Feb. 13, 1962 J. R. WINTER, JR 3,020,779

ROCKER ARM FOR INTERNAL-COMBUSTION ENGINES

Filed March 25, 1959

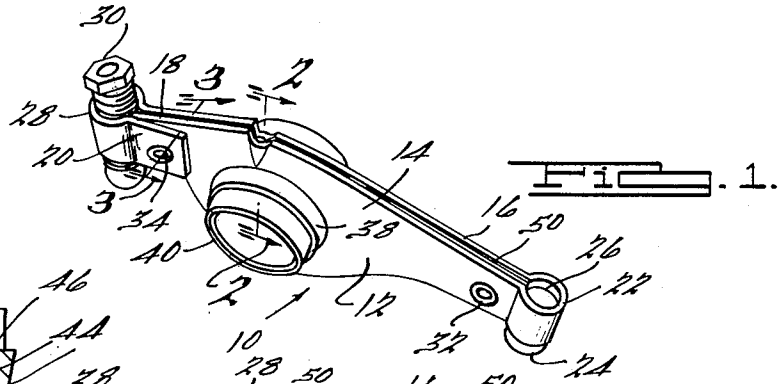


Fig. 1.

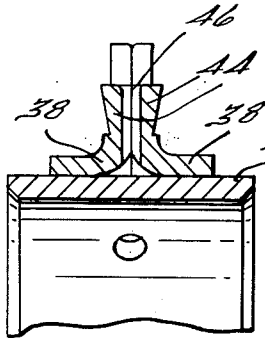


Fig. 2.

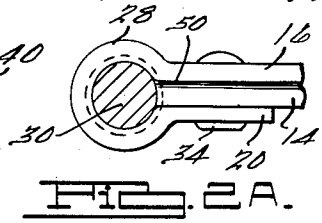


Fig. 2A.

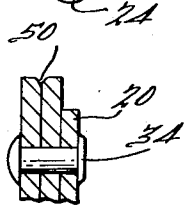


Fig. 3.

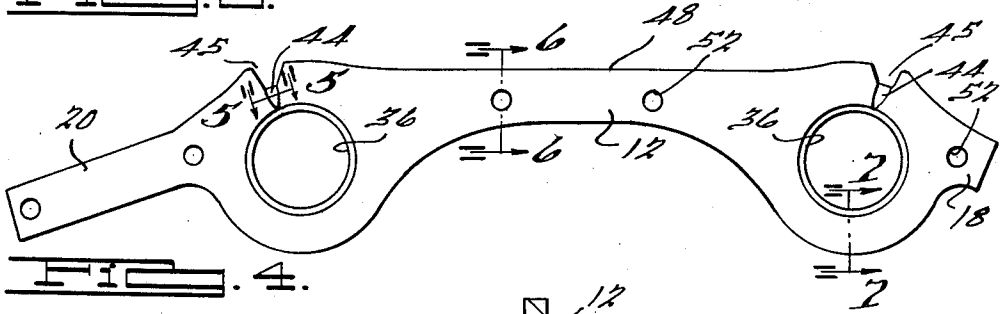


Fig. 4.

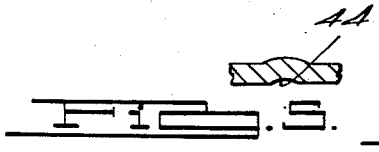


Fig. 5.

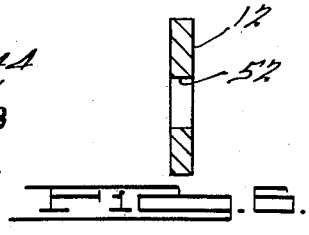


Fig. 6.

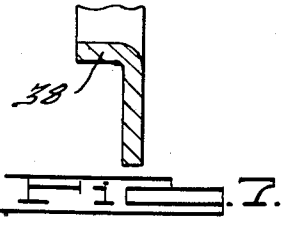


Fig. 7.

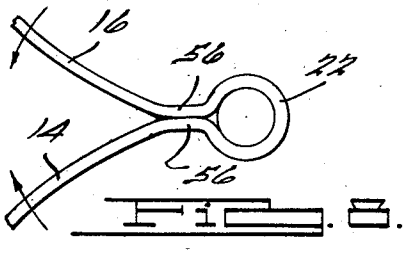


Fig. 8.

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ROCKER ARM FOR INTERNAL-COMBUSTION ENGINES

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This invention relates generally to improvements in the construction of rocker arms for internal-combustion engines of the overhead valve type.

The primary object of this invention, therefore, is to provide a laminated rocker arm which includes improved means for securing the laminae together.

