Aug. 7, 1951 J. R. WINTER, JR 2,563,699

ROCKER ARM CONSTRUCTION

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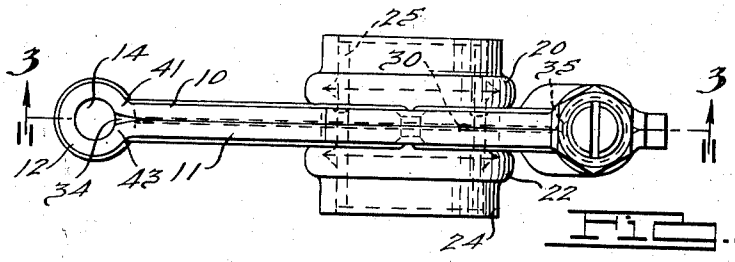


FIG. 2.

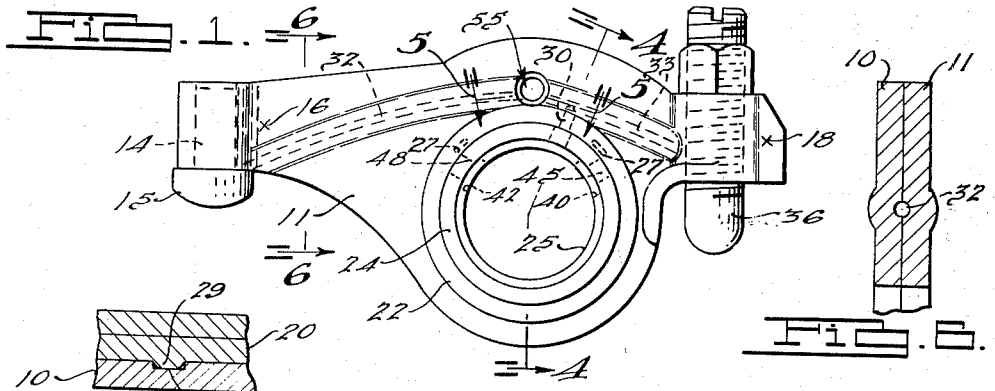
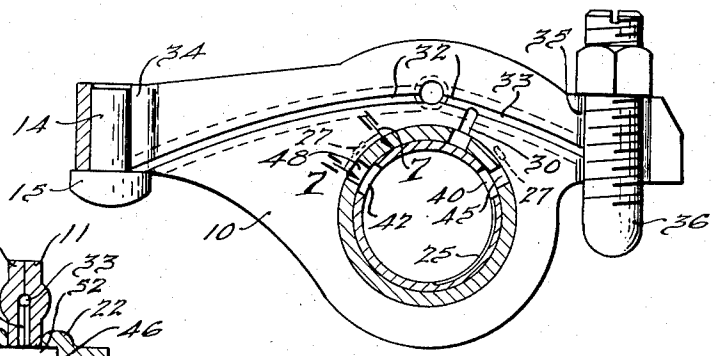


FIG. 1.

FIG. 6.

FIG. 3.

FIG. 7.



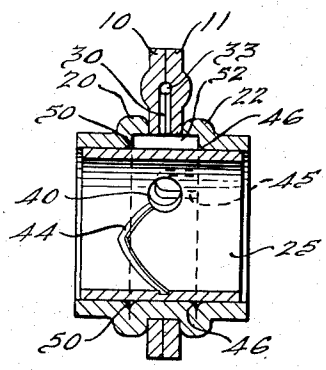


FIG. 4.

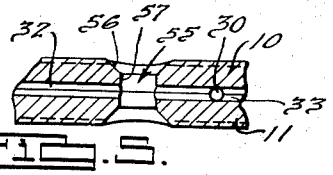


FIG. 5.

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ROCKER ARM CONSTRUCTION

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24 Claims. (Cl. 74—519)

1

The present invention relates to the construction of rocker arms for internal combustion engines of the overhead valve type.

