

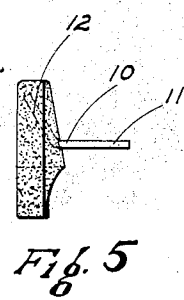
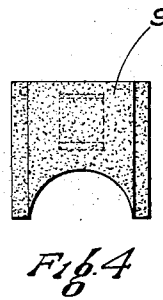
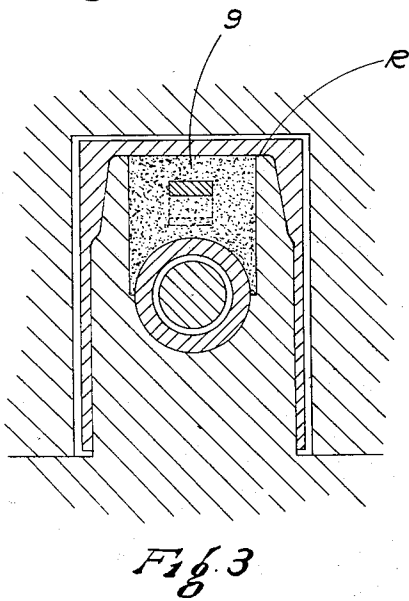
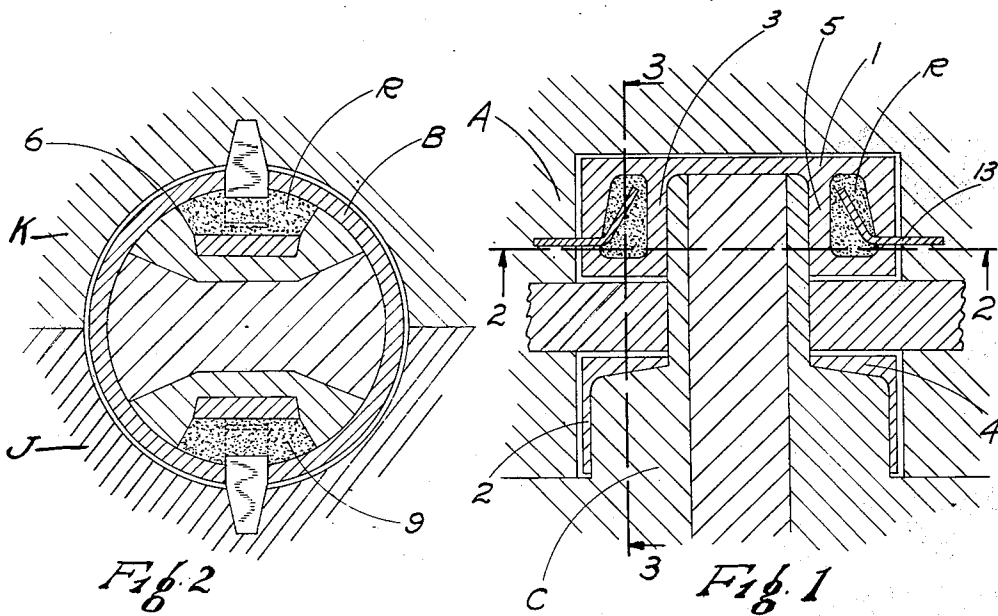
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PISTON SAND CORE

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PISTON-SAND CORE

Application filed November 15, 1929. Serial No. 407,402.

This invention has to do with the art of molding and is particularly concerned with certain novel molding apparatus for casting pistons which are preferably made from an aluminum base alloy.

It is now recognized in this art that an aluminum base alloy piston exhibits characteristics rendering it more desirable in many respects when cast in a mold of the permanent type as compared with casting in a sand mold. The contact of the molten alloy with the metal of the mold chills the molten metal causing it to assume a fine grain structure characterized by improved properties in toughness, density, hardness and tensile strength.

Up to the time of this invention considerable difficulty has been experienced in connection with providing the best core construction to define the inner contour of the piston. In line with the thoughts of the preceding paragraph this core should be permanent, i. e., of metal but the very shape of the piston interior would render difficult or impossible the withdrawal of a wholly permanent core after casting if one were used. This invention therefore has in view the provision of a core construction for piston molding operations which comprises a main body portion of the permanent type and certain portions of the non-permanent type which are designed to core out inaccessible regions of the piston. The idea is that after casting the permanent core may be easily withdrawn while the sand core parts may be broken up and thereby removed.

Molding apparatus such as proposed by this invention is particularly adaptable to the casting of a piston having separated head and skirt portions. The latter are usually divided after casting by a machining operation leaving the internal construction of the piston as the sole connecting means between the head and skirt. The internal structure of such a piston is intricate in design and the practice has been to cast these pistons by using a sand core.

More in detail, this invention contemplates positioning the sand core in proper place to core out certain parts of a piston through

the medium of inserts which are anchored in the mold parts and which project into the sand core portions to provide a support for the latter. This arrangement necessarily dictates that the inserts pass through the wall of the piston and this invention has in mind the locating of the inserts in that portion of the wall that is machined away after casting to provide the separated head and skirt.

