

Aug. 4, 1925.

1,548,401

J. G. WOOD

VALVE OPERATING MECHANISM

Original Filed Dec. 11, 1922

Fig. 1.

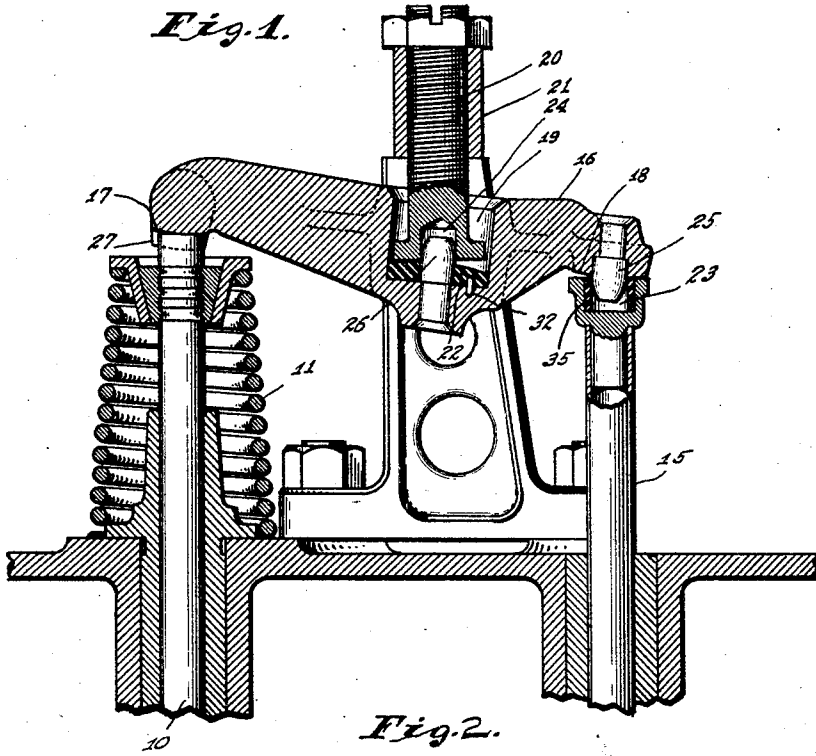


Fig. 2.

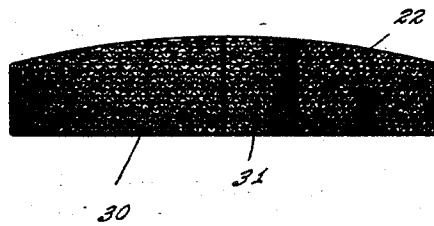
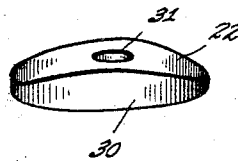


Fig. 3.



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VALVE-OPERATING MECHANISM.

Application filed December 11, 1922, Serial No. 606,269. Renewed September 24, 1924.

To all whom it may concern:

Be it known that I, JOHN G. WOOD, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Valve-Operating Mechanism, of which the following is a specification.

In the operation of the valve mechanism of internal combustion engines of the pop-pet-valve type, it is necessary that a slight lost-motion be provided; of a few thousandths of an inch; to make certain that the valve will surely be seated under all temperature conditions which may exist in operation, and in spite of unequal expansion of the various parts. Although this lost-motion is very slight, it permits a certain slap or knock of some of the parts, and this knock can be heard in the operation of the engine.

It is the main object of my present invention to eliminate this sound, and thereby make the engine quieter; and especially to do so in the type of engine embodying overhead valves with a rocker arm of the so-called rocking-chair type, in which the rocker arm is not carried on a pivot pin but is rocked or rolled on a support. It is a further object of my invention to make it easier to shape the bearing surface of the rocker arm where it engages its fulcrum support.

In carrying out my invention, I provide at the place where the slap or knock may occur, and most particularly at the fulcrum support for the rocker arm, an inserted bearing member which is not metallic, but instead is made up of some sound-destroying material. This sound-destroying material may be suitably shaped to get the desired rocker-arm action; and as the shaping may be done apart from the rocker arm, it may be done much more easily than is otherwise possible. A number of non-metallic materials may be used, but the material I prefer is made up of a plurality of superposed layers of fabric impregnated with and bound together by phenolic-condensate varnish; as I have found that this makes a material which is properly and easily workable to the desired shape, and which largely if not wholly eliminates the noise of operation.

