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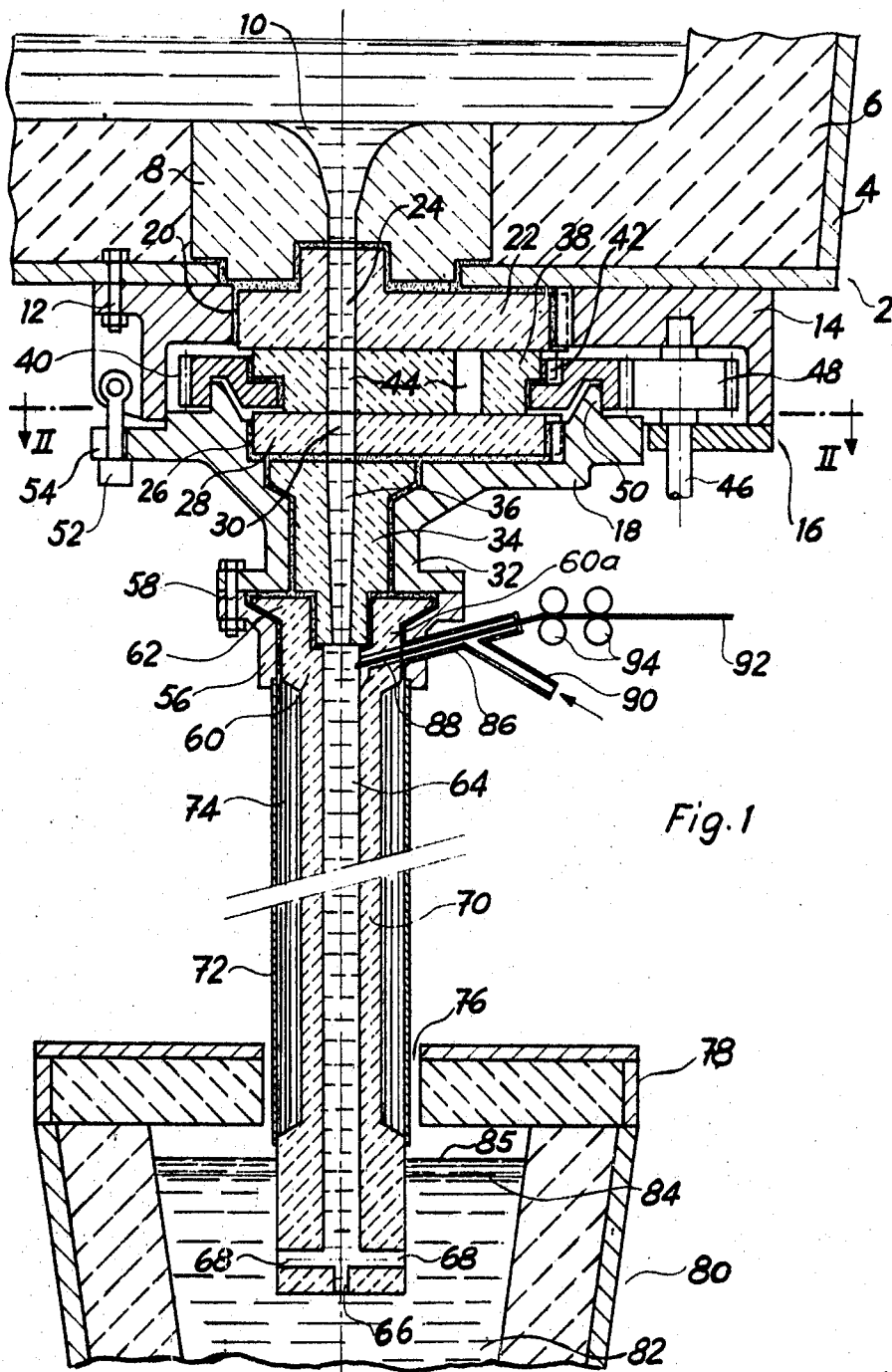
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3,459,346