These and other more detailed objects and advantages will in part become apparent and in part be stated as the description of the invention proceeds. For a full and more complete understanding thereof, reference may be had to the following description and accompanying drawing wherein:

Figure 1 is a fragmentary section through a mold and core designed in accordance with this invention.

Figure 2 is a horizontal section through the structure shown in Figure 1, being a section taken about on the plane represented by the line 2—2 of Figure 1.

Figure 3 is a vertical section taken about on the line 3—3 of Figure 1.

Figure 4 is an enlarged detailed showing of one of the sand core members, and

Figure 5 is a side view of the core member shown in Figure 4.

Referring now to the drawing, the mold in which a piston is cast is represented somewhat diagrammatically and referred to as A. This mold may be of conventional type comprising a pair of separable sections J and K having their meeting faces recessed to form a casting cavity. A piston is indicated at B and comprises a head, and a skirt 2 which are separated by machining operations carried out after casting as above noted. These head and skirt portions 1 and 2 are connected by an internal structure referred to generally as 3. This structure may include wrist pin bosses 4 and struts 5 or may be of other design if desired. In any event the internal structure, together with the head 1 defines certain inaccessible recesses in the ultimate product which must be cored out during the casting operations. In the construction illustrated these recesses are referred to as R. One of the recesses R is defined by the one of

the wrist pin bosses 4, top and side of the head 1 and a strut 5. The recess opens at each side into the interior of the piston as indicated by the line 6 in Figure 2.

5 For coring out the major portion of the piston a permanent core C is availed of. This core C is preferably of a ferrous alloy and is sectional in construction to facilitate assembly and removal after casting. The particu-
10 lar sectional design is not a part of this invention and for illustrative purposes, one sectional arrangement that may be availed of is shown in Figure 2. It is notable that the core C fills entirely the interior of the piston with
15 the exception of the recesses R and that the core C closes the open side of these recesses as indicated at 6.

According to this invention, cores for forming the recesses R are provided in the
20 form of sand cores 9 which are of the construction clearly shown in Figures 4 and 5. Partially embedded in the cores 9 are flat inserts 10 having angularly disposed arms 11
25 and 12. The arm 12 is that portion that is embedded in the core 9 while the arm 11 is designed to project through the wall of the piston B into the mold A in which it is detachably anchored as indicated at 13. These
30 inserts 10 are preferably of the same aluminum base alloy which is used in casting the piston and the arm 11 pass through the piston at the place where the latter is machined away to separate the head and skirt portions
35 1 and 2.

A casting operation involving the use of the foregoing apparatus may be described by starting with the mold A in an unassembled condition. The core C is properly positioned
40 and the arm 11 of inserts 10 carrying cores 9 are detachably anchored at 13 in the mold A. The latter is then assembled and the alloy poured. After the aluminum alloy has solidified the mold A is withdrawn leaving the arms 11 projecting from the piston wall. The
45 core C is now removed and the sand cores 9 are broken up to permit of their removal through the open sides of the recesses R. In this condition the head 1 and skirt 2 are integrally joined and the arms 11 and 12 project
50 respectively outwardly and inwardly from the piston wall. The protruding arms 11 may now be cut off and the piston subjected to machining operation to separate the head and skirt. The latter operations eliminate those portions of the arms 11 passing
55 through the piston wall and permit the arm 12 to be removed from the recesses R.

While a preferred specific embodiment of the invention is herein set forth, it is to be
60 understood that I am not to be limited to the exact constructions illustrated and described because various modifications of these details may be provided in putting the invention into practice within the purview of the ap-
65 pended claims.

What I claim is:

1. Molding apparatus for aluminum base alloy pistons comprising a permanent mold construction, a permanent core, sand cores, and metal inserts for detachably mounting
70 the sand cores on the mold construction, said inserts having portions designed to be cast in the piston at the place where the latter is to be machined away to separate the skirt and head with said permanent and sand cores defining the internal construction of the piston.
75

2. Molding apparatus comprising a permanent mold having a casting cavity therein shaped to form the outer walls of a piston, a permanent core construction removably positioned within said casting cavity and spaced from the walls thereof to define the inner surface of the piston skirt and a pair of oppositely disposed piston pin bosses, said permanent core construction extending toward
80 said mold to form a portion of the under surface of the piston head and being widely spaced from the side walls of said casting cavity between the piston pin bosses and the head to form the inner surfaces of a pair of webs extending from the head to the bosses, and a pair of oppositely disposed cores spaced from said mold and from said permanent core construction to define portions of the inner surface of the piston and the outer walls
85 of the webs.
90
95