The primary object of the invention is to provide improved means for the controlled feeding of oil to the ends of such rocker arms and particularly to insure proper and adequate delivery of oil to the valve-actuating push pad ends of rocker arms, without over-oiling, without permitting unwanted escape of the oil, and without allowing delivery of oil directly to the sides of the valve stem. The delivery of excess oil directly to the valve stems causes excess oil consumption due to the tendency of the engine to draw the oil into the cylinders along the valve stems during each suction stroke.

A more specific object of the invention is to provide such an improved rocker arm which allows escape of excess oil, while preventing the escaping oil from reaching the valve stems.

Another object is to provide such an arm constructed of sheet metal and having internal oil passages formed without drilling, the blanking and forming of the sheet metal which imparts the desired configuration to the arm being performed in a novel and economical manner which simultaneously forms the internal oil passages therein.

Still another object is to provide such an arm having oil feeding means so arranged that oil cannot be discharged in the form of a spray or jet, either due to pump pressure or due to the centrifugal action of the rocker arms, the rate of delivery of oil to the valve stems and to the adjacent push pin portions being limited and positively controlled in a manner to prevent wastage of oil.

The invention is exemplified in a sheet metal arm constructed of two laminations folded from a single blank so that flat surfaces lie parallel to and against one another, internal oil passages in the finished arm being formed by conventional press operations carried out upon the blank before folding, and the internal passage system being in communication with diversionary outlet openings for excess oil, which openings are arranged to direct excess oil outwardly and down the sides of the arm and away from any points where harmful over-oiling might occur.

Other objects and advantages of the invention will become apparent upon consideration of the present disclosure in its entirety.

In the drawings:

Figure 1 is a side elevational view of a rocker arm constructed in accordance with the principles of the present invention;

2

Fig. 2 is a top plan view thereof;

Fig. 3 is a vertical longitudinal sectional view taken substantially on the line 3—3 of Fig. 2 and looking in the direction of the arrows;

Figs. 4, 5 and 6 are cross-sectional views taken substantially on the lines 4—4, 5—5 and 6—6 of Fig. 1, and looking in the direction of the arrows; and

Fig. 7 is a cross section taken substantially on the line 7—7 of Fig. 3 and looking in the direction of the arrows.

Referring now to the drawings, the body of the arm is formed of a single blank of sheet metal which, during fabrication of the arm, is folded to provide two laminations. This general mode of forming an arm is disclosed in my previously filed copending application Serial No. 701,150, and the hub and hub bearing portions employed in the arm of the present invention may be constructed and assembled substantially in the manner disclosed in such prior application. The two laminations are designated 10 and 11, and these are integrally joined by the portion 12 which is wrapped about the stem portion 14 of the tappet bearing pad member or push pin 15. The laminations may also be secured together by welding as in the areas designated 16, 17 and 18, and are also secured by annular bulged portions 20, 22 formed upon the hub 24.

On an outer face of one of the laminations as 10, near the margin of the hole 23 in which the hub is fitted, one or more relatively shallow depressions as 27 are formed into which the metal at the side of the adjacent bulged head 20 may flow during the bulging operation, to provide a keying portion 29 which positively locks the hub against turning with relation to the arm.

A bearing sleeve 25 is fitted in the hub and adapted to be journaled upon the rocker arm shaft (not shown).

Oil passages are formed inside the body of the arm, consisting of a generally vertical riser passage 30, and longitudinal passageways 32, 33 extending from the upper end of the riser passage 30 to the outer ends of the arm. The oil flows outwardly through passageways 32, 33 in opposite directions from the centrally positioned riser 30. Passage 32 extends to juncture at its outer end with a vertical passage 34 formed by the reversely curved portions 41, 43 of the metal of the laminations 10 and 11, located in the region where the part 12 which encircles the pin 14 joins the flat abutting sections of the arm proper. The passage 34 is thus of generally tri-

angular section and extends downwardly to the head of the push pin pad 15. The cross-sectional contour of passage 34 is such that it extends inwardly from pin 14 far enough to provide an opening around the inner edge of the pad 15, so that oil may flow downwardly over the edge of the pad and onto its lower surface.

