Feb. 8, 1938. G. J. TRAPP 2,107,456

CAM AND FOLLOWER MECHANISM

Filed July 21, 1936 2 Sheets-Sheet 1

Fig. 1.

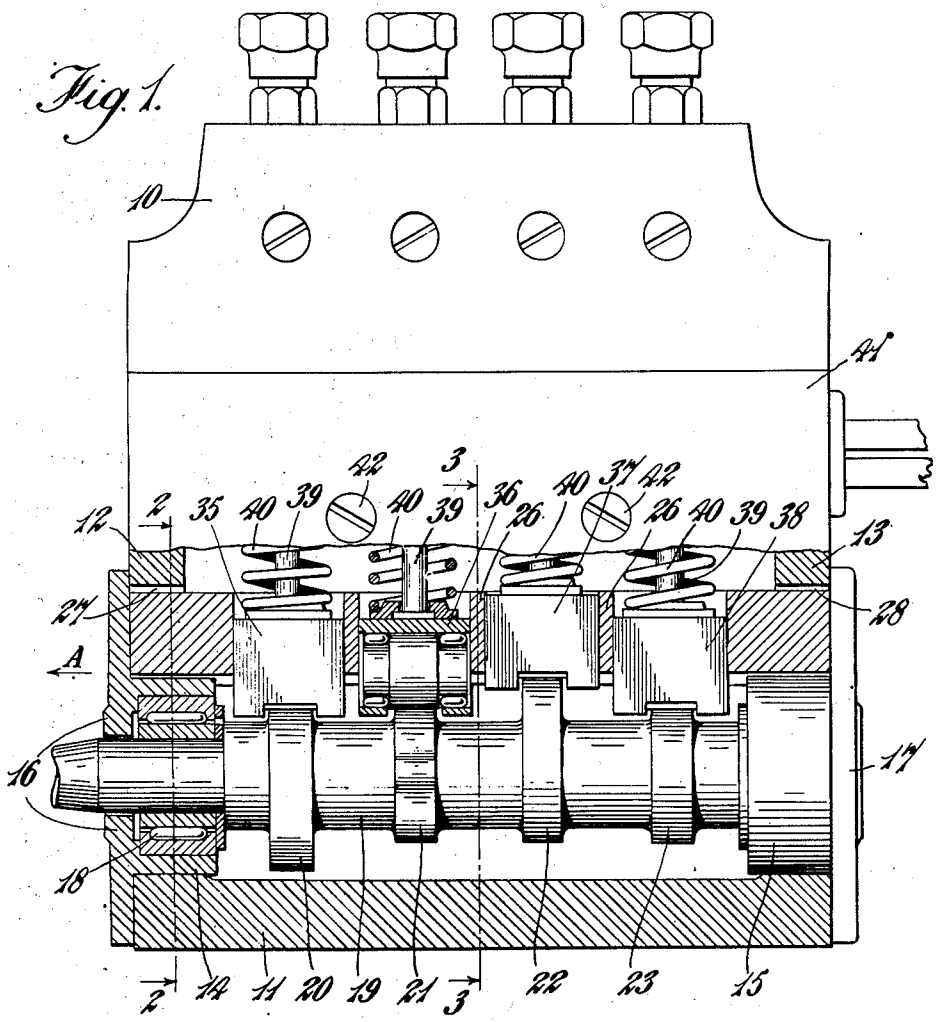
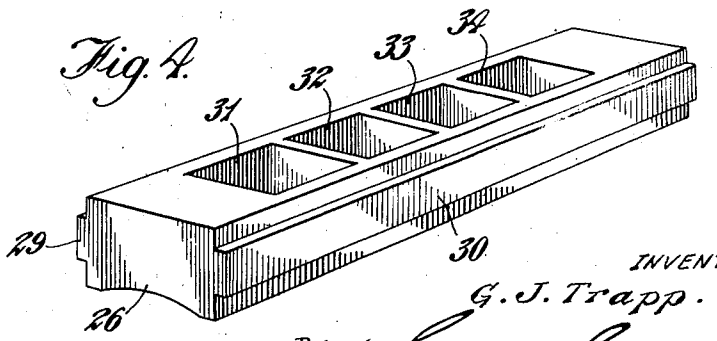


Fig. 4.



