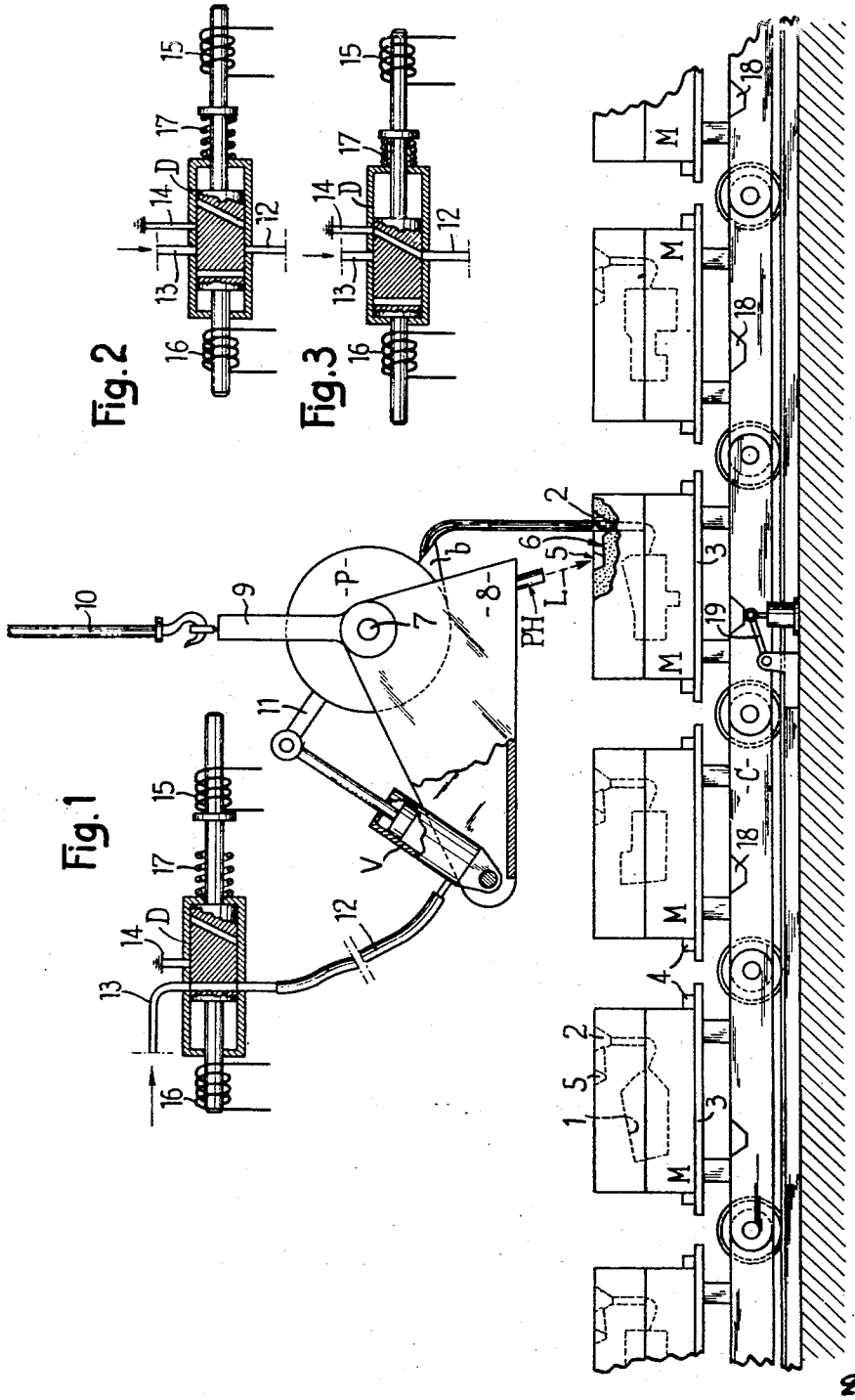
Sept. 26, 1967 P. E. LORANG 3,343,591

AUTOMATIC MOLD POURING WITH STOP MEANS RESPONSIVE TO MOLTEN METAL IN OVERFLOW BASIN

Filed Nov. 23, 1964 3 Sheets-Sheet 1




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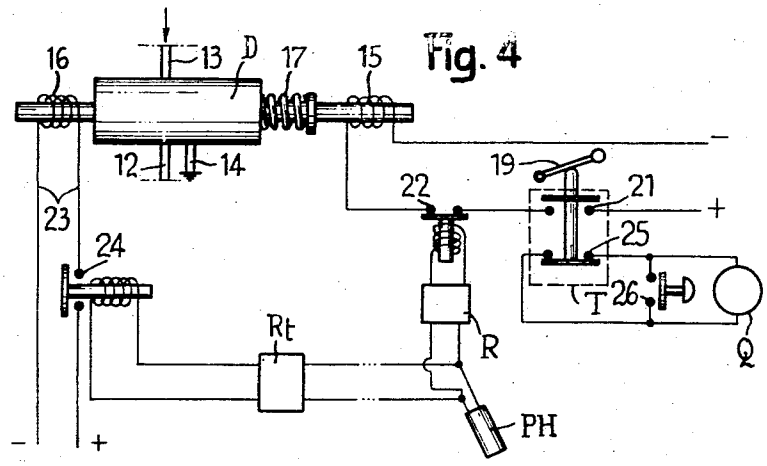



