

[54] **ELECTROMAGNETIC CONVEYOR
TROUGH FOR CONVEYING LIQUID
METALS**

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[56] **References Cited**

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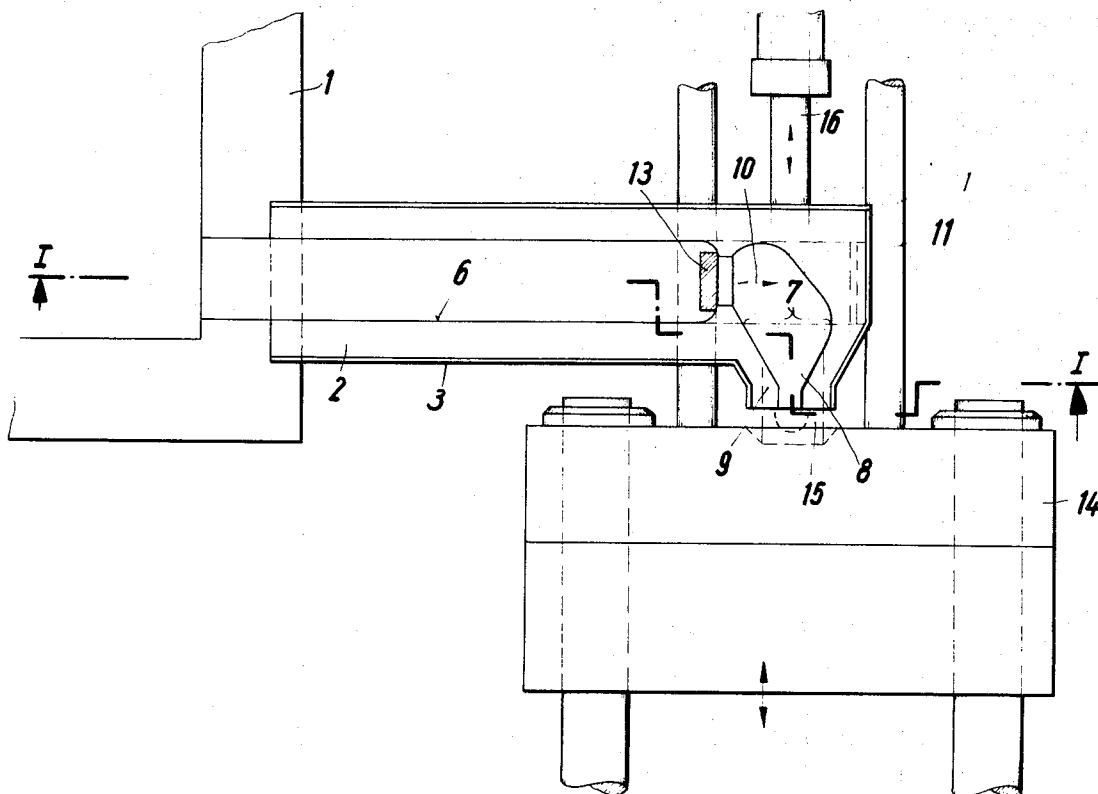
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[57] **ABSTRACT**

An electromagnetic conveyor of the type having a trough body ascending obliquely from a liquid metal storage vessel and an associated travelling field inductor for producing a field which causes liquid metal in the vessel to be conveyed upward to a pouring spout. In the embodiment described below, a side wall of the body has an opening near the upper end of the body from which a delivery channel extends at an angle to the trough direction. The trough body is also preferably provided with a flow restricting orifice having a mean cross sectional dimension of no more than 80 percent and preferably not more than 75 percent of the mean trough body width in the same direction and also an obliquely extending terminal wall for deflecting the upwardly moving liquid metal stream to the delivery channel.