The accompanying drawing illustrates my invention: Fig. 1 is a fragmentary view,

partly in section, of a rocker-arm mechanism embodying my invention, the parts being shown in the positions they occupy when the valve is closed; Fig. 2 is an enlarged half-sectional, half-elevational view of one of the impregnated-fabric buttons used; and Fig. 3 is a perspective view of such button, in about its natural size.

The valve stem 10 may be of any ordinary type, with the usual valve (not shown) at its lower end, and is spring-pressed upward to closed position by any suitable compression spring 11. A valve push-rod 15 is mounted for vertical reciprocation in the usual manner, as by a cam (not shown), and is usually parallel to the valve-stem 10. The push-rod 15 acts on the valve stem 10 through a rocker arm 16. In the rocking-chair type of valve-operating mechanism in connection with which I have illustrated my invention, and to which the invention is particularly applicable, this rocker arm near its two ends has on its under face two downwardly convex curved surfaces 17 and 18, which co-operate with and bear upon the upper end of the valve stem 10 and push-rod 15 respectively. These convex surfaces 17 and 18 are cylindrical surfaces, which roll on the ends of their associated valve stem and push-rod respectively. The upper side of the rocker arm 16 has a pocket 19, into which projects downwardly an adjustable fulcrum screw 20 carried by and vertically adjustable in a suitable stationary support 21 fixed on the frame of the engine. The lower end of the fulcrum screw 20 is a plane surface, perpendicular to the axis of the screw adjustment, and this plane surface co-operates with an upwardly convex surface 22 located within the pocket 19 and fixed with relation to the rocker arm 16. This surface 22 is also a cylindrical surface, similar to the surfaces 17 and 18, but is convex upward instead of being convex downward, so that it will roll on the plane end-face of the fulcrum screw 20 as the rocker arm 16 rocks.

In order to prevent relative displacement between the rocker arm and its associated parts, the upper end of the valve rod 15 and the lower end of the fulcrum screw 20 are provided with axially extending holes 23 and 24 respectively, which may be simple cylindrical holes; and pins 25 and 26 are mounted in the rocker arm and project into

said holes respectively. The heads of the pins 25 and 26 are preferably circular in cross-section, and are curved axially, something like a gear-tooth addendum, being larger at their bases where they abut against the rocker arm than at any other point. By thus shaping the heads of the pins 25 and 26, they effectively prevent slipping of the rocker arm without interfering with the rolling co-operation thereof with its associated parts. No such pin and hole are necessary at the valve stem 10; but to prevent relative lateral slipping of the surface 17 on the end of the valve stem 10 I preferably provide guide flanges 27 from the under face of the rocker arm 16 on the two sides of the upper end of the valve stem 10, as is clear from Fig. 1. These guide flanges do not interfere with the co-operation of the surface 17 with the upper end of the valve stem.

The valve-operating mechanism so far described is not my invention, but is merely the preferred form of valve-operating mechanism to which I contemplate applying my invention. With this valve-operating mechanism as so far described, there would be a certain amount of slap or knock; due to the fact that to ensure the complete closing of the valve on the lower end of the valve stem 10 when the latter is raised, under all temperature conditions which may be encountered, it is necessary to let the push-rod 15 descend a very slight distance farther downward than would be necessary for the bare closing of such valve; and this results in letting the rocker arm 16 as a whole drop slightly when the valve is closed to produce a very slight separation between the surface 22 and the lower plane end of the fulcrum screw 20. Because of this separation, there is a slight slap or knock when these two surfaces are re-engaged upon the next upward movement of the valve push-rod 15.

To avoid this slap or knock, and also to make it possible to machine the surface 22 more easily than if it were originally at the bottom of the pocket 19, I provide such surface 22 on a non-metallic button 30, which is originally separate from the rocker arm but is pushed into the pocket 19 after first being completely machined. This button 30 has a central hole 31 for allowing the projection therethrough of the pin 26, which said button surrounds. The upper surface of the button thus forms the surface 22, which may be machined easily before the button has been put into the pocket. The button 30 is held in proper position in the pocket by an eccentrically located dowel pin 32, which prevents the button from turning and holds it in position so that its upper surface 22 curves in the plane desired. By having this button 30 of non-metallic material, the metallic slap or knock which is otherwise caused when the rocker arm 16 is lifted upon

the beginning of the valve-opening movement is practically wholly eliminated.

In order further to assist in eliminating noise in the operation of the valve mechanism, I preferably provide a bushing 35 of material similar to that of the button 30 as a lining for the hole 23. The upper edge of this bushing 35, therefore, serves as the bearing surface upon which the curved surface 18 of the rocker arm 16 bears.

