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CAM AND FOLLOWER MECHANISM

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2 Sheets-Sheet 1

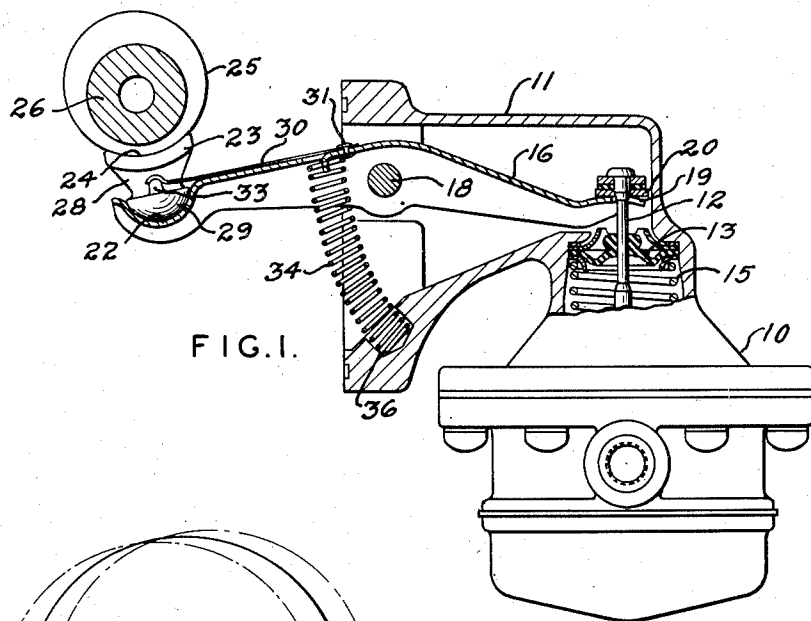


FIG. 1.

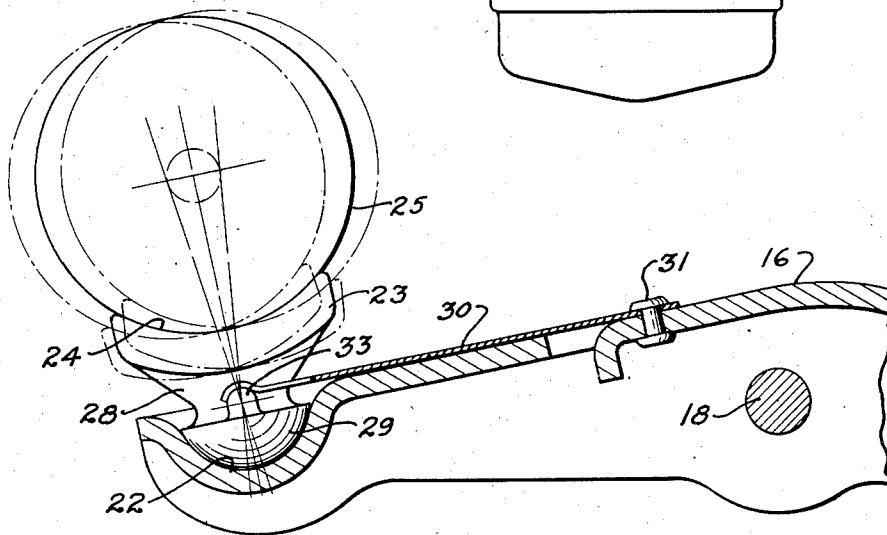


FIG. 2.

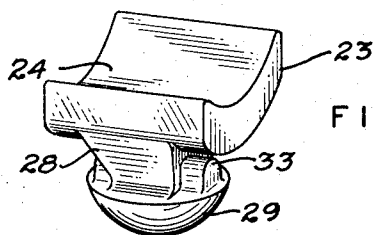


FIG. 3.

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2,829,540

CAM AND FOLLOWER MECHANISM

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2 Claims. (Cl. 74-569)

This invention relates to eccentric and follower mechanisms, and consists particularly in contact shoes for eccentric followers.

