United States Patent [19]

Sarra

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[54] **FLASH REMOVAL**

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[52] **U.S. Cl.** **83/13,** 83/188, 83/914, 164/70

[51] **Int. Cl.** **B22d 31/00**

[58] **Field of Search** 83/13, 914, 188, 83/192–194; 164/69, 70, 262

[56] **References Cited**

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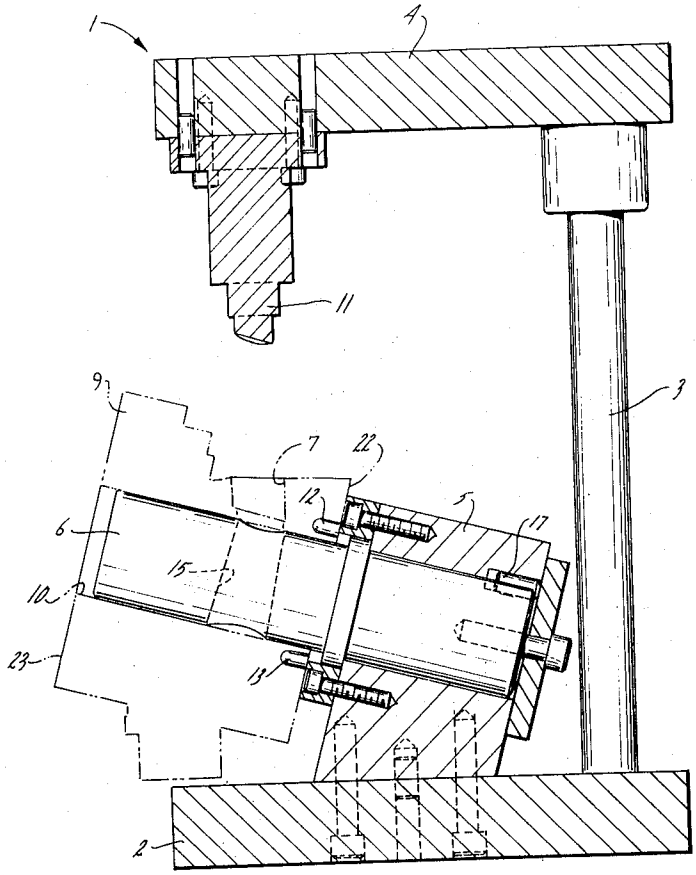
Primary Examiner—J. M. Meister

Attorney—Andrus, Sceales, Starke & Sawall

[57] **ABSTRACT**

Following die casting of an aluminum alloy cylinder block with an insert liner having openings extending through the liner and block to the outside, the flash across the opening is removed by employing a mandrel in the liner with a passage through the mandrel registering with the liner opening, and inserting a male punch through the opening from the outside to shear the flash around the edge of the opening and break it loose after which it falls out through the passage in the mandrel upon removal of the punch and mandrel.