It has been a common practice to secure the laminae together in laminated rocker arms by welding. An example of such a rocker arm is shown in my prior Patent No. 2,509,661. However, many problems must be dealt with in the manufacture of arms in this manner. First of all, the only way effective quality control can be accomplished is to subject selected finished arms to load tests which determine whether or not the welds are of the required strength. Such a test always results in the destruction of the test arms. When an arm with a defective weld is found, all of the arms welded in the machine between the time of the test which disclosed the defective arm and the preceding arm tested must be rejected. Secondly, the metal in a welded arm becomes embrittled and the arms are subject to some warping and deformation due to the heating involved in the welding step. Furthermore, the material from which the arms can be made is limited to weldable metals.

It is an object of the present invention, therefore, to provide a rocker arm which overcomes the above disadvantages, is economically produced by mass production methods, and is capable of performing efficiently over a prolonged service life.

Further objects, features and advantages of this invention will become apparent from a consideration of the following description, the appended claims and the accompanying drawing in which:

FIGURE 1 is a perspective view of the rocker arm of this invention;

FIGURE 2 is a fragmentary enlarged sectional view looking along the line 2—2 in FIG. 1;

FIGURE 2A is a fragmentary plan view of one end portion of the arm shown in FIG. 1;

FIGURE 3 is a fragmentary enlarged sectional view looking along the line 3—3 in FIG. 1;

FIGURE 4 is a plan view of the stamping which is bent to form the rocker arm shown in FIG. 1;

FIGURES 5, 6 and 7 are enlarged sectional views looking substantially along the lines 5—5, 6—6 and 7—7, respectively, in FIG. 4, and

FIGURE 8 is a diagrammatical illustration of the manner in which the blank shown in FIG. 4 is bent to form the rocker arm shown in FIG. 1.

With reference to the drawing, the rocker arm of this invention, indicated generally at 10, is illustrated in FIG. 1 as consisting of a body member 12 which is blanked and formed from a single piece of sheet metal, shaped and folded to provide two laminae 14 and 16 which are positioned side by side and flat against each other. The end portions 18 and 20 of the body member 12 are overlapped at one end of the rocker arm, as shown in FIG. 1, to facilitate attachment of the laminae 14 and 16 in a manner to be hereinafter described. A loop 22 formed at one end of the body member 12 supports a push pin element 24 having a stem 26 received in a flexible press fit in the loop 22. A loop 28 at the opposite end of the arm 10 receives a threaded stud 30 which is actuated by

the push rod (not shown) in the internal combustion engine during use of the arm 10. The laminae 14 and 16 are held together at positions adjacent the loops 22 and 28 by rivets 32 and 34, respectively, with the rivet 34 extending also through the overlapped end portion 20. The stud 30 is illustrated as being of the self-locking adjustable type which does not require a lock-nut. The rivets 32 and 34 hold the laminae so positively that this type of a stud can be used, thereby facilitating assembly of the stud and arm and making adjustment of the stud easier as compared with a stud and lock-nut combination. It was necessary to use this latter type of stud on prior arms in which the laminae were welded together because there was danger that a self-locking type stud might loosen the weld.

In the manufacture of the arm 10, it is blanked from a single piece of sheet metal in the form illustrated in FIG. 4. Hub receiving openings 36 are formed in spaced portions of the body 10 and the metal surrounding the openings 36 is drawn outwardly as illustrated in FIG. 2 so as to form tubular supports 38 for a tubular hub member 40 frictionally supported in the supports 38 and extended axially through the openings 36.

When the body member 10 is in the blank form shown in FIG. 4, it is formed with a pair of grooves 44, each of which extends outwardly from one of the openings 36 and communicates with a notch 45 formed in one edge 48 of the body member 12. When the body member 12 is bent to form the laminae 14 and 16, the grooves 44 cooperates to form an upright oil passage 46 for a purpose to appear presently.

When the body member 10 is in the blank form shown in FIG. 4, it is also swaged along the edge 48 so that when it is bent to form the laminae 14 and 16, V-shape oil supply grooves 50 are formed which terminate at their inner ends at the notches 45 and at their outer ends at the loops 22 and 28. The grooves 50 are supplied with oil at their inner ends from passage 46 and function to direct this oil to the loops 26 and 28 which accommodate and support the element 24 and the stud 30, referred to generically as thrust members. At the loop 22, the oil flows downwardly around the stem 26 to the contact pad surface of the push pin 24. At the opposite end of the arm 10, the oil flows downwardly on the actuating screw 30 to the ball-shaped lower end thereof.

The five openings 52 for the rivets 32 and 34 may be formed by extending suitable punch means (not shown) through the blank-shape body member 12 from the same side of the blank that the punches which form the openings 36 are extended, at the same time that the body member 12 is blanked. The openings 52 can also be formed after the blanked body member 12 is folded to form the laminae 12 and 14. In such case there may be some deformation caused by the punch in the area of the openings 52 but this deformation will tend to provide for a nested relationship of the laminae 14 and 16 so it will not be harmful.