In eccentric and follower mechanisms, in which the follower member is a lever resiliently urged into contact with the surface of the eccentric cam, it is well known that due to the small contact area of the lever, excessive wear occurs on the contact surface substantially reducing the service life of the lever. It has been suggested that a contact shoe, having an arcuate contact surface be interposed between the lever and the cam, with pivotal mounting on the lever to compensate for oscillating movements of the eccentric cam between its dead center positions. It has been found, however, that wear on the journal portions of the pivot pin used in the pivoted construction substantially reduces the service life of the pivoted construction.

It is an object of this invention to provide arcuate contact shoes having improved means of engagement with the follower lever whereby to reduce wear and increase service life of the mechanism.

I achieve this object by rounding the undersurface of the contact shoe, in one form of the invention making the undersurface convex spherical, in another form convex cylindrical, and a third form concave cylindrical. In the convex spherical and concave cylindrical forms, the shoe rotates in or about a mating surface on the lever, and in the convex cylindrical form the shoe rolls on the upper surface of the lever in conformance with the displacement of the eccentric from its dead center positions. The spherical type shoe has an additional advantage in that it permits self-adjustment of the shoe with respect to the longitudinal axis of the cam as well as to the displacement of the cam from its dead center positions.

Additional objects and advantages will appear from the specification when read with the accompanying drawings in which:

Fig. 1 is an elevation view, partially sectionalized, of an automotive fuel pump embodying one form of the invention.

Fig. 2 is an enlarged vertical sectional view of the shoe and lever illustrated in Fig. 1, showing extreme and mean positions of the shoe.

Fig. 3 is a perspective view of the shoe of Figs. 1 and 2.

Fig. 4 is an enlarged vertical sectional view of a modified form of shoe and lever, in which the shoe is formed with a convex undersurface for rocking engagement with the lever.

Fig. 5 is a perspective view of the shoe illustrated in Fig. 4.

Fig. 6 is a transverse vertical sectional view along the line 6-6 of Fig. 4.

Fig. 7 is an enlarged vertical sectional view of a modified shoe and lever, in which the shoe is formed with a concave undersurface for engagement with a registering convex surface on the lever.

Fig. 8 is a perspective view of the shoe of Fig. 7. The automotive fuel pump illustrated in Fig. 1 is of

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the widely used Carter type and includes a body portion 10, which contains an operating diaphragm, valves, and vapor dome spaces, all as disclosed in a copending application, Serial No. 728,929, filed February 17, 1947, in the name of Irvan E. Coffey now Patent No. 2,625,114 Jan. 13, 1953. Secured to the upper part of body 10 is a right-angle lever housing 11 into which projects diaphragm stem 12 through flexible seal 13. Diaphragm spring 15 constantly urges the diaphragm into the discharge direction, that is, downwardly. An operating lever 16 is pivoted at 18 to the walls of the lever housing and has a bifurcated end 19 which underlies an abutment washer 20 at the end of stem 12.

According to one form of the present invention, the outer end of lever 16 is provided with an upwardly facing concave recess 22. Contact shoe 23 is provided with an arcuate upper surface 24 for engagement with the surface of eccentric cam 25 mounted on engine camshaft 26. The undersurface of the shoe is provided with a downwardly extending projection 28, the lower end of which is of convex spherical form with a hemi-spherical surface 29 of substantially equal radius with the concave recess 22 in the lever, whereby the shoe may be mounted for universal pivotal movement in the lever recess. For retaining the shoe in the recess a flat spring 30 is secured at one end by a rivet 31 and is bifurcated at the other end so as to permit pivotal engagement with the concentrically arranged upper rounded surface of boss 33 on either side of the shoe. The shoe is constantly urged into engagement with cam 25 by means of a coiled spring 34 compressed between the undersurface of the lever and a seat 36 formed in the open mouth of lever housing 11.

