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[54] **ROTARY STOPPER FOR MOLTEN METAL POURING**

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[51] **Int. Cl.** **B22d 37/00**

[58] **Field of Search** ..... 222/557, DIG. 18, 222/DIG. 1; 251/144, 177, 179

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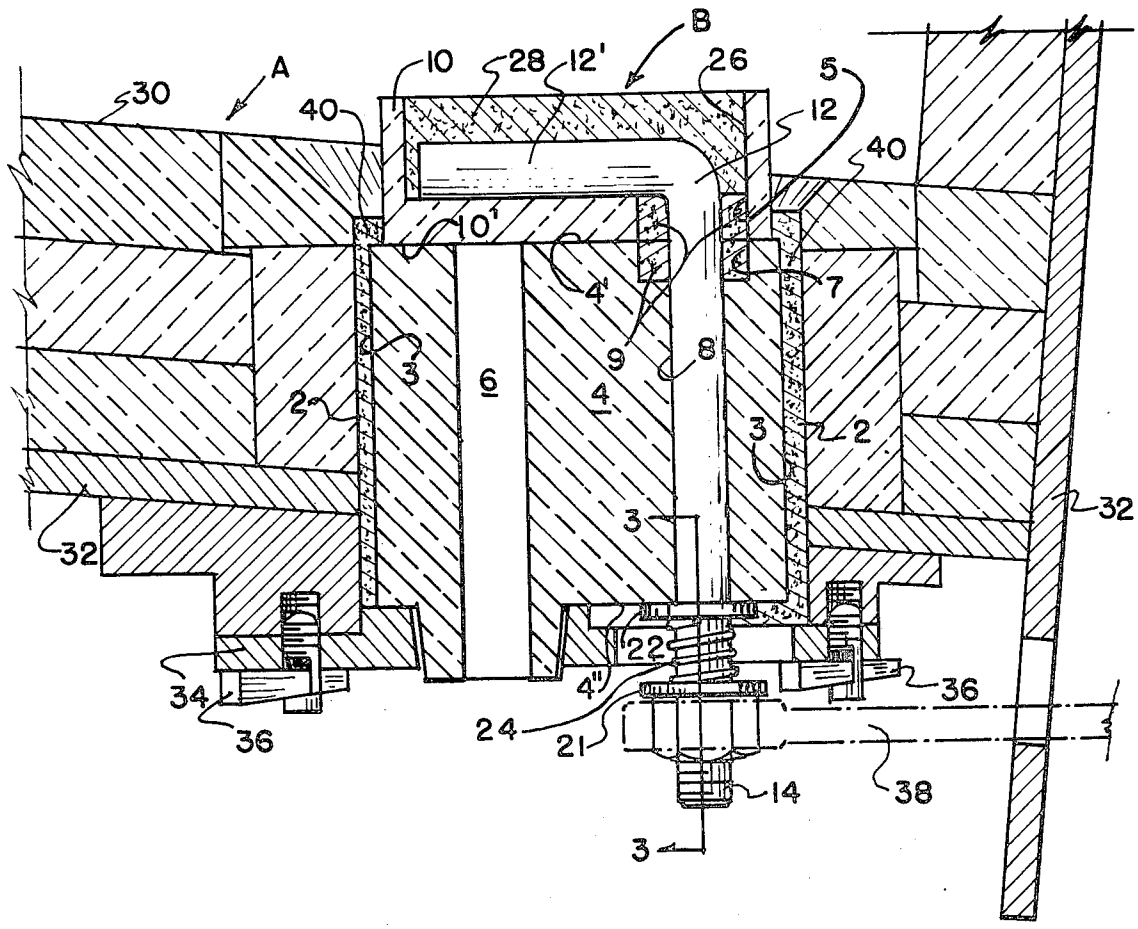
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[57] **ABSTRACT**

A valve for ladles carrying high temperature molten metals having a valve unit adapted to be fixed into an opening in the ladle, the valve unit being provided with a stationary block having its upper surface forming a valve seat, including a metal outlet opening therethrough from its upper to its lower surface and a valve member movable horizontally over the upper surface of the block to cover and uncover the metal outlet opening therein.

