An improved sand casting mold having a pair of separable mold elements is provided with a casting chamber which is offset from a main parting plane along which the mold elements are joined with the mold elements providing mating beveled surfaces between the main parting plane and the casting chamber to define an auxiliary angular parting line therebetween so that any incidental flashing on a casting formed within the casting chamber occurs along the parting line in such a portion on the casting so as to be readily removed by automatic surface grinding machines. The beveled surfaces of the mold elements along the angular parting line further serve to strengthen the corners of the mating mold elements so as to resist breakage during handling and use of the mold.

6 Claims, 3 Drawing Figures
BACKGROUND OF THE INVENTION

In the manufacture of metal castings, superfluous metal is often formed about the periphery of the casting coincident to where the parting line of the casting mold intersects the casting cavity. One common cause of such superfluous metal is the flashing of metal along the parting line due to imperfectly mating parting surfaces on the opposite elements of the mold. Another cause is the breakage of the outside corners formed by the intersection of such parting surfaces with the casting cavity.

Therefore, the parting surfaces of prior molds have been oriented substantially perpendicular to the casting cavity creating right angular outside corners. Such right angular corners are highly susceptible to breakage during handling and use of the mold due to the fragile nature of the sand casting material used to construct such casting molds.

Because such superfluous metal is disposed about the periphery of the casting, the most frequently used method to remove such metal is by a hand controlled grinding wheel. Hand grinding is an extremely laborious and time-consuming operation which greatly contributes to the overall expense of the casting.

Another problem associated with the broken corners is that if the loose material therefrom is in the casting cavity when the molten metal is poured, such material becomes lodged in the casting resulting in undesirable imperfections therein.

OBJECTS OF THE INVENTION

Accordingly, it is an object of this invention to provide an improved sand casting mold for producing metal castings.

Another object of this invention is to provide such sand casting mold wherein the marginal edge of the casting chamber along the parting line of the mold is formed at an obtuse angle for greater resistance to breakage during handling and use of the mold.

Another object of this invention is to provide a sand casting mold wherein any incidental flashing occurring along the parting surfaces connected with the casting chamber is angled outwardly from the surface of a single side of the casting chamber to facilitate the removal of such flashing from a casting manufactured in such a mold.

Other objects and advantages of the present invention will become more readily apparent upon reference to the accompanying drawing and following description.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal cross-sectional view of an improved casting mold embodying the principles of the present invention.

FIG. 2 is a fragmentary sectional view of a corner of the casting chamber shown in FIG. 1, but illustrating an alternate embodiment of the present invention.

FIG. 3 is a fragmentary sectional view of a corner of a casting produced by the alternate embodiment of the casting mold of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to the drawing, an improved casting mold embodying the principles of the present invention is generally indicated at 10 and is constructed from a molding sand or other suitable material. As best shown in FIG. 1, a two-part flask 12 including an upper flask portion 14 and a lower flask portion 16 is utilized to support the mold. The upper flask portion 14 is provided with a lower end 18 which is separately joined in abutting relation to an upper end 20 of the lower flask portion 16 along a generally horizontal main parting plane 22 formed therebetween.

An upper cope element 24 of the mold 10 is formed in the upper flask portion 14. The upper cope element 24 is provided with a lower parting surface 26 disposed generally along the main parting plane 22. The upper cope element also includes a protuberance 28 having a substantially flat outer surface 30 disposed in spaced substantially parallel relation to the main parting plane 22. The protuberance has a continuous marginally extending beveled side surface 32 which extends between the lower parting surface of the upper cope element and the flat outer surface of the protuberance. The intersection of the beveled side surface 32 and the flat outer surface 30 of the protuberance defines a continuous marginally extending corner 33 having an included angle greater than 90 degrees.

