Sept. 6, 1966 M. L. THOMPSON 3,270,725

SPRING FOR BIASING A ROCKER ARM AND MOUNTING THEREFOR

Filed Dec. 2, 1964

FIG. 1.

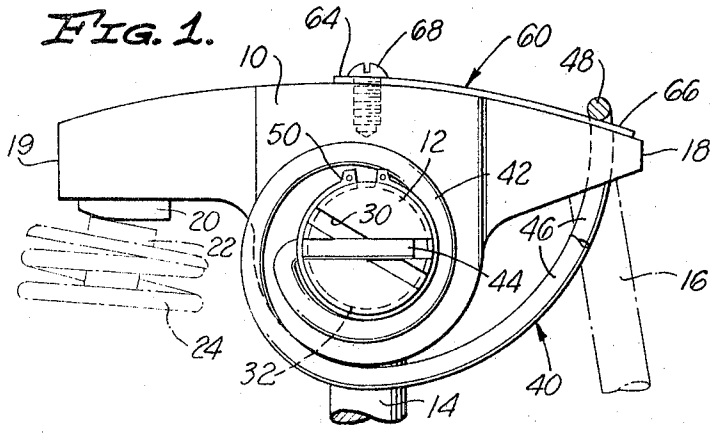


FIG. 3.

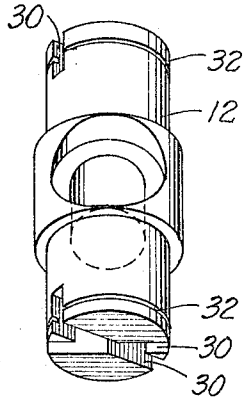


FIG. 2.

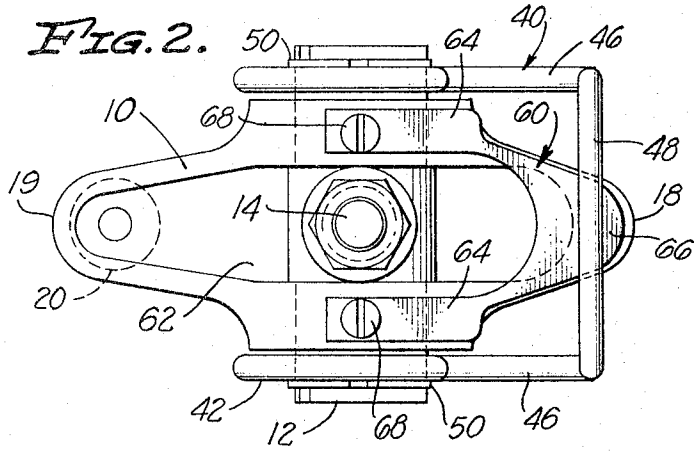


FIG. 4.

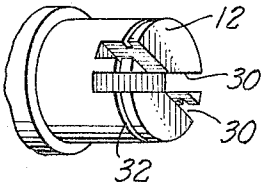


FIG. 5.

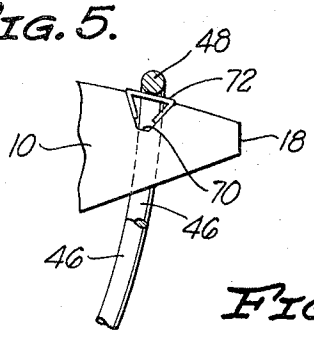


FIG. 6.

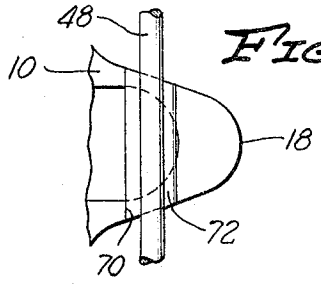
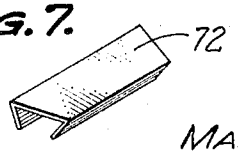


FIG. 7.



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SPRING FOR BIASING A ROCKER ARM AND MOUNTING THEREFOR

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This invention relates to a spring component for an engine and more particularly, to a spring employed to exert a torque on a rocker arm so as to aid the rocker arm in following the movements of a reciprocally acting push rod. This invention also relates to means for mounting the spring on the rocker arm supporting the shaft, and on the head of the rocker arm adjacent the push rod.

