

[72] Inventor **Roger Owen Durham**
415 E. North Naranja Drive, Glendale,
Calif. 91206
[21] Appl. No. **27,760**
[22] Filed **Apr. 13, 1970**
[45] Patented **Oct. 5, 1971**

1,741,678	12/1929	Brewer	74/519 X
1,895,060	1/1933	Wolfe	74/103
2,543,649	2/1951	Wales et al.	74/53
2,666,452	1/1954	Sheppard et al.	74/53 X
2,937,633	5/1960	Lorenz	123/90.25
3,211,013	10/1965	Quesinberry	74/103 X
3,394,684	7/1968	Stark	123/90.25

FOREIGN PATENTS

106,566	5/1917	Great Britain	123/90.25
122,180	3/1920	Great Britain	123/90.25
343,688	2/1931	Great Britain	123/90.25
519,914	4/1940	Great Britain	123/90.25

Primary Examiner—Al Lawrence Smith

[54] **DESMODROMIC VALVE ACTUATOR**
10 Claims, 3 Drawing Figs.

[52] U.S. Cl. **123/90.25,**
123/90.41, 123/90.44, 74/53, 74/102, 74/519

[51] Int. Cl. **F011 1/30,**
F011 1/18, F16h 25/08

[50] Field of Search. **123/90.25,**
90.27, 90.39, 90.41, 90.42, 90.44; 74/53, 103,
102, 519, 559

[56] References Cited

UNITED STATES PATENTS

1,264,083	4/1918	Jouffret	123/90.44 X
1,408,781	3/1922	Sewell	74/53 X

ABSTRACT: A threaded valve stem extends through a central clearance hole in a trunnion yoke member. Opposed flanged stop-nuts on the valve stem slidably engage opposite surfaces of a flat central yoke. Journaled ends of the trunnion yoke pivotally engage bearing surfaces at one end of a pair of rocker arm side plates. The rocker arm side plates are pivotally supported. Coacting camshaft lobes, acting on a cam-follower supported by the rocker arm side plates, impart an oscillation to the rocker arm assembly.