A lower drag element 34 of the mold 10 is formed in the lower flask 16. The lower drag element is provided with an upper parting surface 36 disposed for mating engagement with the lower parting surface 26 of the upper cope element 24 along the main parting plane 22. The lower drag element also includes a cavity 38 formed in its upper parting surface which is defined by a retracted bottom wall 42 and a continuous marginally extending sidewall 44. The sidewall is divided into a beveled outer portion 46 extending inwardly from the upper parting surface 36 and an inner sidewall portion 48 extending outwardly from the bottom wall 42. The beveled outer portion 46 is disposed in substantially parallel relation to the beveled side surface 32 of the protuberance so that cooperative mating engagement is provided with a central auxiliary angular parting line 49 therebetween. The inner sidewall portion 48 is disposed generally normal to the bottom wall 42 and intersects with the beveled outer portion 46 intermediate the upper parting surface 36 and the bottom wall to form a continuous marginally extending corner 50 therebetween. The continuous marginally extending corner 50 is provided with an included angle greater than 90 degrees which is substantially equal to the corner 33 of the protuberance 28 on the upper cope element 24.

Insertion of the protuberance 28 into the cavity 38 is effective to form a substantially closed casting chamber 52 in the mold 10 having a removable wall defined by the flat outer surface 30 of the protuberance and stationary walls defined by the inner sidewall portion 48 and the retracted bottom wall 42 of the cavity. The protuberance and cavity are constructed so that their respective continuous marginally extending corners 33 and 50 are disposed in closely adjacent relationship to define a substantially right angular inner corner 54 of the casting chamber 52. Thereby, the auxiliary angular parting line 49 interconnects the main parting plane 22
with the casting chamber 52 along such inner corner. The casting mold 10 also includes a gating system, generally indicated at 56, for communicating molten metal, not shown, into the casting chamber 52. Such a gating system includes a vertically disposed downsprue 57, a horizontal runner 58, a riser cavity 59, and an ingate 60. It should be noted that the present invention is not intended to be limited by the above enumerated components of the gating system which are used merely for illustrative purposes, as numerous other components and combinations thereof will be readily apparent to those skilled in the art.

Operation

While the operation of the present invention is believed to be clearly apparent from the foregoing description, further amplification will subsequently be made in the following brief summary of such operation. In operation, after assembly of the mold 10, a predetermined quantity of molten metal is introduced into the casting chamber 52 for the manufacture of a casting which will acquire a shape conforming to that of the casting chamber 52. Such molten metal is introduced into the mold in the usual manner through the gating system 56, wherein molten metal which is poured into the downsprue 57 is directed through the runner 58 into the riser cavity 59. The molten metal is then channelled from the riser cavity into the casting chamber through the ingate 60.

Ordinarily, any mislocation of the upper cope element 24 on the lower drag element 34 of the mold 10 would cause their respective parting surfaces 26 and 36 to be imperfectly mated during assembly. Accordingly, when the casting is poured imperfect mating of the parting surfaces intersecting the casting chamber 52 would allow the flashing of molten metal from the chamber along the auxiliary parting line 49. This tendency is substantially minimized with the mold of the present invention, however, because of the piloting function of the beveled protuberance 28 into the beveled outer portion 46 of the cavity 38 which virtually insures proper assembly of the mold. If there should be some imperfection in or damage to the mating mold surfaces some flashing may occur about the periphery of the casting produced. Even when this occurs, the structure of the present invention facilitates the more economical removal of such flash material by the utilization of the auxiliary angular parting line 49 which is oriented outwardly from a single side defined by the outer surface 30 of the protuberance of the casting produced in such a mold. Consequently, this permits the flash material to be removed in a single pass over the flashing side of the casting with a belt type grinder.

The corner breakage problem associated with the right or acute angular outside corners formed in prior molds by the intersection of parting surfaces with casting chambers thereof is also alleviated by the particular orientation of the auxiliary parting line 49 of the present invention. The angular disposition of the beveled side surface 32 of the protuberance and the beveled outer portion 46 of the cavity forming the auxiliary parting line provide the outside corners of the present mold defined by the continuous marginally extending corners 33 and 50, respectively, with relatively large, blunt obtuse angles. By positioning the beveled side surface 32 and its mating beveled outer surface portion 46 in bisecting relationship to the inner corner 54 of the casting chamber, the corners 33 and 50 are provided with the greatest equalized obtuse angles possible so as to have greater strength in order to resist breakage during handling and use of the mold.

