

July 2, 1963

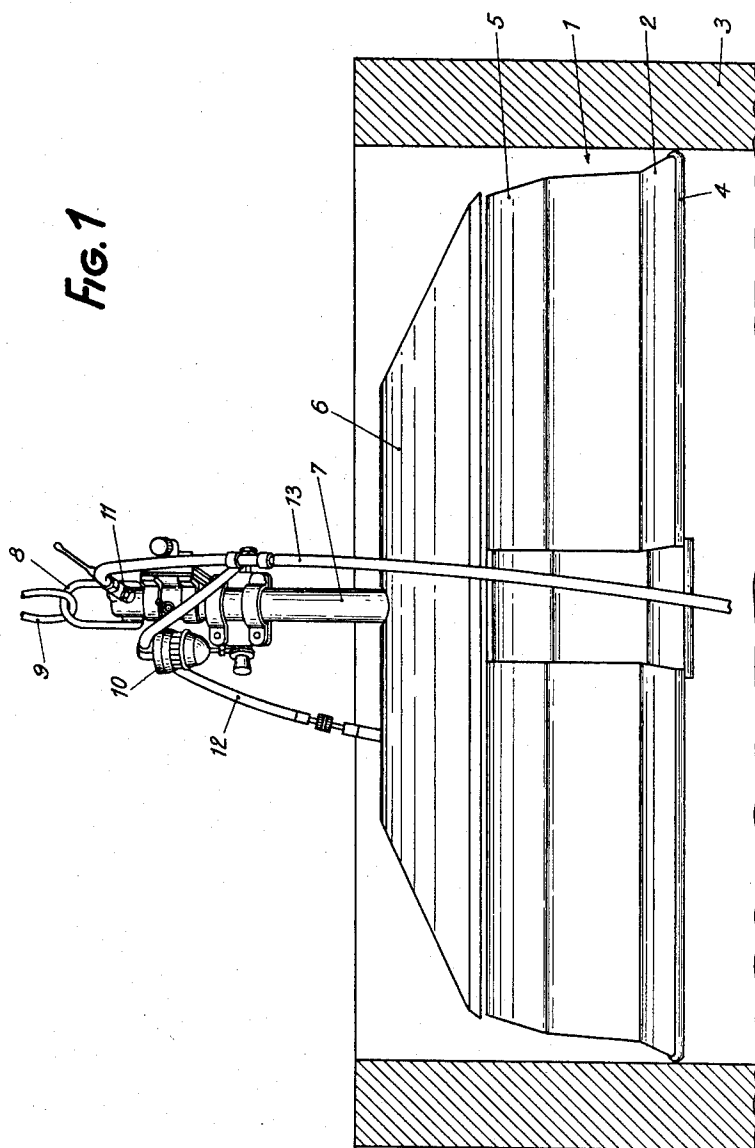
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CASING FOR THE PRODUCTION OF A SHRINKAGE FUNNEL
INHIBITOR COATING IN AN INGOT OR LIKE MOLD

