

[54] **MUSHROOM VALVE, ESPECIALLY FOR INTERNAL COMBUSTION ENGINES**

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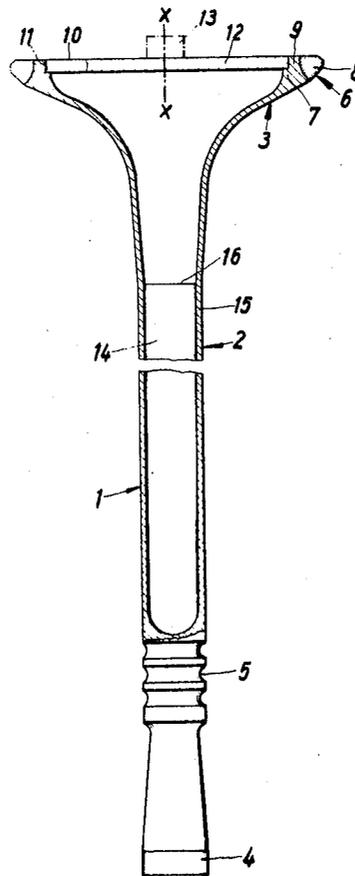
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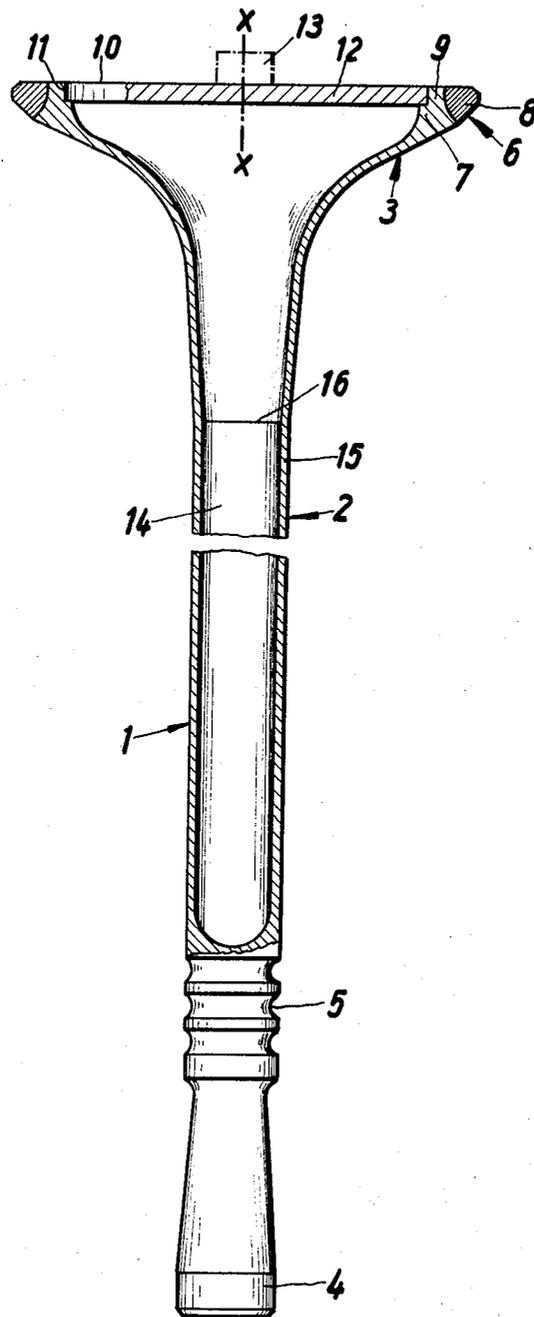
[57] **ABSTRACT**

A mushroom valve, especially for internal combustion engines, having a valve stem provided with a hollow space extending from the stem end to the valve cone and closed in the area by a cover plate. This cover plate is joined with a shell zone of the valve cone in the plane of the valve seat armor by electron-ray welding.

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9 Claims, 1 Drawing Figure





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MUSHROOM VALVE, ESPECIALLY FOR INTERNAL COMBUSTION ENGINES

BACKGROUND OF THE INVENTION

The present invention relates to a mushroom valve, especially for internal combustion engines, and more particularly, to a mushroom valve having a valve stem provided with a hollow space extending from the stem end and continuing to the valve cone and closed in this area by a cover plate.