MOLTEN METAL POURING SPOUT

Filed Oct. 16, 1967

2 Sheets-Sheet 1



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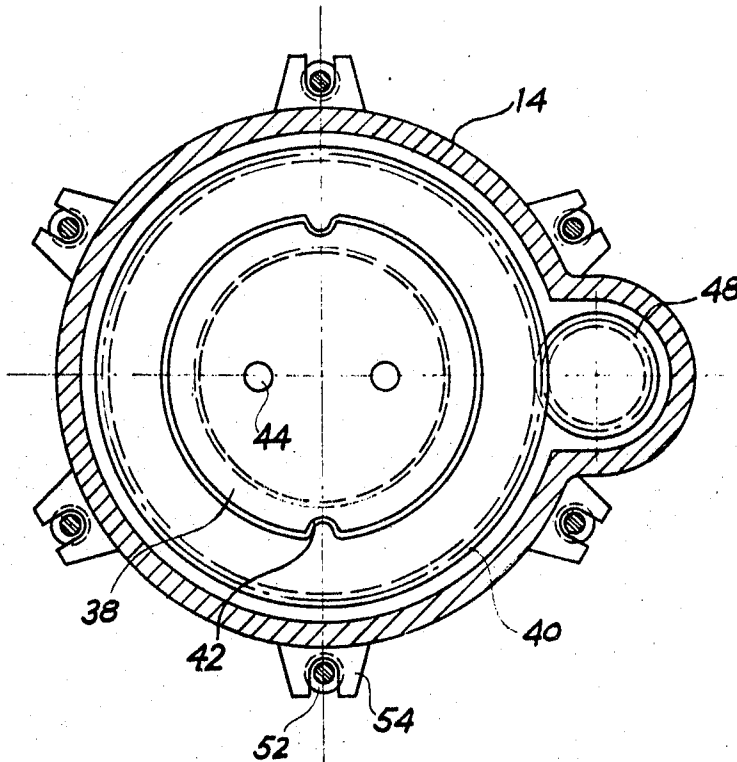
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Fig. 2



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MOLTEN METAL POURING SPOUT

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6 Claims

ABSTRACT OF THE DISCLOSURE

A pouring apparatus for a receptacle containing a molten material, especially steel and comprising slide closure means which incorporate two superimposed stationary slide closure elements and a movable slide closure element which is disposed between the aforesaid two superimposed stationary slide closure elements. Additionally, the invention contemplates the provision of pouring tube means formed of refractory material and arranged at the lower stationary slide closure element. The pouring tube means is adapted to be immersed in a molten bath and possesses an internal compartment for the through passage of the molten material. The lower stationary slide closure element is equipped with an opening with which communicates the internal compartment of the pouring tube means.

Background of the invention

The present invention relates to an improved pouring or casting apparatus for a container or receptacle containing a molten material, in particular steel.

In foundry work, an attempt has been made for quite some time now to minimize the entry of air to the molten steel during its flow from the furnace to the mould or ingot mold. On the other hand, it can not be prevented that the steel from the furnace must usually be poured a number of times before it finally arrives for instance in the mould or the like.

Summary of the invention

Accordingly, it is a primary object of the present invention to provide an improved pouring apparatus which can be readily employed with containers or the like, such as for instance mixers or agitators, intermediate vessels or casting or pouring ladles, which contain a molten material, which pouring apparatus is capable of considerably preventing the entry of oxygen.

A further significant object of the present invention relates to an improved pouring apparatus which allows the casting of molten material under extremely favorable conditions.

A further significant object of the invention is concerned with an improved construction of pouring apparatus which not only prevents the undesired entry of oxygen into the molten metal during casting, but further deposits the molten material into the metal bath at a location beneath the level of the bath and therefore beneath the slag layer, so that the latter is not disturbed and commingled with the rest of the molten liquid bath.

Yet a further noteworthy object of this invention pertains to an improved casting or pouring apparatus which is relatively simple in construction, extremely reliable in operation, safe to use, and provides for extremely good pouring conditions for the liquid or molten material being handled.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the inventive pouring apparatus is generally manifested by the provision

of a slide or traveling closure means which incorporates two superimposed stationary slide closure elements and a movable slide closure element which is disposed between the aforementioned two superimposed stationary slide closure elements. Further, a pouring tube means formed of refractory material is arranged at the lower stationary slide closure element and its internal compartment operatively communicates with an opening appearing at the lower stationary slide closure element. This pouring tube means is adapted to be immersed in a metallic bath.

Due to the use of a pouring tube means which is fixedly connected with the slide closure means of the container, and wherein such pouring tube means can be immersed in the material bath of the subsequent container, it is not only possible to effectively prevent the entry of oxygen during the pouring operation, but additionally it is possible to overcome any danger during this pouring operation to the operating personnel. In this latter regard it is particularly mentioned that safety in operation is insured by virtue of the fact that no spattering of material can occur.

A further considerable advantage of the inventive pouring apparatus resides in the fact that the entry of the liquid material in the subsequent bath takes place at a location beneath the liquid level of such bath, and therefore, beneath the slag layer. Consequently, the slag layer is not broken up and there is effectively prevented a circulation of the slag in the bath by the inflowing material.