Filed Dec. 5, 1961

3 Sheets-Sheet 1



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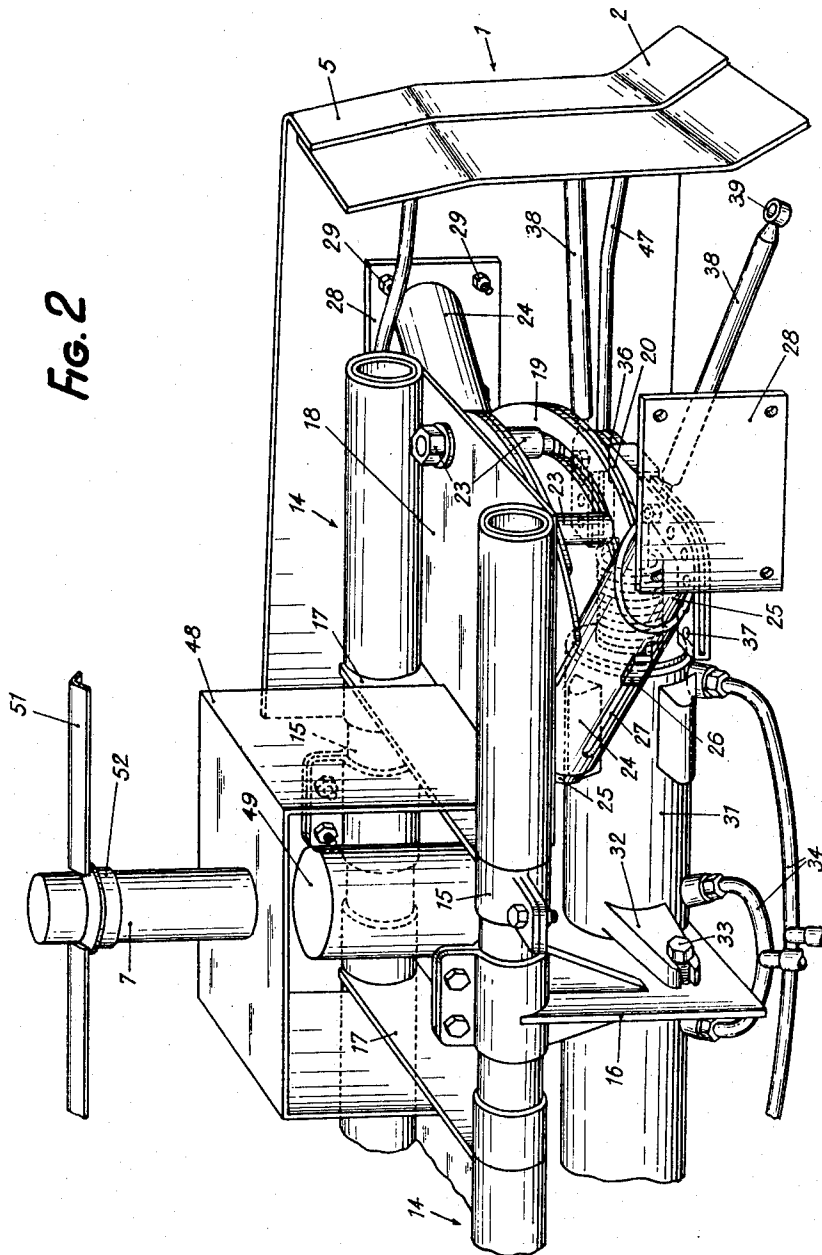
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3 Sheets-Sheet 2