Fig. 4

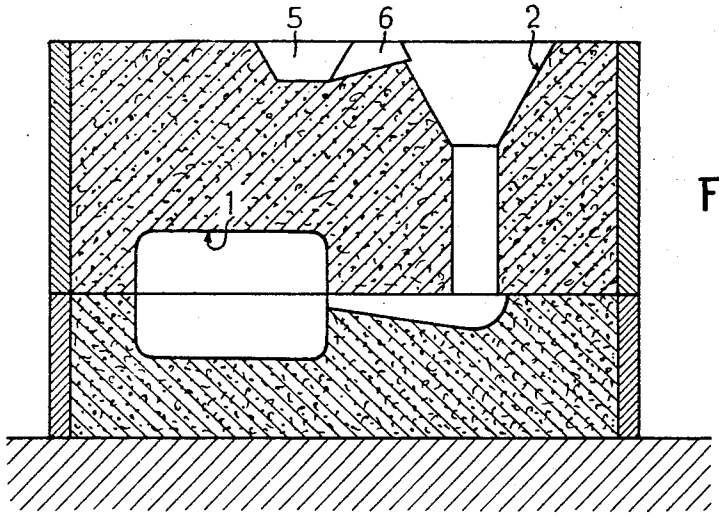



Fig.5

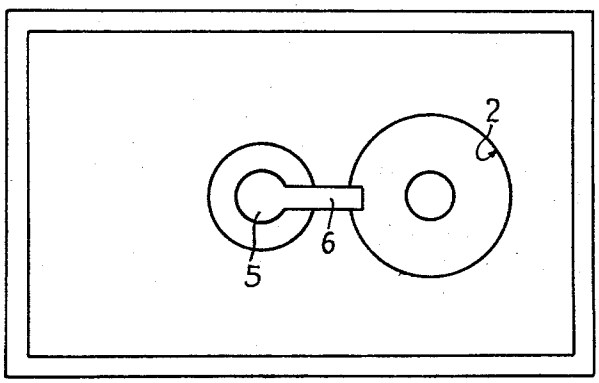



Fig.6

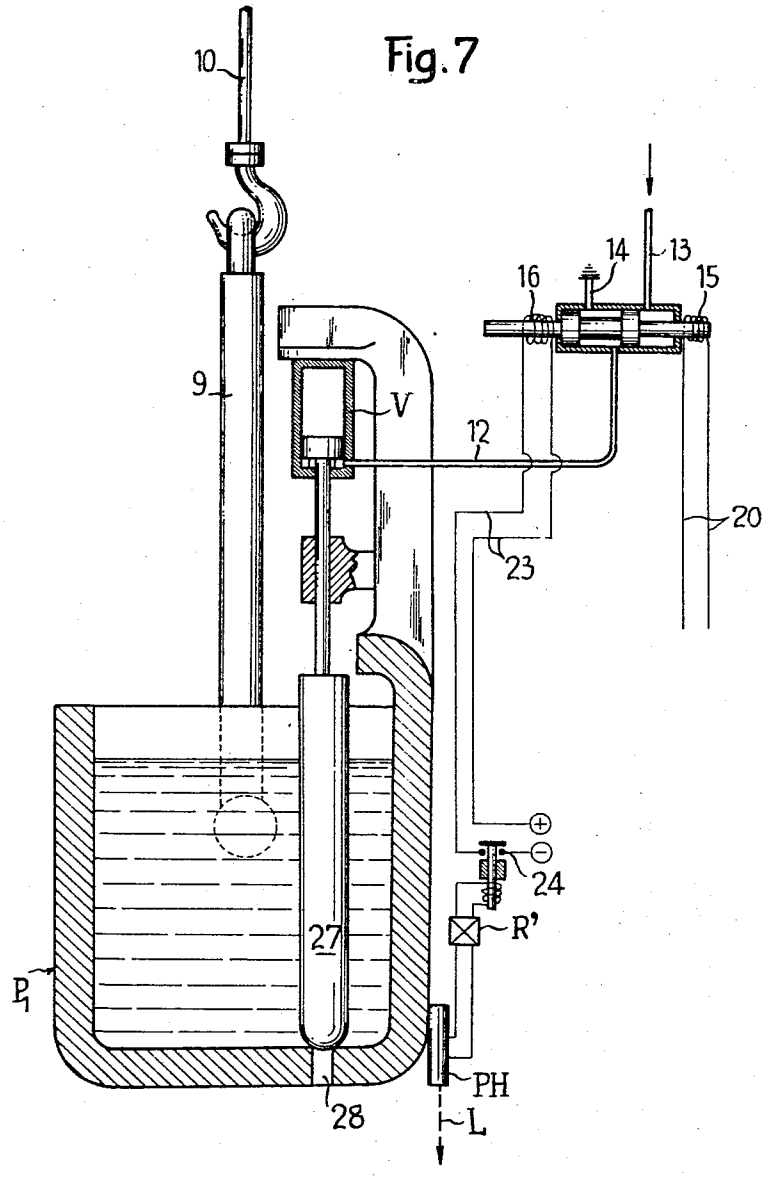
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AUTOMATIC MOLD POURING WITH STOP MEANS RESPONSIVE TO MOLTEN METAL IN OVERFLOW BASIN

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Fig. 7




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3,343,591

# AUTOMATIC MOLD POURING WITH STOP MEANS RESPONSIVE TO MOLTEN METAL IN OVERFLOW BASIN

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3 Claims. (Cl. 164—155)

The present invention relates to the pouring of molten metal into foundry molds and in particular to the automatic stoppage of the pouring as soon as the molds are filled.

The object of the invention is to provide an automatic control device for a pouring vessel or ladle equipped with a pouring mechanism for the molten metal in molds provided with a pouring funnel, said device comprising in combination, for each mold, an additional pouring basin connected to the pouring funnel by a short overflow passage formed at the upper part of said pouring funnel and, for the pouring vessel mechanism, means for stopping the pouring which are actuated by a photoelectric cell directed onto the additional pouring basin of a mold.

Owing to this device, the pouring is automatically stopped by the photoelectric cell as soon as the molten metal poured into the casting funnel reaches the upper part of the latter and pours over, through the passage, and into the additional basin.