A further advantage of the inventive pouring apparatus resides in the fact that by virtue of the pouring tube means which is secured to a stationary slide closure element it is possible to carry out pouring of the material through a narrow cover opening at the container, so that the thermal losses and oxidation of the material in such container is reduced. Moreover, by combining the pouring tube means with the slide closure means, it is also possible to simultaneously regulate the casting velocity and the quantity of cast of poured material.

In accordance with a preferred embodiment of the inventive pouring apparatus, the pouring tube means is equipped with means which renders it possible to introduce alloying additives into the pouring jet in the presence of a protective gas.

Brief description of the drawings

The invention will be better understood, and objects other than those set forth above, will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings, depicting a preferred embodiment of inventive pouring apparatus, and wherein:

FIGURE 1 schematically depicts a vertical sectional view through the inventive pouring apparatus which has been mounted at an intermediate vessel for instance; and

FIGURE 2 is a cross-sectional view of the inventive pouring apparatus depicted in FIGURE 1, taken along the line II—II thereof.

Description of the preferred embodiments

Describing now the drawings, in FIGURE 1 reference numeral 2 generally designates an intermediate vessel or receptacle which is equipped with a sheet metal jacket 4 and a refractory lining 6. A pouring block or stone 8 arranged at the bottom of the intermediate vessel 2 possesses a substantially trumpet-shaped pouring or discharge opening 10. Further, it should be understood that a slide housing 14 of a slide or traveling closure arrangement generally designated by reference numeral 16, is secured to the sheet metal jacket 4 by means of screws 12 or equivalent fastening expedients. This slide housing 14 is closed at its underside by means of a cover member 18. Continu-

ing, it should be recognized that the slide housing 14 possesses a cylindrical bed stone or bottom block 22 defining a stationary slide closure element and which is arranged in a cylindrical recess 20 of the aforementioned slide housing 14. This cylindrical bottom block 22 has an eccentrically arranged throughflow opening 24 which communicates with the pouring opening 10 of the pouring block 8. On the other hand, the cover member 18 of the slide housing 14 is equipped with a cover block or stone 28 providing a further stationary slide closure element and which is likewise arranged in a cylindrical recess 26. This cover block 28 possesses a throughflow opening 30.

Cover member 18 further includes an eccentric projection or shoulder 32 in which there is inserted a pouring sleeve or bushing 34 formed of refractory material and the pouring or casting opening 36 of which is arranged substantially coaxial with respect to the openings 24 and 30 provided at the bottom block 22 and the cover block 28 respectively. Between the bottom block 22 and the cover block 28 there is situated a slide block 38 providing a movable slide closure element and which is surrounded by a gear ring 40 which is rotatable in the housing 14. The movable slide block or element 38 is rigidly connected for rotation with the rotatable gear ring 40 by means of a suitable keyway and key connection 42 or the like. This slide block 38 possesses two eccentrically arranged throughflow openings 44 which are displaced with respect to one another through an angle of 180°, as best seen by inspecting FIGURE 2. The eccentricity of these eccentrically arranged throughflow openings 44 corresponds to that of the throughflow openings 24 and 30, so that each of the throughflow openings 44, in one of both open positions of the slide block 38, can provide an operable communication between the throughflow openings 24 and 30.

A drive shaft 46 which is mounted in the housing 14 and the cover member 18, as shown, and which, for instance, can be operably connected with a nonillustrated ratchet, carries a pinion 48 which meshes with the gear ring 40. This gear ring 40 is mounted upon an inwardly projecting annular or ring flange 50 of the cover member 18 and is centered by such in the housing 14. The cover member 18 is detachably secured to the housing 14 by means of threaded bolts 52 or the like which are pivotably attached to such housing 14, and these threaded bolts 52 engage with radial attachment flaps 54 provided at the periphery of the housing 14, as seen by inspecting FIGURE 2.