Fig. 2



July 2, 1963

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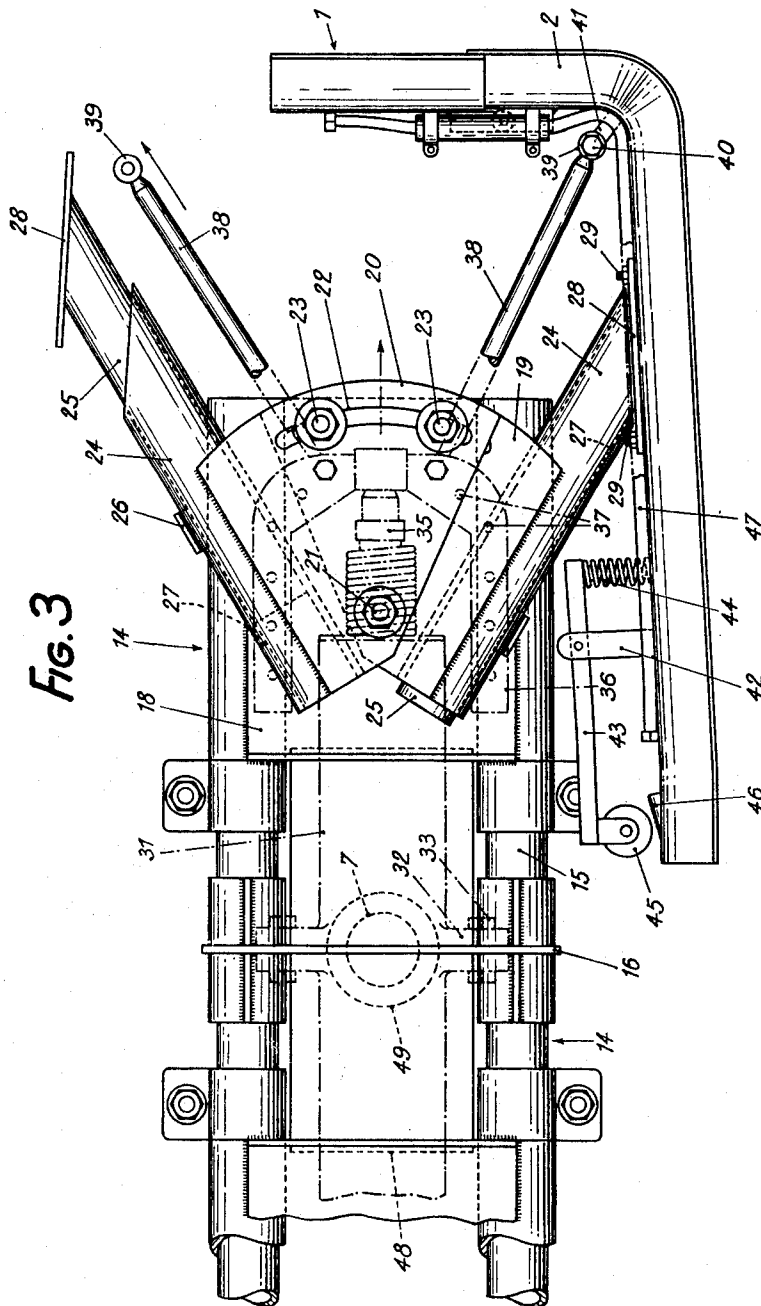
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3 Sheets-Sheet 3

FIG. 3



1

3,095,618

CASING FOR THE PRODUCTION OF A SHRINKAGE FUNNEL INHIBITOR COATING IN AN INGOT OR LIKE MOLD

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2 Claims. (Cl. 22—9)

The present invention relates generally to the art of casting molten metals or alloys into ingot molds or casting molds for obtaining steel ingots or moldings.

It is known that while the molten metal sets or becomes solidified, primary and secondary shrinkage funnels or recesses are formed which are detrimental to the quality of the work. Hence why a large waste is often encountered in the head portion of ingots, said waste representing in some cases from 20% to 35% of the upper portion of the ingot and why furthermore sprues or dead heads of substantial volume are provided during the casting operation.

Various attempts have already been made for overcoming this disadvantage by the provision of coatings or linings in the upper part of the ingot mold or casting mold for generating a controlled amount of heat which remelts the metal and fills up said shrinkage funnels. Such coatings or linings are generally made of exothermic substances.

Several methods have already been provided for providing such a coating or lining in an ingot mold and it is already known for example to arrange in the mold a casing adapted to receive a powdered substance which is then hardened prior to the casting operation.

It is an object of the invention to provide a new or improved casing of this type of relatively simple and practical form capable of being swiftly installed in the mold and of achieving a satisfactory hardening of the shrinkage funnel inhibitor which is poured into the space defined between said casing and the inner wall of the mold.

Another object of the invention is to provide a new or improved casing as aforesaid for the production of a shrinkage funnel inhibitor coating or lining in ingot and like molds, said casing comprising an expandable set of plates or shutters defining an inner enclosure of suitable size, a supporting frame in the central portion of said enclosure, arms extending from said supporting frame and connected to said plates, fluid operated jacks interposed between said frame and said plates, and a system of valves controlling the flow of the operating fluid toward said jacks.

With these and such other objects in view as will incidentally appear hereafter, the invention comprises the novel construction and combination of parts that will now be described hereafter with reference to the accompanying diagrammatic drawings exemplifying the same and forming a part of the present disclosure.

In the drawings:

FIG. 1 is an elevational view of the entire casing as it is arranged in an ingot or like mold.

