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(71) Applicant: **TOLEDO STAMPING & MANUFACTURING COMPANY**
99 Fearing Blvd.
Toledo Ohio 43693(US)

(72) Inventor: **Wherry, Joseph L.**
101 Heilman Avenue
Perrysburg Ohio 43551(US)

(72) Inventor: **Patel, Ramanlal L.**
7036 Shadowcreek Dr.
Maumee Ohio 43537(US)

(74) Representative: **Huchet, André et al,**
Service Brevets Bendix 44, rue François 1er
F-75008 Paris(FR)

(54) **Heavy-duty rocker arm.**

(57) A heavy-duty rocker arm construction is provided, particularly for diesel engines. The rocker arm (20) is stamped and consists of two stamped metal sheets (32, 60) each having wide portions jointed by a narrow web portion. The wide portions are turned back around the web portion and are located in continuous relationship to form the main body portion of the rocker arm (20) and with push rod screws (86) and stem pads (84) carried by the now-looped web portions. The resulting four layers (34, 36, 62, 64) of metal in the main body portion of the rocker arm (20) provide the desired strength at the middle portion without resulting in excessive weight in the outer end portions of the rocker arm.

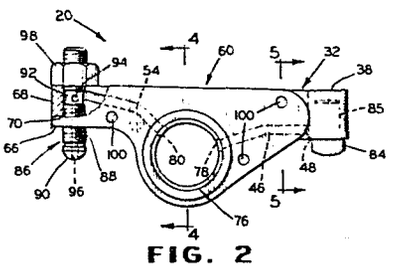

FIG. 2

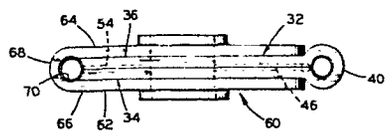

FIG. 3

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HEAVY-DUTY ROCKER ARM

This invention relates to a heavy-duty rocker arm formed of stamped metal sheets.

Heavy-duty rocker arms, particularly for diesel engines and other larger engines, are commonly cast or forged to provide the high strength which is required. In particular, the cast or forged construction has been needed in order to obtain sufficient strength in the main body portion of the rocker arm below the rocker arm shaft, where space is limited. Greater strength is required in that area in diesel engines, for example, because of the higher cylinder pressures and other forces encountered in comparison with smaller gasoline engines.

The present invention provides a stamped rocker arm basically which consists of two stamped metal pieces or sheets, each having two wide portions joined by a narrow web portion. The wide portions are turned back around the web portions and are located in contiguous relationship to form the main body portion of the rocker arm. The web portions thereby form loops which carry push rod screws and stem pads. The wide portions of one of the metal sheets have inner surfaces in contiguous relationship with the wide portions of the other metal sheet having inner surfaces in contiguous relationship with the outer surfaces of the first sheet. The four layers of metal are affixed together, as by rivets, with the four layers providing the required strength for the main body portion of the rocker arm without excessive weight in outer portions. Further, the wide portions of the second sheet can be shaped to extend closer to the looped end portion of the first sheet, if desired, when greater strength is required of the outer portions of the rocker arm.

It is, therefore, a principal object of the invention to provide a stamped rocker arm construction, particularly for heavy-duty applications, such as for diesel engines which has high strength in the area below the shaft on which the rocker arm is mounted and which is lighter in weight.

Other features and advantages of the invention will be apparent from the following description thereof, which refers to the accompanying drawings wherein :

- Figure 1 is a somewhat schematic view in perspective of a

rocker arm assembly employing rocker arms embodying the invention ;

- Figure 2 is a side view in elevation, with parts broken away and with parts in section, of one of the rocker arms of Figure 1 ;

- Figure 3 is a top view of the rocker arm of Figure 2 ;

- Figure 4 is an enlarged view in transverse cross section taken along the line 4-4 of Figure 2 ;

- Figure 5 is an enlarged view in transverse cross-section taken along the line 5-5 of Figure 2 ; and

- Figure 6 is a side view in elevation of another rocker arm of Figure 1, with certain components omitted.

Referring to the drawings, and more particularly to Figure 1 an overall rocker arm assembly for a diesel engine or the like is indicated at 10. The assembly is located above a cylinder head 12 of the engine, on which are located two bearing blocks 14 carrying a rocker arm shaft 16 into which oil can be supplied from a suitable passage 18. A center rocker arm 20 mounted on the shaft operates a fuel injector through a stem 22 while outer rocker arms 24 and 26 operate supply and exhaust valves of the engine cylinder therebelow through valve stems 28 and 30.

