Jan. 20, 1931. W. B. SULLIVAN 1,789,374

VALVE AND METHOD OF MAKING THE SAME

Filed June 4, 1927

Fig. 1

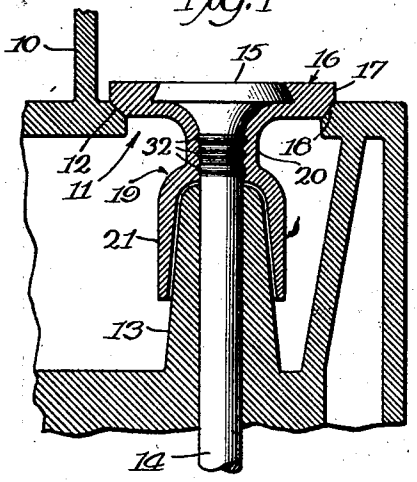


Fig. 2

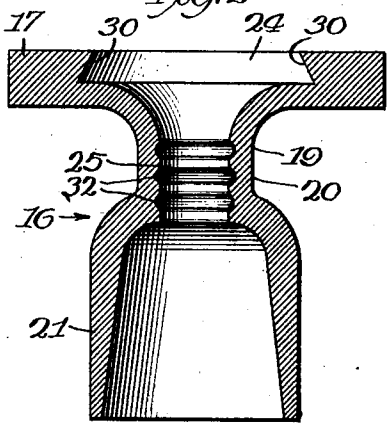


Fig. 5

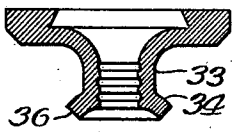


Fig. 4

Fig. 6

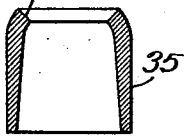
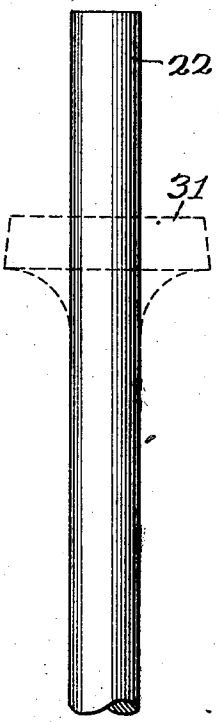
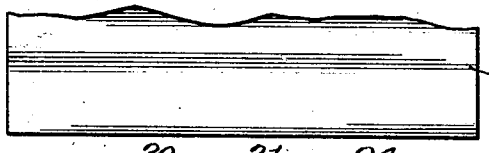
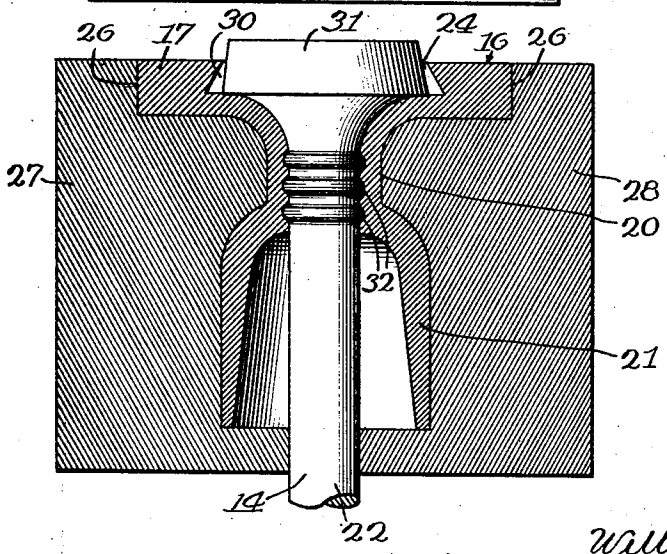


Fig. 3







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UNITED STATES PATENT OFFICE

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VALVE AND METHOD OF MAKING THE SAME

Application filed June 4, 1927. Serial No. 196,533.

This invention relates to valves for internal combustion engines and the method of manufacturing the same.

