Aug. 27, 1957 R. J. HINES 2,803,860

METHOD AND APPARATUS OF MAKING MOLDS FOR CASTINGS

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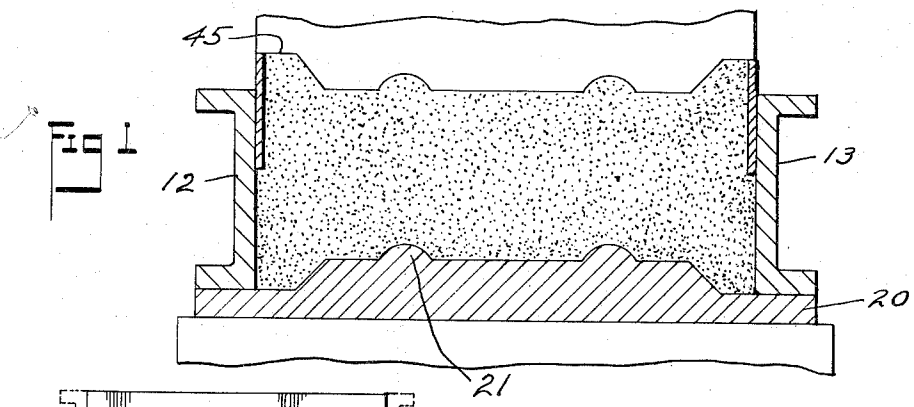


Fig. 1

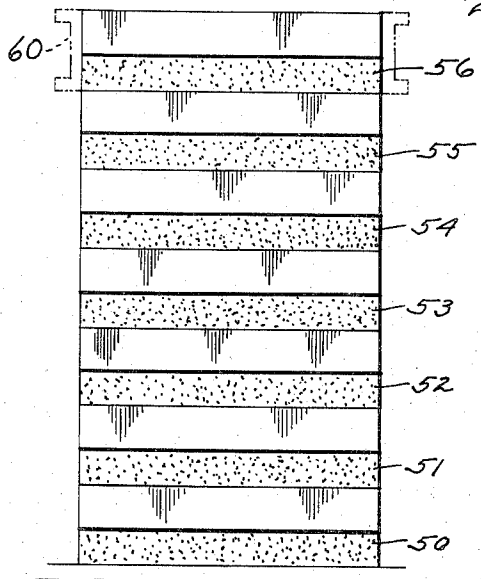


Fig. 3

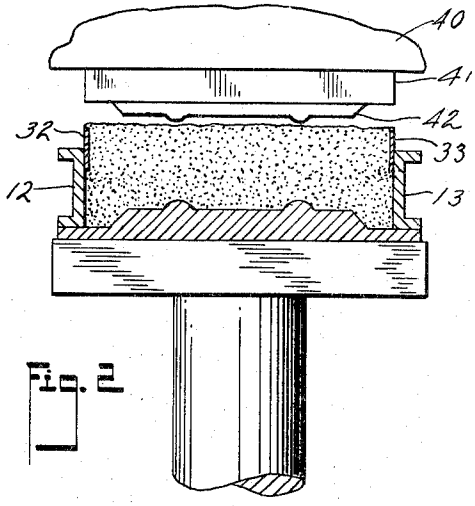


Fig. 2

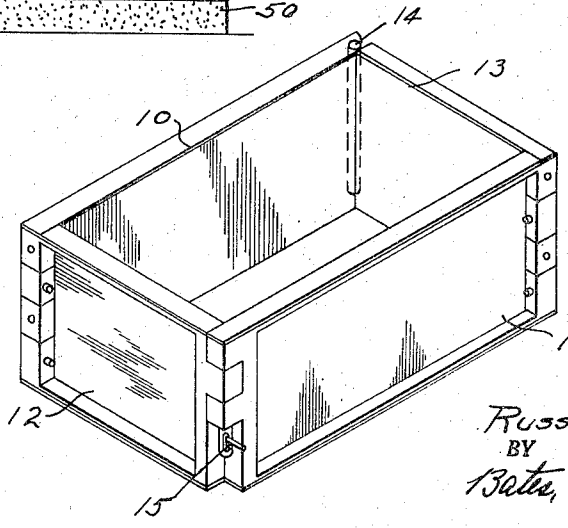


Fig. 4

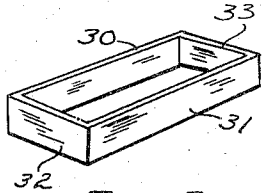


Fig. 5

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METHOD AND APPARATUS OF MAKING MOLDS FOR CASTINGS

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4 Claims. (Cl. 22—40)

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

The invention is not only applicable for making a single mold cavity but also is adapted for stack molding. One of the difficulties encountered in stack molding has been the tendency for the sand to burst due to the pressure of the metal during the pouring operation. An effort has heretofore been made to solve this problem by leaving each flask around its mold, but this has required too many flasks to remain idle. Another difficulty has been that of estimating the correct amount of sand to put into a flask to assure uniform compacting of the sand, under varying degrees of sand consistency.

