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(54) METAL POURING LADLE

(71) We, SEATON ENGINEERING COMPANY, a corporation organised and existing under the laws of the State of Michigan, United States of America, of 4595 Platt Road, Ann Arbor, Michigan, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a pouring ladle for pouring molten metal into moulds or other containers.

In recent times, much has been accomplished in automating foundries so that both the quantity and quality of castings has been enhanced. Molds are produced in assembly line fashion, at a high rate of production. The equipment for pouring molten metal into these molds has likewise been automated and improved along with the mold making machinery. A typical foundry metal pouring system will consist of a stationary bottom pouring stopper holding ladle which is used to fill one or more pouring ladles which shuttle back and forth on a track between the holding ladle and the molds. Some molds are quite large today, being on the order of 6 feet square, and require hundreds of pounds of molten metal for a single casting. This large mold size presents some problems, in pouring with conventional ladles, such as molten metal spillage, and premature chilling of the molten metal. Known ladle tilting pouring systems require either a connecting channel, or a long spout on the ladle to pour metal into the centrally located pouring basin. The long spout will chill the metal and become built up with an accumulation of solidified metal and dross.

According to the present invention there is provided a pouring ladle for pouring molten metal into molds or other containers, including wall means forming a chamber for holding the molten metal, a spout having wall means forming longitudinal passage means therein, the passage means having an inlet end in fluid communication with the chamber, and an outlet end through which molten metal can be discharged, means for rotating the pouring ladle about an axis of rotation which is inclined to the horizontal and which passes through the centre of the discharge end of the passage means, the lower outer surface of the wall means forming the chamber and the lower outer surface of the wall means of the spout lying in the same substantially horizontal plane when the ladle is in its full, non-pouring position.

Using the invention it is possible to provide a pouring ladle which can in its entirety be positioned above a mould while it is being filled with molten metal or while it is being moved to the pouring position.

A construction embodying the invention is diagrammatically illustrated by way of example, in the accompanying drawings in which:

Figure 1 is a plan view of a foundry metal pouring system including pouring ladles;

Figure 2 is a side view of one of the pouring ladles shown in Figure 1;

Figure 3 is a sectional view taken on line 3-3 of Figure 2;

Figure 4 is a sectional view taken on line 4-4 of Figure 1; and

Figure 5 is a sectional view taken on line 5-5 of Figure 2.

Referring firstly to Figure 1 of the drawings, a pair of pouring ladles 10 are shown mounted on cars 12 so they can shuttle back and forth on tracks 13 between a bottom pouring stopper holding ladle 14, and a conveyor line of moving molds 16. The pouring ladles 10 are sized to hold a sufficient amount of metal to fill one mold 16. The holding ladle 14 is suspended above the elevation of the pouring ladles and alternately replenishes the two ladles through ladle openings 20; that is, when one ladle is mak-

ing a pour into a mold 16, the other is being filled by the holding ladle, and vice versa. Molten metal is gravity discharged through a bottom opening (not shown) in the holding ladle 14, into a chamber 18 of a pouring ladle 10, through an upper opening 20. The controls for the pouring ladles 10 and the cars they are mounted on can be designed such that the molds 16 can be poured while they are moving, if desired.

Looking now to Figures 2, 3 and 4, the construction of one of the pouring ladles 10 is shown in more detail. The ladle 10 has a chamber 18 which is completely enclosed by insulating walls 30, with the exceptions of upper opening 20, and passageway 32 in spout 34. The ladle 10 is fixedly mounted in yoke 36, in such a manner that the yoke and ladle can be rotated about the axis 38 by means of drive 40. The entire chamber 18 lies to one side of the pouring spout 34. The axis of rotation 38 coincides with the longitudinal axis of passageway 32 in the spout 34. Thus, the discharge end of the spout 34 does not change its location relative to the mold during a pour. The pouring ladle 10 and its associated cradle arrangement is also rotatable about a vertical axis by means of a drive gear arrangement 42, shown in dashed lines in Figure 2. This permits the ladle to be rotated so as to be properly aligned with the discharge opening in the holding ladle when being filled, and rotated out over the upper surface of the mold so that the pouring spout can be accurately positioned with respect to the sprue opening 44 of the mold during a pour, regardless of where on the upper surface of the mold the opening 44 is located. It also permits the ladle to be rotated 180° so that an operator can occasionally clean the lip of the spout, or exchange ladles when necessary. The rotating feature could also be used for pouring different molds, having different sprue opening locations. For example, alternate or every third mold could be different, and the control could be programmed so that the unit would automatically operate in this manner.