One of the objects of the invention is the provision of a new and improved valve adapted to be used in the exhaust passage of an internal combustion engine, and having means for protecting the stem from the deteriorating effects of the hot gases.

A further object of the invention is the provision of a new and improved envelope for protecting valve stems and for constituting the seat engaging portion of the valve.

Other objects of the invention are the provision of a new and improved valve having a protective covering of non-oxidizing or heat resisting material, that is cheap to manufacture, easily assembled, that is durable, and not likely to warp, or the parts become loose or detached.

Other and further objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a vertical section of a portion of an internal combustion engine showing my invention in position thereon;

Fig. 2 is a vertical section of the valve head and sleeve;

Fig. 3 is an elevational view of one end of the valve stem showing the same upset in dotted lines;

Fig. 4 is a vertical section of a die with the parts of the valve in assembled relation in position to be operated upon by the die; and

Figs. 5 and 6 are vertical sections of the head and neck and of the skirt portion, respectively, of a modified form.

In internal combustion engines, the valves in the exhaust passages are subjected to the intense heat of the exhaust gases and consequently if special heat resisting or non-oxidizing material be not employed the valve will soon deteriorate due to the action of the heated gases on the material. The cost of heat resisting or non-oxidizing material, however, renders its use for valves prohibitive. It has been proposed to provide protective coverings for the valves, but these coverings have not been extended to provide a protection for the valve stem. Valve stems are especially subjected to the oxidizing effects of the hot gases. The gases are not only hot but are moving at a high speed through the exhaust port and around the valve stem as they pass into the exhaust passage, which materially increases the deteriorating effects of those gases.

It has also been proposed to provide protective sleeves or skirts for the valve stems, but these skirts are of such diameters adjacent to the head as to materially interfere with the discharge of the exhaust gases through the exhaust port. Furthermore, in some cases the skirts are separately attached to the stem and leaks soon develop at the joints, due to the unequal expansion of the material of the stem and skirt, which soon causes the parts to deteriorate.

The present invention contemplates a combined envelope and sleeve of non-oxidizing or heat resisting material which is so applied to the valve as to protect the exposed portions of the head and stem, and so arranged that a minimum obstruction is presented to the exhaust gases escaping through the exhaust port.

Referring now to the drawings, the reference character 10 designates an internal combustion engine having the exhaust port 11, valve seat 12 and guide 13 for the valve stem 14 as is usual in such constructions.

The valve comprises a head or expanded portion 15 to which is rigidly secured the protector member or envelope 16 of suitable heat resisting or non-oxidizing material. The protector member 16 comprises a head 17 having a valve seat engaging portion 18 and a sleeve portion 19. The sleeve portion comprises a restricted or neck portion 20 and a skirt 21. The neck portion 20 closely fits the stem while the skirt portion is spaced about the stem and telescopes over the guide 13 for protecting the stem 14 from the hot exhaust gases when the valve is opened to permit the escape of said gases. The neck portion 20 is restricted in order that the same shall offer a minimum resistance to the escape of the exhaust gases. The entire envelope is formed from a suitable heat resist-

ing or non-oxidizing material whereby the valve seat engaging portion will remain smooth and the other parts will not be deteriorated by the contact of the exhaust gases.

The enlarged portion of the valve stem 14 is distorted into the recess 24 and into the marginal undercut 30 in order to interlock the head 17 and stem 14.

Any suitable method may be employed in fabricating the valve. In the method employed for illustrating one embodiment of the invention, a rod blank 22 is upset at one end in a die to form the enlargement or attaching head as shown at 31 in dotted lines in Fig. 3. Preferably this enlarged portion is slightly tapered as shown, whereby the base may more easily be distorted into the undercut portion of the recess in the head, as will presently appear.

The envelope 16 is formed in any suitable manner into a head 17, neck portion 19 and bell-shaped skirt portion 23. The envelope is provided with a recess 24 having a marginal undercut 30 in the face of the head 17 and with an axial opening 25 through the head and neck portion. The envelope is placed in the recess 26 in the lower die blocks 27 and 28 and the valve stem inserted through the opening 25 with the attaching or head portion within said recess 24 and with the stem 14 extending downward through the opening 25. The hammer portion 29 of the die is then operated to expand the head 31 into the undercut portion of the recess 24 so that the parts will be interlocked as shown in Fig. 1. The head 17 is then beveled on its lower inner edge to form the valve engaging seat 18, see Fig. 1.