In applicant's Patent No. 3,139,872, issued July 7, 1964, a spring for biasing a rocker arm and a split-shaft seat for said spring are disclosed. The present invention relates to a modified form of such a spring, to other seating means for such a spring, and to abutment means for mounting the spring on the rocker arm.

The primary object of the invention is to provide a spring and simplified means for mounting the spring in association with a rocker arm for an engine valve assembly, the spring being disposed so as to apply a torque to the rocker arm to cause the rocker arm to follow closely the movements of a push rod.

Another object of the invention is to provide such a spring and mounting means therefor whereby, particularly on the movement of the push rod away from the rocker arm, the torquing action of the engine's compression spring on the rocker arm causing the rocker arm to pivot and follow the push rod, will be aided and abetted by the rocker arm spring.

Yet another object of the invention is to provide a spring and mounting means therefor of the character described wherein the spring may be easily, firmly, and adjustably seated on the supporting shaft for the rocker arm so as to provide selective adjustment of the torque exerted on the rocker arm by the spring.

A further object of the invention is to provide abutment means on the rocker arm in the area of the abutment of the spring thereon, so that wear of the rocker arm is resisted and longer effective life is imparted to the rocker arm.

A still further object of the invention is to provide such a spring which may be firmly seated so as to be resistant to displacement which might otherwise occur due to shocks and vibrations from the engine.

Another object of the invention is to provide such a spring which is easy and inexpensive to manufacture and install in association with a rocker arm.

With these and other objects in view, the invention consists of the construction, arrangement, and combination of the various elements of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims, and illustrated in the accompanying drawing, in which:

FIG. 1 is a side elevation view of the device of the present invention;

FIG. 2 is a top plan view of the device as illustrated in FIG. 1;

FIG. 3 is a perspective view of the shaft element of the device;

FIG. 4 is a fragmentary perspective view of the shaft element as illustrated in FIG. 3, but turned 90°;

FIG. 5 is a fragmentary, side elevational view of an alternative form of construction;

FIG. 6 is a top plan view of the device as illustrated in FIG. 5; and

FIG. 7 is an isometric view of the buffer element illustrated in FIGS. 5 and 6.

A rocker arm **10** is pivotally mounted on a shaft **12** which in turn is mounted on an intersecting shaft **14** projecting from an engine housing (not shown). A push rod **16** abuts on the underside of the rocker arm **10** adjacent one end **18** of the rocker arm **10**. It will be understood that the push rod **16** is mounted on the engine for reciprocal movement caused by the action of a rotatable cam shaft disposed within the engine housing (not shown).

Disposed on the underside of the rocker arm **10** adjacent the other end **19** thereof is an anvil **20** which bears on a reciprocating valve stem **22**, in association with which a valve compression spring **24** is mounted.

The ends of the shaft **12** protrude beyond the rocker arm **10**, and formed in the protruding ends of the shaft **12** are transverse slots **30** which, preferably, pass through the center of the shaft **12** and intersect each other at that point. The slots **30** are disposed so as to receive and secure anchors legs of a spring hereinafter described.

As illustrated in FIGS. 1, 3 and 4 of the drawing, two of said slots **30** are provided at each end of the shaft **12** so that, selectively, the said spring anchor legs may be mounted in one or the other of said slots, dependent on the spring torque desired. Although two slots **30** are shown in the drawing at each end of the shaft **12**, it will be understood that one slot or a larger plurality of slots may be provided, the two slots being shown by way of illustration, and not by way of limitation.

An annular groove **32** is formed adjacent each end of the shaft **12**, the grooves **32** being disposed so as to receive and secure a C-ring, hereinafter described, or other retaining means for retaining the spring anchors legs within the slots **30**.

A spring, generally designated **40**, embodies a pair of spaced-apart torque producing coils **42**, in substantially axial alignment with each other. As best shown in FIG. 1 of the drawing, each of the coils **42** may be a double coil, but this is by way of illustration, and not by way of limitation, because either a single coil or a larger plurality of coils may be provided. The free end of each coil **42** is straightened to provide an anchor leg **44**.