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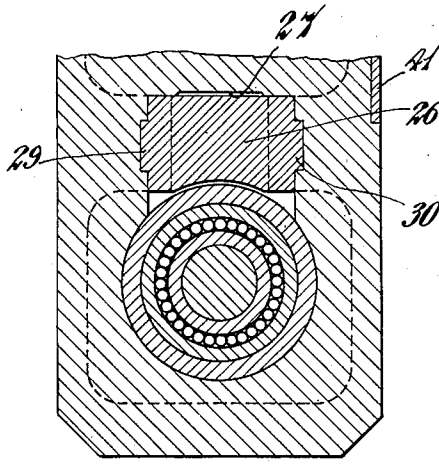


Fig. 2.

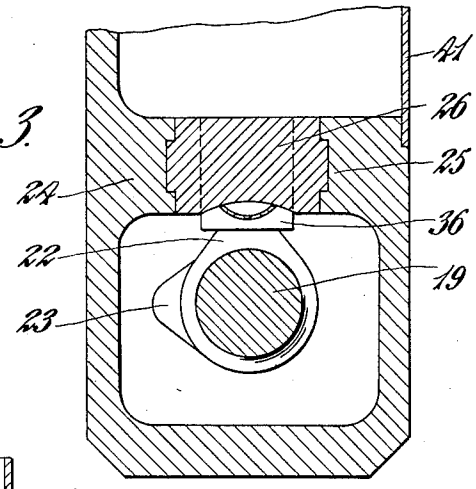


Fig. 3.

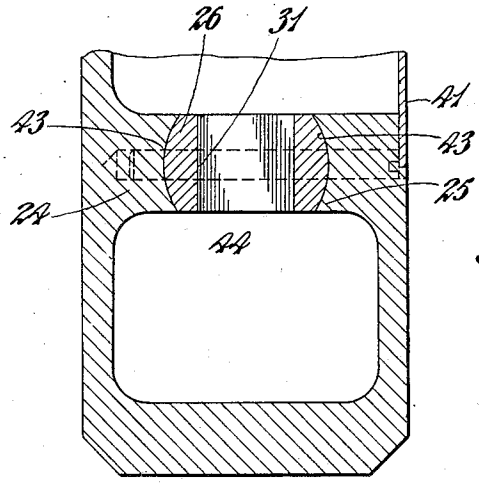


Fig. 5.

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UNITED STATES PATENT OFFICE

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CAM AND FOLLOWER MECHANISM

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Application July 21, 1936, Serial No. 91,775
In Great Britain July 31, 1935

11 Claims. (Cl. 74—55)

This invention relates to cam and follower mechanism, such as that employed in fuel injection pumps, and it has for its object to provide an improved construction of such mechanism which enables the design and manufacture of fuel injection pumps and other machines employing cam and follower mechanism to be considerably simplified. At the same time the invention enables a saving in weight to be effected and further permits the cam follower or followers to be removed from the body of the pump or equivalent in an expeditious manner.

In a cam and follower mechanism having a housing member within which a cam follower reciprocates slidably during its normal operation, the present invention is characterized by the fact that the housing member is itself fitted in slides arranged transversely with respect to the follower travel, the arrangement being such that the housing member is inserted into place and removed therefrom in a direction substantially at right angles to the reciprocatory motion of the follower or followers.

In a cam and follower mechanism disposed within a structure serving as the body of a pump or equivalent device, the invention further provides a housing having a hole forming parallel guiding surfaces for a reciprocating sliding follower, said housing itself being fitted within the body by means of slides extending at right angles to the movement of the followers and being inserted in place by movement along its slides. The housing may, of course, provide guiding surfaces for a plurality of followers, which latter may conveniently be arranged in a single straight line, said housing preferably consisting of a bar of metal formed with a series of transverse holes each fitted with a reciprocatory cam follower, the edges of said bar being engaged between a pair of parallel slides carried by the body of the mechanism whereby the housing is slid into place in a direction at right angles to the follower travel. If desired, the housing may be held against endwise displacement by a plate serving also to support a bearing for the cam shaft, while in order to simplify the construction of the pump body or equivalent, said body may be formed with a transverse tunnel extending through one or both ends of said body for the reception of the housing member.

The invention further provides an improved construction of fuel injection pump embodying the above described form of cam and follower mechanism.