In the operation of the engine the valve is elevated in the usual manner to permit the escape of the exhaust gases through the exhaust port. The head portion 17, neck 20 and skirt 21 protect the parts of the valve that would be affected by the hot moving gases. The neck being restricted will not interfere materially with the escape of the gases through the exhaust port.

It will thus be seen that the parts that are normally most affected by the hot exhaust gases are efficiently protected without the necessity of forming the entire valve of non-oxidizing or heat resisting material. It is also apparent that the parts are rigidly and efficiently locked together by means of the head being expanded into the undercut portion 30 of the recess 24.

If desired, the interior of the bore through the neck 20 may be grooved or scored as at 32, into which the stem is distorted. This arrangement will not only more firmly lock the parts together and relieve the head from strain, but will also assist in forming a seal to prevent any likelihood of the gases leaking past the valve after long continued use of said valve. It is understood that this feature is optional; it may or may not be employed as desired.

If desired the head and neck portion of the protective envelope may be cast separate from the skirt portion and the two welded together by a later operation. As shown in Figs. 5 and 6, the neck portion 33 of the device may be provided with a fin 34 to which the skirt portion 35 may be welded, the fin and skirt portion being preferably provided with the smooth surfaces 36 and 37, respectively, for facilitating the welding.

It is understood that the head and neck portion may, if desired, be employed without the skirt portion, in which event the fin 34 may be entirely removed.

It is thought from the foregoing taken in connection with the accompanying drawings that the construction and operation of my device will be apparent to those skilled in the art, and that various changes in size, shape, proportion and details of construction may be made without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. A valve for internal combustion engines comprising a stem, a head portion of heat resisting material interlocked with said stem, a neck portion integral with said head portion and clamped on said stem, and a skirt portion integral with said neck portion and spaced from said stem and head.

2. A method of fabricating a valve, which consists in upsetting a rod to form a stem and an enlarged portion, inserting the stem through an axial opening in a combined head and skirt member, seating said enlarged portion in a recess having a marginal undercut, in said head, and distorting said enlarged portion into said marginal undercut.

3. As an article of manufacture, a valve comprising a head provided with a recess in its face, said recess having a marginal undercut, a valve stem extending through said head and having one end distorted into said recess and marginal undercut for locking said head to said stem.

4. A method of securing valve heads to valve stems which comprises forming the stem with an enlarged end, forming a recess having a marginal undercut in the face of said head, assembling said head and stem with said enlarged head in said recess and finally distoring said enlarged end into said marginal undercut to interlock the same with said head.

5. A valve comprising an integral head and sleeve portion, a valve stem extending axially through said head and sleeve portion and rigidly secured thereto, said sleeve portion comprising a neck portion closely fitting said stem and a skirt portion concentric with said stem but spaced therefrom and from said head.

6. As an article of manufacture, a valve

member comprising an integral head, neck and skirt portion, said member being provided with an axial opening therethrough for the reception of a valve stem.

7. A valve comprising an integral head, neck and skirt portions provided with an axial bore, the inner surface of said bore being provided with a roughened surface and a stem extending through said bore and having its bore-engaging portion distorted to conform to said roughened surface.

8. In combination, a valve seat, an upwardly extending valve guide the top of which is a substantial distance from the plane of the valve seat, an axial bore in said guide in alinement with the axis of said valve seat, a valve stem of relatively low grade material slidably mounted in said bore, a sleeve for said stem of relatively high grade material, said sleeve comprising a head for cooperating with said valve seat, a restricted portion to allow free passage of gases through the valve opening and a skirt for telescoping said valve guide and protecting said valve stem, and means for rigidly securing said sleeve to said stem.

In testimony whereof I affix my signature.

WILLIAM B. SULLIVAN.