2 Claims, 7 Drawing Figures



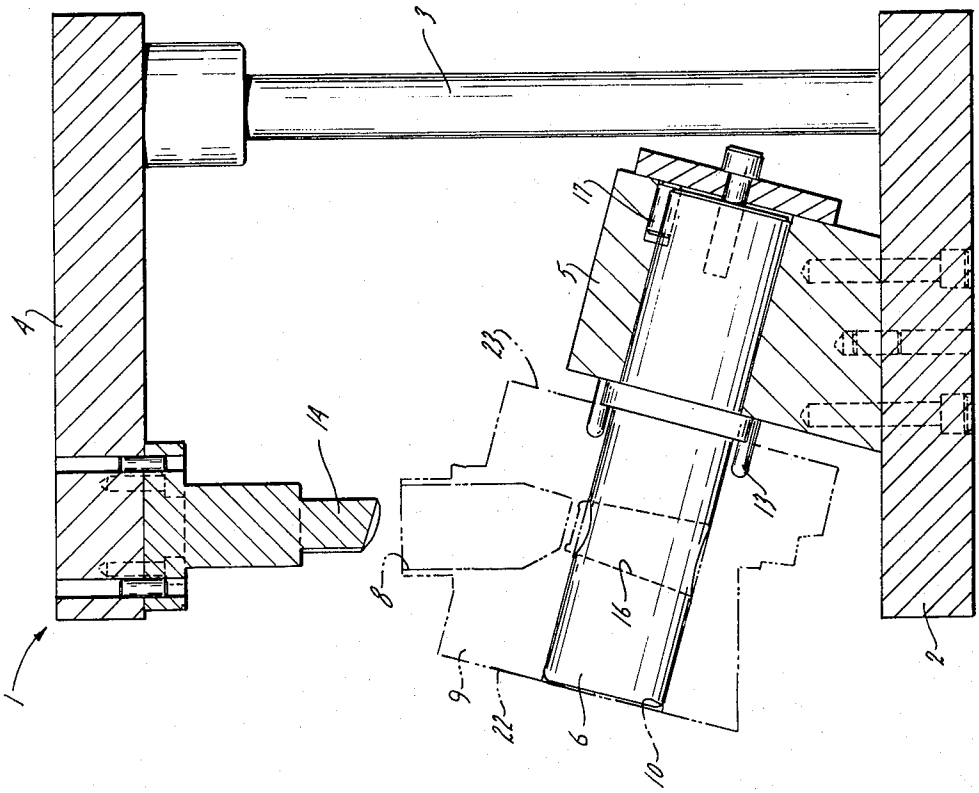


FIG_2

