

Jan. 24, 1956

G. KUBERA
PROCESS FOR MANUFACTURE OF HOLLOW POPPET VALVES
ESPECIALLY FOR INTERNAL-COMBUSTION ENGINES
Filed April 27, 1953

2,731,708

Fig. 1

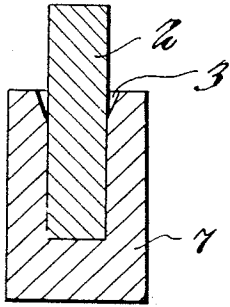


Fig. 2

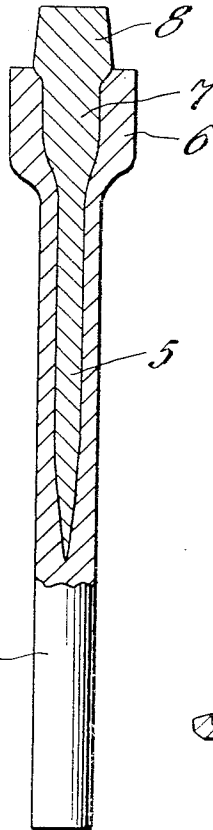


Fig. 3

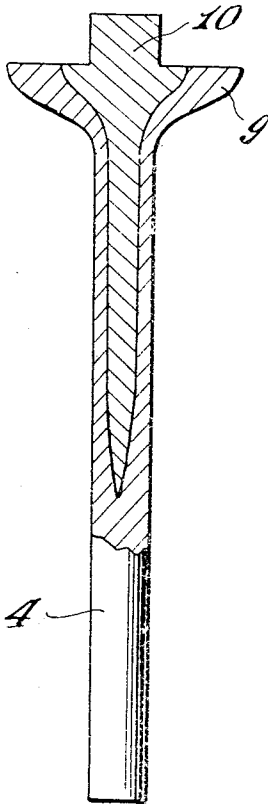
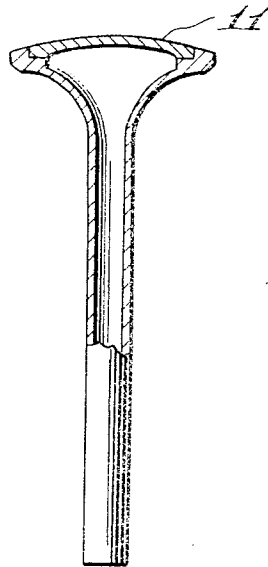


Fig. 4



INVENTOR.
GERHARD KUBERA
BY *Arnold E. McIntire*
ATTORNEYS

1

2,731,708

PROCESS FOR MANUFACTURE OF HOLLOW POPPET VALVES ESPECIALLY FOR INTERNAL-COMBUSTION ENGINES

Gerhard Kubera, Blumberg (Baden), Germany, assignor to Alfred Teves Maschinen- und Armaturenfabrik KG, Frankfurt am Main, Germany

Application April 27, 1953, Serial No. 351,212

Claims priority, application Germany October 31, 1952

9 Claims. (Cl. 29—156.7)

There are known processes for producing hollow valves for internal-combustion engines by first making a solid valve and then boring it out, either from the stem or from the head. This method of manufacture is of course extremely costly and inconvenient.

The present invention avoids these disadvantages. It substantially consists in the insertion of a core of ferrous or other metal into a pierced billet which is then subjected to a drawing operation so as to produce a forging which, after removal of the core, constitutes the blank for a hollow valve, to be finished by conventional means. In drawing, the billet, together with the core, is reduced to the stem diameter of the final valve. According to the invention, only part of the billet and core is formed by drawing, so that the remainder may serve to constitute the valve body. This remainder can be formed in any desired manner, for example by upsetting, pressing, forging or the like.

In the process according to the invention, an iron core is set into a billet pierced with a preferably blind bore. To permit removal of the core after forming, there must be no constriction in diameter of the blank towards the head end, since it will otherwise not be possible to withdraw the core. To facilitate withdrawal, the core may be provided with a suitable coating, for example a phosphatic coating.

According to the invention, to further facilitate withdrawal, a head may be formed on the core in the course of the forming operations. For this purpose, the core, preferably projecting from the billet, is formed to a head either by the mandrel of the draw press or by the top die of the forging press.

According to the invention, such a head may be formed by the mandrel of the draw press. In that case, in any subsequent drop-forging operation, there must be a suitable recess in the top die. However, the head may also be formed in a drop-forging operation, namely if the male die is previously provided with a smooth under surface. Such a die is used, according to the invention, if the stock of the core is to be upset in the top of the blank, for example in order to expand the cavity in the final valve body, for purposes of more effective cooling.