Mushroom valves having a hollow stem are already conventional. In such arrangements, the hollow space in the valve stem is sealed off by means of a cover in the area of the valve cone. The cover is joined or combined with the valve stem by built-up welding whereby the weld seam, at the same time, serves as armor for the valve seat. Further, the stem end in this arrangement is combined or joined with the valve stem by welding. The disadvantage of this type of arrangement resides in that the entire valve body is strongly and severely heated in the area of the welding zone to the build-up welding, which results in warping.

This abnormal condition may be partly equalized through certain wall and cover thicknesses of respectively the valve stem and the valve plate whereby, however, the weight of the valve is thereby increased. Furthermore, machining of the valve can be accomplished only after welding in each case. Through the formation of a hollow space in the valve stem, a decrease in weight of the valve is attained which is limited, however, by the described fabrication method.

SUMMARY OF THE INVENTION

It is an aim of the present invention to overcome the problems and disadvantages of the prior art arrangements by providing a mushroom valve for controlling the gas-changing process for internal combustion engines.

More particularly, it is an object of the present invention to provide a mushroom valve with a hollow shaft which is distinguished by its lightweight and simple and inexpensive manufacture.

The foregoing problems have been solved in accordance with the present invention by providing that the hollow space of the valve cone is covered or sealed by a cover plate which is joined with a shell zone of the valve cone in the plane of the valve armor by electron-ray welding. Preferably, the cover is made of a flat, thin-walled plate which corresponds to the thickness of the plate and is inserted into a recess in the valve cone and joined therewith. Appropriately, the cover plate is provided at its rotating axis with a centering lug.

A further advantage of the present invention resides in that the wall thickness of the cover plate is made to be about double the wall thickness of the valve stem. A special advantage resides in the fact that the wall thickness of the valve stem remains uniform throughout the entire extent of the hollow space. The hollow space of the valve stem is preferably filled in a known manner with a cooling agent such as, for example, sodium.

The mushroom valve in accordance with the present invention is advantageous in that the joining of the cover plate with the valve cone by electron-ray welding provides for an unobjectionable closure of the valve stem even with small wall thicknesses of the cover plate

and stem whereby the valve body may be completely machined prior to the welding process. A further advantage of the electron-ray welding resides in that the work piece being welded absorbs only a small amount of welding heat, thereby allowing it to remain unwarped. Thus, due to the cover plate consisting of a flat plate, a simple manufacture thereof is provided, and by means of a corresponding recess in the valve cone, a simple insertion of the cover plate into the valve cone is made possible so that costly welding or holding devices are not required in the present invention.

By means of the centering lug arranged in the area of the rotating axis of the cover plate, the latter can be held in position relative to the stem in a very simple manner prior to the welding process. By means of the double wall thickness of the cover plate in relation to the stem, a crushing thereof at high loads, especially by gas forces, is also avoided. Through the construction of the valve stem having uniform wall thickness, the weight of the mushroom valve, as compared to conventional valve constructions and under equal loading, can be considerably reduced whereby the reciprocating mass of the valve actuating gear mechanism may be considerably reduced for high-speed internal combustion engines. The hollow space of the valve stem may be filled in a known manner with, for example, sodium which serves for better removal of the heat from the valve cone to the valve stem.

BRIEF DESCRIPTION OF THE DRAWING

These and further aims, objects, features and advantages of the present invention will become more apparent from the following description when taken in conjunction with the accompanying drawing which shows, for purposes of illustration only, an embodiment in accordance with the present invention and wherein:

The sole FIGURE is a partial cross-sectional, elevation or side view of the mushroom valve for an internal combustion engine in accordance with the present invention.

DETAILED DESCRIPTION OF THE DRAWING

Referring now to the drawing, the mushroom valve 1 consists of a cylindrical valve stem 2 and a valve cone 3. The valve stem is provided with radial grooves 5 at the shaft end 4, which grooves serve to receive valve cone pieces (not shown). Opposite to the shaft end 4, the end of the cylindrical valve stem 2 is progressively enlarged to the diameter of the valve seat surface 6. The valve cone 3 is provided at its outer rim 7 with a layer 8 of hard metal which forms the valve seating surface 6. The layer of hard metal 8 is applied in such a manner that it rests on a rim zone 9 of the valve cone 3 and is joined with it.

