July 5, 1960 A. G. MIDDLER 2,943,612

VALVE GEAR

Filed Feb. 21, 1958

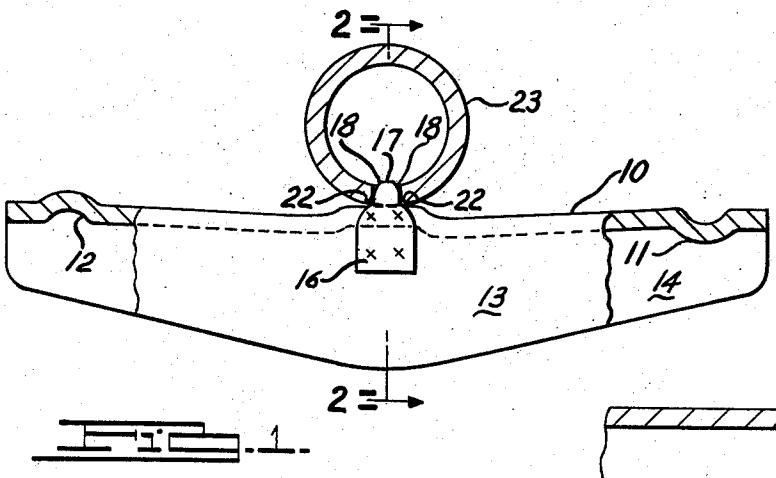


FIG. 1.

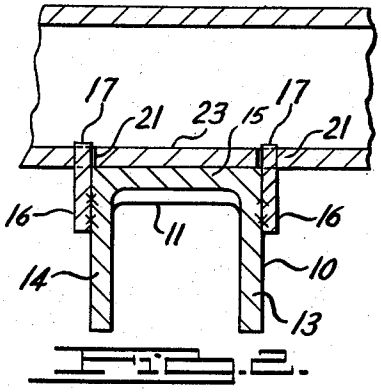


FIG. 2.

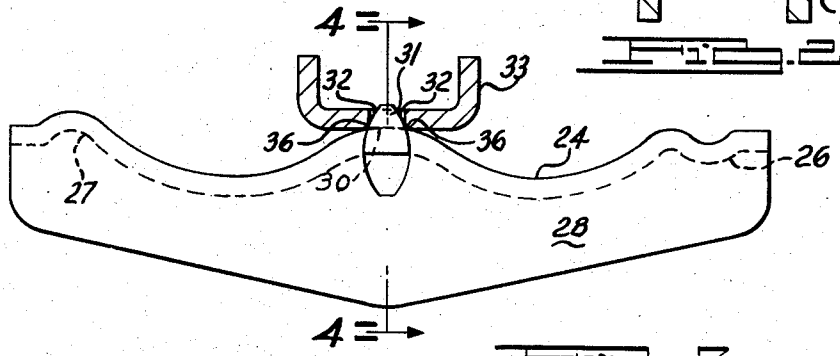


FIG. 3.

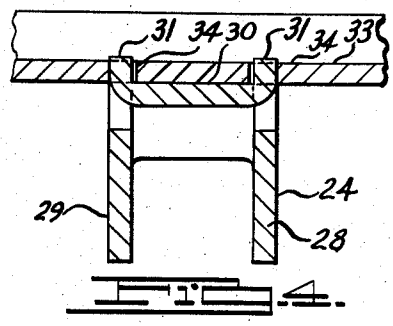


FIG. 4.

INVENTOR.
A. G. MIDDLER
BY E. C. McRae
J. R. Faulkner
T. H. Oster
ATTORNEYS

United States Patent Office 2,943,612 Patented July 5, 1960

2,943,612

VALVE GEAR

Alexander G. Middler, Detroit, Mich., assignor to Ford Motor Company, Dearborn, Mich., a corporation of Delaware

Filed Feb. 21, 1958, Ser. No. 716,584

3 Claims. (Cl. 123—90)

This invention is concerned with an internal combustion engine valve gear and is especially concerned with a new and improved rocker pivot construction for inclusion in the valve train of overhead valve engines to provide a valve system in which friction is minimized. This invention is an improvement over that invention disclosed and claimed in United States Letters Patent No. 1,497,451 which issued on June 10, 1924.

An object of this invention is to provide a simply constructed rocker arm which utilizes a true rocking motion in place of the conventional pivot motion. In the past, rocker arms have generally been of the type which oscillated about a fixed pivot point. Assemblies of this construction are prevalent throughout the art.

The satisfactory operation of the usual rocker arm and the controlled oil consumption of the overhead valve engine depends considerably upon the tolerances existing between the rocker arm and the sleeve upon which it oscillates and the provision of an accurate supply of oil. The instant invention utilizes a rolling action as opposed to the sliding friction used in the prior art. The rocker underlies a fixed support and is positioned upon the support by projections on the rocker which engage projection receiving depressions in the support. The support requires little or no machining except for the projection receiving depressions as compared with the high surface finish which was required in the conventional sliding friction rocker arm shaft. The applicant's improved rocker arm construction is capable of easy manufacture at a considerable reduction in cost to conventional rocker arms.

Another object of this invention is to provide a rocker arm which minimizes push rod whipping and holds to a minimum the scrubbing action of the rocker on the valve stem foot. Because of the rolling action of the rocker arm against the support, the rocker arm is moved laterally as it rocks so that both the push rod and the valve stem travel in a generally axial direction which avoids the relative whipping motion inherent in the push rods used in conventional sliding friction pivot rocker arms.

