprocatory movement within said cylinder, and a ram rod of greater length than that of said cylinder and being reciprocable through the end closure walls thereof, said ram rod having a recessed area intermediate the ends thereof defined axially by spaced apart end shoulders, a threaded keeper loosely seated within said recessed area to afford rotational movement of the ram with respect thereto and with the ends thereof substantially abutting said shoulders, said piston being mounted concentrically upon said ram rod and having a threaded bore therein for threadedly receiving said keeper, and seal means on said ram rod to prevent fluid passage between said ram rod and said piston.

4. The assembly of claim 3 in which said keeper comprises a pair of keeper sections split longitudinally to permit the same to be seated within and removed from said recess area.

5. In a cylinder ram assembly, a cylinder providing a cylinder bore therein and being equipped with end walls each having an elongated bearing portion adapted to slidably receive a ram rod therein, an elongated ram rod mounted for reciprocatory movement within said bearings and projecting outwardly from said cylinder bore, said cylinder having means at one end thereof for admitting fluid under pressure to said cylinder bore and for exhausting the bore, a piston mounted upon said ram rod, said ram rod, piston and cylinder bore all being concentric, seal means on said ram rod preventing fluid passage between said ram rod and said piston, and means securing
said piston to said ram rod to prevent relative axial movement therebetween while permitting relative rotational movement and providing such concentricity.

6. The apparatus of claim 5 in which said means comprises a longitudinally split, externally threaded keeper, a threaded portion provided by said piston for threadedly receiving said keeper, and a recessed area provided by said ram rod for seating said keeper therein and having axially spaced abutments inhibiting axial movement of said keeper along said ram rod.

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U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,825,610

Walter Jakowchuk

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 33, for "cam" read -- ram --.

Signed and sealed this 22nd day of April 1958.

(Seal)

Attest:

KARL H. AXLINE
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Commissioner of Patents