An object of the present invention is to provide a method and apparatus by means of which the flask can be removed and yet the sand mold is automatically reinforced during the forming operation. Thus, the superimposing of one mold section over the other, and the removal of the flask, results in the production of a mold cavity which is suitable for pouring either a single mold or for stack molding, as desired.

Another object is to utilize a method and apparatus by means of which the sand may be squeezed until it is automatically compacted to the desired degree without imposing a fixed shoulder or abutment in the path of travel of a squeeze head.

The object of the invention are carried out by supporting an empty flask upon a pattern plate which has the cope forming portion of a pattern thereon, partially filling the flask with sand, introducing an endless member in the form of a band into the flask and supporting it upon the sand therein with a portion of the band projecting above the top of the flask, then filling the band with sand and forcing it into the sand during the squeezing operation until the top thereof is flush with the top of the sand and preferably 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 operation of flask filling, band inserting and squeezing is repeated, whereupon a second mold section is superimposed upon the first, the flask is removed, and, in the case of stack molding, the operation is repeated until the desired number of molds, suitable for pouring, is obtained. In this way, a band remains imbedded within the sand of each section, after the flask is removed, and provides a satisfactory reinforcement against bursting of the stack upon the introduction of molten metal thereto. Moreover the bottom of the superimposed mold section rests upon a smooth upper surface which extends around the margin of the adjacent lower section and facilitates registration of the sections.

Referring now to the drawings,

Fig. 1 is vertical section through a mold section which is made in accordance with the present invention;

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

Fig. 3 is a side view showing a stack of mold sections made according to the present method;

Fig. 4 is a perspective view of a flask used in carrying out the method of the present invention; and

Fig. 5 is a perspective view of a band which is inserted into the flask in carrying out the method. In this view the band is on a scale reduced from that shown in Fig. 4.

The present invention is adapted for making a single mold cavity by superimposing a cope section over a drag section. Additionally, the invention is adapted for stack molding, wherein any desired number of sections may be superimposed upon each other, and wherein each section has a cope cavity on one side and a drag cavity on the opposite side, so that a pair of cavities register to form a single mold cavity into which the molten metal is to be poured. Fig. 4, for example, illustrates a flask which comprises side walls **10** and **11** and end walls **12** and **13**. The walls are hinged together at **14**, and are locked at **15** to form a hollow frame, which is open at the top and bottom.

The empty flask is placed upon a pattern plate **20** (Figs. 1 and 2) which has the cope forming portion **21** of a pattern thereon and the flask is then substantially filled with sand. A band in the form of an endless frame having side walls **30**, **31** and end walls **32** and **33** is inserted into the flask and is supported on the sand, with a portion of the band projecting above the top of the flask, as shown in Fig. 2. The band illustrated is complementary to and has a close fitting but sliding engagement with the side and end walls respectively of the flask.

After the band is inserted partially into the flask, additional sand is introduced, until the band is substantially filled, whereupon a press head **40** having a pattern plate **41** thereon is moved over the flask for the squeezing operation upon the sand. The plate **41** carries the drag portion **42** of a pattern, which matches with the cope portion **21** on the plate **20**. During the squeezing operation, the band is forced down into the flask until the sand is squeezed to the predetermined limit of desirable pressure, which preferably is sufficient to obtain adequate compacting of the sand without forcing the band entirely into the flask, as shown in Fig. 1, and simultaneously, the drag portion of the mold cavity is formed in the top surface of the sand, while the cope portion is formed in the bottom surface of the sand. During this operation a smooth marginal surface **45** is formed around the periphery of the mold cavity. This serves as a support for the superimposed mold section.

After the squeezing operation, as aforesaid, the filled flask is removed from the press and transported to a pouring station, and the flask is removed. This leaves the mold section **50** (Fig. 3) as self-supporting, with the band embedded in the sand.