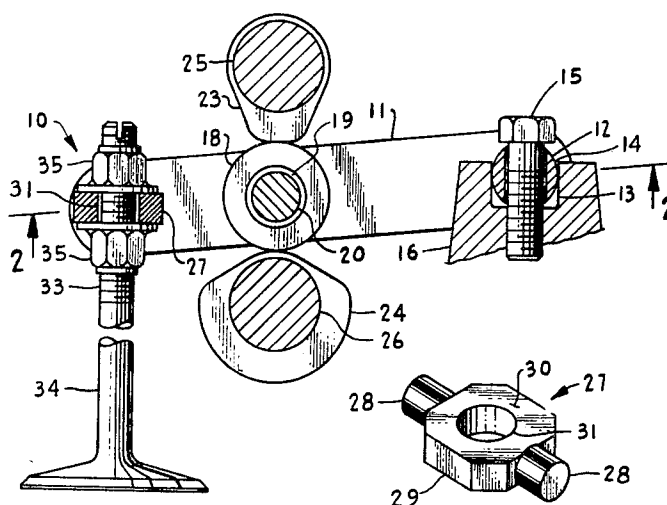


FIG. 1

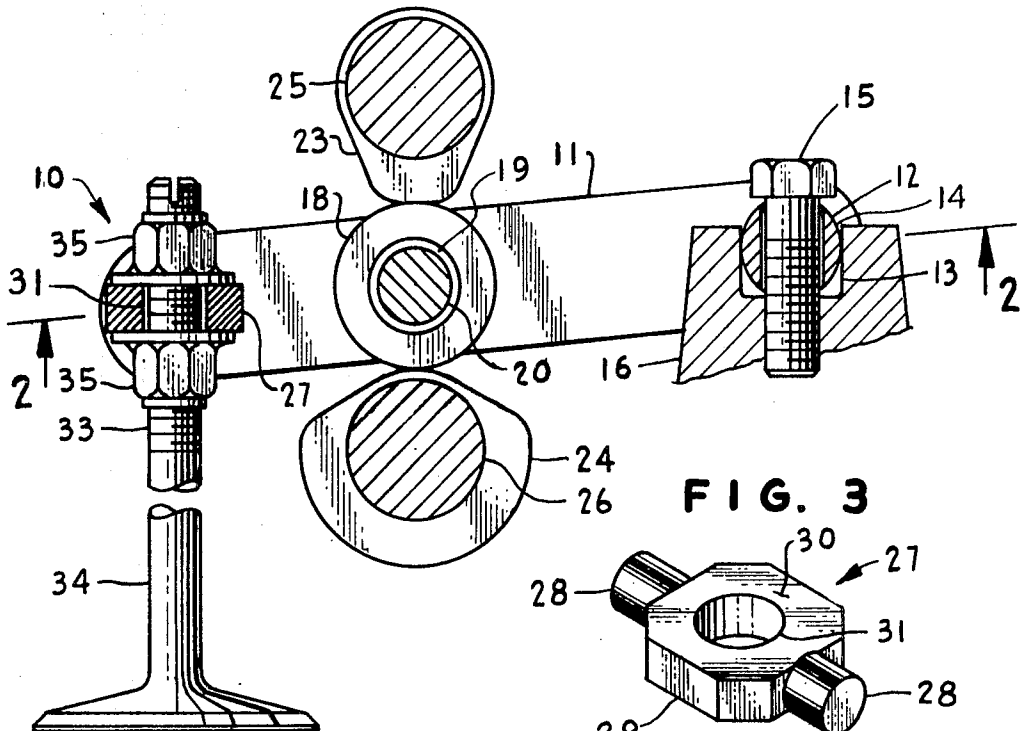


FIG. 3

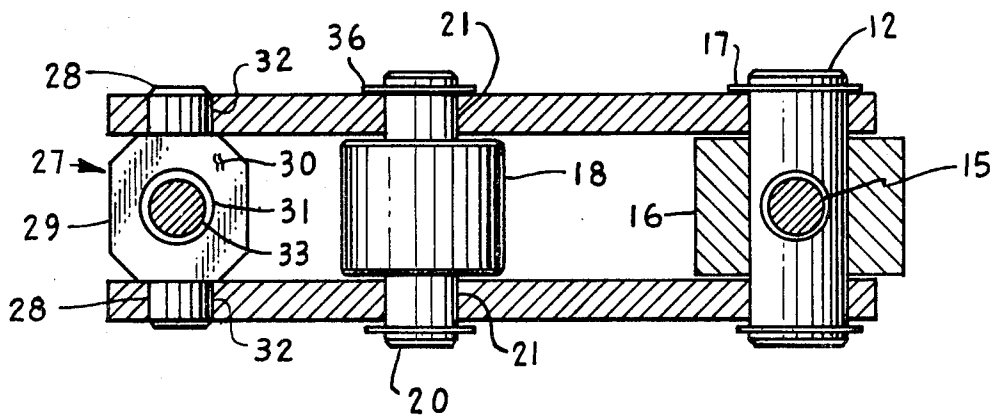
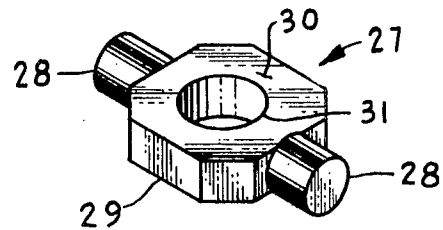


FIG. 2

INVENTOR

Roger O. Durham

DESMODROMIC VALVE ACTUATOR

BACKGROUND OF THE INVENTION

This invention relates to a poppet valve actuator of the desmodromic-type for use in internal combustion engines and the like.

In the past, most linkages between valve stem and rocker arm involved forked arrangements which gave line contact between members and were therefore subject to high stresses and attendant wear.

My invention, titled VALVE ACTUATOR, U.S. Pat. No. 3,254,637, issued on June 7, 1966 taught an actuation in which reversed partly spherical or partly cylindrical washers, seated in or on the rocker arm, engaged flanged surfaces of stop nuts on a threaded valve stem extending through a central hole in the rocker arm.

While this invention solved the problem of line contact, was strong, and was easy to adjust, it required close layout in order to avoid interference between members and yet provide sufficient bearing area. Bearing pressures were difficult to analyze because the most effective bearing area, that normal to the force, was removed for the passage of the valve stem. In its preferred embodiment, increased lateral motion was encountered because of the distance between the centers of its spherical washers.

In the current invention surface contact is provided of two simple types, cylindrical and planar. The cylindrical bearing area is not interrupted by a hole. Lateral motion between members is minimized. The components forming the actuation are more simple in design and manufacture.