As may be clearly seen in Fig. 2, the very slight angular movement of spherical surface 29 responsive to the displacement of the cam between its dead center positions, combined with the large bearing contact area between convex spherical surface 29 and concave recess 22, will result in minimizing wear on these surfaces. The spherical bearing 29-22 has the further advantage that it facilitates adjustment of the shoe to compensate for non-parallelism between the lever surface and the cam surface.

A modified form of shoe and lever is illustrated in Figs. 4-6. In this form the shoe is provided with an arcuate contact surface 24 for wiping engagement with cam 25 and the undersurface 37 of the shoe is in the form of an arc of a cylinder coaxial with the arcuate upper surface, so that as the eccentric is displaced from one to the other of its dead center positions, the shoe merely rolls on the upper surface of the lever, thus substantially eliminating any sliding frictional engagement between the shoe and lever. For retaining the shoe against the lever a W-shaped torsion spring 38 is provided. Torsion spring 38 is wound on a pin 39 fitted into recess 40 in the upper surface of the shoe, and extends through narrow longitudinal slot 41 in the lever so that the arms of the spring abut against the undersurface of the lever. Thus, due to the resiliency of spring 38, the shoe is permitted to rock on the upper surface of the lever to conform to displacements of the cam surface, but is prevented from becoming disengaged from the lever when not in contact with the cam. The shoe is further provided with a concentrically arranged flange 43 on either side to prevent lateral movement with respect to the lever; although it is clear that spring 38 would also perform this function, the flanges serve as a safety factor in the event the spring should become damaged, and also serve to center the spring with respect to the slot thereby to prevent frictional engagement between the portion of the spring passing through the slot and the side walls of the slot.

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A third form of my invention is illustrated in Figs. 7 and 8 in which the shoe, as in the embodiment described above, is formed with an arcuate upper surface 24 for engagement with eccentric 25. The undersurface of the shoe is provided with a pair of diverging projections 46, the surface 48 between projections 46 being semi-cylindrical and concave with respect to the body of the shoe. The surface 48 registers with mating convex semi-cylindrical surface 49 of mounting member 50 and is free to oscillate thereon. Mounting member 50 is secured by rivets 52 or other suitable means to the sides of lever 16, the adjacent upper surface of the lever being cut away as at 53 to permit the protrusion therethrough of the upper portion of the shoe. It will be noted from Fig. 7 that the length of the opening 53 in the upper surface of the lever is slightly less than the extreme distance between the ends of projections 46 thereby precluding separation of the shoe from the lever. This opening provides end surfaces concentrically arranged with respect to the outer surface provided on arcuate projections 46. In operation, as the shoe oscillates about mounting member 50 to conform to the displacement of the cam, wear between the shoe and the lever will be minimized by the large bearing surface provided by the mounting member and the concave undersurface of the shoe and by the very small angular displacement of the shoe with respect to the mounting member due to the increased distance between the contact surface and the central axis of the mounting member.

It will be understood that the forms described and illustrated herein are but the preferred embodiments of my invention, and that exclusive use is contemplated of all modifications coming within the scope of the appended claims as will occur to those skilled in the art.

I claim:

1. In an eccentric and follower mechanism, a follower element comprising a lever and a unitary contact shoe, said shoe having a concave arcuate contact surface for engagement with said eccentric and a pair of diverging

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projections extending from its undersurface, the concave surface between said projections being substantially semi-cylindrical, and a convex semi-cylindrical mounting member secured to the lever below its upper surface to rotatably receive the concave undersurface of said shoe, the surface of said lever being formed with an opening for said shoe.

2. In an eccentric and follower mechanism, a follower element comprising a lever and a unitary contact shoe, said shoe having a concave, arcuate contact surface for engagement with said eccentric and a pair of diverging projections extending from its undersurface, the concave surface between said projections being substantially semi-cylindrical, and a convex semi-cylindrical mounting member secured to the lever below its upper surface to rotatably receive the concave undersurface of said shoe, the surface of said lever being formed with an opening for said shoe, the length of said opening being less than the spread of said projections whereby to prevent separation of said shoe from said lever.

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