Each of the coils **42** has a cantilevered, internal extension or leg **46**, which may be slightly arcuate, as best illustrated in FIG. 1, or substantially straight, the legs **46** being disposed substantially parallel to each other and extending upwardly when the spring is mounted in the position shown in FIG. 1. The legs **46** then bend to define a substantially straight transverse yoke **48** disposed so as to abut on the top of the rocker arm **10** in substantial alignment with the point of abutment of the push rod **16** on the underside of the rocker arm **10**.

To mount the spring **40** on the shaft **12** and the rocker arm **10**, the yoke **48** is positioned over the end **18** of the rocker arm **10**, and the anchor legs **44** are inserted in selected, aligned slots **30** on opposite ends of the shaft **12**, dependent on the spring torque desired. C-rings **50** are then mounted in the grooves **32**. The grooves **32** being positioned externally of the anchor legs **44**, the C-rings **50** will secure the anchor legs **44** in the slots **30**, and the spring **40** will thus be firmly anchored to the shaft **12**, while the yoke **48** is in abutment with the upper side of the rocker arm **10**.

As, by engine valve action, the valve stem **22** moves downwardly, against the biasing action of the compression spring **24**, and the push rod **16** moves upwardly, the rocker arm **10** will pivot on the shaft **12**, with the end **19** of the rocker arm **10** following the valve stem **22**.

As the rocker arm **10** pivots in that direction, torque will build up in the spring **40**. Then, as the valve stem **22** reaches the end of its stroke and commences to move

reciprocally upwardly, while the push rod 16 simultaneously commences to move downwardly, the torque in the spring 40 will be applied to the end 18 of the rocker arm 10 to cause the pivoting rocker arm 10 to follow closely the down stroke of the push rod 16, while aiding the biasing action of the compression spring 24 on the rocker arm 10.

Referring to FIGS. 1 and 2 of the drawing, there is shown a preferred form of reinforcing for the top side of the rocker arm 10 so as to make it resistant to frictional wear in the area where the yoke 48 of the spring 40 abuts on the rocker arm 10. A U-shaped plate 60, is provided. The plate 60 is made of metal which is substantially harder than the metal of which the rocker arm 10 is constructed. The rocker arm 10 has a centrally disposed, elongate opening 62 therein. The plate 60 has its legs 64 overlying the top side of the rocker arm 10 laterally of the opening 62, and has its body portion 66 overlying the top surface of the end 18 of the rocker arm 10. The plate 60 may be mounted on the rocker arm 10 by any suitable means, such as by screws 68, disposed adjacent the free ends of the legs 64. It will thus be seen that the body 66 of the plate 60 will present a wear-resistant abutting surface to the yoke 48 of the spring 40. Consequently, the rocker arm 10, even though made of a relatively light metal, will be assured of a long, effective operational life, despite the torque exerted thereon by the spring 40.

In FIGS. 5–7 of the drawing, an alternative form of means of providing friction wear-resistance is shown. A transverse groove 70, V-shaped in cross-section, is formed on the top surface of the rocker arm 10 adjacent the end 18 on the line of abutment of the yoke 48 thereon. An elongate, hard metal clip 72, V-shaped in cross-section, is firmly disposed in the groove 70, with its flat body portion aligned with, and preferably slightly above, the plane of the top surface of the rocker arm 10. The clip 72 is positioned so that the yoke 48 will abut thereon.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

I claim:

1. In combination, an engine rocker arm assembly, a push rod, and a spring for torque biasing the rocker arm into substantially continuous engagement with the push rod, which combination comprises: a shaft; a rocker arm pivotally mounted on the shaft, the ends of the shaft protruding beyond the rocker arm; aligned, transverse slots formed in the axially outwardly facing surfaces of the protruding ends of the shaft; a reciprocally movable push rod abutting on the underside of the rocker arm adjacent one end of the rocker arm and adapted to pivot the rocker arm on the shaft; a spring having a pair of parallel coils spaced apart from each other and adapted to produce a torque; a first, substantially straight leg extending from each of the coils, each of said legs being adapted to be received in a transverse slot in an opposite end of the shaft; a second leg extending from each of said coils, said second legs being disposed substantially parallel to each other; and a transverse yoke interconnecting the second legs and adapted to overlie and abut on the rocker arm above the abutment of the push rod thereon, said yoke being in torque biasing engagement with the rocker arm so as to cause the rocker arm to follow the push rod in its reciprocal movement.

2. The combination defined in claim 1, including means for securing the first legs of the spring in the slots in the shaft.