SUMMARY OF THE INVENTION

According to the invention, a desmodromic valve actuator utilizes a trunnion yoke member, the journaled trunnions of which pivotally engage cylindrical bearing surfaces in a pair of parallel rocker arm sideplates. The threaded end of a poppet valve stem extends through a central clearance hole through a flat central yoke of the trunnion yoke member, and opposed, flanged stop-nuts positioned on the valve stem slidably engage central yoke planar surfaces of the flat central yoke. The rocker arm sideplates are pivotally supported by a shaft fixed to the cylinder head.

A cam follower roller is positioned between the rocker arm sideplates and is supported by a roller shaft, the ends of which engage intermediate cylindrical bearing surfaces in the rocker arm sideplates.

The cam follower roller engages coacting cam lobes on a pair of camshafts positioned on either side of the rocker arm sideplates, by which means an oscillation is imparted to the rocker arm sideplates. The camshafts are rotatably supported by bearings in the cylinder head.

Pivoting of the journaled trunnions of the trunnion yoke member allows the central yoke planar surfaces to remain normal to the centerline of the valve stem, and clearance between the valve stem and the central clearance hole in the trunnion yoke allows for the slight lateral movement of the trunnion yoke relative to the valve stem. Slippage occurs between the opposite central planar surfaces and the flanges of the stop-nuts.

Thus oscillation of the rocker arm sideplates results in reciprocation of the poppet valve.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional elevation view of a desmodromic valve actuator of the preferred embodiment of the invention, shown when the valve is in its open position.

FIG. 2 is a section taken along line 2—2 of FIG. 1 and illustrates the device in bottom sectional view.

FIG. 3 is a perspective drawing of the trunnion yoke member by itself.

DETAILED DESCRIPTION

Referring now to FIG. 1, a desmodromic valve actuator 10 includes a pair of rocker arm sideplates 11 with cylindrical bearing surfaces 14 which pivotally engage a rocker support shaft 12. Said rocker support shaft 12, supported by a groove 13 formed in cylinder head 16, is clamped in place by a screw 15. Screw 15 engages a tapped hole in said cylinder head 16. A pair of snap rings 17 retain said rocker arm sideplates 11 to rocker support shaft 12.

A cam follower roller 18, with its bearing 19, is supported by a roller shaft 20, the ends of which are supported in intermediate cylindrical bearing surfaces 21 of said rocker arm sideplates 11. A pair of snap rings 36, engaging grooves in said roller shaft 20, retain the roller shaft 20.

A pair of coacting camshaft lobes 23 and 24 are formed, respectively, on camshafts 25 and 26, and act on the cam follower roller to impart oscillation to said rocker arm sideplates 11. Said camshafts 25 and 26 are rotatably supported by said cylinder head 16 by bearing means not shown.

A trunnion yoke member 27 has journaled trunnions 28 at its ends and a flat central yoke 29 with a pair of central yoke planar surfaces 30 parallel to each other and to the centerline of said trunnion journals 28. A central clearance hole 31 is formed through said flat central yoke 29. Said journaled trunnions 28 are pivotally supported by cylindrical bearing surfaces 32 in said rocker arm sideplates 11.

A threaded valve stem 33 of poppet valve 34 extends through said central clearance hole 31 and threadably engages a pair of flanged stop-nuts 35 which slidably engage said central yoke planar surfaces 30 of said trunnion yoke member 27.

FIG. 2 shows the details of said desmodromic valve actuator in bottom section, with camshafts 25 and 26 omitted.

FIG. 3 shows the elements of trunnion yoke member 27 by itself.

MODE OF OPERATION

Rotation of camshafts 25 and 26, and their respective coacting camshaft lobes 23 and 24, acting on cam follower roller 18, bearing 19, and roller shaft 20, cause rocker arm sideplates 11 to oscillate about rocker support shaft 12.

As said rocker arm sideplates 11 oscillate, journaled trunnions 28 of trunnion yoke member 27 pivot in cylindrical bearing surfaces 32. As trunnion yoke member 28 follows an arcuate path about rocker support shaft 12, a small amount of sliding takes place between the surfaces of flanged stop-nuts 35 and the central yoke planar surfaces 30 of said trunnion yoke member 27.

Thus the desmodromic valve actuator of the invention changes oscillation of the rocker arm sideplates 11 into reciprocation of poppet valve 34.