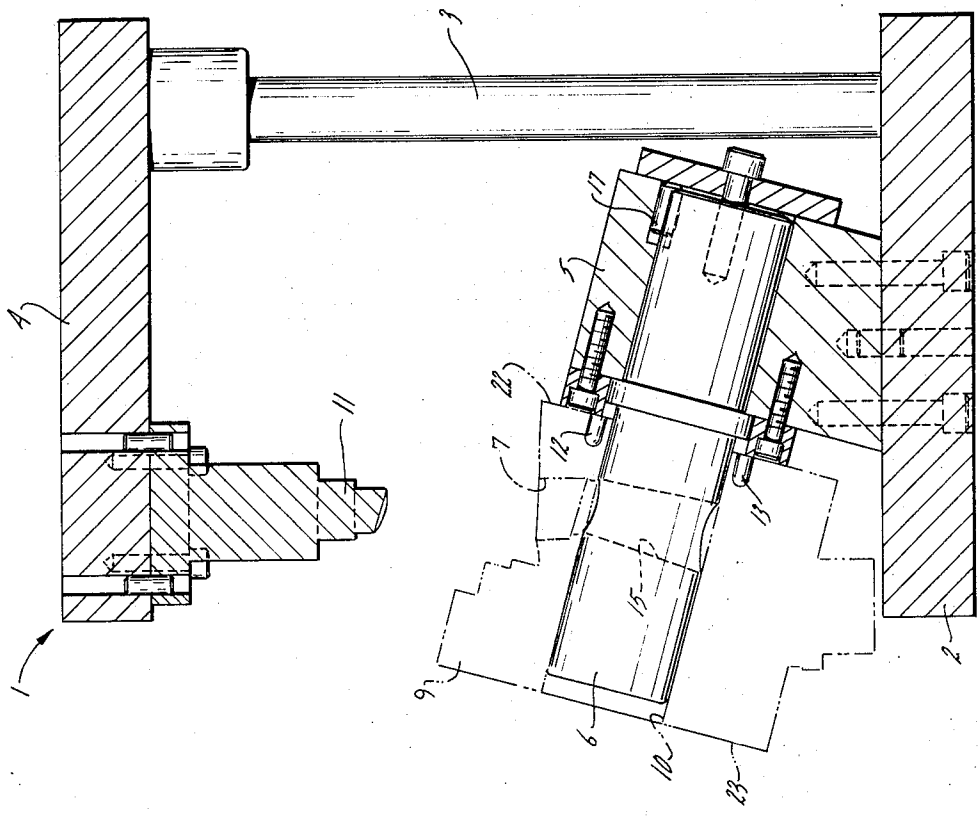


FIG_1

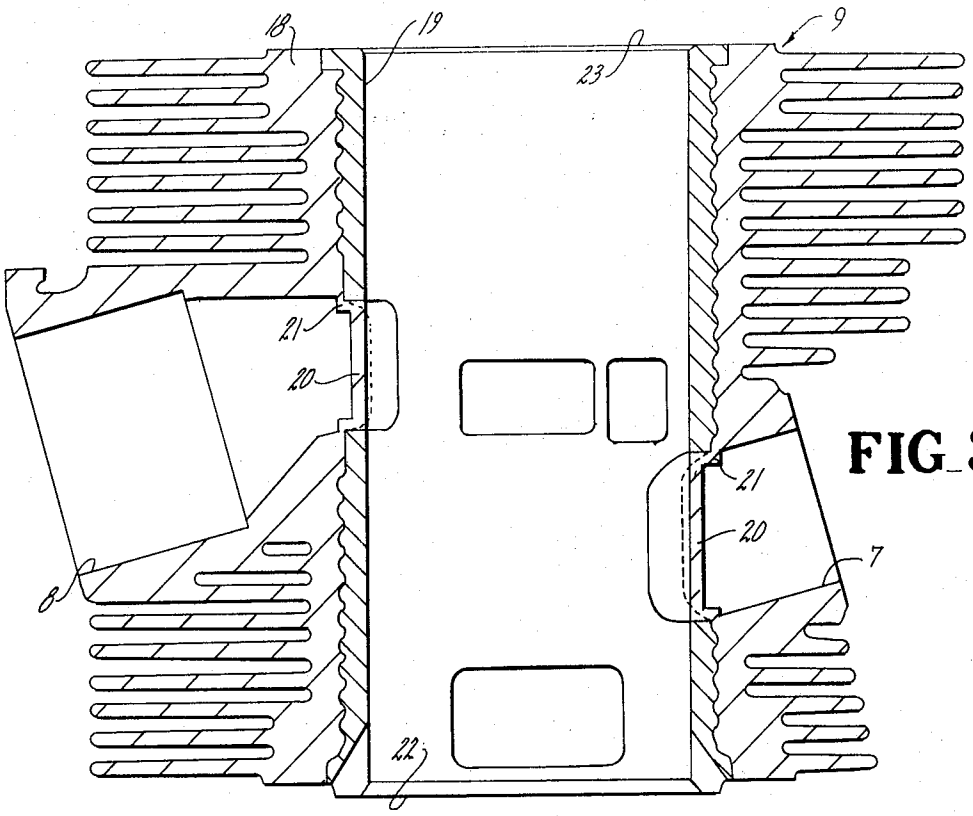


