Jan. 13, 1959 R. J. HINES 2,867,870

METHOD AND APPARATUS FOR MAKING SAND MOLDS FOR CASTINGS

Filed Oct. 5, 1956 2 Sheets-Sheet 1

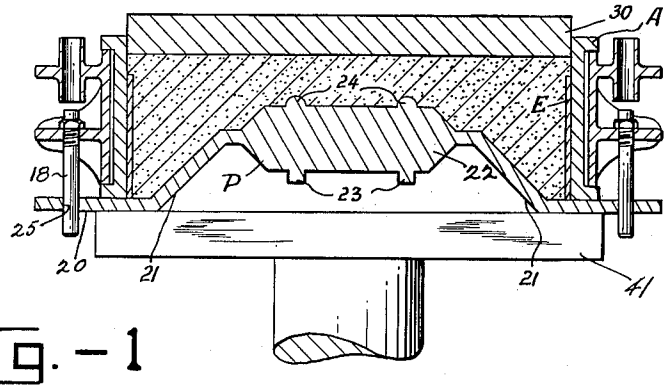

Fig. – 1

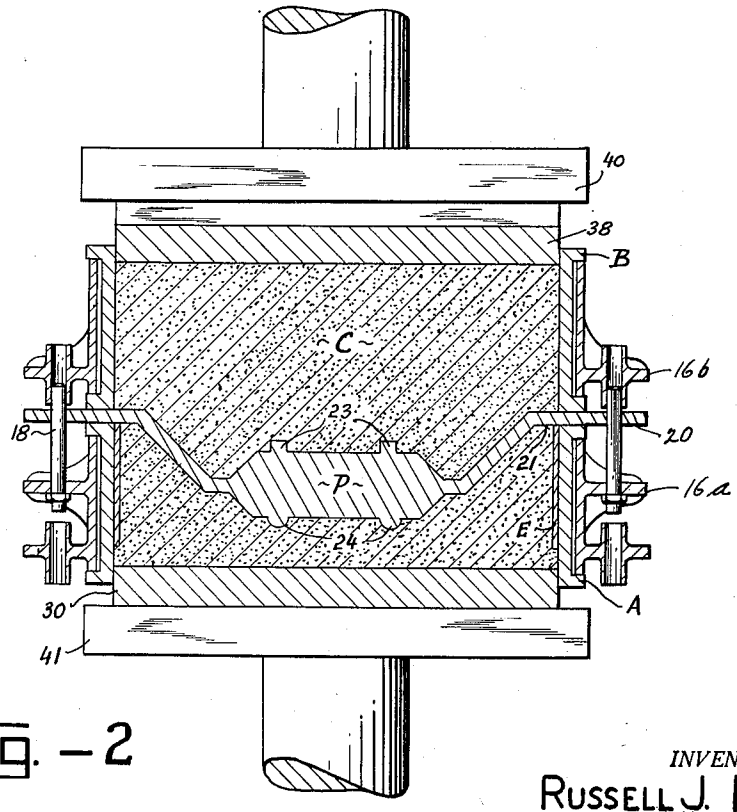

Fig. – 2

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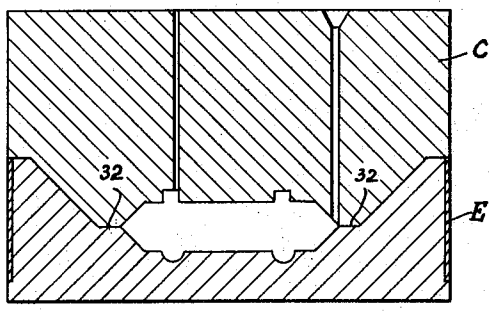