The material for the button 30 and the bushing 35 may be of a number of non-metallic substances. The material I prefer, however, is a built-up material made from layers of fabric, such as canvas, impregnated with a synthetic resin, preferably phenolic-condensate varnish, which serves as a binder to unite the several layers of fabric into a unit capable of being worked very readily and accurately. After the phenolic-condensate varnish which impregnates the fabric has hardened, the material is cut into buttons 30 of the desired shape, or into the bushings 35, and these are machined in the desired forms, with the desired surface on the button 30, and the necessary eccentrically located hole 36 for receiving the dowel pin 32. The shape of the button 30 need not be round, although that is the most convenient shape; but such shape and the shape of the pocket 19 may be anything desired. The button 30 and the bushing 35 are fully machined separately from the rocker arm, and put in place therein when complete.

I claim as my invention:—

1. In a valve-operating mechanism for internal combustion engines, the combination of a rocker arm, said rocker arm having a pocket at an intermediate point, a fulcrum projecting into said pocket to form a bearing for said rocker arm, a button of non-metallic material fixed in the bottom of said pocket and on which said fulcrum bears, and a valve stem and a push rod cooperating with said rocker arm.

2. In a valve-operating mechanism for internal combustion engines, the combination of a rocker arm, said rocker arm having a pocket at an intermediate point, a fulcrum projecting into said pocket to form a bearing for said rocker arm, a button fixed in the bottom of said pocket and on which said fulcrum bears, said button being formed of a plurality of layers of fabric impregnated with and bound into a unit by a resinous binder, and a valve stem and a push rod cooperating with said rocker arm.

3. The combination set forth in claim 1, wherein the button-surface which engages the fulcrum is convexly cylindrical to roll on the fulcrum as the rocker arm rocks.

4. In a valve-operating mechanism for internal combustion engines, the combination of a rocker arm, said rocker arm having a

pocket at an intermediate point, a fulcrum projecting into said pocket to form a bearing for said rocker arm, a button fixed in the bottom of said pocket and on which said fulcrum bears, and a valve stem and a push rod co-operating with said rocker arm, the button surface which engages the fulcrum being convexly cylindrical to roll on the fulcrum as the rocker arm rocks.

5. The combination set forth in claim 2, wherein the button-surface which engages the fulcrum is convexly cylindrical to roll on the fulcrum as the rocker arm rocks..

6. In a valve-operating mechanism for internal combustion engines, the combination of a rocker arm, said rocker arm having a pocket at an intermediate point, a fulcrum projecting into said pocket to form a bearing for said rocker arm, a button fixed in the bottom of said pocket and on which said fulcrum bears, a valve stem and a push rod co-operating with said rocker arm, the bearing face of the fulcrum having a hole in it and said button having a hole through it, and a pin projecting from the base of said pocket through the hole in the button and into the hole in the bearing face of the fulcrum.

7. In a valve-operating mechanism for internal combustion engines, the combina-

tion of a rocker arm, a fulcrum for said rocker arm, and a valve stem and a push rod co-operating with said rocker arm, said rocker arm having a rolling bearing on the end of one of said two last-named parts, such end being provided with a longitudinal hole, a bushing of non-metallic material forming a lining for such hole, and a guide pin projecting from the rocker arm into such hole.

8. In a valve-operating mechanism for internal combustion engines, the combination of a rocker arm, a fulcrum for said rocker arm, and a valve stem and a push rod co-operating with said rocker arm, said rocker arm having a rolling bearing on the end of one of said two last-named parts, such end being provided with a longitudinal hole, a bushing of non-metallic material forming a lining for such hole, and a guide pin projecting from the rocker arm into such hole, said bushing being formed of a plurality of layers of fabric impregnated and bound into a unit by a resinous binder.

In witness whereof I, JOHN G. WOOD, have hereunto set my hand at Indianapolis, Indiana, this 7th day of Dec., A. D. one thousand nine hundred and twenty two.

JOHN G. WOOD.

Certificate of Correction.

It is hereby certified that the name of the assignee in Letters Patent No. 1,548,401, granted August 4, 1925, upon the application of John G. Wood, of Indianapolis, Indiana, for an improvement in "Valve-Operating Mechanism," was erroneously written and printed as "Alonson P. Brush," whereas said name should have been written and printed as *Alanson P. Brush*, as shown by the records of assignments in this office, and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of September, A. D. 1925.

[SEAL.]

KARL FENNING,
Acting Commissioner of Patents.