The lower outer surface 46 of the wall of the chamber 18 lies in the same horizontal plane as the lower outer surface 48 of the wall of the spout 34, so that the entire pouring ladle can be swung out over the mold, while maintaining the spout end in close proximity to the upper surface of the mold so that little spillage occurs during a pour, with the passageway 32 remaining in a fixed position during the entire pour. The pouring spout is fairly short in length, so that the molten metal is not chilled to a great extent in passing through passageway 32 during a pour. Also, since the spout lies at an angle to the horizontal, no metal will remain in the spout after a pour has been made. Any metal remaining in the passageway would solidify to some extent, reducing the quality of subsequent pours.

The angle which the axis of rotation and the longitudinal axis of the spout passageway make with the horizontal is not too critical, other than if the angle is too shallow, the capacity of the chamber 18 may become too small, since the entire chamber volume occupied by molten metal must lie below the spout passageway 32 when the pouring ladle is in its full, nonpour position. The axis of rotation may form an angle X of between 20 to 60° with the horizontal, with 30° to 50° being the ideal for a ladle capable of holding a 200 - 300 pound charge of molten metal.

Figure 5 shows a control arrangement which will permit the tilting speed to be varied during a single pour; i.e., fast rotational speed for the first 30° of rotation, with a slower speed for the rest. As shown, a cam 60 is attached to the shaft 38. This cam 60 turns in the same angular rotation as the ladle. Rotation of the cam profile is used to depress a follower roller 62, which is attached to a control transmitter 64. The control transmitter 64 is connected to motor 36 through member 66 in such a manner that it controls the motor speed. The cam and transmitter combination provides a means to control pouring rate from the ladle which is desirable.

WHAT WE CLAIM IS:

1. A pouring ladle for pouring molten metal into molds or other containers, including wall means forming a chamber for holding the molten metal, a spout having wall means forming longitudinal passage means therein, the passage means having an inlet end in fluid communication with the chamber, and an outlet end through which molten metal can be discharged, means for rotating the pouring ladle about an axis of rotation which is inclined to the horizontal and which passes through the centre of the discharge end of the passage means, the lower outer surface of the wall means forming the chamber and the lower outer surface of the wall means of the spout lying in the same substantially horizontal plane when the ladle is in its full, non-pouring position.

2. A pouring ladle according to Claim 1, in which the axis of the longitudinal passage means lies at an angle to the horizontal.

3. A pouring ladle according to Claim 2, in which the axis of rotation coincides with the axis of the longitudinal passage means.

4. A pouring ladle according to Claim 3, in which the axis of rotation makes an angle of approximately 20° to 60° to the horizontal.

5. A pouring ladle according to any preceding Claim, the chamber being substantially completely enclosed by the wall means, there only being an opening through the upper wall through which molten metal can

be admitted thereto, and the passage means through which molten metal can be discharged therefrom.

6. A pouring ladle according to Claim 5, in which the ladle is further mounted for rotation about a vertical axis, so that the ladle can be swung out over a mold which is to be poured, and the pour can be made at any sprue opening location on the upper surface of the mold.

7. A pouring ladle substantially as described with reference to and as shown in the accompanying drawings.

8. A metal pouring system, including a pouring ladle according to any preceding claim.

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2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