Fig. - 3

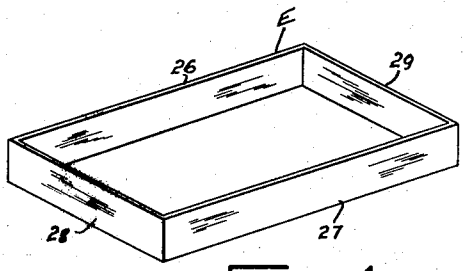

Fig. - 4

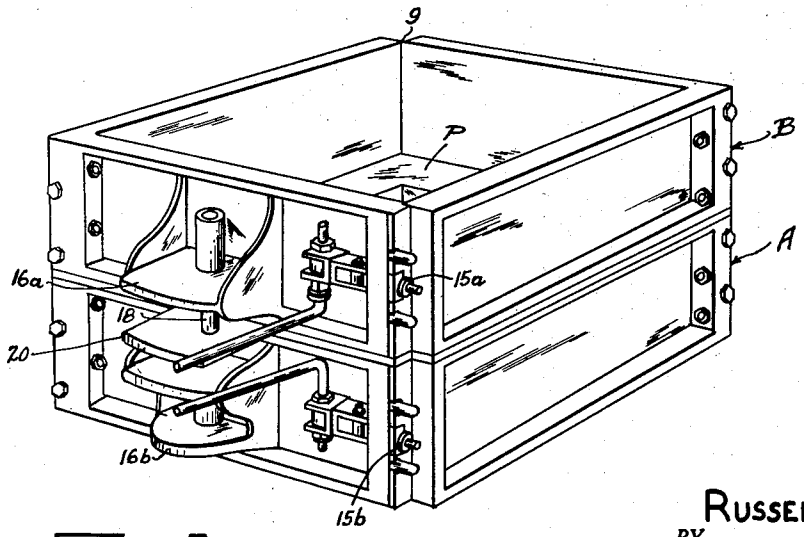

Fig. - 5

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METHOD AND APPARATUS FOR MAKING SAND MOLDS FOR CASTINGS

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2 Claims. (Cl. 22—129)

This invention relates to a method and apparatus for making sand molds for castings and particularly to molds that are used in foundries for making metallic castings.

In one of the methods used for making metal castings, a pattern plate is placed upon the bed plate of a press, the plate having the cope forming portion of a pattern on the upper side thereof. A conventional molders flask is then placed on the pattern plate in aligned relationship therewith. The flask may be rectangular in configuration and it may have side and end walls having a hinged interconnection at one corner and a separable interconnection at a diagonally opposite corner to permit its subsequent removal from a sand mold formed within it. Next, sand is loosely inserted into the flask. An endless member in the form of a band may then be inserted into the flask and supported upon the sand, with a portion of the band projecting above the top of the flask. The flask is then filled with sand, after which the sand and the band undergo a squeezing operation wherein a press head (having a drag forming portion on its under side) is forced down onto the top surface of the sand until the sand is adequately compacted. At this point, the top of the band is flush with the top of the sand and preferably is disposed slightly above the top edge of the flask. Thereafter, the filled flask is transported to a pouring station and the flask is removed from the mold. The band remains embedded in the sand and provides a reinforcement against the bursting of the mold during the pouring operation. The operations of flask filling, band inserting and the squeezing operation are repeated, whereupon a second mold section is superimposed upon the first mold section. The flask is then removed from the second mold section thereby leaving a completed sand mold which is ready for the pouring operation.

In the above described method, the parting plane of the mold cavity is substantially flush with the top surface of the flask. As a result, the protection that the band member affords against bursting of the mold during the pouring operation is confined to about one-half of the mold cavity. A further objection is the fact that there is no automatic aligning of one mold section with relation to the other, except by the coacting flask guide lugs in the respective flask sections. Any loose play in the guide lugs however, would act to cause an offset in the mold sections after they are assembled.

An object of the present invention is to provide a method and apparatus for making sand molds to overcome the foregoing objections by forming the mold cavity in such a manner that the mid portion thereof is substantially in the plane of the mid portion of a reinforcing band.

Additionally, an object of the present invention is to so form the intervening wall of the sand between the mold cavity and the sides of the flask so as to form an inclined guide by means of which, one mold section is substantially guided into registration with a coacting mold section at the time the sections are brought together to form the completed mold.

