

(19)



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(11)

EP 0 674 971 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
14.01.1998 Bulletin 1998/03

(51) Int. Cl.⁶: **B24B 15/04**, B24B 5/28

(21) Application number: **95301920.5**

(22) Date of filing: **22.03.1995**

(54) Method of processing a workpiece

Verfahren zum Bearbeiten eines Werkstückes

Procédé d'usinage d'une pièce

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **30.03.1994 JP 61470/94**
04.11.1994 JP 270840/94
05.12.1994 JP 300715/94
17.03.1995 EP 95301796

(43) Date of publication of application:
04.10.1995 Bulletin 1995/40

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Description

BACKGROUND OF THE INVENTION

The present invention relates to a method of processing a workpiece to make a poppet valve such as an engine valve used in an internal combustion engine.

Material is molded by forging to make a workpiece which comprises a larger diameter head and a stem, and a poppet valve such as an engine valve is manufactured through various mechanical processing steps, which include cutting the end of the stem; grinding the outer circumferential surface of the stem; chamfering the end of the stem; cutting a cotter groove; and grinding a head. In a conventional method, the end of the stem is cut to define the total length of the forged workpiece, and then, the outer circumferential surface of the stem is ground.

In a conventional centerless grinder, when the stem of the workpiece is ground, the range for grinding must be set from the end of the workpiece, and the total length of the workpiece must be set in advance.

In such a centerless grinder, the rotary shafts of the rotating grinding and adjusting wheels are not in parallel, so that thrust force is applied to the workpiece in grinding in a direction of retracting direction, while the outer circumferential surface of the stem is ground such that the head is projected between the grinding and adjusting wheels, so that the end of the workpiece is engaged with a stopper between the grinding and adjusting wheels and is thus positioned. The ground range is determined between the engaged end and the front end of the grinding wheel.

When the length of the stem is different as forged material (at largest about 5 cm is variable in the total length of 10 cm), if the ground range is determined from the engaged end, the distance is variable between the head and the ground portion. So, prior to grinding, the stem must be cut to determine the total length of the workpiece.

In the foregoing method as above, forged material is rotatably supported by a plurality of support rollers, and the end face of the head is engaged with a loader head and positioned. By rotating and driving the support rollers, the workpiece itself is rotated, and the stem of the workpiece is cut by a rotating grindstone. But, black skin of the forged material is stuck on the outer circumferential surface of the support roller, thereby causing unsmooth rotation of the support rollers or workpiece, and increasing wear of the outer circumferential surface of the support roller. The black skin is formed by a mold releasing agent which is burnt on the material during hot forging.

The stem which has bending or warping is supported by the support roller, and a little deviation occurs in the total length, thereby decreasing accuracy in the ground range when the stem is ground.

FR-A-979,744 discloses a method of processing a workpiece having a larger diameter head and stem, by grinding the outer circumference of the stem followed by cutting the stem to a certain distance from an end of the head.

SUMMARY OF THE INVENTION

In view of the foregoing disadvantages involved in the prior art, according to the present invention, it is an object to provide a method of processing a workpiece to increase accuracy in size of the workpiece; to decrease wear of a support roller when a stem of the workpiece is cut; and to assure smooth rotation of the support roller and the workpiece.

To achieve the object, according to the present invention, there is provided a method of processing a workpiece in accordance with Claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the present invention will become more apparent on the basis of the following description with respect to accompanying drawings wherein:

Fig. 1 is a view which shows one embodiment of a method according to the present invention;
Fig. 2 is a top plan view of a main portion of a centerless grinder for grinding a workpiece; and
Fig. 3 is a top plan view of a main portion of a cutting device for cutting a stem of the workpiece.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