5 Claims, 2 Drawing Figures



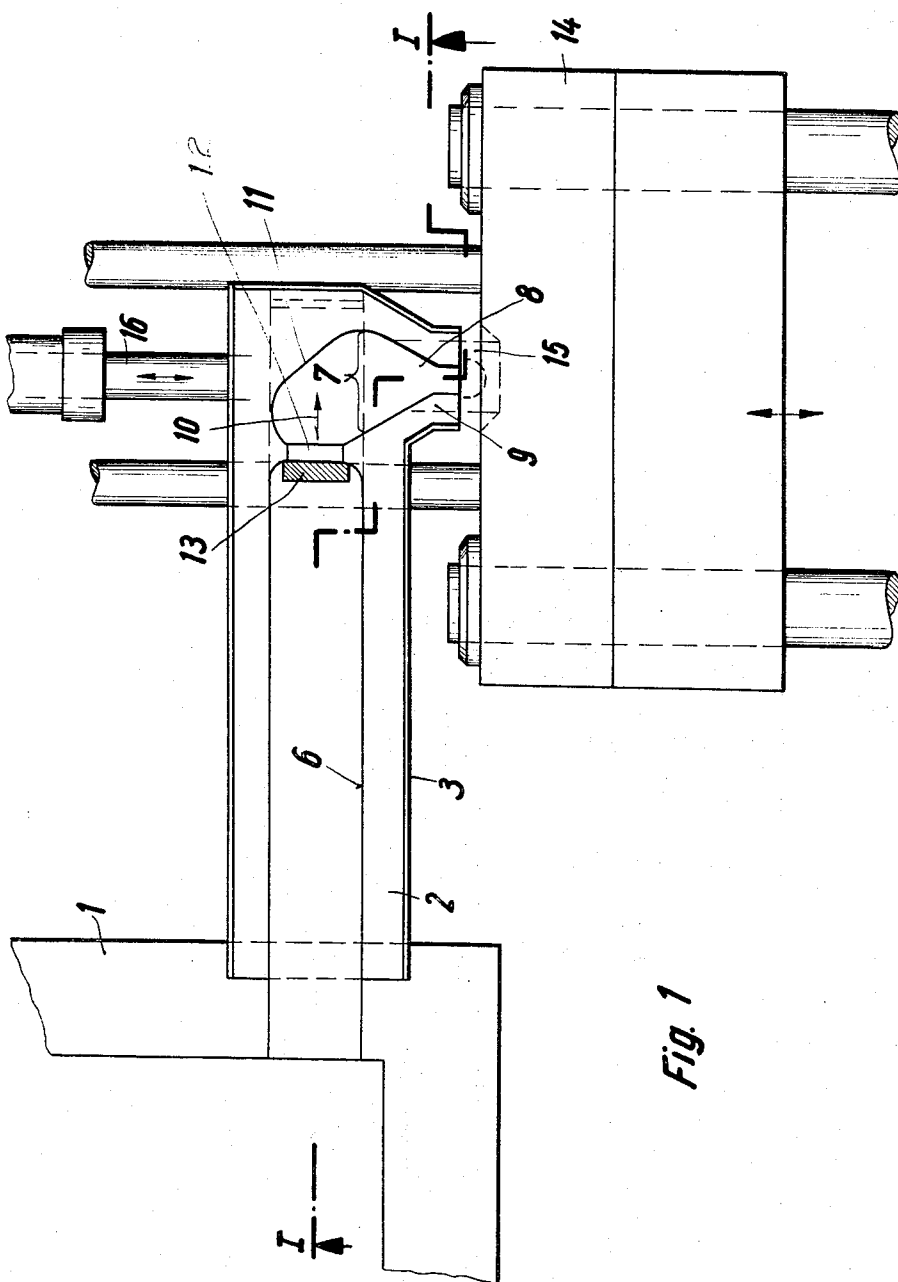
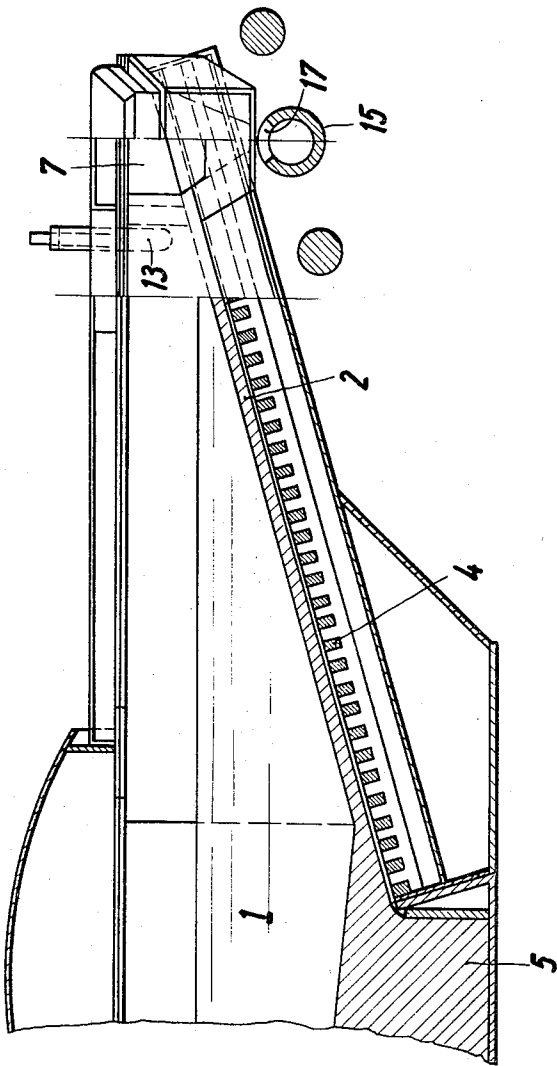


