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2,587,061

MOLD CLAMPING DEVICE

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FIG. 1.

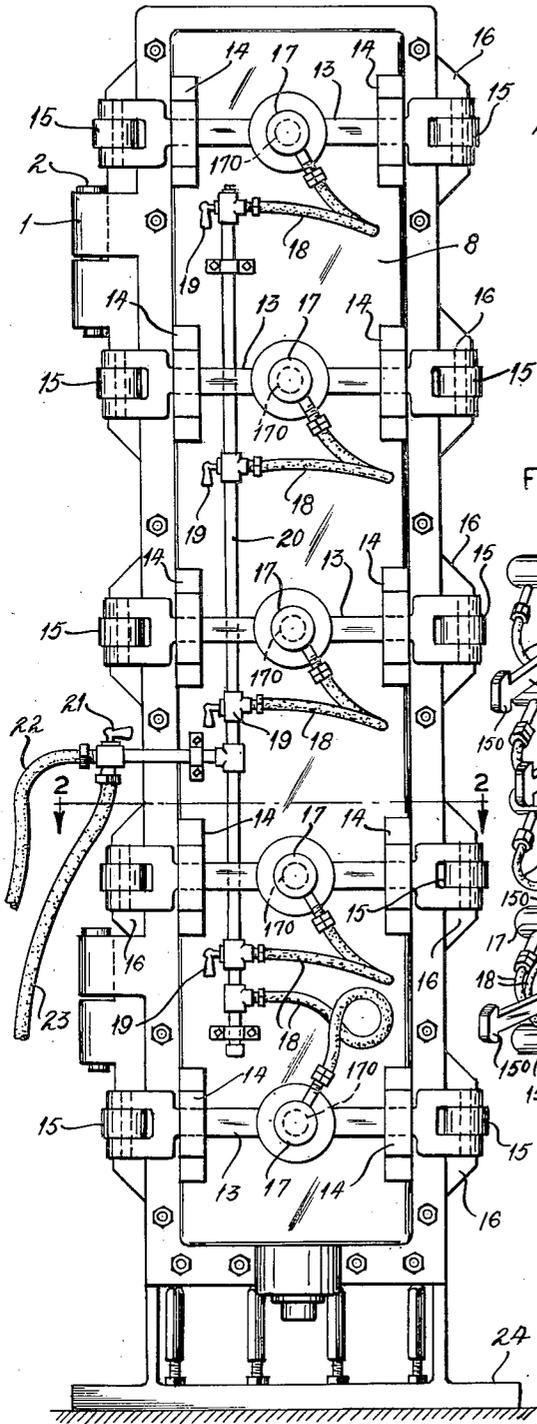


FIG. 2.

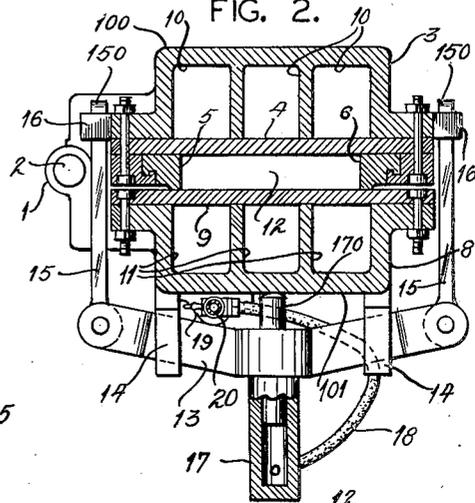
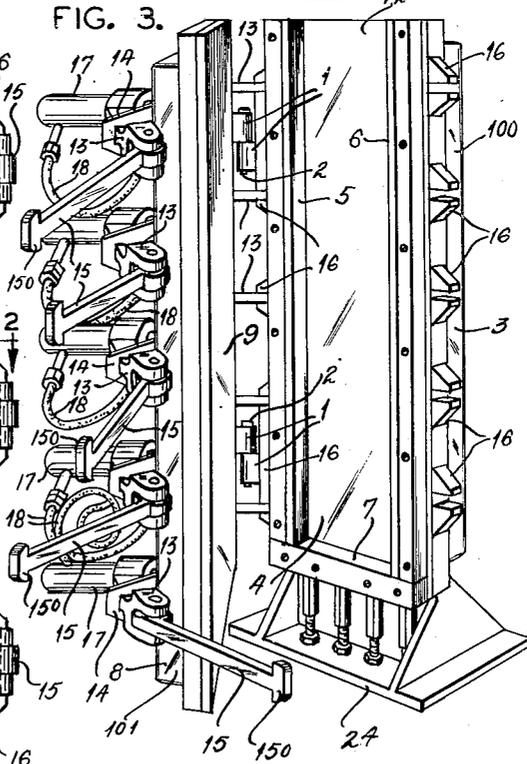


FIG. 3.