3. The combination defined in claim 1, including a plate of hard metal overlying the rocker arm, said plate defining a hard abutting surface for the spring yoke.

4. In combination, an engine rocker arm assembly, a push rod, and a spring for torque biasing the rocker arm into substantially continuous engagement with the push rod, which combination comprises: a shaft; a rocker arm pivotally mounted on the shaft, the ends of the shaft protruding beyond the rocker arm; aligned, transverse slots formed in the axially outwardly facing surfaces of the protruding ends of the shaft; a reciprocally movable push rod abutting on the underside of the rocker arm adjacent one end of the rocker arm and adapted to pivot the rocker arm on the shaft; a spring having a pair of parallel coils spaced apart from each other and adapted to produce a torque; a first, substantially straight leg extending from each of the coils, each of said legs being adapted to be received in a transverse slot in an opposite end of the shaft; a second leg extending from each of said coils, said second legs being disposed substantially parallel to each other; a transverse yoke interconnecting the second legs and adapted to overlie and abut on the rocker arm above the abutment of the push rod thereon, said yoke being in torque biasing engagement with the rocker arm so as to cause the rocker arm to follow the push rod in its reciprocal movement; an annular groove in the shaft adjacent each end of the shaft; and a C-ring disposed in each of said grooves and protruding therefrom, the C-rings being disposed externally of the first legs of the spring and adapted to secure the first legs in the slots in the shaft.

5. In combination, an engine rocker arm assembly, a push rod, and a spring for torque biasing the rocker arm into substantially continuous engagement with the push rod, which combination comprises: a shaft; a rocker arm pivotally mounted on the shaft, the ends of the shaft protruding beyond the rocker arm; aligned, transverse slots formed in the axially outwardly facing surfaces of the protruding ends of the shaft; a reciprocally movable push rod abutting on the underside of the rocker arm adjacent one end of the rocker arm and adapted to pivot the rocker arm on the shaft; a spring having a pair of parallel coils spaced apart from each other and adapted to produce a torque; a first, substantially straight leg extending from each of the coils, each of said legs being adapted to be received in a transverse slot in an opposite end of the shaft; a second leg extending from each of said coils, said second legs being disposed substantially parallel to each other; a transverse yoke interconnecting the second legs and adapted to overlie and abut on the rocker arm above the abutment of the push rod thereon, said yoke being in torque biasing engagement with the rocker arm so as to cause the rocker arm to follow the push rod in its reciprocal movement; an annular groove in the shaft adjacent each end of the shaft; a C-ring disposed in each of said grooves and protruding therefrom, the C-rings being disposed externally of the first legs of the spring and adapted to secure the first legs in the slots in the shaft; and a plate of hard metal overlying the rocker arm, said plate defining a hard, abutting surface for the spring yoke.

6. In combination, an engine rocker arm assembly, a push rod, and a spring for torque biasing the rocker arm into substantially continuous engagement with the push rod, which combination comprises: a shaft; a rocker arm pivotally mounted on the shaft, the ends of the shaft protruding beyond the rocker arm; aligned, transverse slots formed in the axially outwardly facing surfaces of the protruding ends of the shaft; a reciprocally movable push rod abutting on the underside of the rocker arm adjacent one end of the rocker arm and adapted to pivot the rocker arm on the shaft; a spring having a pair of parallel coils spaced apart from each other and adapted to produce a torque; a first, substantially straight leg extending from each of the coils, each of said legs being adapted to be received in a transverse slot in an opposite end of the shaft; a second leg extending from each of said coils, said second legs being disposed substantially parallel to each other; a transverse yoke interconnecting the second legs and adapted to overlie and abut on the rocker arm above the abutment of the push rod thereon, said yoke being in torque biasing engagement with the rocker arm so as

to cause the rocker arm to follow the push rod in its reciprocal movement; an annular groove in the shaft adjacent each end of the shaft; a C-ring disposed in each of said grooves and protruding therefrom, the C-rings being disposed externally of the first legs of the spring and adapted to secure the first legs in the slots in the shaft; a transverse groove of V-shape in cross-section formed on the top side of the rocker arm; and a hard metal clip of V-shape in cross-section disposed in said groove and having its body protruding therefrom, the body of said clip being disposed so as to define a hard, abutting surface for the spring yoke.

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