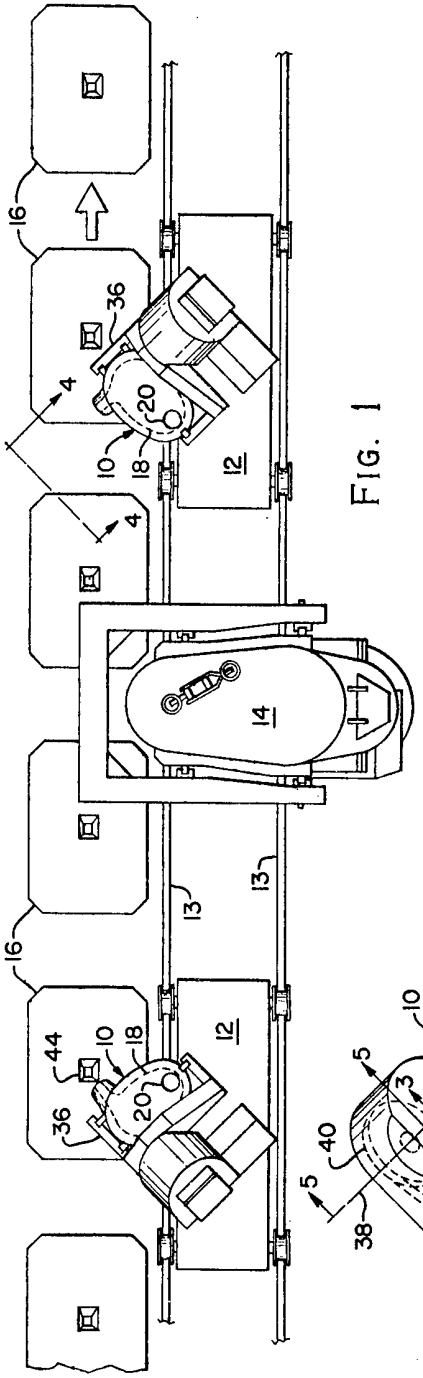

FIG. 1

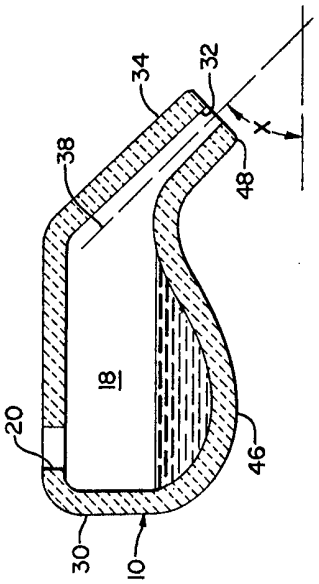

FIG. 3

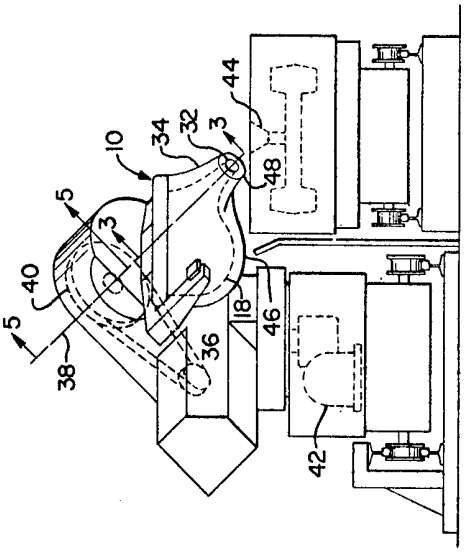

FIG. 2

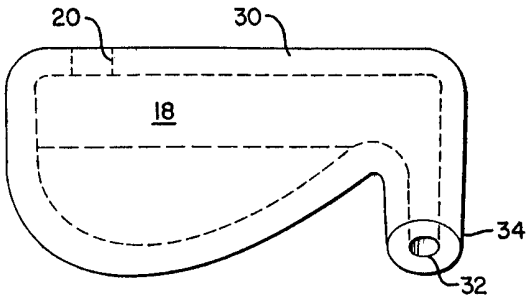

FIG. 4

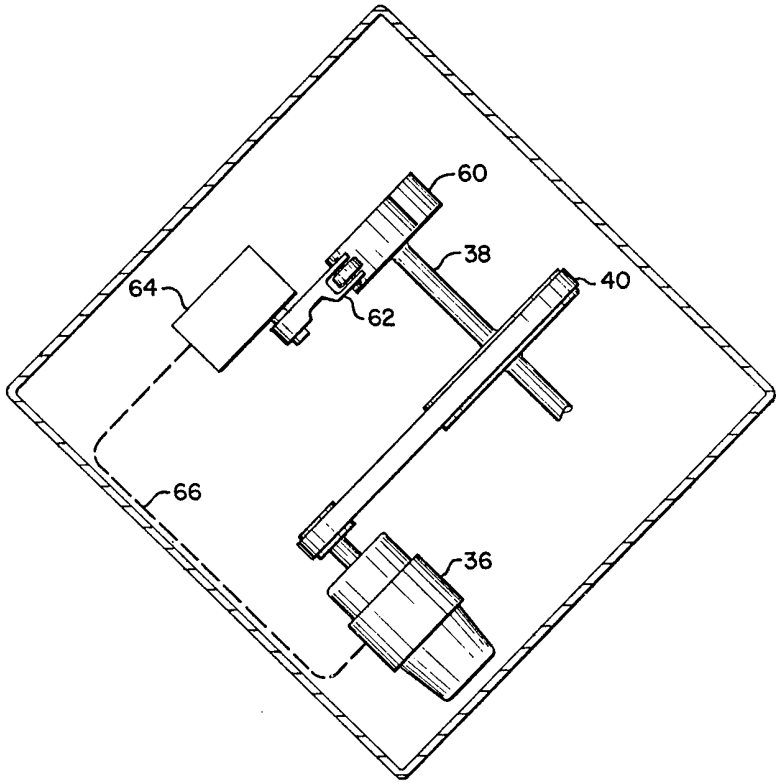

FIG. 5