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APPARATUS FOR THE TEEMING OF MOLTEN METALS

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FIG. 1

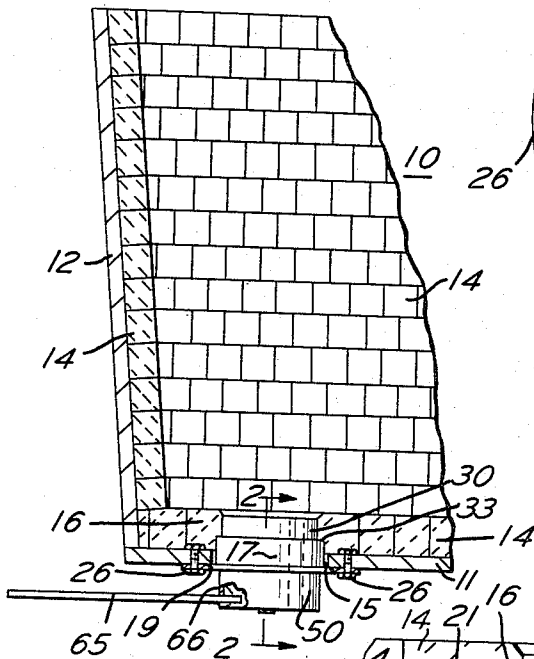


FIG. 4

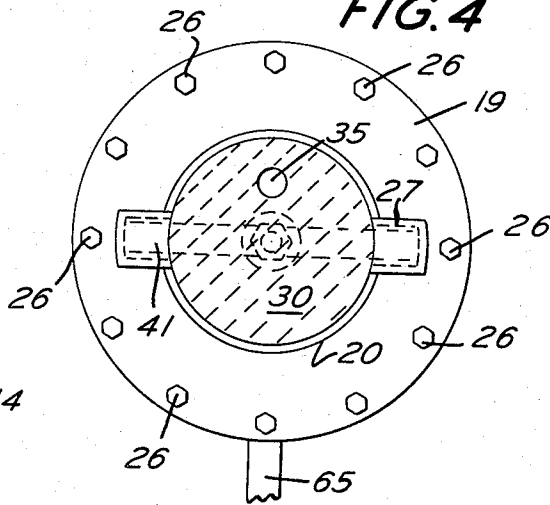


FIG. 2

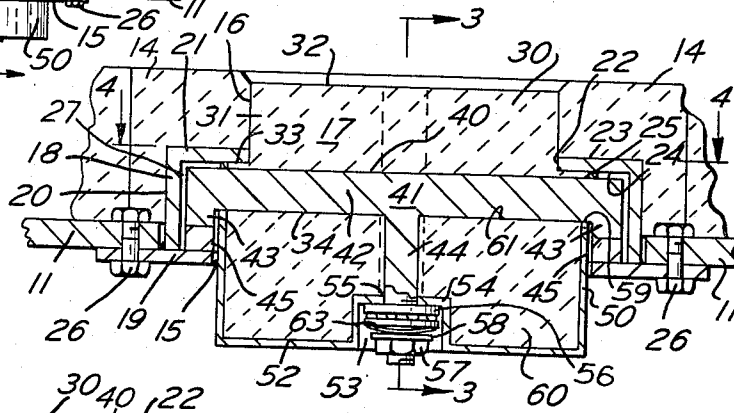
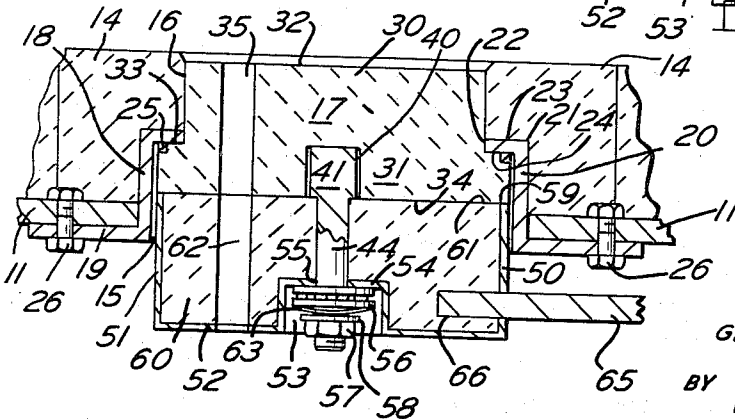


FIG. 3



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APPARATUS FOR THE TEEMING OF MOLTEN METALS

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ABSTRACT OF THE DISCLOSURE

Apparatus for the teeming of molten metals from a refractory lined ladle which is readily accessible from the exterior of the ladle for replacement or repair which can be manually or power operated as desired. The structure includes an outer housing removably carried on the bottom wall of a ladle tank within which an upper cap member is fixedly carried. The cap member has a discharge port which is controlled by a lower flow control member which is rotatably carried on a spindle secured in a supporting element which is carried in said cap and by the housing.