In a forging operation successive to the drawing operation, the core may remain in the blank; alternatively, however, it may be removed prior to such forging operation if the latter is intended to form the valve head in a given manner, for example in order to obtain internal contours of pre-assigned dimensions.

Finally, the valve is closed over with a cover, before or after introducing a coolant medium into the cavity in known manner. The cover may advantageously be attached by butt or lap welding. Instead of a cover, the stock of the valve itself can be used to close the cavity; for this purpose, according to the invention, a collar or bulb of stock is formed by upsetting at the opening of the valve head and used to close the opening by folding or drawing inwards. Prior to forging, according to the in-

2

vention, a seating material may be applied to the rim of the valve in otherwise known manner, so that the said seating material is brought into its final form simultaneously with the forging of the head, thus saving a subsequent operation.

The process will be further illustrated and described in terms of the accompanying drawing, wherein:

Fig. 1 shows a pierced billet 1 in which a core 2 has been inserted. The bulk of the core 2 is greater than the recess in the billet 1, so that the core projects beyond the billet. The recess in the billet 1 is enlarged above at 3, to facilitate removal of the core after forging.

Fig. 2 shows this billet as deformed by drawing, thus producing the stem 4, surrounding the similarly deformed core 5. The upper portion 6 of the billet has not been formed, so that, like the corresponding portion 7 of the core, it retains its original diameter. The enlargement 3 in the billet has been filled out by the upset core, while the top of the core has been formed into a head 8 by a corresponding recess in the die.

Fig. 3 shows a blank resulting from a drop-forging operation applied to a forging as in Fig. 2. The upper, unformed portion 6 of the original billet has become a head 9, the stock of the core being upset at 10 so as to effect an enlargement of the opening left in the valve head when the core is removed.

Fig. 4 shows the finished valve, the opening having been closed off with a cover 11.

In view of the embodiments shown in the drawing and the making of these as described above, it is seen that the formed blank prior to separation of the core therefrom may be finished by a variety of procedures which include:

(a) Utilizing the remainder of the material at the open end of the valve blank to form the valve head by a forging operation;

(b) After drawing the billet by a flat mandrel to make the valve blank, the valve top may be finished by passing under a top die having a recess for forming a head on the core and which additionally spreads the top;

(c) The top may be spread as in (b) by upsetting the core and drawn blank at the open end;

(d) The collar formed during the drawing operation may be folded inwards after removing the core to close the head opening;

(e) The head may be closed with an inset welded cover;

(f) The valve blank before closing the head may be filled with a coolant.

It is a feature of the invention that the core be provided with a phosphatic coating or equivalent, which is well known as a protective coating in the metal working art, and which facilitates separation of the core from the valve blank after forming.

It should also be mentioned that seating material may be applied to the valve and this simultaneously formed with the valve blank during the forging operation.

As mentioned above, the forging operation may include various stages of forming in which the internal contour of the head cavity of the blank is additionally forged to provide the desired internal shape after the core has been removed.

Having thus described my invention, I claim:

1. A process for making hollow poppet valves for internal combustion engines which comprises piercing a blind hole in a billet, inserting a hard metal core into said billet hole with a large portion of said core extending beyond said billet, drawing the closed portion of said core and billet whereby said billet and said core are simultaneously reduced to form the shank portion of said poppet while leaving the other end of the

3

billet and the projecting end of the core larger in diameter than said reduced shank, forming said projecting end of said core in the shape of a shorter and wider head to facilitate withdrawal of said core from said hole and withdrawing said core from the shaped valve member.

2. A process as claimed in claim 1 wherein the valve is additionally finished by forging the material at the head thereof.

3. A process as claimed in claim 1 wherein the open end of said billet and core are enlarged by upsetting the valve.

4. A process as claimed in claim 1 wherein said core is provided with a phosphate coating prior to insertion in said billet.

5. A process as claimed in claim 1 wherein the open portion of said billet is closed by welding an inset cover thereon after said valve is formed and said core removed.

6. A process as claimed in claim 1 wherein said billet is subjected to an additional forging operation to shape the internal contour of the cavity in the head portion thereof after said core is removed.

4

7. A process as claimed in claim 1 wherein said valve is filled with a coolant.

8. A process as claimed in claim 1 wherein the open portion of said billet is formed by forging simultaneously with the finishing of said valve and after said core is removed from said billet.

9. A process as claimed in claim 1 wherein said billet is provided with an outwardly flaring opening for the blind hole prior to inserting said core into said hole.

References Cited in the file of this patent

UNITED STATES PATENTS

1,568,369	Everett	Jan. 5, 1926
1,714,690	Nevius	May 28, 1929
2,093,773	Colwell	Sept. 21, 1937
2,217,193	Armson	Oct. 8, 1940
2,452,636	Cunningham	Nov. 2, 1948
2,498,275	Johnson	Feb. 21, 1950