Briefly, the foregoing objects are accomplished by the provision of a method and apparatus for making castings carried out by supporting an empty foundry flask upon a pattern plate which, in turn, may rest upon a press bed plate. The pattern plate includes a plate portion having a cope forming portion of a pattern on one side and a drag forming portion of a pattern on the opposite side thereof. Extending downwardly and outwardly from the sides or ends of the plate portion are inclined wing portions having a horizontal portion at the outer extremity thereof adapted to extend outwardly beyond the flask walls when the pattern plate and flask are assembled. With this construction, the plate portion of the pattern plate is disposed well within the flask at the completion of the above step. In addition, the horizontal portions of the wings function as a guide means whereby the pattern plate may be aligned with the flask by inserting a guide pin through prepositioned apertures in the flask guide lugs and the horizontal portion of the wings. An endless band member having the same configuration as the flask and having outside dimensions slightly less than the inside dimensions of the flask is then telescoped into the flask until it rests upon wings of the pattern plate. The wing portions of the pattern plate are configured whereby the horizontal center line of the plate portion substantially coincides with the horizontal center line of the band at the completion of the last step. Next, the flask is partially filled with a predetermined amount of sand after which a bottom squeeze board is placed partially into the flask and supported upon the sand therein. The sand then undergoes a squeezing operation whereby a press head is forced down onto the squeeze board until the sand is compacted. The volume of sand in the flask is such that a portion of the squeeze board projects above the top of the flask after the above squeezing operation. The entire apparatus thus far assembled is then inverted and placed again upon the press bed plate. A second flask is then placed upon the inverted mechanisms and aligned with the first flask by means of the guide pins aforedescribed. The second flask is then substantially filled with sand after which a second or top squeeze board is placed on top of the sand in the second flask. The entire mechanism thus far assembled is then subjected to a squeezing operation whereby a press head is forced down onto the top squeeze board until the sand in the second flask is adequately compacted. The top squeeze board is then removed, after which the pouring and vent holes may be formed in the sand mold by any suitable means. Coacting inclined surfaces are formed in the respective mold sections by the wing portions of the pattern plate. These inclined surfaces function as a guide means for accurately aligning the coacting mold sections when they are assembled to form the completed mold. The top half or cope portion of the mold is then removed from the bottom half of the apparatus by lifting the top flask and the cope portion of the mold therein off the pattern plate. This permits removal of the pattern plate. The top flask, with the cope forming portion of the mold therein, is then placed upon the bottom flask with accurate alignment of the respective mold sections being effected by the aforementioned coacting inclined surfaces in the mold sections. Next, both the top and bottom flasks are removed, thus leaving the completed sand mold with the endless band member embedded therein. The horizontal centerline of the mold cavity substantially coincides with the horizontal centerline of the band, thereby enabling the band to act as a direct reinforcement means for the mold during the pouring operation. The mold is then ready for pouring.

Other objects and advantages of the invention will be-

come apparent from the following description taken in conjunction with the drawings in which:

Fig. 1 is a vertical section through a portion of a mold section made in accordance with the present invention and showing a step in the formation of a mold;

Fig. 2 is a vertical section through a mold section showing a subsequent step in the formation of a mold;

Fig. 3 is a vertical section through the completed sand mold made in accordance with the present invention;

Fig. 4 is a perspective view of the band which is inserted into the flask in carrying out the method of the invention. In this view, the band is on a scale reduced from that shown in the previous figures;

Fig. 5 is a perspective view of the aligned flasks used in carrying out the method of the present invention. In this view, the pattern plate is interposed between the flasks.

The invention is adapted for making a mold cavity by a single set of operations and using a pattern match plate having the cope and drag forming portions of a mold on the opposite sides thereof.

In carrying out the method of the invention, there is employed a pair of molders flasks A and B (Fig. 5) which are stacked in aligned relationship, each being separable from the other. Each of the flasks comprises side and end walls joined in the form of a rectangle to form a hollow frame which is open at the top and bottom. The walls may be hinged together at the corner **9**, and may be locked at the diagonally opposite corner by the lock mechanisms **15***a* and **15***b* respectively. The end walls of the flasks may be provided with any suitable means for aligning the flasks when they are stacked, as for example the aligning lugs **16***a* and **16***b* respectively having apertures therein adapted to receive a pin **18** therethrough to vertically align the flasks as shown.

To form a sand mold in accordance with the present invention, an empty flask A is placed upon the horizontal portion **20** of the wing portion **21** (Fig. 1) of a pattern plate P. The plate P includes a plate or body portion **22**, which has both the cope forming portion **23** and the drag forming portion **24** of a pattern on the opposite sides thereof. Extending downwardly and outwardly from the plate portion **22** are the inclined wing portions **21** which have a horizontal portion **20** at the outer extremity thereof. The horizontal portion **20** extends outwardly beyond the flask walls and has an aperture **25** therein which is adapted to receive the flask aligning pin **18** therethrough to accurately align the pattern plate with the flasks as shown in Figs. 2 and 5. The inclined wings **21** may be formed on all sides of the body portion to form an endless skirt thereabout. Next, an endless band E having the side walls **26** and **27** (Fig. 4) and the end walls **28** and **29** is telescoped into the flask and supported upon the wings **21** of the pattern plate as shown (Fig. 1). The band E is complementary to and has a close fitting but sliding engagement with the side and end walls respectively of the flask. The wings **21** of the pattern plate are configured to position the pattern portion **22** of the mold directly within the band E, whereby the band may act as a direct reinforcing means for the mold cavity as will be hereinafter explained. The flask is then substantially filled with sand, after which a bottom squeeze board **30** may be placed within the flask and on top of the sand whereby a portion of the squeeze board extends above the top of the flask. The sand then undergoes a squeezing operation whereby a press head **40** is forced down onto the squeeze board until the sand is compacted.