The accompanying drawings show examples of the invention as applied to fuel injection pumps, and in these drawings—

Figure 1 is a longitudinal part sectional elevation of a four-cylinder fuel injection pump;

Figure 2 is a transverse section on the line 2—2 of Figure 1;

Figure 3 is a similar view on the line 3—3 of Figure 1;

Figure 4 is a perspective view of the follower housing removed; and

Figure 5 shows in sectional end elevation a modified form of follower housing.

The fuel injection pump shown in Figures 1 to 3 comprises a body casting 10, the upper part of which carries the injection cylinders (not shown), while the lower part is formed integrally with a bottom 11. The end walls indicated at 12 and 13 are bored to receive tubular bearing housings 14 and 15 respectively, each having a fixing plate shown at 16 and 17 respectively. These accommodate roller bearings 18 which rotatably support a cam shaft 19 formed with four cams 20, 21, 22 and 23. The cam shaft is thus accommodated in a substantially rectangular compartment as will be seen in Figure 3, the upper wall of which is constituted by a pair of slide flanges 24 and 25 formed integrally with the body of the pump and by a housing member 26 extending for substantially the full length of the pump, as shown in Figure 1. The follower housing is in fact accommodated slidably within a longitudinal tunnel extending completely through the body of the pump and terminating in a hole 27 in the end 12 and a hole 28 in the end 13, said holes as well as the inwardly facing surfaces of the slide flanges 24 and 25 being conveniently finished during manufacture by a broaching operation.

As will be seen in Figures 2 and 3 the follower housing member 26 is of substantially cruciform cross section, its two longitudinal edges being formed with rectangular projections 29 and 30 which snugly engage corresponding grooves in the body 10 and thus prevent vertical movement of the housing member 26. The latter in the present instance is formed with four rectangular holes 31, 32, 33 and 34 arranged in line with their axes vertical, said holes being immediately above the corresponding cams 20, 21, 22 and 23 and providing guiding surfaces for corresponding cam followers indicated at 35, 36, 37 and 38 in Figure 1. The cam followers which may conveniently be of the construction described in my copending application No. 64,377, each serves to actuate a pump plunger 39 in the usual manner and is normally urged to move downwardly by a return

spring 40. Access to the springs 40 and the associated parts of the pump can be obtained by the removal of the front cover 41 having fixing screws 42.

It will be seen from Figure 1 that the upper parts of the plates 16 and 17 associated with the cam shaft bearings 18 completely overlap the ends of the housing members 26, and thus hold the latter positively in an endwise direction. When, however, attention to the follower housing 26 is required, this part of the pump with its associated cam followers can be drawn from the body in the direction indicated by the arrow A after the plate 16 has been removed, suitable precautions, of course, being taken for restraining the influence of the return springs 40. The cam followers may, if desired, be removed from the follower housing prior to its withdrawal from the pump body.

It will be understood that the follower housing 26 can be of any suitable cross-section, and a modification is illustrated in Figure 5 where the housing member is again in the form of a metal bar, the edges 43 of which comprise parts of a common cylindrical surface generated about the longitudinal axis of the bar. In this way the housing can be very readily manufactured, while the surfaces of the slide flanges 24 and 25 supporting it can be accurately formed by a turning or boring operation. In order to prevent rotation of the housing member 26 a bolt 44 can conveniently be fitted or a key or any other suitable means employed. In order that the follower housing 26 may be supported in the best possible manner it is preferable that the slide flanges 24 and 25 should extend for the whole length of the pump body or equivalent, but this is not essential, as in some cases it is possible to support the housing member only at isolated parts of its length, say for example at its two ends only. Further, the invention may be applied to single cylinder pumps or to those incorporating in a single unit a plurality of cylinders arranged in any desired formation, although of course, it is usual for the cylinders and consequently the cam followers to be arranged in a single straight line extending parallel with the cam shaft by which the followers are actuated. Any suitable construction of cam follower may be used in conjunction with the housing according to the invention, the cross section of the holes 31 to 34 being shaped and dimensioned accordingly. Thus, for instance, the housing is readily adaptable to the known form of follower which is cylindrical in shape, and is provided with a transverse pin engaging at its ends in keyways formed in the housing. Further, any suitable means may be employed for retaining the follower housing in position within the pump body or equivalent, and, if desired, said housing may be composed of a number of parts, for example a plurality of bars joined end to end or arranged side by side. Thus the actual design and construction of the improved follower housing can deviate from the examples described, the cross-section of said member being arranged so that it keys with the pump body or equivalent so as to prevent all movement other than that required for insertion.