This invention relates to the teeming of molten metals. The practice in the metal working industry for some time has been to employ an internal stopper rod assembly for the teeming of molten metals from a refractory lined ladle into molds where the metal solidifies and may undergo further processing. The stopper rod assembly is clumsy and not well suited to its intended use. One form of suitable apparatus for the teeming of molten metals is shown in my prior U.S. Patent No. 3,165,795.

The apparatus of the present invention involves improvements over the structure of my prior patent in particular in that better accessibility is provided for replacement or repair of the components.

It is the principal object of the present invention to provide apparatus for the teeming of molten metal which is simple in construction and requires substantially fewer parts than structures presently used or heretofore proposed.

It is a further object of the present invention to provide apparatus for the teeming of molten metal which can be quickly and easily installed on ladles now in use.

It is a further object of the present invention to provide apparatus for the teeming of molten metal which can be installed from the outside of the refractory lined ladle and which can be used in other equipment for teeming operations if desired.

It is a further object of the present invention to provide apparatus for the teeming of molten metal which is expendable and which can be quickly and easily replaced if desired or required for a new heat.

It is a further object of the present invention to provide apparatus for the teeming of molten metal which can be manually or power operated as desired.

It is a further object of the present invention to provide apparatus for the teeming of molten metal which is not adversely affected at the temperatures and forces applied thereon in use.

Other objects and advantageous features of the invention will be apparent from the description and claims.

The nature and characteristic features of the invention will be more readily understood from the following description taken in connection with the accompanying drawings forming part thereof, in which:

FIGURE 1 is a fragmentary vertical sectional view of a ladle having one form of teeming apparatus in accordance with the present invention mounted thereon;

FIG. 2 is an enlarged vertical central sectional view of the teeming apparatus, taken on the line 2-2 of FIG. 1;

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FIG. 3 is a vertical sectional view taken approximately on the line 3-3 of FIG. 2; and

FIG. 4 is a horizontal sectional view taken approximately on the line 4-4 of FIG. 2.

It should, of course, be understood that the description and drawings herein are illustrative merely and that various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Referring now more particularly to FIGS. 1-3 a portion of a ladle tank 10 is illustrated having a horizontal bottom plate 11, vertical sides 12 and a ceramic refractory lining 14. The bottom plate 11 has a circular opening 15 therethrough and the refractory lining 14 inside of bottom plate 11 has a circular opening 16 therethrough axially aligned with the opening 15.

A preferred form of teeming apparatus 17 in accordance with the present invention is shown mounted within the opening 16 of the refractory lining 14 and the opening 15 of the bottom plate 11.

The teeming apparatus 17 includes an outer nozzle housing 18 which may be fabricated of metal and is composed of horizontal bottom attachment flange 19, vertical cylindrically shaped side 20, and horizontal top flange plate 21.

The top flange plate 21 has a circular opening 22 in the center thereof extending through the plate 21 and bounded by top and bottom faces 23 and 24. A vertical downwardly extended circumferential stop flange 25 is provided attached to the bottom face 24 of plate 21 set outside the opening 22 and extending therearound. The housing 18 is secured to the bottom plate 11 of the ladle 10 by a plurality of bolts 26 extending through flange 19 and plate 11.

The vertical side 20 of housing 18 is provided with a pair of integral, U-shaped diametrically opposed keyways 27 which extend vertically between the top plate 21 and bottom flange 19 and horizontally out beyond the normal curvature of the side 20.

Within the opening 22 in the top plate 21 a cap 30 is provided. The cap 30 is preferably composed of pressed or cast refractory material and includes a vertical central cylindrical body portion 31 with top face 32 of slightly dish shape and horizontal offset rim 33. The offset rim 33 extends under the plate 21 of outer housing 18, terminates short of the stop flange 25 and serves to restrain the cap 30 from vertical upward movement. The central body portion 31 extends down further below offset rim 33 and terminates at a flat bottom face 34. A hollow cylindrical discharge port 35 is provided in body portion 31 extending from the top face 32 to the bottom face 34 and offset from the vertical central axis of cap 30.

A slotted diametrical keyway 40 is provided in body portion 31 of cap 30 extending from face 34 vertically upwardly to beneath the rim 33 and terminating thereat.

A T-shaped bar 41 is shown engaged in the keyway 40 of cap 30 and in the keyways 27 of housing 18. The T-shaped bar 41 has a top horizontal cross bar 42 with a pair of peripheral downwardly extending legs 43 and a center spindle 44. The legs 43 of bar 41 are retained in the keyways 27 by keys 45 engaged by the legs 43, bottom flange 19 and effectively preventing rotational or vertical movement of bar 41.