The entire mechanism thus far assembled is inverted and placed upon the bed plate **41** of a molders press, as shown in Fig. 2. With the mechanism thus inverted, the flask B is placed upon the pattern plate P, whereby the flasks A and B and the pattern plate are aligned vertically by inserting the pin **18** in the aligned openings in the flask lugs **16***a* and **16***b* and through the aperture **25** in the horizontal portion **20** of the pattern plate as

previously described. Next, the flask B is substantially filled with sand, after which a top squeeze board **38** may be placed partially within the flask B and on top of the sand therein, thus completing the assembly of the mold making mechanism. By filling the flasks with sand in a manner allowing the squeeze boards to be only partially inserted into the respective flasks, the full available squeezing pressure to be exerted against the sand may be utilized, thus assuring a uniform degree of compactness of the mold. The sand in flask B is then subjected to a squeezing operation wherein the mechanism may be compressed between the press head **40** and the bed plate **41** of a press as shown in Fig. 2.

After the squeezing operation, the top squeeze board **38** is removed and the pouring and vent holes may be formed in the sand as shown (Fig. 3) by any convenient means. Next, the entire top half of the mold section is removed, namely the flask B with the cope portion or section C of the mold therein. The pattern plate P is then removed from the bottom half or drag portion of the mold. The flask B with the cope portion C of the mold therein is then replaced on top of the flask A in alignment therewith, after which the flasks A and B are removed as a unit thus leaving the completed sand mold with the band member embedded therein as shown in Fig. 3. The wings **21** of the pattern plate form inclined surfaces in the respective mold sections, which function as a guide means for accurately aligning the coacting mold sections when they are assembled to form the completed mold.

By introducing a reinforcing band during the squeezing operation, the band is forced into the sand with sufficient pressure to cause it to remain firmly embedded in the mold after the flask is removed. The endless band is disposed in the completed mold substantially opposite the cavity horizontal centerline **32** (Fig. 3) so that it completely surrounds and encases the cavity and thereby provides a direct reinforcement against the bursting of the mold during the pouring operation. If desired, however, the mold may be formed without the band.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention of the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof.

I claim:

1. A method of making a sand mold comprising, placing a first flask upon a pattern plate having a body portion with cope and drag forming portions thereon and having wings extending downwardly and outwardly substantially from the horizontal centerline of the body portion thereby positioning the body portion substantially within the flask, placing a band within the flask and resting it upon the pattern plate, whereby the band directly encircles the cope and drag forming portions of the plate, filling the flask with sand substantially to the top of the flask, placing a squeeze board within the flask and on top of the sand therein, whereby a portion of the board extends above the top of the flask, compacting the sand against the pattern plate, inverting the entire mold forming mechanism thus far assembled, placing a second flask on the inverted mechanism in aligned relationship therewith, filling the second flask with sand substantially to the top of the flask, placing a second squeeze board within the second flask and on top of the sand therein, whereby a portion of the second board projects above the top of the second flask, compressing the sand between the squeeze boards, removing the second squeeze board, forming pouring and vent holes in the mold, removing the second flask with the cope forming portion of the sand therein from the pattern plate, removing the pattern plate from the first flask, replacing the second flask with the cope forming portion of the mold therein on top of the first flask to form a completed mold having

a cavity therein, and removing both of the flasks from the mold, whereby the band remains embedded within the mold directly opposite the cavity.

2. In an apparatus for forming sand molds including a cope and drag flask adapted to be assembled in surmounting relation to provide a sand receiving cavity the combination comprising, a pattern plate adapted to be interposed within the sand receiving cavity of the assembled flasks, said pattern plate having a central body portion having cope and drag forming configurations on opposite sides thereof, an integral flange having a first portion extending outwardly coincident with the center line of said central body portion between the cope and drag forming configurations and having a marginal edge portion extending outwardly, in the same plane but spaced transversely from said first extended portion, an intermediate integral portion of said extended flange being inclined from the plane of said center line and outwardly therefrom to form an endless inclined skirt surrounding the central body portion, said pattern plate adapted to be inserted within the sand receiving cavity of the assembled flasks with the cope and drag forming portions facing respectively the cope and drag sections of the assembled flasks and adapted to be supported in predetermined position therein by means of the marginal edge of said

flange engaging the mating edge of the drag flask, whereby the pattern plate is disposed in the sand receiving cavity of the assembled flasks substantially within the confines of the drag flask, and an endless band having a configuration complementary to the drag flask and disposed therein along the flask walls with one marginal edge in engagement against the marginal edge of the flange of said pattern plate and coacting to reinforce the sand mold about the mold cavity when the pattern plate is removed.

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