The invention is applicable to different types of pouring vessels which are actuated mechanically and in particular tiltable ladles and casting vessels having stopper outlet means employed in mold-pouring lines in mechanized foundries.

Another object of the invention is to provide an improved foundry mold comprising in its upper part near the pouring funnel, an additional basin connected to the funnel by a short overflow passage formed at the upper part of the funnel.

Another object of the invention is to provide a mold filling installation provided with the aforementioned control device and mold of the aforementioned improved type.

Further features and advantages of the invention will be apparent from the ensuing description, with reference to the accompanying drawings to which the invention is in no way limited.

In the drawings:

FIG. 1 is a diagrammatic assembly view of a pouring production line having a tiltable casting ladle equipped with the device according to the invention;

FIGS. 2 and 3 are views of two positions of the distributor valve controlling the tilt of the ladle;

FIG. 4 is a diagram of an electric installation of the device according to the invention;

FIG. 5 is a diagrammatic sectional view of a foundry mold forming part of the device according to the invention;

FIG. 6 is a corresponding view thereof, and

FIG. 7 is a diagrammatic view of a device according to the invention applied to a stopper controlled pouring vessel.

In the embodiment shown in FIGS. 1–4, the invention is applied to a mold-filling production line of a foundry comprising a chain conveyor C having an intermittent feed, that is, regular forward movements interrupted by stoppages at the working stations, namely the molding machine, pouring station, stripping station etc. It is the pouring station which is shown in FIG 1.

The molds M have, if desired, different molding prints 1 and are provided, as known per se with a pouring funnel or runner gate 2 at their upper part. Preferably, they are evenly spaced apart in that they are placed for example between positioning blocks 4 on platforms 3 carried by the conveyor C so that their pouring funnel is always located under the pouring spout of the ladle or pouring vessel when the molds stop in line with the pouring station.



According to the invention, the molds have, in addition to their pouring funnel 2, an additional basin 5 having a flat bottom located near the pouring funnel 2 (see in particular FIGS. 5 and 6). This additional basin 5 is connected to the funnel 2 by a short passage 6 connected to the upper part of the funnel so as to constitute an inclined overflow conduit affording a sill at its junction with the funnel. The funnel 2, the basin 5 and the passage 6 are, for example, printed in the top of the molds when the latter are of sand.

The casting vessel P is, for example, of the ladle type pivotable on horizontal trunnions 7 on a chassis 8 suspended from a yoke 9 attached to a cable 10 of a hoisting apparatus (not shown). The ladle P supplies the molten metal, for example iron, to the pouring funnel in pivoting about the trunnions 7. For the purpose it is, for example, actuated by a hydraulic jack V.

The hydraulic jack V, for example of the single-acting type, is pivoted at one end to the chassis 8. The rod of its piston is pivoted to one end of an arm 11 rigid with the ladle P so as to pivot the latter about the trunnion 7 either in the direction for pouring from the ladle when the jack V is filled, or in the direction to return the ladle when the jack V is emptied. This jack is fed by a controlled supply by way of a conduit 12 which communicates with the lower part of the body of the jack. The conduit 12 is connected to a distributor D which includes a slide valve having three positions and to which are connected a conduit 13 supplying fluid under pressure from a pump (not shown) and an exhaust conduit 14.

When the slide valve is in the position shown in FIG. 1, it puts the oil supply conduit 13 and the jack feeding conduit 12 in communication and closes the exhaust conduit 14. The jack V is thus supplied with fluid and the ladle P assumes its pouring position.

In FIG. 2, the slide valve is shown in its midway position in which it closes all the conduits 12, 13 and 14.

In the position shown in FIG. 3, the slide valve puts the conduits 13 and 14 in communication with each other and closes the conduit 12, the jack V is connected to the exhaust and the ladle P tilts back and thus stops the pouring of the metal.

The two positions shown in FIGS. 1 and 3 are obtained by supplying current to two electromagnets 15 or 16 respectively. When the electromagnets 15 or 16 are not supplied with current, the slide valve is returned to its midway position under the action of a return spring 17 (FIG. 2).