I claim:

1. In a desmodromic valve actuator for an internal combustion engine having a cylinder head and a pair of parallel, engine-driven camshafts with coacting lobes, the combination of:

A pair of parallel rocker arm sideplates, each of said rocker arm sideplates having a cylindrical bearing surface at each end and an intermediate cylindrical bearing surface, the centers of all three bearing surfaces being parallel;

A rocker support shaft fixed to said cylinder head and engaging the cylindrical bearing surfaces at one end of the rocker arm sideplates;

A cam follower roller, said cam follower roller engaging the coacting camshaft lobes of said camshafts, said cam follower roller rotatably supported by a roller shaft, said roller shaft supported at its ends by said intermediate cylindrical bearing surfaces in said rocker arm sideplates;

A trunnion yoke member having two journaled trunnions, a flat central yoke with two central yoke planar surfaces parallel to each other and to the journaled trunnions, and a central clearance hole through said central yoke planar surfaces, said journaled trunnions of said trunnion yoke

3

4

member pivotally engaging said cylindrical bearing surfaces at the other ends of said rocker arm sideplates;

A threaded valve stem extending through said central clearance hole in said flat central yoke;

A pair of opposed stop-nuts threadably engaging said threaded valve stem on opposite sides of the trunnion yoke member, said stop-nuts slidably engaging said central yoke planar surfaces of the trunnion yoke member.

2. A desmodromic valve actuator comprising:

A trunnion yoke member having two parallel central yoke planar surfaces, a central clearance hole therethrough, and journaled trunnions;

A valve stem extending through said central clearance hole through said central planar surfaces of said trunnion yoke member;

A pair of stop means engaging said valve stem and presenting planar surfaces to said central planar surfaces of said trunnion yoke member for sliding engagement therewith;

A pair of pivotally supported rocker arm sideplates having cylindrical bearing surfaces at one end, said cylindrical bearing surfaces pivotally engaging said journaled trunnions of said trunnion yoke member;

Cam means whereby said pivotally supported rocker arm sideplates are caused to oscillate.

3. Apparatus according to claim 2 wherein said valve stem is threaded and said pair of stop means comprises a pair of threaded stop-nuts.

4. In a desmodromic valve gear wherein a pivotally supported rocker arm means is caused to oscillate by cam means, a desmodromic valve actuator comprising:

A trunnion yoke member having a flat central yoke with a central clearance hole therethrough and oppositely disposed cylindrical trunnions engaging cylindrical bearing surfaces in said rocker arm means;

A valve stem of a poppet valve, said valve stem extending through said central clearance hole of said flat central yoke;

A pair of stop means engaging said valve stem and slidably engaging opposite surfaces of said flat central yoke of said trunnion yoke member.

5. Apparatus according to claim 4 wherein said valve stem is threaded and said stop means are threaded stop-nuts.

6. In a desmodromic valve actuator wherein a pair of coacting camshaft lobes impart oscillation to a pivotally supported rocker arm means, linkage between a valve stem and said rocker arm means comprising:

A trunnion yoke member having cylindrical trunnions and a flat central yoke with a central clearance hole therethrough, said cylindrical trunnions pivotally supported by cylindrical bearing surfaces in the end of said rocker arm means, and said clearance hole loosely engaging said threaded valve stem end;

A pair of stop means engaging said valve stem and slidably engaging opposite surfaces of said flat central yoke.

7. Apparatus according to claim 6 wherein said rocker arm means is a pair of rocker arm sideplates.

8. Apparatus according to claim 6 wherein said valve stem is threaded and said stop means are threaded stop-nuts.

9. In a desmodromic valve actuator wherein a pair of coacting camshaft lobes impart oscillation to a pivotally supported rocker arm means, and a pair of opposed stop means engage the stem of a poppet valve, linkage between the end of said rocker arm means and the stop means comprising:

A trunnion yoke member having cylindrical trunnions and a flat central yoke with a central clearance hole therethrough, said cylindrical trunnions pivotally supported by cylindrical bearing surfaces in the end of said rocker arm means, said valve stem extending through said central clearance hole in said flat central yoke, and opposite surfaces of said flat central yoke slidably engaging said stop means.

10. Apparatus according to claim 9 wherein said valve stem is threaded and said opposed stop means comprises a pair of stop-nuts.

40

45

50

55

60

65

70

75