FIG_3

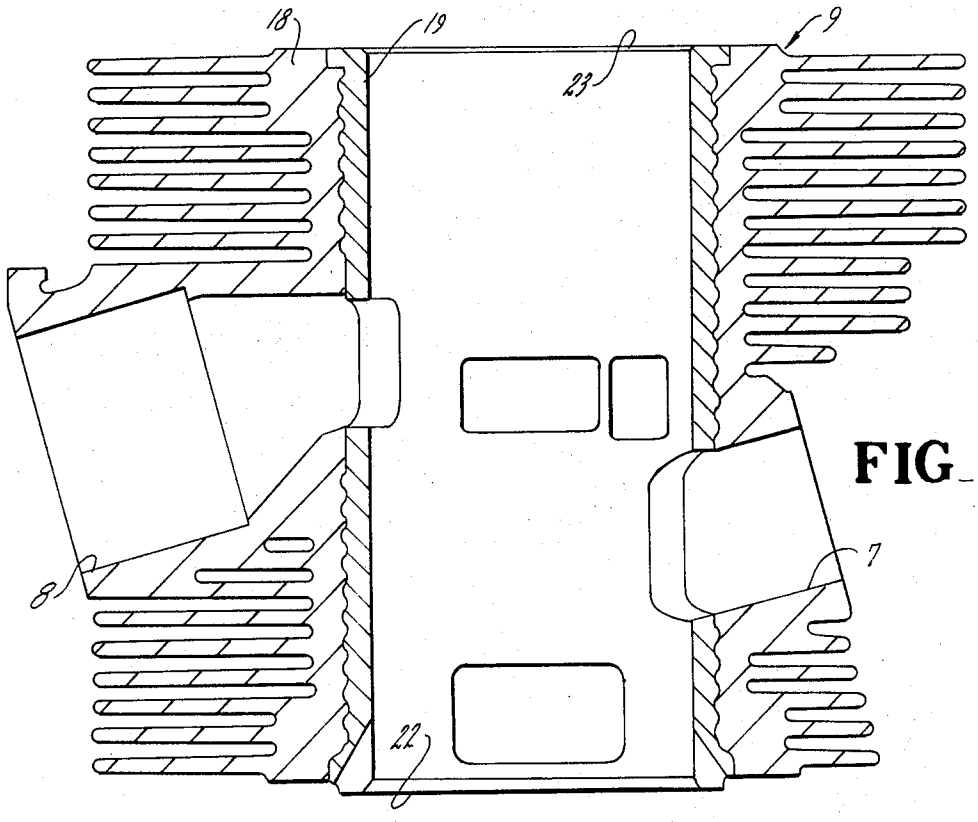
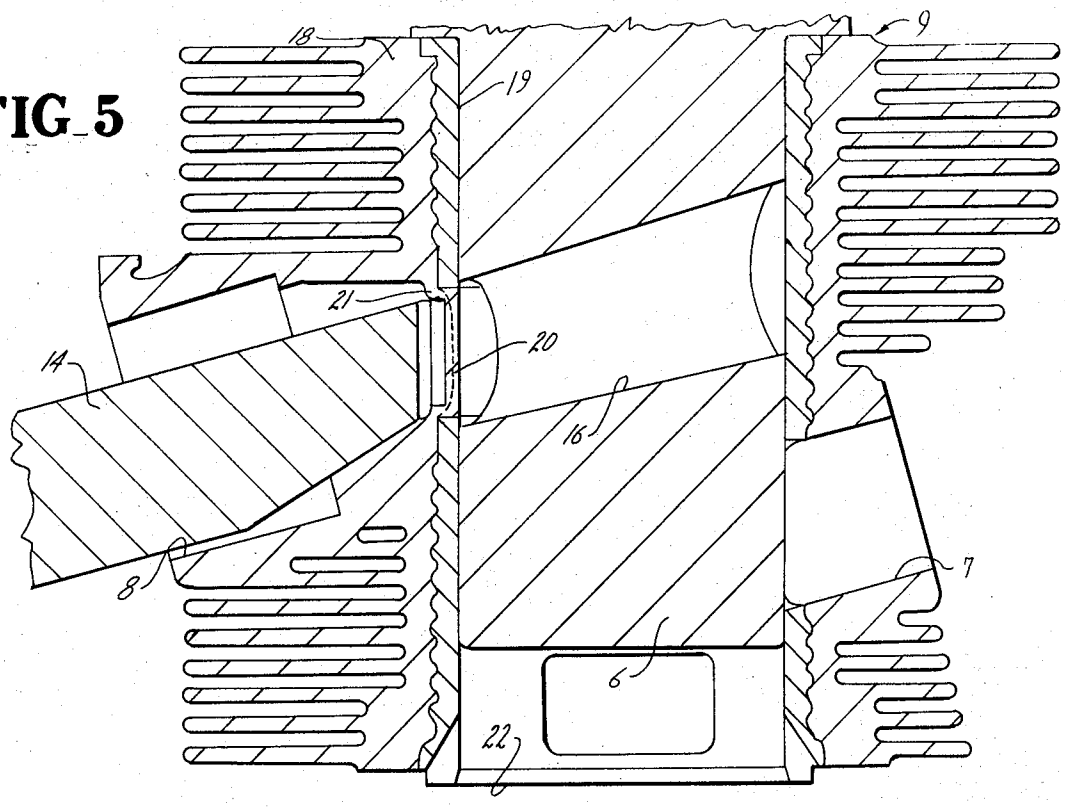


