

April 8, 1958

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2,829,541

FUEL PUMP LEVER WITH SLIDING SHOE

Filed Nov. 3, 1952

2 Sheets-Sheet 1

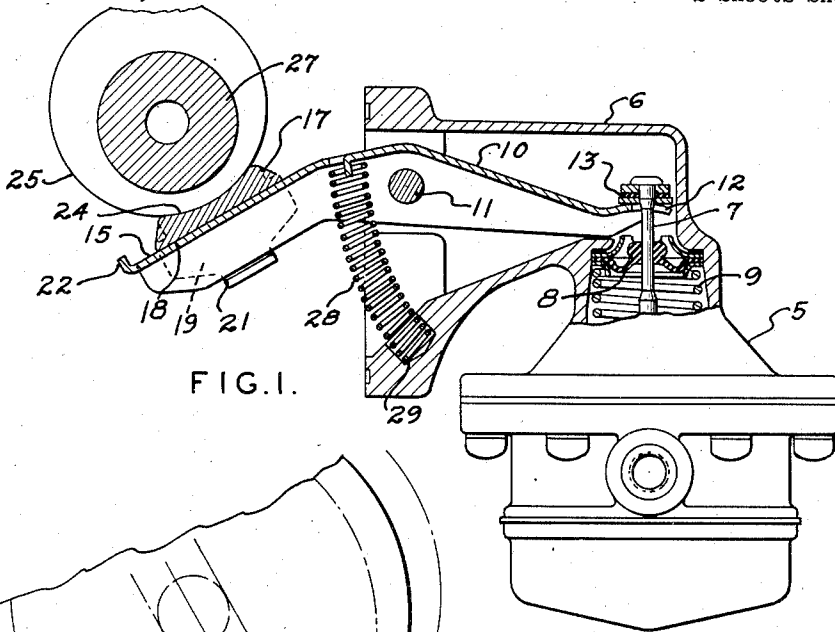


FIG. 1.

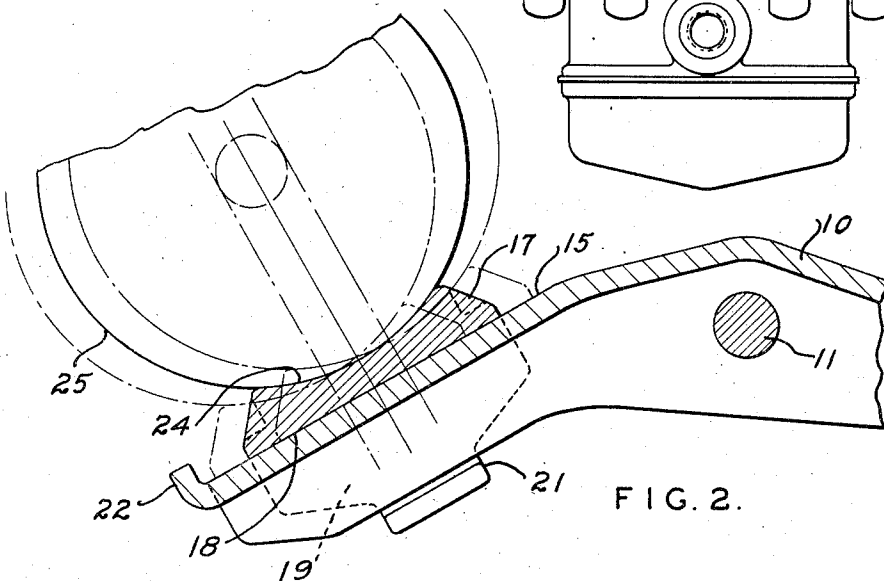


FIG. 2.

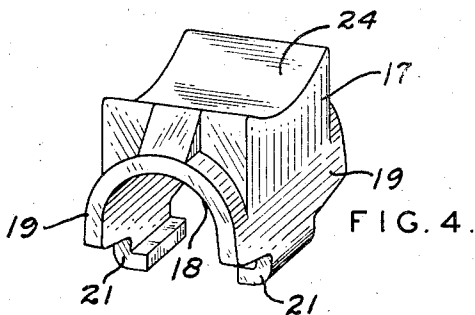


FIG. 4.