Second Form

An alternate embodiment of the present invention is illustrated in FIG. 2, wherein components identical to those employed in the first form are designated by corresponding reference numerals. In the second embodiment, the protuberance 28 is formed somewhat smaller than the cavity 38 so that the continuous marginally extending beveled side surface 32 is spaced a predetermined parallel distance apart from its formerly engaging beveled outer portion 46 of the cavity for forming a fin cavity 62 therebetweeen. As partially illustrated in FIG. 3, a casting 64 is formed in the alternate mold of FIG. 2 having a fin 66 conforming to the fin cavity 62. The fin projects outwardly from the surface of the casting formed by the outer surface 30 of the protuberance at an oblique angle along the corner thereof formed by the substantially right angular inner corner 54 of the casting chamber 52.

Operation of the Second Form

The structure of the alternate casting mold illustrated in FIG. 2 operates in essentially the same manner as the structure heretofore described, wherein molten metal is introduced into the casting chamber 52 for the manufacture of the casting 64 shown in FIG. 3. As is well known in the art, relatively thin flash material solidifies very rapidly which may have an adverse chilling effect on the casting adjacent such flashing. Such chilling may be undesirable in particular instances because it increases the hardness of the metal which makes machining of the casting more difficult. The particular construction of the alternate casting mold of FIG. 2 prevents such chilling by eliminating the presence of such relatively thin flash material about the periphery of the casting. This is accomplished by the purposeful spacing of the beveled side surface 32 of the protuberance from the beveled outer portion 46 of the cavity so that the relatively thick fin 66 is produced in the fin cavity 62 about the casting 64. The fin cavity is adapted to contain a sufficient mass of molten metal for the particular casting being produced so that the solidification of the fin 66 formed therein is sufficiently retarded so as not to induce a chilling effect on the body of the casting. The fin is later economically removed from the casting by the belt grinding operation previously described.

While the invention has been described and shown with particular reference to the preferred embodiment, it will be apparent that variations might be possible that would fall within the scope of the present invention which is not intended to be limited except as defined in the following claims.

What is claimed is:

1. An improved sand casting mold comprising; a pair of mold elements separable along a main parting plane formed therebetween; means forming a substantially closed casting chamber in such casting mold with the entire casting chamber being disposed in spaced offsetting relation to said main parting plane; and auxiliary parting line means extending in interconnecting relation between said main parting plane and said casting chamber.
An improved sand casting mold comprising; a pair of mold elements having engaging planar surfaces defining a main parting plane along which such mold elements are separable; means forming a relatively large cavity within one of said mold elements extending inwardly from its respective engaging surface; and means forming a protuberance on the other of said mold elements extending outwardly from its respective engaging surfaces, said protuberance being adapted for receipt into said cavity of said one of said mold elements in nonfilling relation therewith to define a substantially closed casting chamber in said mold, which casting chamber is disposed entirely in spaced offsetting relation to said main parting plane of the mold.

The casting mold of claim 2 wherein; said protuberance includes an outer surface defining a removable wall of said casting chamber and a continuous marginally extending beveled side surface adapted to be readily receivable within said cavity; and said cavity includes a continuous marginally extending inner side wall having a portion defining a stationary wall of said casting chamber and an adjoining beveled outer portion defining the portion of said cavity which is adapted to receive said protuberance, said beveled outer portion being disposed in substantially parallel relation to said beveled side surface of the protuberance when assembled so as to cooperatively define therewith an auxiliary parting line interconnecting said main parting plane with said casting chamber so that any flash material flowing therethrough during the casting operation may be subsequently expeditiously removable from a casting formed in the mold.

The casting mold of claim 3 including; a continuous marginally extending corner defined by the intersection of said beveled side surface of the protuberance with its outer surface; and a continuous marginally extending corner disposed between said portions of the inner sidewall forming said cavity with each of said continuous marginally extending corners forming a relatively blunt obtuse angle for added strength in order to resist breakage during handling and use of the mold.

The casting mold of claim 4 wherein said outer surface of said protuberance and said stationary wall of the cavity form a substantially right angular inner corner of said casting chamber, and said auxiliary parting line being inclined in substantially bisecting relation to said inner corner so that said obtuse angles of the continuous marginally extending corners of the casting mold are substantially equally maximized.

The casting mold of claim 5 wherein said beveled side surface of said protuberance and said beveled outer portion of said inner sidewall of the cavity are spaced a predetermined distance apart to define a fin cavity therebetween of a size to contain sufficient casting material during the casting operation to minimize premature chilling of such material in said inner corner of the casting chamber during solidification.

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