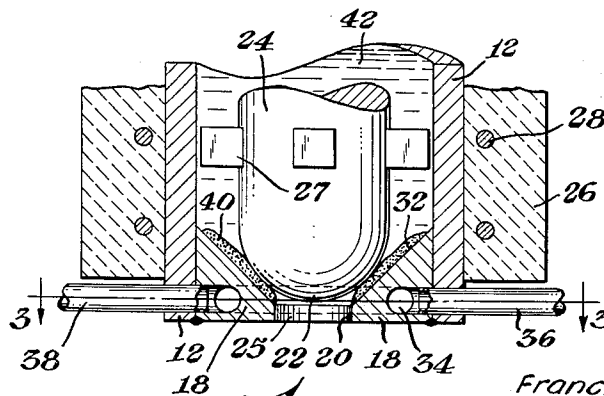
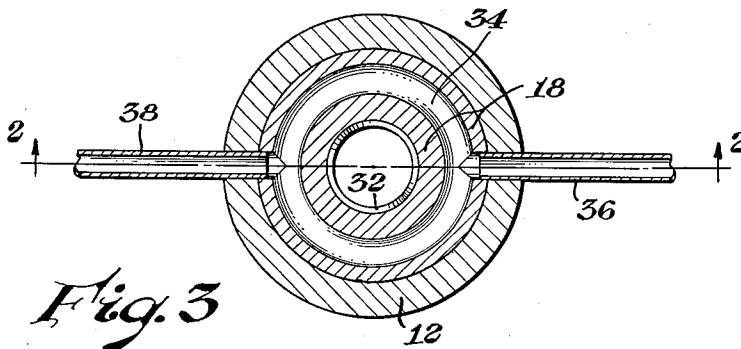
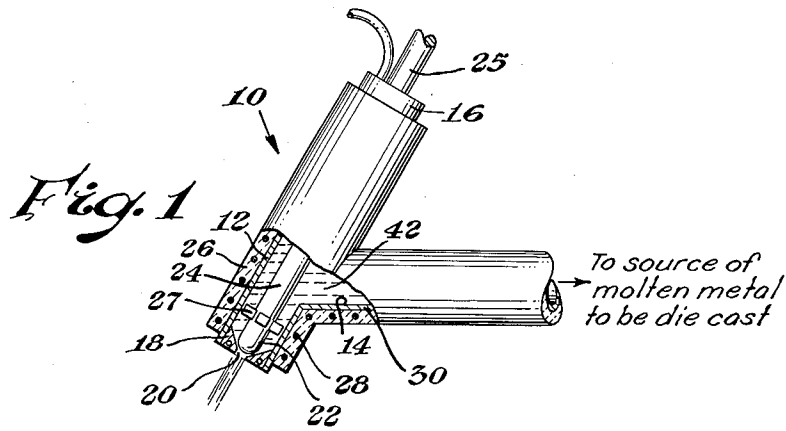


3,028,874

VALVE

Filed Nov. 2, 1959



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3,028,874
VALVE

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Filed Nov. 2, 1959, Ser. No. 850,214
7 Claims. (Cl. 137—340)

This invention relates to valves and particularly to valves for use in controlling the flow of molten metal.

The delivering of a measured quantity of molten metal to the shot well of a die casting machine has received considerable attention in the die casting art. One example of how to do this is disclosed and claimed in U.S. Patent No. 2,745,153, entitled "Apparatus for Dispersing Shots of Molten Metal," issued to F. L. Burkett.

While the valve for metering molten metal shown in the above mentioned patent is an excellent one, when the valve seat or the valve becomes worn or excessively misaligned some dripping or dribbling of molten metal, which is undesirable, can occur through the valve.

Accordingly, a principal object of this invention is to provide an improved valve for controlling the flow of molten metal therethrough.

Another object of this invention is to provide an improved, longer wearing valve for use in metering molten metal.

A further object of this invention is to provide an improved non-dripping valve for use in metering light metals.

In accordance with this invention there is provided a valve seat adapted to receive a plunger having a valve at one end thereof. Adhering to the valve seat and in sealing contact with the valve when it is in a closed position is a layer of semi-molten metal of generally mush-like consistency. Means are provided to maintain the valve seat at a predetermined temperature to keep the sealing layer in a semi-molten condition.

The invention, as well as additional objects and advantages thereof will best be understood when the following detailed description is read in connection with the accompanying drawing, in which:

FIG. 1 is a side elevational view, partly in section, of the valve assembly of the invention;

FIG. 2 is a fragmentary view, in section of the lower or valve end of FIG. 1, and

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2.