FIG. 2 is a perspective view partly broken away showing the inner arrangement of the casing.

FIG. 3 is a plan view of the casing partly broken away.

As illustrated, the casing comprises generally an enclosure made up of plates or shutters designated by 1 whose lower margin 2 slants outwardly so as to cause their free edge to come in operative position into contact with the inner wall of the ingot or other mold 3 eventually through the medium of a distortable bead 4 (FIG. 1). The upper margin 5 of the plates 1 slightly slants

2

inwardly and the entire enclosure is surmounted by a roof 6 the function of which is indicated hereafter. As visible in FIG. 1, the roof 6 has a central aperture through which an upright 7 extends. This upright terminates at its upper end in the form of a hanging ring or shackle 8 whereby the entire casing may be hung from a suitable hoist or lifting gear of which only the suspension hook 9 is shown in the drawings. Valves 10 and 11 clearly visible in FIG. 1 are provided for controlling the respective flows of compressed air for operating the jacks and carbon dioxide for hardening the exothermic mixture. The fluids flow through distributing pipes 12, 13 respectively.

In the showing of FIGS. 2 and 3 is illustrated the internal arrangement of the enclosure formed by the casing. There is provided a supporting frame designated in its entirety by 14 and comprising a pair of tubular girders 15 midway of which is secured a middle transverse plate 16 which normally stands vertically. Such girders are interconnected on the opposite sides of the plate 16 by cross beams 17 and horizontal plates 18. The upright 7 is secured to the frame by being welded to a box 48 which is welded in turn to the frame. However, the upright 7 might be secured to the frame in another fashion. A suitable vibrator is provided as shown at 49 on the frame. Such vibrator may be for example of the electric type and is fed by suitable leads (not shown). The provision of this vibrator is optional.

Adjustable sectors are fixed to the horizontal plates 18. The sectors provided at each end of the supporting frame are designated by the reference numerals 19 and 20 and are pivotally supported by a vertical axis 21 (FIG. 3). These sectors are formed with arcuate slots 22 through which bolts 23 are engaged, said bolts having lock nuts adapted to lock the sectors 19, 20 in the required angular position.

As clearly visible in FIG. 2, there are provided adjacent each end of the supporting frame 14 two sets of sectors 19, 20 which are associated pairwise and serve for fastening tubes 24 through which inner tubes 25 can slide within the limits permitted by a lug 26 fixed to the inner tube and displaceable through a slot 27 in the outer tube 24. Each of the inner tubes 25 carries at its free end a bracket 28 secured by bolts 29 to one of the plates 1. Consequently the tubes 24, 25 form telescopic arms.

In the present embodiment of the invention, the enclosure is defined by four plates 1 each of which occupies one quarter of the casing perimeter. One of said plates is visible in FIGS. 2 and 3. It will be seen that the telescopic arms 24, 25 perform a rectilinear guidance of the plates 1 when they are operated as described hereafter, the direction in which said guidance is performed being defined by the adjustment position of the sectors 19, 20.

The middle vertical plate 16 of the casing carries coaxially and oppositely disposed pneumatic or hydraulic jacks 31 which are secured thereto by lugs 32 and bolts 33 as shown by FIG. 2 and are fed by branch pipes 34 connected to the aforesaid pipe 13. Pistons 35 movable through the jack cylinders are fitted at their free end with a yoke member 36 having holes 37 for fastening in the desired position a pair of links 38 interconnected at their free ends by an eye member 39 and a pin 40 with a lug 41 which may be for example welded to one of the plates 1. As illustrated each of the oppositely and coaxially arranged jacks actuates a pair of links 38 which control the position of the plates 1. The jacks are of the double action type.

For permitting retraction of the casing for its insertion into position and its withdrawal while avoiding a gap when said casing has been expanded into operative posi-

tion, means are provided for permitting a certain amount of overlap of the associated edges of the plates 1. Each plate carries a U-shaped member 42 in which is pivotally supported a two-armed lever 43 urged by a compression spring 44 and fitted at its free end with a follower roller 45 which bears against the inner face of the margin of the associated plate 1 (FIG. 3). During retraction of the casing, the edge of said associated plate 1 (not shown) rides along an upwardly sloping ramp 46.