The empty flask is returned to the press and placed upon the pattern plate **20** and the operation of filling, band inserting, and compressing is repeated. The second filled flask is then removed from the press, transported to the pouring station, and superimposed upon the mold section **50** and the flask is removed. This leaves a mold section **51** superimposed upon the section **50**, at which time the cope cavity in the mold section **51** is in registration with the drag cavity in the section **50**, thus forming a complete mold cavity.

The placing of the mold section **51** on the section **50** is suitable for making single cavity molds, but, for stack molding, additional mold sections, identical with those designated **50** and **51**, are subsequently made and superimposed upon the stack, as at **52**, **53**, **54**, **55** and **56**, after which the stack may be poured in the usual way. Thus each mold section has a reinforcing band imbedded therein, as a result of which the stack may be poured to any desired height without danger of bursting. In Fig. 3,

the flask **60** is shown in broken lines as illustrating the position of the flask before removal after the section **56** is placed upon the section **55**.

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 imbedded therein after the flask is removed. The reinforcement occurs in the region of the drag portion of each mold cavity and thus adequately strengthens the section against bursting during the pouring operation. Additionally, utilizing the method of pressing the band only partially into the flask during the squeezing operation permits the full available squeezing pressure to be exerted against the sand, thus assuring a uniform degree of compactness in the mold.

I claim:

1. A method of making a sand mold comprising substantially filling a flask with a predetermined amount of sand, placing a band within the flask and resting it upon the sand so that a portion of the band extends above the top of the flask, filling the band with sand, forcing the band partially into the sand and simultaneously compressing the sand with a predetermined force and forming a mold cavity in the top and bottom surfaces of the sand, removing the flask, and leaving the band embedded in the sand as a reinforcement for the mold whereby the mold is encompassed only by the band.

2. A method of making sand molds comprising substantially filling a flask with a predetermined amount of sand, introducing a band into the flask and supporting the band upon the sand in such manner that a portion of the band extends above the top of the flask, filling the band with sand, forcing the band partially into the sand, but not entirely into the flask and simultaneously compressing the sand with a predetermined force and forming the drag portion of a mold cavity in the top surface thereof, and a matching cope portion of a mold cavity in the bottom surface thereof with smooth parallel marginal portions around the respective cope and drag cavities, transporting the filled flask to a pouring station, removing the flask, but leaving the band imbedded in the mold as a reinforcement therefor whereby the mold is encompassed only by the band, repeating the filling operation with another band inserted in the flask, superimposing the filled second flask upon the first mold section, whereby the cope cavity in the second mold cooperates with the drag cavity in the first mold to form a complete mold cavity, removing the flask and leaving the second band imbedded in the second mold section.

3. A method of stack molding comprising placing an empty flask upon a pattern plate having a cope forming portion of a pattern thereon, substantially filling the flask with a predetermined amount of sand, inserting a band in close fitting engagement with the inner wall of the flask, but supported on said sand therein with a portion of the band projecting above the top of the flask, introducing additional sand until the band is substantially filled, pressing the band partially down into the flask and simultaneously compressing the sand with a predetermined force until it and the band are slightly above the top of the flask, while forming the drag portion of a mold cavity in the top surface of the sand, and the cope portion of a mold cavity in the bottom surface of the sand, transferring the filled flask to a metal pouring station, removing the flask, but leaving the band imbedded within the sand to provide a reinforcement for the upper portion thereof whereby the mold is encompassed only by the band, repeating the operation of flask filling, band inserting, and compressing of the sand, transporting the second filled flask to the pouring station, and superimposing the second mold section upon the first mold section, with the cope cavity in the second mold in registration with the drag cavity of the first mold, removing the flask, but leaving the band embedded in the second mold section and repeating the operation of filling, transporting and removing the flask, until a desired number of molds are disposed in stack relationship, and then filling the mold cavities with metal.

4. An apparatus for molding, comprising a flask, a pattern plate providing a support for the flask and having the cope portion of the pattern thereon, the top of the flask being open and adapted to receive a predetermined amount of sand therein, an endless band in close fitting sliding engagement with the flask and adapted to be supported on the sand therein, and means for compressing the sand and simultaneously forcing the band partially into the flask with a predetermined force, said means including a pattern plate having the drag portion of a pattern thereon, whereby the compressing operation simultaneously forms a cope cavity on one face of the mold, and a matching drag cavity on the opposite face of the mold.

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