It is very important that the laminae 14 and 16 be maintained in positions flat against each other, especially in the area of the tubular supports 38, because if they are spaced at any point, the oil supply to the grooves 50 will be short circuited or will flow downwardly between the laminae before it reaches the loops 22 and 28 thereby interfering with the normal metered supply of oil to the push pin element 24 and the threaded stud 30. The laminae 14 and 16 are formed by first bending the body member 10 when it is in the blank form shown in FIG. 4, to form the loop 22, and the portions 56 of the body member 10 adjacent the loop 22 are held tightly together so that the laminae 14 and 16 assume the relatively diverging positions illustrated in FIG. 8. The free ends of

the laminae **14** and **16** are then forced inwardly toward each other and this action provides for a tight engagement of the laminae **14** an **16** over the full lengths. The loop **28** is then formed at the opposite end of the body **10** so as to provide for the overlapping end portion **20**. The rivets **32** and **34** are then extended through the aligned openings **52** to hold the laminae **14** and **16** against each other.

From the above description, it is seen that this invention provides a rocker arm **10** which is readily formed from the blank shown in FIG. 4 without requiring any welding of the laminae **14** and **16**. The rivets **32** and **34** not only provide adequate mechanical strength, but permit easy and rapid visual inspection which is not possible with welded or brazed constructions, while in addition, when constructed in accordance with my invention, effective sealing of the oil channels is attained despite the relatively wide physical spacing of the rivets, and great strength is afforded at the highly stressed end portions of the structure.

Although the invention has been described with respect to a preferred embodiment thereof, it is to be understood that it is not to be so limited, since changes can be made therein which are within the scope of the invention as defined by the appended claims.

What is claimed is:

1. A rocker arm construction for internal-combustion engines comprising a sheet metal body member having openings punched through predetermined portions thereof, said body member being bent upon itself to form a pair of substantially identical laminae positioned side by side and having pairs of said openings aligned in said laminae, said body being bent to form loops at opposite ends of said laminae, said laminae being formed with means providing for the formation of passages for fluid between said laminae when said laminae are positioned side by side in tight engagement with each other, said body member having a pair of overlapping ends adjacent one of said loops, a first rivet extending through a pair of said openings extending through said ends for securing said ends together, and a second rivet extending through aligned openings through intermediate portions of said laminae, said first and second rivets cooperating to maintain said laminae in sufficiently tight engagement with each other to prevent substantial leakage of fluid from said passages, said laminae in their unriveted condition diverging from each other so that said rivets will result in said tight engagement of said laminae intermediate said rivets.

2. An engine rocker arm comprising a sheet metal body member bent upon itself to form laminae positioned side by side in tight engagement with each other and a hub portion extending transversely through an intermediate portion of said laminae, said hub portion having an opening for lubricant extending therefrom to an intermediate point in one edge face of said body member, fluid supply passages in said one edge communicating at their inner ends with said opening and at their outer ends with opposite ends of said arm, and rivets extending through said laminae for maintaining the laminae in sufficiently tight engagement to prevent flow of fluid out of said passages between said laminae.

3. In a rocker arm structure for an internal-combustion engine or the like, a pair of sheet metal laminae, and means for securing said laminae together and for accommodating a thrust member, said means including a portion integral with one of said laminae and extending beyond one end of the other, said portion being bent in the form of a loop positioned beyond said end of the one lamina and lapped back over said other lamina, and mechanical holding means securing said lapped part and said laminae together.

4. In a rocker arm structure for an internal-combustion engine or the like, a sheet metal body member folded upon itself to form a pair of side by side sheet metal laminae, means for securing said laminae together and for accommodating a thrust member at one end thereof, said means including a portion integral with one of said laminae and extending beyond one end of the other one of said laminae, said portion being bent in the form of a loop positioned beyond said end of the one lamina and lapped back over said other lamina, said body member being formed with a second integral loop positioned at the other end of said laminae for accommodating another thrust member, and mechanical holding means securing said lapped part and said laminae together.

5. A rocker arm construction for internal combustion engines comprising a sheet metal body member bent upon itself to form a pair of substantially identical laminae positioned side by side and provided intermediate the ends of said body member and at one end of said laminae with a first loop for supporting a bearing member, one of said laminae having an integral extension at its opposite end which is of a loop shape and is lapped back over the adjacent end of the other one of said laminae so that said adjacent end is positioned between said one of said laminae and the lapped portion of said extension, said laminae being formed with means providing for the formation of passages for fluid between said laminae terminating at said loops when said laminae are in side by side tight engagement with each other, a first rivet extending through said laminae and said extension at a position adjacent the loop shape portion of said extension, and a second rivet extending through said laminae adjacent said first loop.

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