Fig. 1

Fig. 2



ELECTROMAGNETIC CONVEYOR TROUGH FOR CONVEYING LIQUID METALS

The invention relates to an electromagnetic conveyor trough of the type a refractory body which ascends at an angle from a liquid metal storage vessel, and which by the action of a travelling electromagnetic field conveys an open stream of liquid metal upwards to a pouring spout.

Electromagnetic conveyor troughs of this type are shown, for example, on in U.S. Pat. No. 3,554,670 and U.S. Pat. No. 3,612,720. In this type of electromagnetic conveyor trough, a travelling field is generated by a polyphase linear travelling field inductor which is preferably located underneath the body of the trough, with its lower end extending far enough towards or under the storage vessel so that the liquid metal is within range of the conveying action of the travelling field inductor when the liquid bath in the vessel is at the lowest level at which it is still intended to withdraw metal. Since the mean effective field intensity in the region of the end poles of a linear travelling field inductor falls roughly from its rated value to zero, the avoidance of back pressure of the liquid metal at the upper end of the inductor requires that the inductor surface near the upper terminal pole should abruptly or gradually bend over into the horizontal.

Conveyor troughs of this kind have been a great success in practice. However, for many applications, for instance where the conveyor trough is intended to deliver consecutive metered volumes of metal to a casting machine, particularly a pressure casting machine, the positioning of the storage vessel and of the conveyor trough necessitated by the nature of the casting machine is often very unfavourable, particularly from the point of view of an efficient utilization of the available space. Moreover, the design of the inductor windings when the end pole is off-angled is somewhat complex.

It is the object of the present invention to provide, in association with a storage vessel, an electromagnetic conveyor trough which will often enable the storage vessel and the trough to be more favourably disposed, and which will permit the inductor winding to be of simpler design than that required in the above mentioned conveyor troughs.

This object is achieved by the present invention in which the electromagnetic conveyor trough is provided — in a side wall of the refractory body of the trough and at least partly within the region of the penultimate or last inductor pole — with an opening at the upper end of the trough from which a delivery channel extends to the side at an angle to the longitudinal direction of the trough. At the upper end of the body of the trough, a terminal wall preferably extends obliquely across the longitudinal direction of the trough, serving to deflect the liquid metal flowing up the trough towards the opening and into the delivery channel.

In a useful further development there is provided — at a point preceding the lateral opening into the delivery channel and in a manner as set forth in U.S. Pat. application Ser. No. 77,061 — a flow-restricting orifice for limiting the depth of the flowing metal.

Likewise as set forth in an earlier U.S. application Ser. No. 170,475 it is preferred that in the present conveyor trough the mean dimension of the cross section of the flow-restricting orifice in the direction normal to the effective component of the electromagnetic travel-

ling field should not exceed 80 percent, more particularly that it should not be more than 75 percent of the mean width measured in the same direction of the trough section preceding the restricting orifice in the direction of flow.