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MOLD CLAMPING DEVICE

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1 Claim. (Cl. 22—156)

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This invention relates to permanent metal molds for the casting of metals, and particularly to water-cooled vertical elongated slab molds used for the casting of copper and its alloys in a form suitable for reduction to sheet stock by rolling; and particularly to the means for clamping the separable halves of the mold together.

Permanent molds of this type consist of two elongated vertical members, one of which is stationary and constitutes the back, and the other of which is hingedly supported on one side of the back and constitutes the front, of a split mold. The mold front is complementary to the stationary mold back, and when the two parts are brought together they define, between them, a vertically elongated rectangular chamber or mold cavity. To prevent separation of the front and back of the split mold, these members are held together by some means of clamping which heretofore, in this type of mold, has consisted of a series of spaced yokes, each in combination with a manually operated jack screw. The series of yokes and jack screws extend in spaced relation for the entire height of the mold.

In such molds of the heretofore customary construction, because of inability to obtain controlled equal clamping pressures by means of the manually operated jacks employed, stress concentrations in the face plates lead to warping of these plates, necessitating removal and replacement at frequent intervals. This is believed due to excessive clamping forces at some portions along the elongated mold, accompanied by insufficient clamping forces at other portions, aggravating the tendency of the face plates to deform permanently during thermal expansion and contraction. Although the frame portions of the mold are rigid members relative to the face plates and side bars, there is flexure of the frames in the longitudinal direction, because of the elongated geometry of the mold and because of the tremendous forces caused by expansion and contraction of the face plates undergoing temperature changes, ranging from that of the cooling fluid to nearly that of the molten metal.

The object of the present invention, generally stated, is to provide a slab mold of the character referred to wherein the useful life of the face plates is extended.

A more specific object of the invention is to provide a mold of the character referred to wherein the clamping pressures between the mold halves, when closed, are uniform throughout the contiguous parts thereof.

Other objects will become apparent to those

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skilled in the art when the following description is read in connection with the accompanying drawings, in which:

Figure 1 is a view in side elevation of a slab mold constructed in accordance with the present invention;

Figure 2 is a sectional view taken along line 2—2 of Figure 1; and

Figure 3 is a perspective view, showing the lower portion of the mold illustrated in Figures 1 and 2, when in its opened position.

In accordance with the present invention, means is provided for clamping the mold halves in closed position, such means being of a character such as to equalize the pressures exerted between the mold halves over the entire periphery of their contiguous areas. Such equalizing means preferably takes the form of a plurality of fluid-energized jacks, connected to a common source of fluid under pressure. Such an arrangement assures uniformity of the mold holding pressures, not only prior to casting, but during the pouring and solidification of the casting. Internal stresses developed in the mold during the pouring of the metal, and in both the mold and casting during solidification of the casting, are automatically relieved, so that replacement of the face plates is required at less frequent intervals than has heretofore been necessary.

In the embodiment illustrated in the drawings, the mold comprises a mold back 100, which is stationary, and a substantially complementary mold front 101, which is movable relative to the mold back. The parts 100 and 101 are hingedly connected together by pairs of brackets 1 and pivot pins 2. The mold back 100 has a face plate 4 defining one side of the mold cavity, and the mold front 101 has a corresponding face plate 9. Arranged between the face plates 4 and 9 is a pair of side pieces 5 and 6, which define the edges of the mold cavity.

The side pieces 5 and 6 are connected to one of the mold parts, preferably the stationary back 100, and likewise the mold back 100 (or the mold front, if desired) is provided with a bottom bar 7, which defines the bottom of the mold cavity.

The mold back 100 comprises a hollow rectangular frame 3, open at one side, and provided at one end with a bracket or foot 24 for mounting the mold back erectly. The face plate 4, usually of copper, is slidably secured to the frame to cover the open side of the frame. Side pieces 5 and 6 are detachably secured on the lateral edge portions of that surface on the face plate 4, which faces away from the frame. The bottom

bar 7 is likewise detachably secured to the bottom portion of the surface of the face plate. The movable mold front 101 similarly comprises a heavy casting or frame 8, having a cavity open at one side, and covered by face plate 9, which is detachably secured to the frame by any suitable means such as the series of bolts passing through slots at the edge portions of the face plate 9, as is face plate 4. The hollow cavity of the stationary frame 3, together with the plate 4, provides a cooling compartment 10. Similarly, the cavity of the movable mold front 101 provides a cooling compartment 11. Both the front and back of the mold are provided with appropriate conduits for the admission of a cooling medium, such as water, to the bottom of each cooling compartment 10 and 11. Each compartment is also provided with an appropriate means for withdrawing the cooling medium from the top of the compartments. When the mold front and back are swung into contact, the water cooled face plate of each provides one face of an elongated rectangular vertical mold cavity 12, open at the top. The structure of the mold thus far specifically described is conventional.