Referring to FIG. 1, there is shown a shot dispensing valve assembly 10 of a type used in connection with die casting apparatus. The valve assembly 10 comprises a cylindrical liner or wall part 12 having an entry port 14 for molten metal disposed between the ends of the liner. A packing gland assembly 16 is disposed at the upper end of the liner and a valve seat in the form of an annulus 18 having a central opening 20, is disposed at the lower end of the liner. A hemispherically shaped valve 22 is disposed at the lower end of a cylindrical valve stem 24 whose upper part 25 extends through the packing gland assembly 16 and is actuated by suitable drive means (not shown).

Near the lower end of and around the valve stem 24 are affixed spacer elements 27 which maintain the lower end of the valve stem substantially centrally disposed in the valve liner 12.

The valve assembly 10 includes a heating jacket 26 and electrical resistance heating elements 28. The feed tube 30 which communicates with the port 14 is also jacketed and contains heating elements.

As shown in FIGS. 2 and 3, as well as in FIG. 1, the valve seat 18 is welded or otherwise sealed to the liner 12 along its outer periphery. The upper side 32 of the

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annulus 18 is beveled and slopes downwardly and inwardly towards the central opening 20, the bevel giving the top side of the annulus the form of a conical recess.

An annular cooling channel 34 is disposed in the body of the annulus 18. The cooling channel 34 has an inlet tube 36 and an outlet tube 38 for feeding fluid coolant through and out of the channel 34. A source of fluid (not shown), such as water, for example, is coupled to the inlet tube. While the coolant is circulated, a layer 40 of semi-solid or spongy metal adheres to the beveled face of the annulus. The layer 40 usually is composed of a magnesium base or aluminum base alloy. It is the spongy layer 40 which actually becomes the valve seat in this invention on putting the apparatus into operation.

In operation sufficient coolant is circulated through the channel 34 to cause partial solidification of part of the metal 42, passing through or to be passed through the valve into the die casting apparatus from the source of molten metal to be die-cast, as a layer 40 of slush or semi-solid metal adhering to the upper side 32 of the annulus 19.

When the valve 22 is closed it seats against the spongy, semi-solid layer 40, sealing completely even though the valve 22 or the upper or seat side 32 of the annulus 18 may have surface irregularities and not mate together perfectly with the annulus.

The degree of cooling of the valve seat required to produce the semi-solid layer 40 varies with the type of molten metal which is to pass through the valve. For example, when working with an aluminum alloy having a casting temperature of about 1200 degrees F. a nominal composition of 9½ parts silicon, 4 parts copper, balance aluminum, (total equals 100 parts) the temperature of the surface 32 was kept within the range of 700 degrees to 1100 degrees F. and preferably within the range of 920 to 950 degrees F.

When an alloy composed nominally of 9 parts aluminum, 1 part zinc, balance magnesium (total equals 100 parts) having a casting temperature of about 1200 degrees F., the temperature at the surface 32 was held within a range of from 600 degrees to 1100 degrees F. and preferably between 820 degrees and 850 degrees F. Other alloys will, of course, require that the upper part 32 be held within other temperature ranges, yielding semi-solid metal or a slush, which may readily be determined by trial.

The valve and valve seat are preferably made of materials which are resistant to erosion and corrosion such as silicon carbide or metal borides or carbides, for example.

While the valve has been described with respect to aluminum and magnesium alloys as the metal to be cast, the valve may be also used with zinc.

I claim:

1. A valve assembly for metering molten light metal comprising an annular valve seat body including a frusto-conical shaped depression having a seating surface including a semi-molten layer of said light metal continuously disposed thereon and adhering thereto, a valve having a hemispherical seating end aligned with said depression and adapted to seat thereagainst, and means for maintaining said surface within a predetermined temperature range.

2. A valve assembly in accordance with claim 1, wherein said means for maintaining said surface within a predetermined temperature range includes a coolant flow channel disposed adjacent to said surface.

3. A valve assembly in accordance with claim 1, wherein means are provided for centering said valve with respect to said valve seat body.

4. A valve assembly in accordance with claim 1, where-

in said valve seat body has a bore extending axially there-through in alignment with said valve.

5. A valve assembly in accordance with claim 1, wherein said semi-molten metal is a magnesium base alloy.

6. A valve assembly in accordance with claim 1, wherein said semi-molten metal is an aluminum base alloy.

7. A valve assembly in accordance with claim 1, wherein said semi-molten metal is a zinc base alloy.

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