The chain conveyor is provided with lugs or fingers 18 adapted to act successively on a lever 19 which has a spring-biased return movement and a pivot pin fixed to the support of the chain. The positions of the lugs 18 along the conveyor and the position of the lever 19 are such that when a lug 18 actuates the lever 19 a mold is located under the forming ladle, the pouring hole or funnel of the mold being under the ladle spout *b*.

FIG. 4 shows the electric diagram of the installation according to the invention, the slide valve of the distributor D being in its midway position. The electromagnet 16 is supplied through an electric circuit 20, for example having two conductors in which are mounted in series a closing contact 21, which is part of a double switch T and is actuated by the lever 19, and an opening

contact 22 whose coil is energized by a relay R connected to a photoelectric cell PH.

This cell is mounted on the chassis 8 of the pouring ladle with such orientation that its sighting line L is directed toward the basin 5 of the mold M which is located under the ladle in its filling position (see FIG. 1).

The electromagnet 16 is fed by a circuit 23, for example having two conductors in which is mounted a closing contact 24 whose coil is energized through a relay Rt connected to the photoelectric cell TH. This relay has a time delay whereby the time required to close the contact 24 is prolonged for a given period of time so as to permit energization of the electromagnet 16 and operation of the slide valve of the distributor D for a certain time at the end of which the energization of the electromagnet 16 ceases and the slide valve of the distributor D returns to its midway position under the action of the return spring 17.

The second contact 25 of the switch T is connected in series in the supply circuit of a motor Q (FIG. 4) which feeds the chain C forwardly, a push-button switch 26 being connected in parallel with this circuit.

The device operates in the following manner:

At rest, the slide valve of the distributor D is in its neutral position (FIG. 2), the jack V is locked in position and the tilting of the ladle is stopped. When a mold is located at the pouring station, it having been brought there by the conveyor chain C, the lug 18 swings down the lever 19 and this opens the contact 25 and stops the feed of the conveyor chain. As mentioned hereinbefore, this stoppage is so arranged that the pouring hole of the mold is under the spout of the ladle P. Simultaneously, the contact 21 is closed and this supplies current to the electromagnet 15 and causes the slide valve of the distributor D to move to the position shown in FIG. 1, which puts the conduit 13 in communication with the conduit 12. The jack V is progressively supplied with fluid and the ladle is tilted forwardly. The molten iron is poured through the spout of the ladle and fills the mold. The rate of feed of the jack V is so arranged as to obtain an adequate flow of iron.

When the mold is completely filled, the level of the iron rises up to the upper part of the runner gate or pouring funnel and then pours over into the additional basin 5 by way of the overflow passage 6.

The arrival of the molten iron in the basin 5 causes the energization of the photoelectric cell PH whose line of sight L has been so adjusted as to be directed toward the basin 5. The coils of the relays R and Rt are then energized and this causes the opening of the contact 22 and consequently the stoppage of the energization of the electromagnet and, moreover, the closure of the contact 24 which causes energization of the electromagnet 16. The slide valve of the distributor D is then urged to its other extreme position (FIG. 3) and compresses the return spring 17. The conduit 12 is then put in communication with the exhaust 14 and this results in a partial emptying of the jack V. This emptying occurs during a period of time depending on the time delay of the relay Rt after which the energization of the switch ceases, the contact 24 opens and the slide valve of the distributor returns to its midway position. During this time, the ladle has tilted rearwardly; the pouring stops but the movement of the ladle is stopped before the jack V has been completely emptied. The ladle is then ready to start another pouring movement as soon as the following mold arrives under the ladle. The conveyor chain C is started up in operating the switch 26 and maintaining it closed until the moment when the lever 19 ceases to be in contact with the lug 18, the photoelectric cell PH no longer being energized, which results in the closure of the contact 25 and the opening of the contact 22. The pushbutton 26 can then be released. When a following lug 18 once more actuates the lever 19 the conveyor chain once more stops and a further pouring cycle commences.