Still a further object of this invention is to provide a rocker arm movable about a support in a rolling motion wherein the closing and opening of the valve will be done at a slower rate when the valve is being seated or unseated thereby preventing pounding and battering of the valve seat due to the momentum of the valve. The change in velocity is permitted by a change in the lever arm length between the rocker arm push rod receiving portion and the center of oscillation and the poppet valve actuating portion as the rocker arm moves about the surface of the fixed support.

Other objects and advantages of this invention will be made more apparent as this description proceeds, particularly when considered in connection with the accompanying drawings, wherein:

Figure 1 is a side elevation partly in section of a

rocker arm and pivot construction incorporating the applicant's invention;

Figure 2 is a cross section taken on line 2—2 of Figure 1;

Figure 3 is a side elevation view of a modification of Figure 1, and

Figure 4 is a cross section taken on line 4—4 of Figure 3.

Referring now to the drawings, and in particular Figures 1 and 2, the rocker arm is generally indicated at **10** and may be of the stamped, cast, brazed, or otherwise fabricated design preferably of a channel shape. A convex bearing surface **11** is provided at one end of the rocker for contact with the valve stem (not shown) and a concave bearing surface **12** is provided at the opposite end for receiving the valve push rod (not shown). It is, of course, possible to change the surface to provide for an adjustable rocker arm bolt in event that fixed steel tappets are used. The depending sides **13** and **14** straddle the concave and convex bearing portions of the rocker to support the load on the rocker. The sides are joined by a web portion **15** which is in rolling contact with the fixed support. The web portion **15** in the area of the contact with the fixed support **23** is formed in the shape of an involute curve. Secured to each of the sides **13** and **14** are positioning tabs **16** which have a formed projection **17** extending above the uppermost portion of the rocker. A contact surface **18** is provided on each side of the projection **17**.

The rocker **10** contacts the underside of fixed support **23**. A pair of aligned projection receiving depressions **21**, having mating surfaces **22** for engagement with the projection contact surfaces **18** is provided on the underside of the support. In the rocking motion of the rocker, the contact is between the underside of the fixed support **23** and the web **15** of the rocker guided in its rolling movement by the projection **17** and its surfaces **18** contacting the respective surfaces **22** of the support **23**.

In Figures 3 and 4 a modified form of the construction is provided in the formation of the guide tab and projection and in its projection receiving depression in the fixed support. The rocker **24** is of a similar construction to the one shown in Figures 1 and 2 and has the convex bearing surface **26**, concave bearing surface **27**, and depending sides **28** and **29** joined by web **30**. Instead of the projection tab **16** secured to the sides **13** and **14** as shown in Figures 1 and 2, the projection **31** is stamped from the sides **28** and **29** and is bent upwardly to project above the uppermost portion of the rocker arm. It is, of course, possible to stamp the projection **31** from the web portion **30** as well. Projection **31** is also provided with surfaces **32** on each side and is guided in the projection receiving depression **34** against mating surfaces **36** in channel shaped support **33**. It is also to be noted that the web **30** takes the involute form in the area where contact is made with the fixed support **33**.

In this type of construction where a rolling motion is utilized, there is no need for a positive supply of lubricant. Insofar as the projection tabs **17** and **31** are concerned, in their respective sliding movement in their respective projection receiving depressions **21** and **34**, adequate lubrication is available in the form of oil vapors within the engine.

Although the embodiment disclosed shows the projection on the rocker and the projection receiving depression in the fixed support, it is contemplated and possible that the reverse may be utilized and that the projection may be placed on the support and the projection receiving depression in the rocker web. It is also contemplated that only one projection may be used instead of the two projections shown in the drawings.

It will be understood that the invention is not to be

limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. In an internal combustion engine, a stationary support, a rocker arm, said rocker arm having a web portion and a pair of side portions depending from said web portion, said web portion having its upperside in rolling contact with the underside of said stationary support, said rocker arm having at least one guiding projection extending upwardly beyond the web portion, said stationary support having at least one guiding projection receiving depression in the underside to receive said guiding projection, one of said stationary supports and said rocker arm web portions having an arcuate form in the area of contact between said stationary support and said rocker arm web portion whereby said rocker arm web portion rolls on the surface of said stationary support in a path determined by the movement of said guiding projection.

2. An improved rocker arm pivot support arrangement comprising a cylindrical support, a rocker arm underlying said support in abutting relationship, said rocker arm having a web portion and a pair of side portions depending from said web portion, said web portion having its upper side in rolling contact with the underside of said stationary cylindrical support, a positioning projection secured to each of said depending side portions and extending upwardly beyond said web portion, a positioning projection receiving depression in the underside of said stationary cylindrical support to receive each of said projections whereby said rocker arm rolls on the surface of the cylindrical support in a path determined by the movement of said guiding projections inside said guiding projection depressions.

3. In an overhead valve mechanism in an internal combustion engine, a rocker arm for actuating a poppet valve, said rocker arm having a web portion and a pair of side portions integral with and depending from said web portion, a fixed channel shaped support overlying and abutting said rocker arm, said rocker arm web portion having an arcuate form in the area of contact between said support and said rocker arm web portion, a pair of positioning projections extending from said side portions vertically upwardly to project above the uppermost portion of the rocker arm web portion, a pair of positioning projection receiving depressions in the underside of said fixed support for receiving said projections whereby said rocker arm portion rolls on the surface of the fixed channel support in a manner determined by the movement of said guiding projections inside said guiding projection receiving depressions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,497,451	Kytlica	June 10, 1924
1,605,722	Harper	Nov. 2, 1926
1,699,658	Fagan	Jan. 22, 1929
2,572,968	Bachle	Oct. 30, 1951