The internal passage 33 extends outwardly in the opposite direction from passage 32 to a similar vertical passage of substantially triangular cross section, designated 35, adjacent the adjustable push rod bearing screw 36. The oil delivered through the passage 33 flows downwardly through the passage 35 and down the side of the bearing screw 36 to the lower push rod-engaging end of the latter.

The passage portions 30, 32 and 33 may be formed by depressions of approximately semicircular cross section formed in aligned relation in the abutting flat faces of the laminae. This may be done either in the initial blanking or in a subsequent operation.

The means whereby the oil is conducted to the riser passage 30 from the rocker arm shaft is subject to variation, but the arrangement may correspond to that disclosed in my copending application Serial No. 701,150. The bearing sleeve 25 is provided with two radial holes 40 and 42, arranged approximately midway of the length of the sleeve and connected by a shallow sinuous groove 44 in the inner surface of the sleeve. A suitable port in the shaft (not shown) delivers oil to groove 44 from which the oil flows through the holes 40 and 42. The hole 40 communicates with a longitudinal slot 45 in the hub which in turn communicates with an annular channel 46 formed inside the bulb 22 by the outwardly folded metal of the bulb, the inner face of the channel 46 being closed, except at the slots 45, 52, by the bearing sleeve. Hole 42 similarly communicates through a longitudinal slot 48 with annular channel 50 in the bulge 30. A longitudinal slot 52 which intersects the riser passage 30 connects the annular channels 46, 50 with the riser, so that oil delivered to such annular channels can pass through the slot 52 and the riser 30.

The passageway system comprising the passage portions 30, 32 and 33 is provided with one or more openings arranged to permit the escape of all excess oil not required for proper oiling of the push pin and the push rod screw 36. Such opening is shown as formed in the passage 32 relatively close to and directly above the bulged portions 20, 22. This is subject to variation, however, since all of the passages 30, 32 and 33 are connected. In the preferred construction illustrated, riser 30 slants rearwardly or toward the push rod end of the arm, and the opening consists of a continuous transverse orifice generally designated 55 extending through both laminae. Orifice 55 may be formed by punching holes in the blank which register when the blank is folded. Preferably, the outer faces of the laminae are countersunk around the holes which form the orifice 55, as best shown in Figs. 1 and 5 at 56. The countersinking of the outer ends of the orifice provides, in effect, a narrowed internal wall, as indicated at 57, in the area where the passage 32 intersects the orifice 55. The oil flows outwardly through passage 32 from the riser 30 to the orifice 55. The lubricating oil has relatively high viscosity, and due to this fact would tend rather strongly to resist being diverted outwardly laterally through the orifice 55 if such orifice did not have the countersunk portions 56. The excess oil is thus diverted outwardly and away from the arm. Due to the reduced cross section of the portion 57 formed by the countersunk ends 56 of the transverse orifice 55, the viscous oil is smoothly divided, and the excess flows freely outwardly and down the sides of the arm, while a part of the oil which is in alignment with the passage 32 continues outwardly therethrough to provide controlled lubrication of the push-pin.

The excess oil which escapes from the ends of orifice 55 tends, due to capillary action, to stay in the crack between the bulge and the side of the arm, and runs downwardly to the bottom of the bulge before dropping off. By virtue of this action the excess oil strongly resists being thrown out toward the ends of the arm, and this is a further factor tending to prevent over-oiling.

It will be understood that the size, position and shape of the orifice 55 may be altered to vary the relative proportion of the oil which is diverted, and that a substantial difference in rate of flow to the end of the arm can be introduced simply by raising or lowering the position of the orifice slightly with respect to the passage 33.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A rocker arm construction for internal combustion engines and the like, comprising a pair of parallel abutting sheet metal laminae defining a hub-retaining section and an arm section, oil passage-defining portions formed as channel-like relieved areas in an abutting face of at least one of said laminae, and arm portions defining a transverse orifice extending entirely through at least one of said laminae and intersecting said first-mentioned passageway portions.

2. A rocker arm construction for internal combustion engines and the like, comprising a pair of parallel abutting sheet metal laminae defining a hub-retaining section and an arm section, oil passage-defining portions formed as channel-like relieved areas in an abutting face of at least one of said laminae, and arm portions defining a transverse orifice extending entirely through at least one of said laminae and intersecting said first-mentioned passageway portions, said portions which define the orifice including an enlarged part at an outer end of the orifice.