The rocker arm 20 for the injector is shown more fully in Figs. 2-5. The rocker arm includes a first stamped metal piece or sheet 32 of generally bow-tie shape, when flat. It includes two wide end portions or layers 34 and 36 connected by a narrow web portion 38. The first piece 32 is doubled back with the inner surfaces of the wide portions 34 and 36 in contiguous relationship, with the web portion 38 sized or drilled to form a loop 40. The inner surfaces of the wide portions 34 and 36 have matching grooves 42 and 44 forming an oil passage 46 communicating with short, vertical grooves forming a short end or vertical passage 48 adjacent the loop 40. An upper portion of the web portion 38 is staked to close off the loop 40 above the passage 48. The inner surfaces of the wide portions 34 and 38 also have matching grooves 50 and 52 forming an oil passage 54 extending in the oppositive direction from the passage 46. In addition, lower portions of the wide portions 34 and 36 have intermediate circular openings 56 and 58 through which the rocker arm shaft 16 will extend.

The rocker arm 20 also includes a second stamped metal piece or sheet 60 which is also of generally bow-tie shape, when flat. It includes two wide end portions or layers 62 and 64 connected by a narrow web portion 66. The second piece 60 is doubled back to form a loop 68 with the inner surfaces of the wide portions 62 and 64 being contiguous with the outer

surfaces of the wide portions 34 and 36 of the first sheet 32. The loop 68 cooperates with narrower ends of the wide portions 34 and 36, as shown in Fig. 3, to form an opening which is drilled and tapped to produce a threaded bore 70. The wide portions 62 and 64 have outwardly-extending circular flanges 72 and 74 forming intermediate circular openings in alignment with the circular opening 56 and 58 of the wide portions 34 and 36 of the first piece 32. These receive a bronze bushing or sleeve 76 which is force fit and pivotally supports the rocker arm 20 on the shaft 16. The bushing or sleeve 76 has an opening 78 (Fig. 2) communicating with the oil passage 46 and an opening 80 along with a groove 82 (Fig. 5) communicating with the oil passage 54. These openings and groove receive oil through the rocker arm shaft 16 having longitudinally-located openings therein and, in turn supply oil to the loop 40 and the threaded bore 70. The loop 40 receives an engageable member or pad 84 which has a shank 85 force fit in the loop 40 and oil from the passages 46 and 48 is supplied to the lower face of the pad 84 which engages the upper end of the injector stem 22.

An engageable member or screw 86 has a threaded shank 88 threadably engaged in the threaded bore 70 and has a lower rounded end 90 engageable with the upper end of a push rod. The screw 86 is of a known design, having an annular groove 92 with radially-extending passages 94 communicating with a central passage 96 for supplying oil from the passage 54 to the upper end of the push rod. The upper end of the screw 86 can have a hexagonal recess or the like for receiving a tool to adjust the screw up and down relative to the rocker arm, with a jam nut 98 holding the screw in position, when properly adjusted.

The wide portions 34, 36 and 62, 64 of the stamped pieces 32 and 60 can be affixed together by suitable means. As shown, three rivets 100 are employed for this purpose. Because high pressures and high strength are required at the end of the rocker arm 20 having the injector stem pad 84, the wide portions 62 and 64 of the piece 60 extend near the loop end of the piece 32 for additional strength and stiffness. When the rocker arm is otherwise complete, it is brazed to provide additional strength and also to seal the openings on the oil passages. This is done before the components are assembled.

The rocker arm 24 for the valve stem 28 is shown in Fig. 6 without the engageable members assembled in the ends. The rocker arm 24 also includes a first stamped metal piece or sheet 102 and a second stamped metal piece or sheet 104. The basic difference between the rocker arms 20

and 24 from the standpoint of the instant invention is that the wide portions of the second metal piece 104 terminate near the rocker arm shaft openings rather than extend toward the outer end of the first stamped metal piece 102. This is because the force encountered at the outer end, near the valve stem 28 or 30, is not as high as that required for the injector stem 22. Consequently, the wide portions of the second stamped metal piece 104 can accordingly be shortened to reduce the weight of the overall rocker arm. Hence, this construction can be tailored to fit the strength and rigidity requirements of the particular rocker arm to maintain weight at a minimum.