In a workpiece 1 which is forged by hot squeezing to make an engine valve, a stem 1a is put between grinding and adjusting wheels 2 and 3 of a centerless grinder as shown in a left portion of Fig. 1 and Fig. 2. By opening a space between the grinding and adjusting wheels 2 and 3, the workpiece 1 to be processed is put on a workpiece support plate, and the space is reduced, so that the stem 1a of the workpiece 1 is put between the grinding and adjusting wheels 2 and 3. The grinding wheel 2 is rotated at high speed by a first motor 4 via a first rotary shaft 5. The adjusting wheel 3 is rotated by a second motor 6 via a second rotary shaft 7 in the same direction as that of the grinding wheel 2 at speed lower than that of the grinding wheel 2, so that the workpiece 1 is rotated in a direction opposite to the grinding wheel 2 on the workpiece support plate, thereby grinding the outer circumferential surface of the stem 1a.

A head 1b which has diameter larger than the stem 1a is provided at one end of the stem 1a of the workpiece 1 and is projected forward on the grinding and adjusting wheels 2 and 3 as shown in Figs. 1 and 2. The end face of the head 1b is engaged with a loader head

8 as a stopper, and the rear end face of the stem 1a is engaged with a pusher 9 which is inserted between the grinding and adjusting wheels 2 and 3. The loader head 8 comprises a support shaft 8a and a bottom-having cylindrical head 8b which is connected to the end of the shaft 8a by a spherical bearing (not shown) rotatably and somewhat shakably.

The outer circumferential surface of the stem 1a is thus ground. Even if there is variation in length of the stem 1a or even if rearward thrust force is given to the workpiece 1, the workpiece 1 is ground at backward portion at a certain distance from the end face of the head 1b.

In a conventional centerless grinder, the rotary shaft 7 of the adjusting wheel 3 is inclined upward in a front direction with respect to the rotary shaft 5 of the grinding wheel 2, so that rearward thrust force is applied to the workpiece 1. Therefore, forward pressing force to the workpiece 1 by the pusher 9 must be larger than the thrust force. But, the rotary shaft 7 is slightly inclined downward in a forward direction, so that forward thrust force is applied to the workpiece, which is pressed towards the loader head 8 by the thrust force, so that pressing force to the workpiece 1 by the pusher 9 may be relatively small.

Grinding the stem 1a causes no bending or warping of the stem 1a of the workpiece 1 after processing of hot squeeze forging, and removes black skin which is formed from a mold releasing agent.

Then, the workpiece 1 in which the outer circumferential surface of the stem 1a is ground and transferred to a cutting device in Figs. 1 and 3. In the cutting device, the workpiece 1 is placed between two driving rollers 10a, 10a and two driven rollers 10b, 10b as support rollers 10. A driving shaft 11 through the two driving rollers 10a, 10a is rotatably supported by an intermediate bearing, and is driven by a motor 13 via driving and driven gears 14 and 15. The two driven rollers 10b, 10b are arranged against the driving rollers 10a, 10a, and a rotary shaft 11 is rotatably supported by an intermediate bearing 12. After the driven roller 10b is drawn apart from the driving roller 10a, the workpiece 1 is placed therebetween by drawing the driven roller 10b towards the driving roller 10a on a workpiece support plate (not shown).

The axis of the driving shaft 11 of the driving roller 10a is horizontal, while the axis of the rotary shaft 16 of the driven roller 10b is slightly inclined upward in a front direction. (The lower parts in Figs. 1 and 3 are front.) The end of the head 1b of the workpiece 1 is engaged on a loader head 18 having a shaft 18a and a head 18b, similar to the loader head 8 in Fig. 2. By forward thrust force which is caused by slightly inclining the rotary shaft upward in a front direction, the workpiece 1 is pushed against the loader head 18 and is thus positioned correctly, in which a cutting grinding wheel 19 which rotates at high speed 19 is allowed to come near the stem of the workpiece 1, which is cut. Therefore, the

workpiece 1 is thrust towards the loader head 18, so that the total length of the engine valve which is distance from the head to the cut position, is always determined accurately.

The foregoing merely relates to an embodiment of the present invention. Various changes and modifications may be made by person skilled in the art without departing from the scope of claims.