It will be appreciated that the invention is by no means restricted to fuel injection pumps as it may equally well be applied to almost all mechanical units employing cam and follower mechanism, especially where a plurality of followers are positioned within a confined space. For example, the invention is particularly suitable for use in engines and pumps other than fuel injection pumps, thus enabling the body castings and the assembly of these units to be considerably simplified.

What I claim is:—

1. In a cam and follower mechanism, disposed within a structure serving as the body of a pump or equivalent device, a housing having a hole providing parallel guiding surfaces for a reciprocatory sliding follower, said housing itself being fitted within the body by means of slides extending at right angles to the movement of the follower, and being inserted in place by movement along its slides.

2. Cam and follower mechanism disposed within a structure serving as the body of a pump or equivalent device, said mechanism comprising a cam follower housing which consists of a bar of metal formed with a series of transverse holes, each fitted with a reciprocatory cam follower, the edges of said bar being engaged between a pair of parallel slides carried by the body of the mechanism whereby the housing is slid into place in a direction at right angles to the follower travel.

3. In a cam and follower mechanism, a body, a housing having a hole providing parallel guide surfaces, a reciprocatory sliding follower mounted in the hole, and means carried by the body and the housing for slidably mounting the housing within said body at right angles to the movement of the follower.

4. In a cam and follower mechanism, a structure serving as the body of a pump, a housing having a plurality of holes each providing parallel guide surfaces, reciprocatory sliding followers in the holes, and slides carried by the housing and adapted for mounting the housing within the body to extend at right angles to the movement of the followers, said housing being adapted to be mounted in place by movement along the slides.

5. In a cam and follower mechanism, a body, a housing having a plurality of holes arranged in a straight line with their axes parallel, each of said holes providing parallel guide surfaces, a reciprocatory sliding follower for each of said holes, and slides carried by the housing and adapted to cooperate with the body for slidably and removably mounting the housing within the body to extend at right angles to the movement of the followers, said housing being adapted to be inserted in place by movement along the slides.

6. In a cam and follower mechanism, a pump body, a cam shaft carried by the body and mounted in a bearing, a housing having a hole providing parallel guide surfaces, a reciprocatory sliding follower in the hole, slides carried by the housing and adapted to cooperate with the body for mounting the housing within the body at right angles to the movement of the follower, said housing being adapted to be inserted in place by movement along the slides, and a plate carried by the bearing for holding the housing and bearing in place in the body.

7. In a cam and follower mechanism, a body, a housing have a hole providing parallel guide surfaces, a reciprocatory sliding follower mounted in the hole, and slides mounting the housing within the body at right angles to the movement of the follower, said housing being inserted in place by movement along the slides, said slides extending the entire length of the housing.

8. In a cam and follower mechanism disposed within a structure serving as the body of a pump, a housing cruciform in cross section and having

a hole providing parallel guide surfaces, a reciprocatory sliding follower in the hole, and slides removably mounting the housing within the body at right angles to the movement of the follower, said housing being adapted to be mounted in place by movement along the slides.

9. In a fuel injection pump, a cam and follower mechanism comprising a housing having a hole defining parallel guide surfaces, a reciprocatory sliding follower movably mounted in the hole, and slides fitting the housing within the body at right angles to the movement of the follower, said housing being inserted in place by movement along the slides.

10. In a multi-cylinder fuel injection pump, a body, a cam and follower mechanism including a crank shaft extending longitudinally of the body, a bar defining a housing and extending within the body parallel with the cam shaft, said bar having a plurality of holes each providing a parallel guide surface, a reciprocatory sliding follower in each of said holes, and slides fitting the housing within the body at right angles to the movement of the followers, said housing being inserted in place by movement along the slides.

11. In a multi-cylinder fuel injection pump, a pump body, a cam and follower mechanism including a cam shaft extending longitudinally of the pump body, a bar carried by the body and defining a housing extending parallel with the cam shaft, said bar having a plurality of holes each providing parallel guide surfaces, a reciprocatory sliding follower within each of the holes, slides fitting the housing within the body of the pump at right angles to the movement of the followers, said housing being inserted in place by movement along the slides, a bearing at each end of the cam shaft, and a plate at each end of the body for retaining the cam shaft bearings and the housing in place.

GEORGE JOSEPH TRAPP.