The invention will be hereinafter more particularly described with reference to the drawings which illustrate an embodiment of the invention.

FIG. 1 is a schematic view in plan (after removal of the cover) of an electromagnetic conveyor trough associated with a holding furnace representing the storage vessel and serving to supply a pressure casting machine with liquid metal.

FIG. 2, this arrangement, shows a longitudinal section of the embodiment of FIG. 1 taken on the line I — I.

A furnace vessel 1 of a conventional holding furnace is attached to the ascending refractory body 2 of an electromagnetic conveyor trough 3. For generating of a travelling electromagnetic field which conveys the liquid metal from the furnace vessel 1 in an open stream up the trough 2 against the effect of gravity a polyphase linear travelling field inductor 4 is provided underneath the body of the trough 3 with the lower end inductor 4 extending to below the refractory lining 5 of a furnace constituting a storage vessel 1. In the region of the penultimate inductor pole at the upper end of the trough one of the side walls 6 of the trough 2 has an opening 7 from which a lateral delivery channel 8 leads downwards roughly at right angles to the side, forming a pouring spout 9. For deflecting the liquid metal flowing up the trough in the direction of an arrow 10 into the opening 7 of the delivery channel 8, the upper end of the refractory body 2 of the trough is formed with a terminal wall 11 which extends obliquely across the longitudinal direction of the trough.

In order to improve the metering accuracy, the trough 2 contains — at a point which in the direction of flow precedes the lateral opening into the delivery channel — a flow restricting orifice 12 preferably comprising a slide 13 for adjustably varying the cross section of the orifice. The horizontal width of the orifice 12, i.e., in a direction normal to the effective conveying component of the travelling electromagnetic field is, as discussed above, smaller than the mean width of the trough section which in the direction of flow precedes the orifice 12.

The drawings indicate parts of a pressure casting machine, namely the platen 14, the filling bush 15 and the injector 16. Owing to the disposition of the delivery channel 8 at an angle to the longitudinal direction of the trough, it is possible to locate the mouth of the pouring spout 9 directly above the filling opening 17 of the filling bush 15. This arrangement ensures that — by comparison with known metering electromagnetic conveyor troughs — the liquid metal need travel only a minimum distance from the furnace vessel 1 to the pressure casting machine.

Many changes and modifications of the above embodiments of the invention can, of course, be made without departing from the scope of the invention. Accordingly that scope is intended to be limited only by the scope of the appended claims.

What is claimed is:

1. In an electromagnetic conveyor trough having a refractory trough body which ascends at an angle from a liquid metal storage vessel, including a floor side walls

bounding said floor and an electromagnetic field inductor located beneath and adjacent said floor, which inductor by the action of a travelling electromagnetic field conveys an open stream of liquid metal upwards, the improvement wherein the trough body is provided in a side wall of at least partly within the region of the penultimate or last inductor pole, with an opening at the upper end of the side wall from which a delivery channel extends to the side at an angle to the longitudinal direction of the trough.

2. In an electromagnetic conveyor trough as in claim 1, the further improvement wherein at the upper end of the body, a terminal wall extends obliquely across the longitudinal direction of the trough for deflecting the stream of metal conveyed up the trough towards the opening of the delivery channel.

3. In an electromagnetic conveyor trough as in claim 2, the further improvement wherein at a point which in the direction of flow precedes the opening into the delivery channel, a flow restricting orifice is disposed for limiting the depth of the stream of metal conveyed up

the trough.

4. In an electromagnetic conveyor trough as in claim 3, the further improvement wherein the mean dimension of the cross section of the flow restricting orifice in a direction normal to the effective component of the travelling electromagnetic field is not more than 80 percent and preferably not more than 75 percent of the mean width measured in the same direction of the cross section of the trough preceding the flow restricting orifice.

5. In an electromagnetic conveyor trough having a trough body ascending at an angle to the horizontal with a floor and side walls bounding liquid metal flow and a travelling field inductor located beneath and adjacent said floor for producing a travelling electromagnetic field which causes liquid metal to move up said body, the improvement wherein one of said side walls is provided with an opening and including means defining a delivery channel connected to said opening for receiving liquid metal from said body, via said opening.

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