3. A rocker arm construction for internal combustion engines and the like, comprising a pair of parallel abutting sheet metal laminae defining a hub-retaining section and an arm section, oil passage-defining portions formed as channel-like relieved areas in an abutting face of at least one of said laminae, and arm portions defining a transverse orifice extending entirely through at least one of said laminae and intersecting said first-mentioned passageway portions, said portions which define the orifice including enlarged parts at the outer ends of the orifice.

4. A rocker arm construction for internal combustion engines and the like, comprising a pair of parallel abutting sheet metal laminae defining a hub-retaining section and an arm section, oil passage-defining portions formed as channel-

like relieved areas in an abutting face of at least one of said laminae, and arm portions defining a transverse orifice extending entirely through at least one of said laminae and intersecting said first-mentioned passageway portions, said orifice being countersunk to a depth sufficient to provide a reduced edge at the juncture with said first-mentioned passageway portions.

5. A rocker arm construction for internal combustion engines and the like, comprising a pair of parallel abutting sheet metal laminae defining a hub-retaining section and an arm section, oil passage-defining portions formed as channel-like relieved areas in an abutting face of at least one of said laminae, and arm portions defining a transverse orifice extending entirely through both of said laminae and intersecting said first-mentioned passageway portions.

6. A rocker arm construction for internal combustion engines and the like comprising a hub portion having an oil passage extending therethrough, an arm portion fast with respect to and projecting from the hub portion and having a covered oil passage therein communicating with the first mentioned oil passage in the hub portion, and means for diverting excess oil from said passages comprising a transverse orifice portion communicating with said passages and extending to and opening in an exposed surface of the arm.

7. An arm construction as defined in claim 6 wherein said hub portion projects laterally from the arm portion and said orifice opens in one side of the arm portion close to the projecting part of the hub portion.

8. An arm construction as defined in claim 6 wherein said hub portion projects laterally from the arm portion and said orifice opens in one side of the arm portion close to and near the top of the projecting part of the hub portion.

9. An arm construction as defined in claim 6 wherein said orifice intersects the passage in the arm portion and opens in one side of said arm portion.

10. An arm construction as defined in claim 6 wherein said orifice intersects the passage in the arm portion and opens in one side of said arm portion, the terminus of said orifice in said side of the arm portion being formed as an enlarged mouth.

11. An arm construction as defined in claim 6 wherein said orifice intersects the passage in the arm portion and opens in one side of said arm portion, the terminus of said orifice in said side of the arm portion being formed as an enlarged reentrant mouth.

12. An arm construction as defined in claim 6 wherein said orifice intersects the passage in the arm portion and opens in one side of said arm portion, the terminus of said orifice in said side of the arm portion being formed as an enlarged reentrant substantially truncated conic mouth.

13. An arm construction as defined in claim 6 wherein said orifice intersects the passage in the arm portion and opens in one side of said arm portion, the terminus of said orifice in said side of the arm portion being formed as an enlarged reentrant substantially truncated conic mouth, the hub portion projecting laterally from the arm portion and the mouth being located close to said hub portion.

14. An arm construction as defined in claim 6 wherein said orifice intersects the passage in the arm portion and opens in one side of said

arm portion, the terminus of said orifice in said side of the arm portion being formed as an enlarged reentrant substantially truncated conic mouth, the hub portion projecting laterally from the arm portion and the mouth being located close to and near the top of said hub portion.

15. In a rocker arm construction comprising an apertured metal arm member and a tubular sheet metal hub projecting through and secured in the apertured portion of said arm member, the means for securing the hub with respect to the arm member comprising a bulge formed in the hub and projecting laterally beside the arm member and bearing inwardly against the side of the latter, intercommunicating covered passageways formed in said hub and arm member, and means for diverting excess oil from said passageways comprising a transverse orifice portion communicating with said passageways and opening in a side face of the arm close to said bulge.