FIG_4

FIG_5



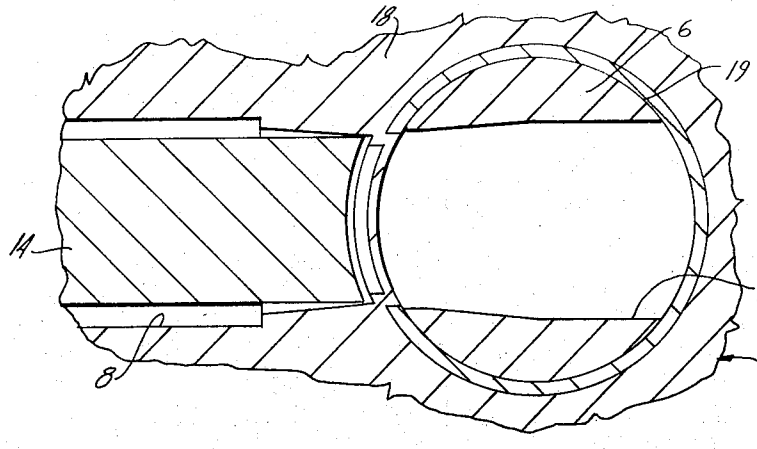


FIG_6

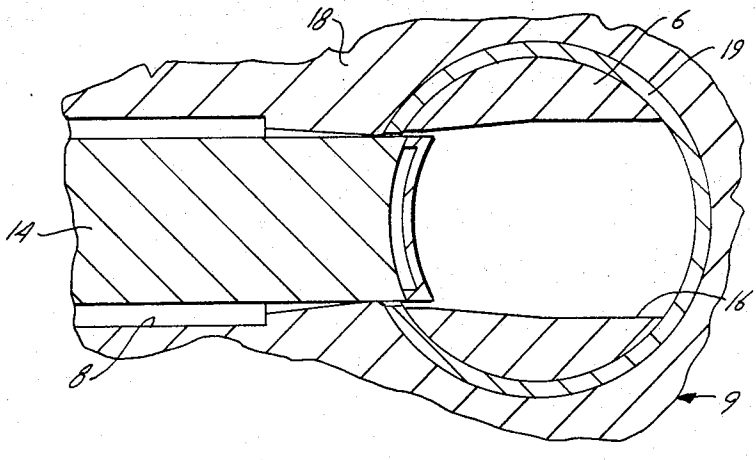


FIG_7

FLASH REMOVAL

BACKGROUND OF THE INVENTION

This invention relates to flash removal in the manufacture of die cast aluminum cylinder blocks for internal combustion engines.

Where such cylinder blocks are cast with an insert cylinder lining in place a problem of flash removal arises at the intake and exhaust openings through the block and liner where the core mandrels are disposed in proximity during the die casting. This flash formed between the core mandrel in the port opening and the mandrel in the liner completely closes off the opening.

In attempting to remove the flash after the casting operation there is danger of distorting the liner and also of leaving ragged edges of cast material at the openings.

SUMMARY OF THE INVENTION

In carrying out the present invention the cast block is supported on a mandrel fitting into the cylinder liner and securing the liner against distortion, and a punch is applied from the outside into the opening to shear the flash at the edge of the opening at the interface between the liner and the cast metal. The punch has a sharp cutting edge slightly smaller than the port opening in the liner so that as the punch moves past the interface it severs the flash from the cast metal. The aluminum alloy casting metal does not bond to the edges of the liner, which is usually of cast iron, and it therefore separates from the liner readily during the shearing operation.

The supporting mandrel in the liner has an opening through the mandrel registering with the opening in the liner for receiving the flash as it is sheared by the punch. This mandrel opening may be flared downwardly to a larger diameter to facilitate dropping of the sheared flash from the punch and permitting the flash to fall out upon removal of the cylinder block from the mandrel.

The apparatus employed includes the mandrel which is generally disposed at an incline to support the block with the opening orientated to alignment with the punch, and the punch which may be manually or hydraulically actuated toward the mandrel to effect shearing of the flash. For the purpose of establishing the desired orientation of the block an interlock is provided between the same and the mandrel, as by the employment of a dowel fixed to the mandrel fixture and which enters a guide recess in the face of the block when the latter is placed upon the mandrel.

BRIEF DESCRIPTION OF THE DRAWING

The best mode presently contemplated for carrying out the invention is illustrated in the accompanying drawing in which:

FIG. 1 is a central vertical section through the apparatus and a block mounted thereon, and showing the punch in retracted position and with phantom lines showing the punch in extended position upon completion of a flash shearing operation for the inlet opening of the block;

FIG. 2 is a view similar to FIG. 1 showing the shearing of the flash from the exhaust opening of the block;

FIG. 3 is a transverse section of the cylinder block taken axially of the cylinder and showing the inlet and exhaust ports with the flash therein as would be apparent immediately after casting;

FIG. 4 is a view similar to FIG. 3 showing the block free from flash after its removal;

FIG. 5 is an enlarged detail showing of the punch and block just prior to the shearing operation;

FIG. 6 is a transverse section taken on line 6—6 of FIG. 5; and

FIG. 7 is a view similar to FIG. 6 taken after the punch has completed its shearing stroke.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The apparatus employs a punch press 1 having a base 2 with upstanding post 3 and a slide or ram 4 vertically movable on the post in the usual manner.

A fixture 5 is secured upon the base and holds a cylindrical mandrel 6 inclined at an angle corresponding to the angular disposition of the ports 7 and 8 in the cylinder block 9.

The mandrel 6 is of a diameter to closely fit within the cylinder liner 10 in block 9 so that the latter may be mounted upon the free end of the mandrel with one of the ports 7 and 8 disposed vertically upward.