3 Claims, 3 Drawing Figures



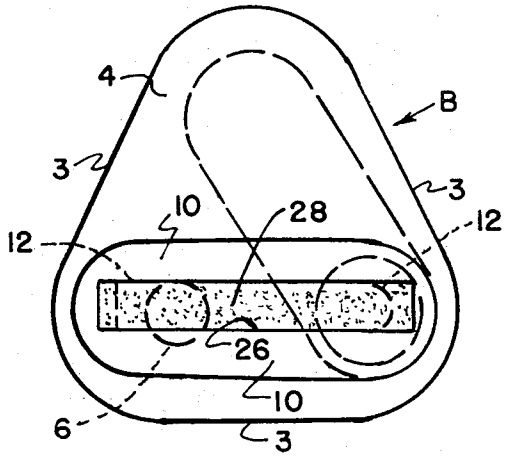


FIG. 2

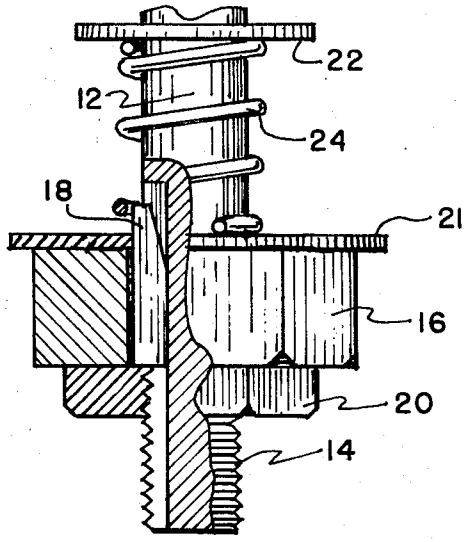


FIG.3

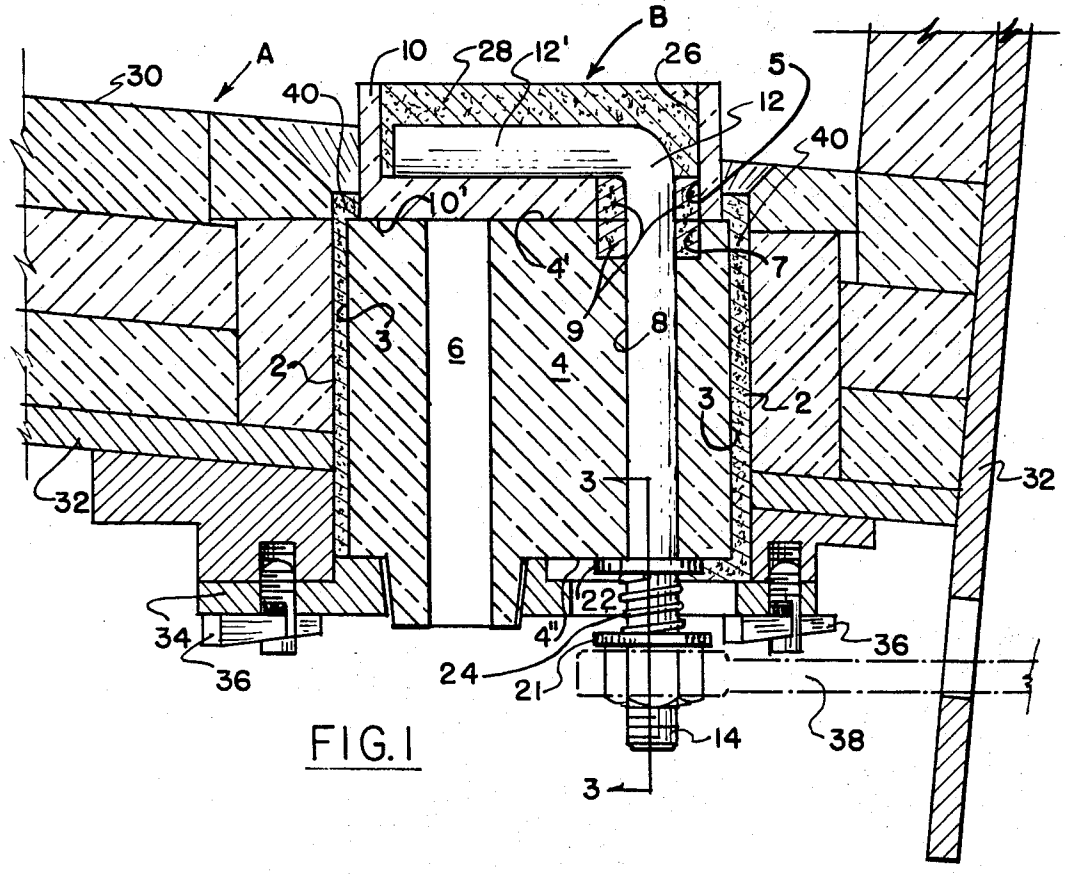


FIG. 1

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ROTARY STOPPER FOR MOLTEN METAL POURING

The present invention relates to a valve unit for liquids of high temperatures such as molten metals, etc., where ordinary material normally used in valve construction would immediately disintegrate under the high temperatures.

It is one object of the invention to provide a valve unit which can withstand extremely high temperatures without deterioration or failure.

Another object of the invention is to provide such a valve in which the vulnerable parts of the valve unit are prevented from coming in contact with the molten metals.

A further object of the invention is to provide an economical construction and one with a minimum amount of moving parts and easy to assemble.

While several objects of the invention have been pointed out, other objects, uses and advantages will become more apparent as the nature of the invention is more fully disclosed in the following description with reference to the accompanying drawings, in which:

FIG. 1 is a sectional view of the valve unit shown installed within an opening in the bottom of a ladle in which the ladle is fragmentarily shown.

FIG. 2 is a top plan view of the valve unit.

FIG. 3 is an enlarged fragmentary view partly in elevation and partly in section of the lower end of the means for operating the valve member, taken on line 3—3 of FIG. 1.

This type of valve unit is referred to in the trade as a stopper valve.

