June 4, 1963

J. C. MANSHEL

3,091,824

METAL CASTING MEANS

Filed Feb. 28, 1961

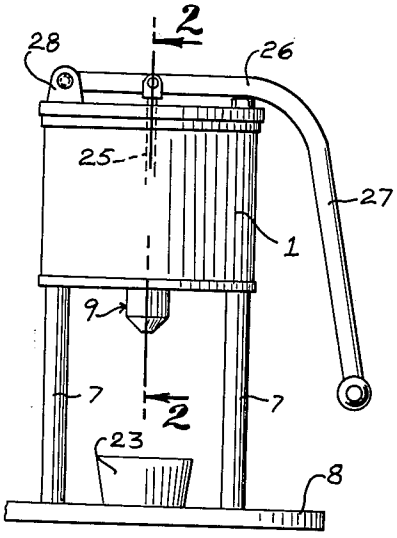


FIG. 1

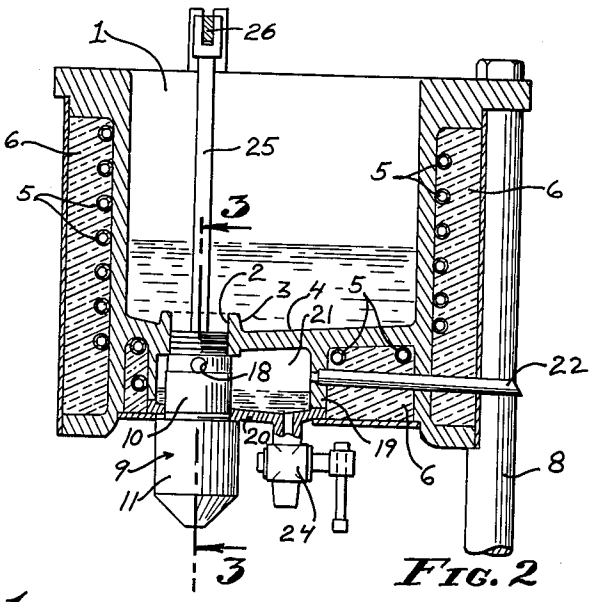


FIG. 2

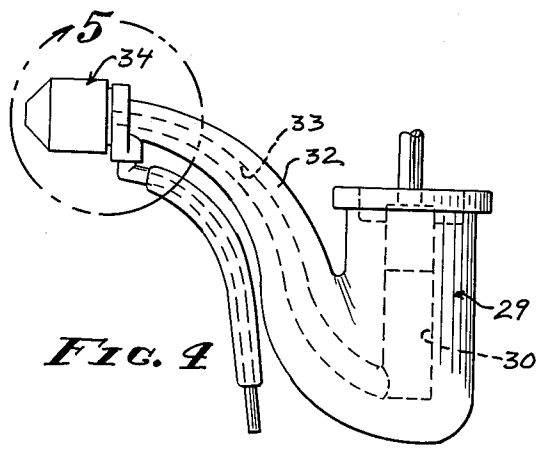


FIG. 4

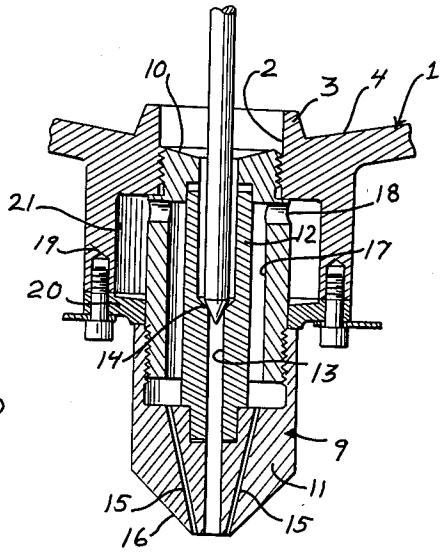


FIG. 3

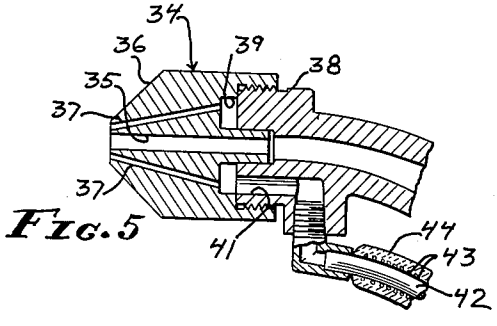


FIG. 5

INVENTOR.
JACK C. MANSHEL
BY
Lyon & Lyon
ATTORNEYS

United States Patent Office 3,091,824 Patented June 4, 1963

3,091,824

METAL CASTING MEANS

Jack C. Manshel, P.O. Box 186, Palmdale, Calif.