The main advantages of the device according to the invention are the following:

The additional basin 5 and its small passage 6 communicating with the pouring funnel 2 are easy to obtain by means of suitable shapes added to existing pattern plates when it concerns sand molds. However, they can be obtained by machining when it concerns metal dies. The automatic control device stopping the pouring as soon as the mold has been completely filled is very simple and strong. It operates with precision regardless of the shape and volume of the molding cavity and consequently avoids the use of any delicate and complex metering or weighing device for the poured metal. It is applicable to the pouring of molds in a production line, the molds producing different pieces but having pouring funnels 2, basins 5 and passages 6 of the same type. It insures high regularity in the filling of the molds since the molds are filled under identical conditions in particular as concerns the speed of filling up to the upper part of the funnel 2 at the level of the passage 6. This regularity in the filling contributes to a great extent to the obtainment of sound cast pieces and an economy of molten metal. The device does not require any adjustment apart from the suitable orientation of the photoelectric cell for the purpose of directing its line of sight L toward the additional basin 5 of each mold fed to the pouring station.

In the variant shown in FIG. 7, the invention is applied to a pouring vessel P1 having a stopper 27 closing a pouring outlet 28 located in the bottom of the vessel. This stopper 27 is actuated by a jack V of the same type as that described hereinbefore. The hydraulic and electric control is also the same as that described. Mounted on the casting vessel P1 is the photoelectric cell PH whose line of sight L is directed toward the basin 5 of the mold M.

This device operates in the same manner as the foregoing device except that it is the raising or lowering of the stopper 27 which results in the pouring or stoppage of the pouring of the molten metal. As in this embodiment the stopper provides a full flow or stops the flow completely in each direction, the jack 10 can empty itself completely in each operation thereof, consequently, the spring 17 is not needed and the relay R' need not be a time delay relay as the relay Rt of the first embodiment.

Although specific embodiments of the invention have been described, many modifications and changes may be made therein without departing from the scope of the invention as defined in the appended claims.

Thus, instead of being provided in the form of recesses in the upper part of the molds, the pouring funnel 2, the additional basin 5 and the passage 6 can be formed in a metal cup or a cup composed of facing sand or resin sand placed on the top of the mold.

The invention has been described with reference to a conveyor C which moves intermittently, but it is also applicable to mold conveyors which move in a continuous way, without stopping, in the known manner.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. Automatic molten metal pouring unit comprising a mold having a runner gate, a pouring mechanism so positioned relative to the mold as to pour molten metal directly into said runner gate, means defining a basin on said mold and a short relatively narrow overflow passage interconnecting the runner gate and the basin and located somewhat below the upper end of the runner gate, stop means associated with said mechanism for stopping the pouring and an optical device for actuating said stop means and directed onto said basin and responsive to the presence of molten metal in said basin.

2. Automatic molten metal pouring unit as claimed in claim 1, wherein said overflow passage is downwardly inclined toward said basin and defines an overflow sill with said runner gate.

3. Mold pouring unit comprising a metal pouring vessel, a mechanism associated with the vessel for controlling the pouring from the vessel, a series of mold interconnected in a chain, drive means for feeding the chain to place each mold under the vessel, a basin provided on each mold, each mold having a runner gate, and a short relatively narrow overflow passage interconnecting the runner gate and the basin and located somewhat below the upper end of the runner gate, stop means associated with the mechanism for stopping the pouring from the vessel and a photoelectric cell directed onto the basin of the mold under the vessel and combined with the stop means for bringing the stop means into action when the photoelectric cell is energized by the presence of metal in said basin, and a lever controlling said chain drive means and adapted to cooperate with lever shifting elements on the chain to stop the forward feed thereof each time a mold arrives under the pouring vessel in such position that the pouring vessel can pour the metal directly into said runner gate.


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