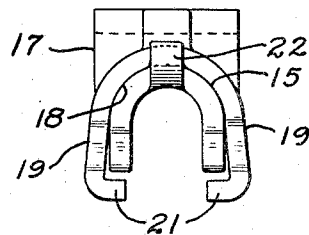


FIG. 3.

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2 Sheets-Sheet 2

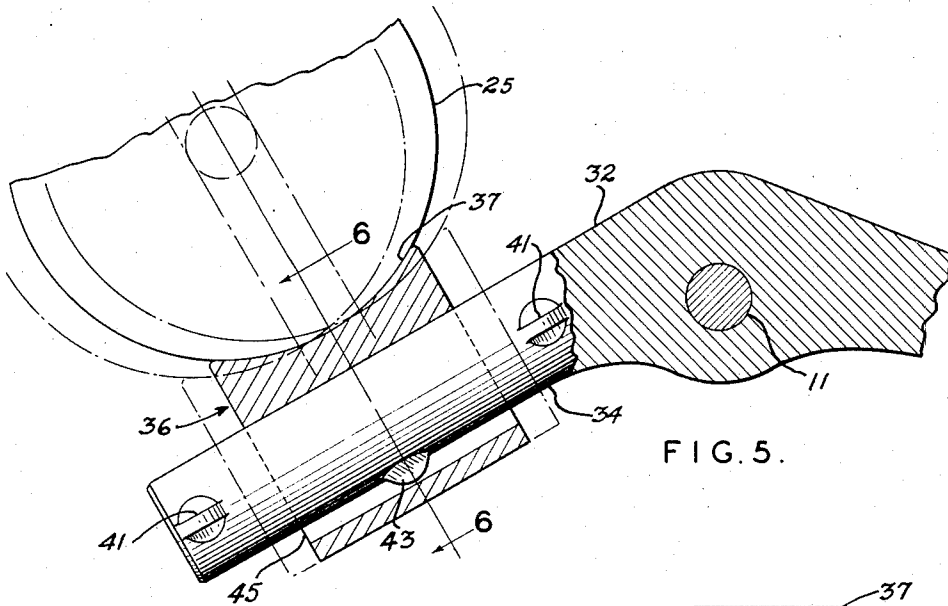


FIG. 5.

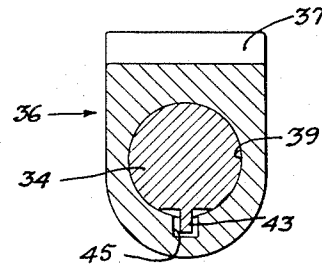


FIG. 6.

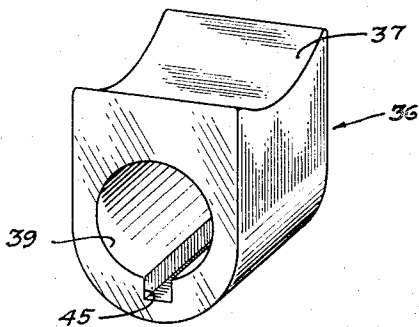


FIG. 8.

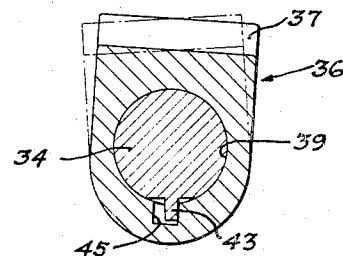


FIG. 7.

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FUEL PUMP LEVER WITH SLIDING SHOE

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Application November 3, 1952, Serial No. 318,454

5 Claims. (Cl. 74—569)

This invention relates to contact shoes for eccentric and follower mechanisms and consists particularly in a contact shoe having an arcuate contact face and means for maintaining the arcuate face in constant registry with the eccentric surface.

Fuel pumps and vacuum booster pumps of the type used on automotive vehicles are commonly actuated by a lever resiliently urged in contact at one end with an eccentric on the engine camshaft. In the conventional mechanism, a flat surface of the follower lever makes a line contact with the face of the eccentric at the point of tangency. As a result of the small contact surface and of the extremely hard services to which mechanisms of this type are put, wear on the lever is severe, so that the service life of the lever is relatively short.

Accordingly, it is an object of this invention to provide a novel means for reducing wear between the eccentric and the follower lever, so as to prolong the service life of the mechanism.