The construction of this stopper valve is relatively simple. The ladle A is normally made with an opening 2 in the bottom thereof into which the valve unit is accommodated. The side walls 3 of the valve unit B are shown as triangular in form, as best shown in FIG. 2, but may be of any suitable cross-sectional form. The valve unit comprises a block 4 having a seat 4'. The block 4 is provided with at least an outlet opening 6, through which the molten metal flows, and an opening 8 to accomodate the means for operating a valve member 10. The opening 8 is perpendicular to the upper surface 4' of the block 4. The valve member 10 is narrower than the valve seat or upper surface 4' of the block 4 and is adapted to move over the surface 4' to cover and uncover the opening 6, through which the metal flows.

Rotatably extending through the opening 8 is a shaft 12. The upper end of the shaft 12 is angled to one side as shown at 12'. The opposite end of the shaft 12 extends through the opening 8 and below the lower surface 4'' of the block 4. The lower end of the shaft 12 is preferably provided with a thread 14 on which a nut-like member 16 is fixed by a key 18 and a lock nut 20. Extending above the member 16 is a washer 21. Bearing against the lower surface 4'' of the block 4 is a washer 22. Extending between the washer member 21 and the washer 22 is a compression spring 24 for holding the shaft 12 and the valve member 10 downwardly in order to keep the valve member in contact with the upper surface 4' of the block 4. The angled portion 12' of the shaft is embedded in a recess 26 about which is packed a fire resistant material 28.