CLAIM

A heavy-duty rocker arm (20) characterized in that said rocker arm (20) comprises a first stamped sheet of metal (32) including two wide first layers (34, 36) having contiguous inner surfaces and having aligned first openings (56, 58) for receiving a rocker arm shaft (16), said wide first layers (34, 36) being joined by a first narrow loop portion (40) at common ends of said wide layers (34, 36), ends of said layers on the other side of said intermediate openings terminating in adjacent locations, a second stamped sheet of metal (60) including two wide additional layers (62, 64) having surfaces contiguous with outer surfaces of said first layers (34, 36), said additional layers having second openings (72, 74) aligned with the first openings (56, 58) and joined at common ends by an additional loop portion (68) on the side of said first and second openings (56, 58, 72, 74) opposite said first loop portion (40) and means (100) affixing said wide first layers (34, 36) and said wide additional layers (62, 64) together.

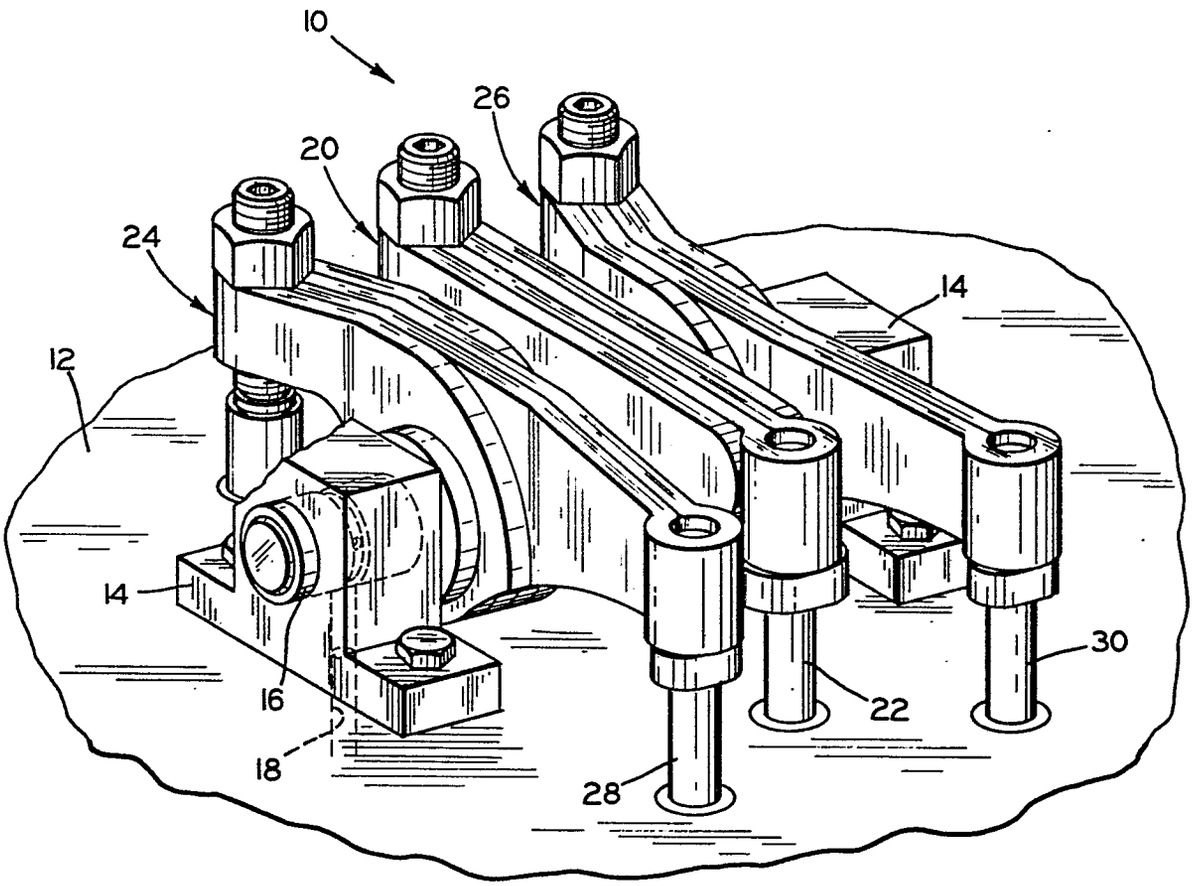

FIG. 1

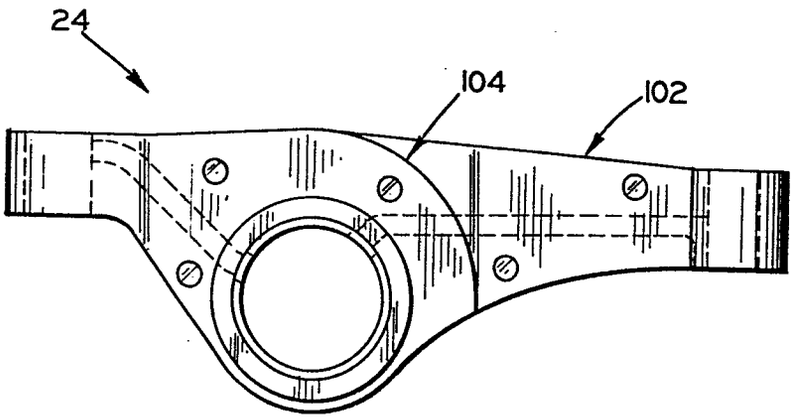

FIG. 6

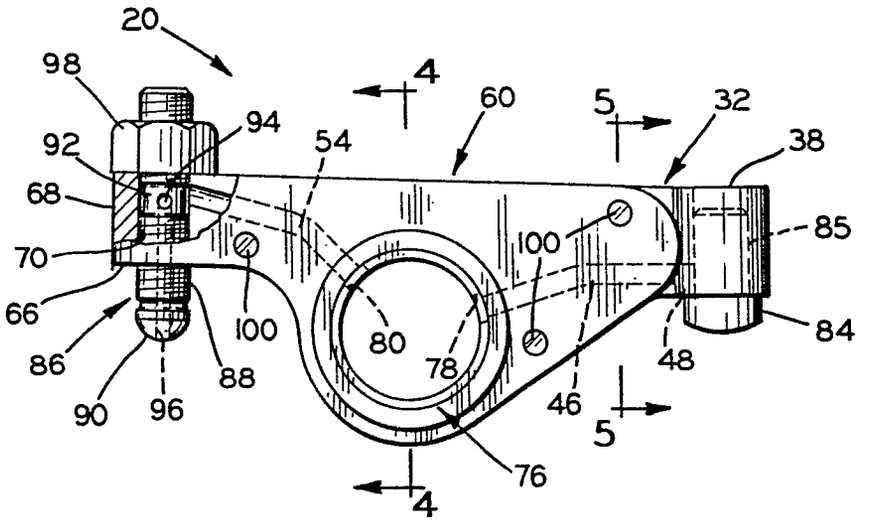

FIG. 2

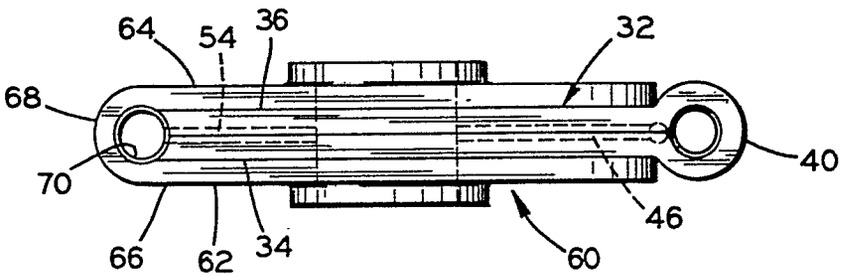

FIG. 3

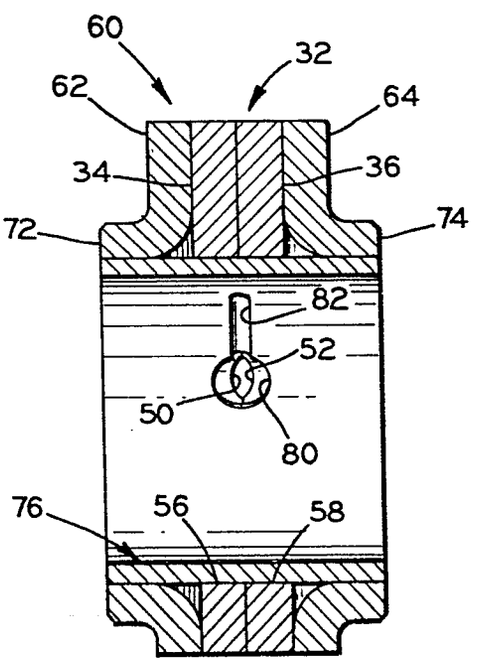

FIG. 4

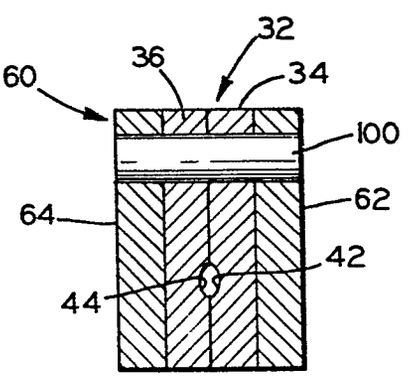

FIG. 5