Another object is to provide an arcuate contact shoe for eccentric and follower mechanisms with means for automatically maintaining the entire contact face of the shoe in engagement with the eccentric surface, regardless of the rotational position of the eccentric or of slight non-parallelism between the axis of the eccentric and the fulcrum of the follower lever.

These objects are achieved by interposing between the eccentric and the lever a contact shoe having a concave arcuate upper surface of the same radius as the eccentric for registry with the eccentric and by forming the undersurface of the shoe with a longitudinal semi-cylindrical cavity and the upper surface of the lever of semi-cylindrical cross-section for registry with the shoe, so as to permit not only slidable movement of the shoe along the longitudinal axis of the lever, but also slight rotary movement of the shoe about the lever.

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

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

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

Fig. 3 is an end view of the shoe.

Fig. 4 is a perspective view of the shoe.

Fig. 5 is an elevation view, partially sectionalized, of a modified form of shoe and lever.

Fig. 6 is a transverse vertical sectional view of the modification of Fig. 5 along the line 6—6 of Fig. 5.

Fig. 7 is a transverse vertical sectional view similar to Fig. 6, but showing tilted positions of the shoe.

Fig. 8 is a perspective view of the shoe.

The automotive fuel pump illustrated in Fig. 1 is of the Carter type now in wide use, and includes a body portion 5 which contains an operating diaphragm, valves, and vapor dome spaces, all as disclosed in a copending

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application, Serial No. 728,979, filed February 17, 1947, now Patent No. 2,625,114 issued January 14, 1953, in the name of Irven E. Coffey. Secured to the upper part of body 5 is a right angle lever housing 6 into which projects diaphragm stem 7 through flexible seal 8. Diaphragm spring 9 constantly urges the diaphragm into the discharge direction, that is, downwardly. An operating lever 10 of channel cross-section is pivoted at 11 to the walls of the lever housing, and has a bifurcated end 12 which underlies an abutment washer 13 at the end of stem 7.

This application describes an improvement in the sliding shoe for a pump actuating arm disclosed in a copending application by J. L. Edelen, now Patent No. 2,654,266, dated October 6, 1953.

According to the present invention, the outer end of the lever is of U-shaped channel cross-section, the upper surface 15 being of semi-cylindrical section. A contact shoe 17 having a longitudinally extending semi-cylindrical recess 18 in its undersurface, is slidably mounted on the U-shaped end of the lever 10. For retaining shoe 17 on the lever and for limiting rotation of the shoe about the longitudinal axis of the lever, the sides 19 of semi-cylindrical recess 18 are extended downwardly at a slight divergency with each other and terminate in inwardly extending retaining flanges 21, which are adapted to engage the lower edges of the flanges of lever 10 when the shoe reaches its limit of rotation in either direction. Sides 19 and flanges 21 constitute, in effect, stops concentrically arranged with respect to bearing 18 limiting rotational movement of the shoe; this is particularly useful in installing fuel pumps on engines, because the shoe is thus retained upright at all times, with its contact face toward the eccentric. In order to prevent the shoe from sliding off the end of the lever, tip 22 of the lever is bent upwardly as shown in the drawing for engagement with the adjacent end of the shoe. The upper surface of the shoe 24 is of concave arcuate form for engagement with the surface of eccentric cam 25 which is mounted on and driven by camshaft 27. A coiled spring 28 seated at 29 in the lever housing and bearing at its other end against the undersurface of the lever constantly urges the shoe against the cam.

Operation of the device is as follows: As eccentric 25 is rotated by camshaft 27, its movements are transmitted through sliding shoe 17 to the lever 10, which is at all times urged by spring 28 upwardly. Rotational movements of the eccentric causes an oscillating movement of the lever, the bifurcated end of which, on its upward movement, moves diaphragm stem 7 upwardly, downward movement of the stem and diaphragm being accomplished by spring 9, which in turn serves to hold abutment washer 13 against the upper surface of the lever. Wear on the cam and follower mechanism is minimized due to the large upper arcuate bearing surface 24 of the shoe which is in wiping contact with the cam surface, and the lower large bearing surface 18 of the shoe and 15 of the lever which are in slidable relation with each other. The semi-cylindrical undersurface of the shoe and the semi-cylindrical upper surface of the lever permit sufficient rotation of the shoe about the longitudinal axis of the lever to insure that the entire upper surface of the shoe will be at all times in contact with the surface of the cam.