It will be further recognized that a connecting flange 56 is attached by means of screws 58 to the underside of the projection or shoulder 32 of the cover member 18. A pouring or casting pipe or tube 60 is inserted in this connecting flange 56. The pouring tube means 60 bears against the connecting flange 56 by means of an annular or ring shoulder 62 provided at its upper end. The pouring tube 60 which is manufactured from refractory material possesses an internal compartment in the form of a cylindrical bore 64 which communicates at its upper end with the pouring opening 36. This internal bore 64 possesses a larger diameter than the smallest diameter of the opening 36 which conically tapers or narrows in the flow direction of the material. Further, the internal bore 64 branches off at its lower end into three channels 66 and 68, whereby the channel 66 which provides a so-called starting channel stands axially whereas both of the other channels 68, which open diametrically opposite one another, extend radially at least at an angle of 45° with respect to the longitudinal axis of the pouring tube 60, and in the depicted embodiment preferably extend at substantially a right angle to such tube axis. Furthermore, it should be understood that the channels 66 and 68 individually possess a smaller cross section than the bore 64. However, in this regard the cross section of the channel 66 is smaller than that of the channels 68. The pouring tube 60 is tapered or constructed to converge at its central region

70 and is surrounded by a substantially cylindrical metallic jacket 72 which is secured to the connecting flange 56, as shown. Between the tapered central region 70 and the metallic jacket 72, the internal diameter of which is somewhat larger than the external diameter of the tube 60, there is located an insulation 74 which, for instance, can be formed of two half shells or similar type construction.

Further, it will be recognized that the pouring tube 60 extends by means of its free end through the central infeed opening 76 of a cover member 78 provided at a pouring ladle 80 or the like and into the latter. In so doing, this pouring tube 60 is immersed so deeply into the steel bath 82 or the like which is contained in the pouring ladle 80 that the respective openings of the channels 68 are situated beneath the slag layer 85 which covers the liquid level 84. As a result, the slag layer 85 is prevented from being broken up by the pouring jet emanating or flowing out of the pouring tube 60, thereby further preventing that the slag will be washed into the metallic bath 82. The opening 76 at the cover member 78 of the pouring ladle 80 requires only a slightly larger diameter than that of the pouring tube 60 in order to render possible the introduction of such pouring tube 60 into the ladle 80 so that the heat losses can be maintained quite small.

The attachment or connecting flange 56 is pierced by an infeed conduit or pipe 86 which communicates with an infeed bore 88 provided at a widened cross sectional portion 60a of the pouring tube 60. This infeed pipe 86 possesses a connecting stud 90. This connecting stud 90 is connected to a non-illustrated source of protective gas, whereas an alloying material 92 in the form of a wire is introduced through the infeed pipe or tube 86 by means of feed rolls 94 or the like.

It is still to be mentioned that the slide closure elements 22, 28, 38 as well as the pouring tube means 60 are embedded in the corresponding portions of the housing 14 or cover member 18 and the connecting flange 56 by means of an appropriate refractory tamping compound or stamping mass, as such has been schematically represented in the drawings.

The described inventive pouring apparatus is of course particularly suitable for the casting or pouring ladles of continuous casting installations, whereby the pouring tube is introduced into the ingot mold. On the other hand, it is also conceivable to provide the invention pouring apparatus directly at a furnace.

While there is shown and described a present preferred embodiment of the invention, it is to be distinctly understood that the invention is not limited accordingly.

What is claimed is:

1. A pouring apparatus for a receptacle containing a molten material, especially steel, comprising:

slide closure means incorporating two spaced superimposed stationary slide closure elements and a movable slide closure element disposed between said two superimposed stationary slide closure elements;

pouring tube means formed of refractory material, one end of said pouring tube means being disposed adjacent the lower stationary slide closure element, the other end of said pouring tube means being adapted to be immersed in a molten bath, said pouring tube means having a through passage therein for the through passage of the molten material, said through passage being of a given cross-section at said one end of said pouring tube means, said through passage further exhibiting a widened cross-sectional portion: means associated with said pouring tube means for introducing alloying additives in the presence of a protective gas, said introducing means including an infeed bore means for the alloying additives provided at said widened cross-sectional portion of said pouring tube through passage;

said lower stationary slide closure element being provided with an opening in communication with and of substantially the same cross-section as the cross-section

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tion of said through passage at said one end of said pouring tube means.

2. A pouring apparatus as defined in claim 1, wherein said pouring tube means is provided with a plurality of pouring channels which open at an angle of at least 45° with respect to the longitudinal axis of said pouring tube means.

3. A pouring apparatus as defined in claim 2, wherein said pouring channels open at substantially right angles to the longitudinal axis of said pouring tube means, said pouring tube means further being provided with a starting channel means which is disposed along said longitudinal axis.

4. A pouring apparatus as defined in claim 1, further including insulating jacket means provided for said pouring tube means.

5. A pouring apparatus as defined in claim 1, further including means for rotatably mounting said movable slide

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closure element, said movable slide closure element being provided with a number of throughflow openings arranged along a substantially circular arc.

6. A pouring apparatus as defined in claim 5, wherein said mounting means includes a rotatably mounted gear ring which supports said movable slide closure element.

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