In order to perform proper hardening of the exothermic mixture, pipes 47 for injecting carbon dioxide gas are connected to the pipe 12 extending from the appropriate valve, and apertures in said pipes communicate with small injection nozzles (not shown) in the plates 1. Said holes are advantageously associated with filters which prevent entry of the powdered exothermic mixture into the injection pipes.

The roof is supported above the aforesaid assembly by a channel member 51 (FIG. 2) which may be secured for example to the upright 7 by a clamp 52.

The operation of this improved casing takes place as follows: The entire casing is hung from the suspension hook of a hoist or lifting gear as indicated in the foregoing and as shown in FIG. 1. In the inoperative position, the plates 1 of which the casing is made up occupy their retracted position which means that control of the double acting jacks 31 has occurred for returning their piston 35 by an inward motion, thereby retracting the plates 1 through the links 38. Assumption is made here that the sectors 19, 20 have been preliminarily adjusted for taking into account the dimensional relationship of the ingot mold in which the casing has to be used. Actually the angle defined between the telescopic arms 24, 25 arranged adjacent one and the same end of the supporting frame 14 is the smaller as the length of the ingot mold is the larger with respect to its width. This possibility of adjusting the sectors 19, 20 and consequently the telescopic arms 24, 25 thus permits one and the same casing to be adapted to ingot molds having slightly different shapes or configurations.

The hoist or lifting gear is then operated (for example by remote control) for bringing the casing above the ingot mold, then for lowering the same into said mold, for example to the position shown in FIG. 1. At this instant, the appropriate valve is opened for controlling the jacks so as to eject their piston and to cause expansion of the plates 1 through the medium of the links 38 until finally the lower edge of their slanting margin 2 is applied against the inner face of the ingot mold wall, whereupon the casing is installed in operative position.

The workers can then pour into the space defined between the casing plates 1 and the wall of the ingot mold 3 the powdered exothermic mixture up to the

required height. Roof 6 prevents said mixture from penetrating into the enclosure defined by plates 1 and from coming into contact with the movable parts of the casing. The vibrator automatically settles down the exothermic mixture, thereby permitting special tamping operation by the workers to be dispensed with.

When the exothermic mixture has properly filled up the space defined between the casing and ingot mold, a worker can cause (by manipulating the appropriate valve) injection of carbon dioxide gas into the mass of exothermic material through the pipes 47 and the apertures in the casing plates 1. Such an injection of gas hardens in known manner the exothermic material which thus forms a strong coating or lining along the wall of the ingot mold.

When it is desired to disengage the casing, it is only sufficient to cause the jacks 31 to pull back the casing plates 1. These plates then collapse inwardly, whereupon the casing may be upwardly withdrawn by means of the hoist or lifting gear. It will be understood that the production of such a coating or lining along the inner wall of the ingot mold may be thus performed in a very short period of time.

Minor constructional details may be varied without departing from the scope of the subjoined claims.

What is claimed is:

1. In a casing for the production of hot tops and the like, an expansible set of plates defining an inner enclosure, means defining a supporting frame within said enclosure, means defining sector members, means pivotally connecting said sector members with said frame, locking means for securing said sector members to said frame in different pivotal positions, telescopic arms connecting said plates to said sector members, means defining fluid operated control jacks secured to said frame and having rectilinearly movable elements, means pivotally connecting said rectilinearly movable elements with said plates, conduit means connecting said control jacks with a source of operating fluid, valve means in said conduit means for controlling the admission of said operating fluid to said control jacks whereby to vary the cross-section of said casing, and pipe means connected to said casing for supplying carbon dioxide gas for hardening an exothermic mixture to form said hot top.

2. The casing as set forth in claim 1, including a vibrator secured to said frame for promoting the settling of said exothermic mixture.

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