The ram 4 carries a depending punch 11 disposed vertically above and in alignment with the upwardly facing port in block 9 when the latter is mounted on mandrel 6.

For the purpose of orienting the block 9 so that the upwardly facing selected port 7 is in alignment with punch 11, the fixture 5 has two dowels 12 and 13 parallel to mandrel 6 and disposed diametrically opposite with relation to the mandrel, dowel 12 being above the mandrel and dowel 13 being below the mandrel.

Dowels 12 and 13 register with and enter corresponding recesses in the faces of block 9 when the latter is mounted on mandrel 6, to effect the orientation of the intake opening 7 in FIG. 1 in alignment with punch 11 and the orientation of exhaust opening in alignment with punch 14 in FIG. 2.

The mandrel 6 in FIG. 1 is provided with a passage 15 registering with opening 7 in the cylinder block 9 and having a corresponding diameter at its upper end and gradually flaring to a larger diameter at its lower end. A similar flared passage 16 extends through mandrel 6 in FIG. 2 in registry with opening 8 in cylinder block 9.

In order to make sure that the mandrel 6 is oriented properly to align passage 15 with opening 7 in FIG. 1 and to align passage 16 with opening 8 in FIG. 2, a dowel 17 interlocks the inner end of the mandrel with the fixture 5.

The cylinder block 9 illustrated comprises a die cast body 18 of aluminum alloy with an iron liner 19 for the cylinder therein. The port openings 7 and 8 are present in the liner 19 prior to casting of the body 18. During the die casting operation the molten aluminum alloy fills the space formed in the port opening in the insert liner 19, between the core mandrel registering with the port opening and the mandrel in the liner, whereby a flash 20 of material is left in the space or cavity rooted at the interface 21 between the liner 19 and body 18.

It is this flash 20 that needs to be removed from both openings 7 and 8 after the casting operation, as shown in FIG. 3.

FIG. 1 illustrates removal of the flash 20 from inlet opening 7, and FIG. 2 illustrates removal of the flash 20 from exhaust opening 8. It will be noted that openings 7 and 8 are disposed at different distances from the

lower face 22 of the cylinder block and that the openings are of different dimensions and require correspondingly different punches 11 and 14 positioned differently by the ram 4.

Ordinarily different shearing presses 1 will be employed in FIGS. 1 and 2 so that the cylinder blocks 9 may be moved in succession from one press to the other in removing flash successively from opening 7 and then opening 8. During the transfer from the press 1 of FIG. 1 to the press 1 of FIG. 2 the block 9 will be rotated 180° on the axis of its cylinder, and the positioning of the two dowels 12 and 13 accommodate this rotation.

In the event the inlet port opening 7 is disposed at a different angle than the exhaust port 8, the mandrel 6 for the press 1 of FIG. 1 will be disposed at a correspondingly different angle than the mandrel 6 of the press 1 of FIG. 2.

In the block 9 illustrated, the openings 7 and 8 are disposed parallel to each other thus enabling the employment of mandrels 6 at approximately the same angle by inverting the block in transferring it from the press in FIG. 1 to the press in FIG. 2.

Thus, in FIG. 1 the dowels 12 and 13 enter corresponding recesses in the lower face 22 of block 9, whereas in FIG. 2 the dowels 12 and 13 enter recesses in the upper face 23 of block 9.

In all instances the liner 19 is retained by mandrel 6 against distortion from the punch forces and the punch is always aligned with the corresponding opening to effect an accurate removal of the flash.

In operation, the punch is forced completely through the corresponding port opening and into the upper end of the corresponding passage 15 or 16 in mandrel 6 so that the severed flash 20 is pushed ahead of the punch into the larger diameter portion of the passage where it will drop freely to the lower end of the passage. Then, upon removal of the cylinder block 9 from the mandrel 6, the piece of flash 20 will fall from the mandrel for collection in a suitable container beneath, not shown.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. The method of removing flash from port openings in a die cast cylinder block having an insert cylinder liner, comprising supporting the block upon a mandrel substantially fitting within the cylinder liner, forcing a punch axially into the port opening and through the interface between the liner and the die cast material to loosen the flash at its root, and thereafter retracting the punch and removing the cylinder block from the mandrel whereby the loosened flash falls away.

2. The method of claim 1 and employing the punch to force the severed flash into an enlarged passage through the mandrel to facilitate release of the flash upon removal of the cylinder block from the mandrel.

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