16. In a rocker arm construction comprising an apertured metal arm member and a tubular sheet metal hub projecting through and secured in the apertured portion of said arm member, the means for securing the hub with respect to the arm member comprising a bulge formed in the hub and projecting laterally beside the arm member and bearing inwardly against the side of the latter, intercommunicating covered passageways formed in said hub and arm member, and means for diverting excess oil from said passageways comprising a transverse orifice portion communicating with said passageways and opening in a side face of the arm close to and near the top of said bulge.

17. An arm construction as defined in claim 6 wherein the arm has two projecting ends comprising a push-rod end and a valve end and the passage in the arm includes a riser section and branching sections extending to the push-rod end and the valve end, said orifice portion communicating with the branching passage section which extends to the valve end.

18. An arm construction as defined in claim 6 wherein the arm has two projecting ends comprising a push-rod end and a valve end and the passage in the arm includes a riser section and branching sections extending to the push-rod end and the valve end, said orifice portion communicating with the branching passage section which extends to the valve end, and intersecting said last-mentioned branching passage section between the riser section and the free end of said valve end of the arm.

19. An arm construction as defined in claim 6 wherein the arm has two projecting ends comprising a push-rod end and a valve end and the passage in the arm includes a riser section and branching sections extending to the push-rod end and the valve end, said orifice portion communicating with the branching passage section which extends to the valve end, and intersecting said last-mentioned branching passage section between the riser section and the free end of said valve end of the arm, the riser being inclined toward the push-rod end and the orifice portion being located substantially over the hub portion.

20. An arm construction as defined in claim 6 wherein the arm has two projecting ends comprising a push-rod end and a valve end and the passage in the arm includes a riser section and branching sections extending to the push-rod end and the valve end, said orifice portion communicating with the branching passage section

which extends to the valve end, and intersecting said last-mentioned branching passage section between the riser section and the free end of said valve end of the arm, the riser being inclined toward the push-rod end and the orifice portion being located substantially over and close to the hub portion.

21. An arm construction as defined in claim 6 wherein the arm has two projecting ends comprising a push-rod end and a valve end and the passage in the arm includes a riser section and branching sections extending to the push-rod end and the valve end, said orifice portion communicating with the branching passage section which extends to the valev end, and intersecting said last-mentioned branching passage section between the riser section and the free end of said valve end of the arm, the riser being inclined toward the push-rod end and the orifice portion being located substantially over and close to the hub portion, and having an enlarged mouth through which oil may flow downwardly onto the hub portion.

22. An arm construction as defined in claim 6 wherein the arm has two projecting ends comprising a push-rod end and a valve end and the passage in the arm includes a riser section and branching sections extending to the push-rod end and the valve end, said orifice portion communicating with the branching passage section which extends to the valve end, and intersecting said last-mentioned branching passage section between the riser section and the free end of said valve end of the arm, the riser being inclined toward the push-rod end and the orifice portion being located substantially over and close to the hub portion and having an enlarged mouth through which oil may flow downwardly onto the hub portion, the hub portion comprising a sheet

metal tube secured in the arm portion by means including an annular bulged head formed in such hub portion and bearing against the side of the arm portion beneath and close to said mouth.

23. An arm construction as defined in claim 6 wherein said hub portion comprises a tubular sheet metal member secured in and projecting laterally from the arm portion, the means for securing the hub portion in the arm portion comprising an annular head formed in the tubular sheet metal member and bearing against the side of the arm portion, and said orifice opens in one side of the arm portion close to said head.

24. An arm construction as defined in claim 6 wherein said hub portion comprises a tubular sheet metal member secured in and projecting laterally from the arm portion, the means for securing the hub portion in the arm portion comprising an annular bulged head formed in the tubular sheet metal member and bearing against the side of the arm portion, and said orifice opens in one side of the arm portion close to and near the top of said head.

JOHN R. WINTER, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,943,631	Skillman	Jan. 16, 1934
2,176,083	Leake	Oct. 17, 1939
2,288,831	O'Harrow	July 7, 1942
2,385,309	Spencer	Sept. 18, 1945

FOREIGN PATENTS

Number	Country	Date
349,508	Great Britain	May 26, 1931