A modified form of shoe and lever is shown in Figs. 5-8. In this modification the numeral 32 indicates a lever arranged for pivotal mounting at 11 in lever housing 6 of the pump illustrated in Fig. 1. The outer end portion 34 of lever 32 is cylindrical, and is adapted to slidably mount shoe 36. Contact shoe 36 is provided with a concave, arcuate upper contact surface 37, the radius of this surface being equal to that of the eccen-

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tric 25 in order to permit registry between a large area of each of the two surfaces. Shoe 36 is provided with a longitudinal, cylindrical opening 39 to permit rotatable, as well as slidable, mounting of the shoe on cylindrical portion 34 of the lever, as shown in Fig. 5. To limit longitudinal movement of the shoe on the lever, and thus to prevent its coming off the lever at the outer end or wedging against the thickened portion of the lever adjacent the fulcrum, a pair of raised bosses 41 are formed on the surface of the lever at each end of the shoe's permissible travel. In order to hold the shoe in a substantially upright position during installation of the pump on the engine, and at the same time to permit such slight rotation of the shoe about the longitudinal axis of the lever as may be desirable for keeping the contact face of the shoe at all times in registry with the eccentric surface, an additional fin-shaped boss 43 is formed on the bottom surface of the lever intermediate the bosses 41, and the bottom of cylindrical opening 39 in the shoe is provided with a longitudinally extending groove 45 somewhat wider than boss 43 and are equally spaced from a central plane axially of bearing 39. Thus, slight rotation of the shoe is permitted, its magnitude being limited by the engagement of either of the concentrically arranged sides of groove 45 with the corresponding side of boss 43, as best seen in Fig. 7.

Operation of the device of Figs. 5-8 is as follows: As the eccentric rotates on the camshaft, shoe 36 slides along the cylindrical portion 34 of the lever so that its contact surface 37 always stays in contact with the eccentric surface, wear on the mechanism being minimized by the large areas of contact between the shoe and the eccentric and between the shoe and the lever. The maintenance of a constant large area of contact between the shoe and the eccentric is further insured in this form of my invention by the rotatable mounting of the shoe on the lever, which permits the shoe to compensate for any non-parallelism existing between the surface of the eccentric and the fulcrum of the lever.

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 a mechanism for driving a fuel pump, a pump housing, a lever pivotally mounted on said housing and having an outwardly projecting arm, a shoe on said arm, a rotatable eccentric engaging said shoe to pivot said lever, and means providing linear sliding movement of said shoe longitudinally of said arm and pivotal adjustment of said shoe transversely of said arm during sliding movement.

2. In a mechanism for driving a fuel pump, a pump housing, a lever pivotally mounted on said housing and having an outwardly projecting arm, a shoe on said arm, a rotatable eccentric engaging said shoe to pivot said lever, and means providing linear sliding movement of

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said shoe longitudinally of said arm and pivotal adjustment of said shoe transversely of said arm, said eccentric having a convex cylindrical working surface conforming to and engaging a semi-cylindrical concave surface on said shoe, the axis of rotation of said eccentric extending transversely of the arm.

3. In a mechanism for driving a fuel pump, a pump housing, a lever pivotally mounted on said housing and having an outwardly projecting arm, a shoe on said arm, a rotatable eccentric engaging said shoe to pivot said lever, and means providing linear sliding movement of said shoe longitudinally of said arm and pivotal adjustment of said shoe transversely of said arm, said arm being of channel section and having an arcuate convex surface engaging an arcuate concave surface on said shoe.

4. A mechanism according to claim 1 wherein, said shoe is provided with a cylindrical bore, and said arm is of circular section and extends through said bore.

5. In a mechanism for driving a fuel pump, a pump housing, a lever pivotally mounted on said housing and having an outwardly projecting arm, said arm including an elongated portion formed with a transversely arcuate convex upper bearing surface, means yieldably resisting pivotal movement of said arm, a shoe having a lower transversely concave bearing surface mounted on the upper convex bearing surface of said arm for transverse movement and longitudinal sliding movement relative to said arm, and a rotatable eccentric engaging said shoe to pivot said lever.

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