3. Molding apparatus comprising a permanent mold having a substantially cylindrical casting cavity therein to form the outer walls of a piston, a permanent core construction removably positioned within said casting cavity and having a substantially cylindrical portion spaced from said mold to define the inner surface of a portion of the piston skirt, said permanent core construction being offset inwardly on opposite sides to define the inner surfaces of a pair of piston pin bosses and a web integral with one of said piston pin bosses, and a sand core spaced from
100 said mold to define the inner surface of a portion of the cylindrical wall of the piston and spaced from said permanent core construction to define the outer wall of the web.
105
110

4. Molding apparatus comprising a permanent mold having a casting cavity therein shaped to form the outer walls of a piston, a permanent core construction removably positioned within said casting cavity and spaced from the walls thereof to define the inner surface of the piston skirt and a pair of oppositely disposed piston pin bosses, said permanent core construction extending toward
115 said mold to form a portion of the under surface of the piston head and being widely spaced from the side walls of said casting cavity between the piston pin bosses and the head to form the inner surfaces of a pair of webs extending from the head to the bosses, and a pair of oppositely disposed sand cores
120 releasably carried by said mold, said sand
125
130

cores being spaced from said mold to define portions of the inner surface of the piston and spaced from said permanent core construction to define the outer walls of the webs.

5. Molding apparatus comprising a permanent mold having a substantially cylindrical casting cavity therein to form the outer walls of a piston, a permanent core construction removably positioned within said casting cavity and having a substantially cylindrical portion spaced from said mold to define the inner surface of a portion of the piston skirt, said permanent core construction being offset inwardly on opposite sides to define the inner surfaces of a pair of piston pin bosses and a pair of webs integral with said bosses, and a pair of sand cores spaced from said mold to define the inner surfaces of portions of the cylindrical wall of the piston and spaced from said permanent core construction to define the outer walls of the webs.

6. Molding apparatus comprising a permanent mold having a substantially cylindrical casting cavity therein to form the outer walls of a piston, a permanent core construction removably positioned within said casting cavity and having a substantially cylindrical portion spaced from said mold to define the inner surface of a portion of the piston skirt, said permanent core construction being offset inwardly on opposite sides to define the inner surfaces of a pair of piston pin bosses and a pair of webs integral with said bosses, and a pair of sand cores releasably carried by said mold, said sand cores being spaced from said mold to define the inner surfaces of portions of the cylindrical wall of the piston and spaced from said permanent core construction to define the outer walls of the webs.

7. In a piston mold, the combination of a mold section, a non-permanent core member, and a metal insert embedded in the core member and releasably connected to said mold section to support said core member from said mold section during assembly and pouring of the mold, said core member and mold section being spaced apart by said insert to provide a casting cavity therebetween with said insert positioned in said cavity.

8. In combination, a permanent mold having a casting cavity shaped to define the outer walls of the head, ring flange, and skirt of a piston, a permanent core member disposed within said casting cavity and spaced therefrom to define a portion of the inner walls of the piston, a non-permanent core member arranged to core out inaccessible recesses in the piston, and a metal insert secured to said non-permanent core member and releasably connected to said mold, said insert supporting said non-permanent core member spaced from said mold and passing

through the casting cavity at the junction of the portions of the mold for forming the ring flange and skirt of the piston.

9. In combination, a permanent mold having a casting cavity defining the outer surfaces of the article to be cast, a permanent core for coring out the major portion of the article, a non-permanent core for coring out inaccessible recesses in the article, and a metal insert secured to said non-permanent core and releasably engaged with said mold, said insert supporting said non-permanent core spaced from said mold and in engagement with said permanent core and being arranged to be embedded in the article cast.

10. In combination, a permanent mold having a substantially cylindrical casting cavity, a permanent core arranged to be supported within said casting cavity and having a substantially cylindrical portion spaced from said mold and defining an annular cavity, said permanent core being offset to form internal boss and internal web cavities, a non-permanent core member for coring out a recess between the web cavity and the annular cavity, and means for supporting said non-permanent core member extending through the annular cavity.

11. A piston mold comprising a permanent mold having a substantially cylindrical casting cavity, a permanent core member supported within said casting cavity and spaced from said mold to define the inner surface of the piston skirt, oppositely disposed inwardly projecting piston pin bosses and webs extending from the bosses to the head of the piston, and a pair of sand cores spaced from said permanent core to define the outer surfaces of the webs between the bosses and the head, and spaced from said mold to define a portion of the inner surface of the wall of the piston.

12. A piston mold comprising a permanent mold having a substantially cylindrical casting cavity therein shaped to form the outer walls of the head and skirt of a piston, a permanent core construction removably supported in said casting cavity and having a substantially cylindrical portion spaced from said mold to define the inner surface of the piston skirt and a reduced extension for defining the inner surfaces of a pair of piston pin bosses, said reduced extension being continued to form the central portion of the inner surface of the head, and a pair of non-permanent cores arranged between the bosses and the head on opposite sides of said reduced extension.

In testimony whereof I hereunto affix my signature this 9th day of November, 1929.

GEO. L. MOORE.