10 Claims

1. A method of processing a poppet valve (1) which comprises a valve stem (1a) and a valve head (1b), the method comprising the steps of:

grinding an outer circumferential surface of the valve stem (1a) while the end of the valve head (1b) is engaged with a first stopper (8) to position the poppet valve (1); and

cutting the valve stem (1a) at a predetermined distance from the end of the valve head (1b) while the outer circumferential surface of a ground portion of the valve stem (1a) is supported by a plurality of support rollers (10a, 10b), the end face of the valve head (1b) being engaged on a second stopper (18), wherein

a rotary shaft (16) of one (10b) of the support rollers is slightly inclined so that the poppet valve (1) is pressed onto the second stopper (18), thus cutting of the valve stem (1a) always at a predetermined position to keep a total length of the poppet valve (1) equal.

Patentansprüche

1. Verfahren zum Bearbeiten eines Tellerventils (1), das einen Ventilstößels (1a) und einen Ventilkopf (1b) umfaßt, mit den folgenden Verfahrensschritten:

Schleifen der Mantelfläche des Ventilstößels (1a), während das Ende des Ventilkopfes (1b) von einem ersten Anschlag (8) erfaßt wird, um das Tellerventil (1) zu positionieren; und
Abschneiden des Ventilstößels (1a) in einem vorbestimmten Abstand vom Ende des Ventilkopfes (1b), während die Mantelfläche eines geschliffenen Teiles des Ventilstößels (1a) von einer Mehrzahl von Tragrollen (10a, 10b) getragen ist, und die Endfläche des Ventilkopfes (1b) von einem zweiten Anschlag (18) erfaßt wird, wobei

eine Welle (16) eines (10b) der Tragrollen leicht geneigt wird, so daß das Tellerventil (1) gegen den zweiten Anschlag (18) angedrückt wird, so daß der Ventilstößel (1a) stets in einer bestimmten Position abgeschnitten wird, um die Gesamtlänge des Tellerventils (1) gleich groß zu halten.

Revendications

1. Procédé de fabrication d'une soupape à champignon (1) comportant une tige de soupape (1a) et une tête de soupape (1b), le procédé comportant les étapes consistant à :

polir une surface circonférentielle extérieure de la tige de soupape (1a) pendant que l'extrémité de la tête de soupape (1b) est engagée dans un premier dispositif de retenue (8) pour positionner la soupape à champignon (1); et couper la tige de soupape (1a) à une distance prédéterminée de l'extrémité de la tête de soupape (1b) pendant que la surface circonférentielle extérieure d'une zone de base de la tige de soupape (1a) est supportée par plusieurs rouleaux supports (10a, 10b), la face d'extrémité de la tête de soupape (1b) étant engagée dans un second dispositif de retenue (18), dans lequel

une tige pivotante (16) de l'un (10b) des rouleaux supports est légèrement inclinée de façon que la soupape à champignon (1) est pressée sur le second dispositif de retenue (18), permettant ainsi de toujours couper la tige de soupape (1a) à une position prédéterminée pour garder la longueur totale de la soupape à champignon (1) égale.