The valve unit block 4 and the valve member 10 are each preferably provided with an opening and/or well 5 and 7 respectively into which sand 9 is packed about

the shaft 12 to prevent the molten metal from seeping between the seat surface 4' of the block 4 and the under surface 10' of the valve member 10 and in contact with the shaft 12 and damaging the same. The valve unit is assembled by placing the portion 12' of the shaft 12 into the slot 26 of the valve member 10 and extending the shaft 12 through the opening 5 which is substantially larger in diameter than that of the shaft, after which the shaft is extended through the opening 8 in the block 4, the washer 22, the spring 24, and washer 21, after which the nut 16 is screwed upon the shaft and keyed by the key member 18 and the lock nut 20 as previously described. The valve unit is then placed in an upright position and the sand 9 is poured into the spaces 5 and 7 surrounding the shaft after which a fire resistant material, such as commercial "Red Devil" or its equivalent, is placed about the angled portion 12' of the shaft for protecting the shaft from the molten metals. The valve unit is then heated and dried in a suitable oven. The unit, after being sufficiently heated and dried, is coated with fire clay and inserted into the ladle from the bottom where it is retained in place by the support 34.

A very hot gas-fired heat should be put directly over the mechanism while waiting for the molten liquid to enter the ladle. This will eliminate any skull that might form around the shut off block. A waste ball and sand is placed in the pouring hole to prevent any leakage of steel until the valve is ready to be opened.

The valve unit B is fixed into the opening 2 in the bottom of the ladle A by the supporting means 34. The supporting member 34 engages the bottom of the block 4 and is secured to the ladle by conventional knock-out pins 36. When the block 4 is placed within the opening 2 it is sealed therein by fire clay 40, or other suitable material, to prevent leakage of the molten metals from the ladle.

Extendable over the member 16 is a detachable operating handle 38. This handle 38 is used to rotate the valve member 10 to open and close the opening 6. When in one position the valve member extends over the opening as shown in solid lines in FIG. 2. When the handle is in another position the valve member is moved to uncover the opening 6 as shown in dash lines in FIG. 2.

With this arrangement the rotatable valve member 10 may be swung over the valve seat of the block 4 by the operating means 38 to open and close the opening 6 through which the molten metal will flow. When the ladle is empty and cooled the valve is removed by removing the knockout pins 36 which releases the valve unit support 34 which allows the ladle to be lowered on to a device that will push or punch the old used valve unit into the ladle from which it may be easily removed and allow for the installation of a new valve unit.

It should be noted that after each heat of molten metal carried by the ladle, the valve unit is replaced.

While a particular form of the invention has been described in detail, it is not intended as a limitation as the scope of the invention is best defined in the appended claims.

I Claim:

1. A ladle valve unit for high temperature molten metals, comprising:

a. a fixed rigid block of fire resistant material having a flat upper surface and at least two openings ex-

tending through the block from its top to its bottom;

b. a slidable valve member positioned atop the solid rigid block of substantially uniform thickness having at least a flat bottom surface of substantially less width and thickness than the fixed rigid block;

c. a rotatable shaft extending through one of the said openings in the fixed rigid block and having means at its upper end for fixedly engaging the slidable valve member adjacent one end thereof for operating said valve member;

d. the opening in the rigid block, through which the shaft extends, being at right angles to the upper surface thereof;

e. the lower end of the shaft extending beyond the lower surface of the fixed block having means fixed thereto for engagement with an operating member for rotating the shaft for positioning the opposite end of the said valve member on the upper surface of the fixed rigid block for shifting the slidable valve assembly to open and close the other said second opening in the fixed block;

f. the area adjacent the upper surface of the fixed rigid block being provided with with a well for receiving a fire resistant material for sealing the shaft from the molten metals.

2. A valve unit for molten metals as claimed in claim **1** wherein the shaft opening in both the fixed rigid block and the slidable valve member adjacent their contacting surfaces are of substantially larger diameter than the diameter of the shaft and granulated fire resistant material surrounding the shaft and filling the remainder of said openings.

3. A ladle valve unit for molten metals as claimed in claim **1** wherein the inner end of the shaft is formed at an angle of approximately 90° to the shaft portion extending through the fixed rigid block for engaging the said slidable valve member.

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