A hollow cup shaped housing 50 is provided mounted on the spindle 44 and with its open end towards the top abutting the bottom face 34 of cap 30. The housing 50 is preferably composed of metal, and includes a vertical circumferential side wall 51 with top edge 59 and bottom plate 52. The bottom plate 52 has a recess 53 in the

center thereof which recess has a top bearing plate 54 therein with hole 55 in its center. The spindle 44 passes through hole 55 with nut 57 threadably engaged therewith, and can be provided with a thrust bearing 56, a flat washer 58 and spring washer 63 which spring is interposed between the thrust bearing 56 and the washer 58. Washer 63 provides a resilient sealing pressure at faces 34 and 61.

Within the housing 50, a core 60 is provided of pressed or cast refractory material. The core 60 completely fills the space within the housing 50 and is provided with a flat upper face 61 which terminates at the top edge 59 of the wall 51. A hollow cylindrical port 62 is provided, within side walls 51 of the same diameter as the port 35 of cap 30 and offset a similar distance from the vertical central axis of the housing 50. The port 62 extends from the top face 61 down through core 60 and through the bottom plate 52 of housing 50 thereby providing a channel or passageway through the core 60 and housing 50.

A horizontal operating lever 65 is provided engaged in a socket 66 which extends into core 60 and housing 50, the lever 65 extends outwardly so as to provide a handle for rotating the core 60 and housing 50 about the central spindle 44 of bar 41.

The mode of operation will now be pointed out.

The teeming apparatus 17 is placed in the openings 16 and 15 of the ladle tank 10. The bolts 26 are put in place in the flange 19 and plate 11 and tightened. The operating lever 65 is positioned so that discharge port 35 in cap 30 and discharge port 62 in housing 50 are not in vertical alignment. Molten metal is placed in ladle tank 10 and presses down on the face 32 of cap 30.

When it is desired to teem the molten metal into a mold (not shown) the mold is placed under the apparatus 17 and the lever 65 is moved about the spindle 44 until ports 62 and 35 are in alignment. The molten metal is then free to flow out of the ladle through ports 35 and 62 into the mold. When the mold is filled or when otherwise desired the lever 65 is moved to position the port 62 out of alignment with port 35 and cut off flow of metal through port 62. Should additional pressure on face 34 of cap 30 be desired the nut 57 can be tightened thereby forcing housing 50 upward. The nut 57 can be also loosened should less pressure be desired.

The teeming apparatus 17 can be readily removed for replacement by withdrawing the bolts 26 from the flange 19 and plate 11.

Should replacement of the cap 30 or housing 50 be desired the nut 57 can be removed and housing 50 withdrawn off spindle 44. The keys 45 can be removed from keyways 27 and the T-shaped bar 41 removed, at which time cap 30 can also be removed, so that worn parts or damaged parts can be removed and replaced without removing the outer housing 18 from the ladle tank 10 which is usually necessary with other teeming devices.

It will thus be seen that a suitable apparatus has been provided for effectively carrying out the objects of the invention.

I claim:

1. Teeming apparatus for use with the lower wall of a

ladle tank comprising:

a supporting housing detachably carried by said bottom wall,

an upper cap member fixedly mounted in said housing, and having a downwardly extending discharge port terminating at a lower horizontal face,

a supporting member fixedly engaged in said cap member and having a downwardly extending spindle, and a lower flow control member rotatably mounted on said spindle and having an upper horizontal face engaging said lower end face with a discharge port extending downwardly from said upper horizontal face normally in offset relation to said first mentioned port and movable into alignment therewith.

2. Teeming apparatus as defined in claim 1 in which said spindle is provided with a thrust bearing engaging said lower member.

3. Teeming apparatus as defined in claim 2 in which said spindle has a retaining member, and said spindle has a resilient member interposed between said retaining member and said thrust bearing.

4. Teeming apparatus as defined in claim 1 in which said cap member is formed of refractory material.

5. Teeming apparatus as defined in claim 1 in which said supporting member is a T-shaped bar.

6. Teeming apparatus as defined in claim 5 in which said T-shaped bar has a pair of downwardly extending legs engaged in said outer housing.

7. Teeming apparatus as defined in claim 1 in which the bottom wall of the tank has a refractory lining with a cylindrical opening therein,

said apparatus is insertable into said opening from below and detachably retained therein by bolts extending through said outer housing and said bottom wall of said tank.

8. Teeming apparatus as defined in claim 1 in which said lower member is cap shaped and includes an outer hollow enclosing portion filled with cast refractory material.

9. Teeming apparatus as defined in claim 1 in which said discharge port in said upper cap member is offset from the vertical central axis of said member.

10. Teeming apparatus as defined in claim 1 in which said cap member is provided with a horizontal rim engaging the outer housing and preventing vertical movement of said cap member.

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