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FIG.1

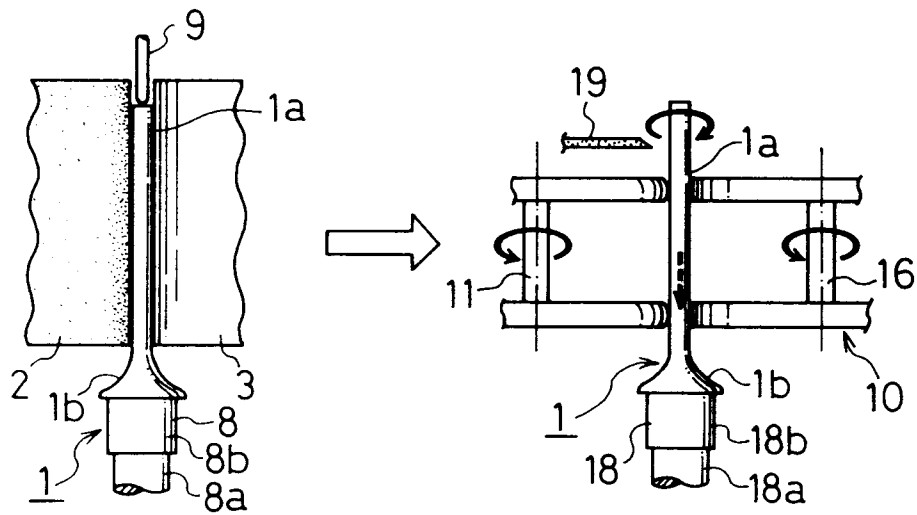


FIG.2

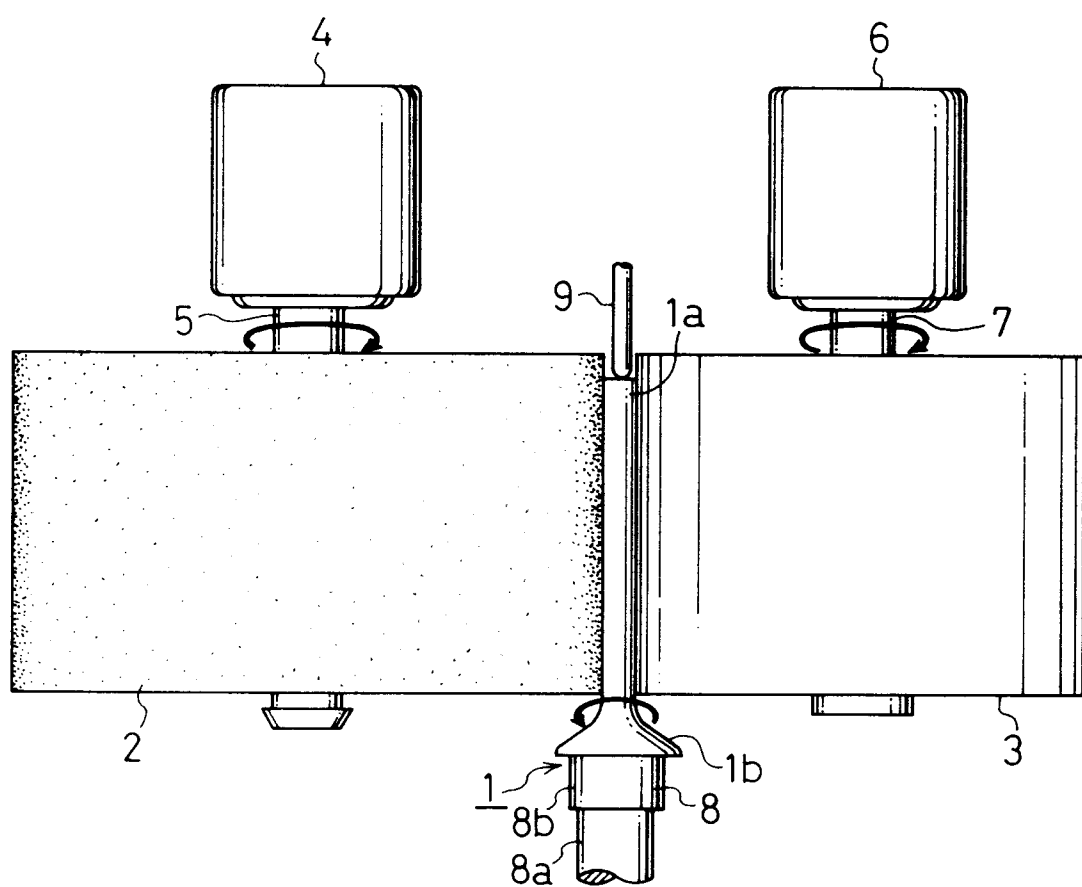


FIG. 3