The bottom portion 10 of the valve cone 3 is provided with a recess 11 which serves for the admission of cover plate 12. The cover plate 12 is provided with a centering lug 13 (shown in dot-dash lines) in the area of its rotational axis X—X. The valve stem 2 contains a hollow space 14 which extends from the bottom 10 of the valve cone 3 to a point close to the stem end 4. Wall 15 of the valve stem 2 extends throughout the entire region of the hollow space at a uniform thickness to a point close to the bottom 10. For the admission of the hard-metal layer 8, the wall 15 is made somewhat

heavier in the region of the layer. The hollow space 14 of the valve stem 2 is filled by three-fifths of the total volume with paste-like sodium 16.

For the manufacture of the mushroom valve 1 and after finishing the valve stem 2, the hard metal layer 8 which forms the valve seat surface 6 is applied to the valve cone 3. Subsequently, the valve seat surface 6 is ground and the valve stem 2 is provided with the radial recesses 5 and then finish ground. After this, the recess 11 for the cover plate 12 is machined into the bottom portion 10 of the valve cone 3. Then and subject to the application of the valve 1, the hollow space 14 of the valve stem 2 may be filled with a cooling medium such as sodium 16. Now the pre-finished mushroom valve is put into a welding device of an electron-ray welding machine (not shown) and is subjected to a vacuum having a magnitude which depends on the required welding quality. In the vacuum chamber of the electron-ray welding machine, the cover plate 12 is inserted into the recess 11 of the valve cone with the help of the centering lug 13. Thereafter, the cover plate 12 is welded to the rim zone 9 of the valve cone 3. After completion of the welding process, the mushroom valve is ready for use. If required, the centering lug 13 can be removed. Through the electron-ray welding method, the humps of the welding seam are held to a minimum so that machining thereof is unnecessary.

While we have shown and described one embodiment in accordance with the present invention, it is to be clearly understood that the same is not to be limited thereto, but is susceptible to numerous changes and modifications. For example, the cover plate 12 may be constructed without the centering lug 13. It is equally possible to insert the cover plate 12 into the recess 11 before it is placed into the vacuum chamber of the welding machine, especially when a small number of valves is involved. Venting of the hollow space 14 is therefore accomplished at the beginning of the welding process whereby, during smelting of the work material through the electron rays, the air overpressure is weakened by the capillary action created in the area of the welding zone taking along the work material particles. By this means, the hollow space 14 is vented so that a perfect weld seam is formed. In this case, the weld zone must necessarily be welded twice whereby, during the second welding process, the break-throughs brought about in the molten phase must again be closed. Accordingly, we do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed within the scope of the present invention.

We claim:

1. Mushroom valve, especially for internal combustion engines, comprising a valve cone, armor secured to the periphery of the valve cone and forming a valve seat, a valve stem provided with a hollow space extending from the stem end into the valve cone, and cover plate means covering the hollow space in the area of the valve cone, wherein said cover plate means is joined to a rim zone of the valve cone in the plane of the armor by an electron-ray weld, wherein the wall thickness of the cover plate means is approximately double the wall thickness of the valve stem, wherein the valve stem and valve cone are of one-piece homogeneous material construction and the armor is formed of a different material than the valve stem and cone, wherein the end of said valve cone facing away from said valve stem has a circumferential groove accepting the armor and a circular stepped recess accepting the cover plate means, said groove and said recess being spaced from one another by an annular rim portion of the cone, and wherein the ends of the armor, the cover plate means, and the annular rim portion all terminate in a common plane that is perpendicular to a rotational axis extending through the center of the cover plate means.

2. Mushroom valve according to claim 1, wherein the cover plate means comprises a flat, thin-walled plate inserted into said recess, the depth of said recess corresponding to the plate thickness.

3. Mushroom valve according to claim 1, wherein the cover plate means has a rotational axis, and centering lug means is provided in the area of the rotational axis.

4. Mushroom valve according to claim 3, wherein the cover plate means comprises a flat, thin-walled plate inserted into said recess, the depth of said recess corresponding to the plate thickness.

5. Mushroom valve according to claim 1, wherein the valve stem is provided with a uniform wall thickness throughout the entire extent of the hollow space.

6. Mushroom valve according to claim 1, wherein at least a portion of the hollow space of the valve stem is filled with cooling means.

7. Mushroom valve according to claim 1, wherein end portions of the armor, the cover plate means, and the annular rim portion form a continuous flat surface in said common plane.

8. Mushroom valve according to claim 7, wherein the valve stem has walls of substantially uniform thickness throughout its length, and wherein the cover plate means is a flat plate.

9. Mushroom valve according to claim 8, wherein the cover plate means has centering lug means formed integrally therewith adjacent its center.

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