In accordance with the present invention, the means for clamping the mold halves together comprises a plurality of vertically spaced yokes 13, slidably received in brackets 14 on the outer surface of the mold front 101, and extending horizontally across the outer face thereof. Associated with each yoke is a pair of links 15, one end of each of which is pivotally attached to the yoke 13 at the respective ends thereof. Each link 15 has a shank portion, the free end of which consists of an enlargement or head 150, adapted to engage with one of the slotted lugs 16 extending laterally from the sides of the frame 3 of the mold back 100, when the adjacent portion of the shank is swung into the slot. Mounted on the center of each yoke 13 is a fluid operated ram 17, having a plunger 170 adapted to be forced toward the frame 8. Fluid pressure to each ram is supplied through a flexible conduit 18, the opening of which is controlled by a normally open valve 19. Each of the flexible conduits 18 is connected to a header pipe 20, which makes connection through a conduit 22 with the high pressure side of a suitable fluid pump, not shown. A three-way master valve 21 selectively controls the flow of fluid from conduit 22 to header 20, or from the latter to exhaust conduit 23. In a pneumatically operated system, the conduit 23 may exhaust to the atmosphere, but in a liquid operated system, the conduit 23 extends back to the low pressure side of the pump.

In preparation for the operation of casting an elongated metal slab, the surfaces which form the mold cavity are first dressed with any suitable mold coating material, such as a mixture of oil and graphite. The movable mold front 101 is swung toward the mold back 100, placing the face plate 9 in contact with the side pieces 5 and 6, and the bottom bar 7, of the mold cavity. Each link 15 is then swung toward the mold back 100 until the shank passes through the slot of the mating lug 16, with the heads 150 thereof behind the corresponding lugs. As a final step in the closing of the mold, the valve 21 is actuated to connect the high pressure conduit 22 with all the rams 17 simultaneously. When the pressure is brought up to a value suitable for

holding the mold parts, the master valve 21 is closed to retain the pressure on all the rams during the casting operation.

Before molten metal is poured into the mold cavity, a cooling medium, such as water, is admitted to the cooling compartments, and the flow of water is continuous through the compartments until the casting operation is completed.

On receiving the charge of the molten metal poured into the open top of the mold cavity, local areas of the expanse of the cooled face plates undergo large and unequal changes in temperature, giving rise to stress concentrations in the face plates. Since the several rams 17 are connected together through the header 20, the pressure exerted at one locus of the mold will be equalized in the system, and consequently slight relative movement of the mold parts may take place to automatically relieve local stresses, and yet maintain uniform clamping pressure at all of the yokes 13.

After the slab has solidified, the master valve 21 is moved to the position whereat the header pipe 20 is connected to exhaust pipe 23, thereby relieving the pressure upon the several rams 17, and permitting the links 15 to be disengaged from their corresponding lugs 16. Thereupon, the mold parts 100 and 101 may be swung open, and the casting removed.

From the foregoing description it should be apparent that the present invention accomplishes its objects, and provides a mold of the character described wherein the mold parts are held clamped together under uniform pressure, and any localized increase in pressure is immediately equalized by interflow of pressure fluid from one ram to another.

While one complete embodiment of the invention has been described in detail, it is apparent that many modifications thereof will present themselves to those skilled in the art, without departing from the spirit of the invention or the scope of the appended claim.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

An ingot mold comprising two face plates with side bars and a bottom bar therebetween defining a mold cavity open at the top, a pair of hinged frames contacting the back surfaces of the respective face plates, yokes distributed uniformly throughout the length of said frames, said yokes being carried by one of said frames and engageable with the other, a fluid operated ram mounted in each of said yokes and single means for operating all of said rams to apply pressure uniformly throughout the length of said face plates.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,618,245	Udale	Feb. 22, 1927
1,746,236	Barton	Feb. 11, 1930
2,223,385	Plessman	Dec. 3, 1940
2,381,664	Hansen	Aug. 7, 1945
2,428,660	Falk	Oct. 7, 1947