Filed Feb. 28, 1961, Ser. No. 92,239
1 Claim. (Cl. 22—85)

This invention relates to metal casting means, and included in the objects of this invention are:

First, to provide a metal casting means whereby metal in excess of that required for the mold is fed back through the casting nozzle, thereby to ensure removal of air and to produce a solid, void-free casting.

Second, to provide a metal casting means which though primarily designed for gravity casting of low melting metals and alloys is adapted to die casting operations wherein molten metal is discharged by operation of a piston and cylinder means.

Third, to provide a metal casting means which is particularly simple in construction and dependable in operation.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawings in which:

FIGURE 1 is a side view of the metal casting means;

FIGURE 2 is an enlarged, fragmentary, sectional view through 2—2 of FIGURE 1;

FIGURE 3 is a further enlarged, fragmentary sectional view through 3—3 of FIGURE 2;

FIGURE 4 is a side view showing a portion of a modified form of metal casting means;

FIGURE 5 is an enlarged, fragmentary, sectional view within circle 5 of FIGURE 4.

Reference is first directed to FIGURES 1, 2, and 3. The metal casting means shown in these figures includes a metal casting crucible or container for molten metal 1 open at its upper side, and provided with an outlet 2 at its bottom end surrounded by a low rim 3 to provide around the rim a dross sump 4. The sides and available portions of the bottom of the crucible are provided externally with heating elements 5 covered by insulation 6. The crucible is supported from one side by a pair of posts 7 which extend upwardly from a base 8.

Fitted in the outlet 2 is a nozzle structure 9. The nozzle structure includes a cylindrical body 10 screw-threaded to the outlet 2. Screw-threaded onto the lower end of the body 10 is a nozzle tip 11. The major portion of the body 10 is counterbored and receives a sleeve 12 which extends between the upper end of the nozzle body and into the nozzle tip 11. The sleeve 12 and nozzle tip 11 are provided with a central bore 13, the upper portion of which is counterbored so as to form midway in the sleeve a valve seat 14.

The lower end of the bore 13 intersects the lower end of the nozzle tip 11. Also intersecting the lower end of the nozzle tip 11, adjacent to but spaced from the central bore 13, are upwardly diverging vent passages 15, preferably of relatively small diameter. Radially outward from the bore 13 and vent passages 15 the lower extremities of the nozzle tip 11 are beveled as indicated by 16. The beveled end of the nozzle tip is adapted to fit into and mate with a sprue opening in a conventional mold, not shown.

The upper ends of the vent passages 15 communicate with a vent chamber 17 formed between the nozzle tip 11 and body 10 as well as between the body 10 and the sleeve 12. The vent chamber 17 extends upwardly to a point immediately under the bottom wall of the crucible 1 and is there intersected by overflow ports 18.

The bottom wall of the crucible 1 is provided with a depending skirt 19 which surrounds the body 10 and is closed at its underside by a cover 20 through which the

body extends. The nozzle tip 11 is screw-threadedly connected to the body 10 so as to bear against and form a sealing connection with the cover 20. The skirt 19 and cover 20 form an overflow collector chamber 21 surrounding the body 10.

At a level below the overflow portions 18, the overflow collector chamber 21 communicates with an overflow duct 22 which extends to one side, clear of the crucible. An overflow-receiving vessel 23 may be placed on the base 8 below the discharge end of the overflow duct 22. The overflow collector chamber 21 is also provided with a drain valve 24. The overflow collector chamber 21 is surrounded by heating elements 5 and by insulation 6 so that the contents of the overflow collector chamber may be maintained in a molten state.

A valve rod 25 extends downwardly into the sleeve 12 and engages the valve seat 14. The upper end of the valve rod projects above the crucible and is attached to a hand lever 26 which extends diametrically across the crucible and terminates in a handle 27 located at one side and preferably below the crucible, as shown in FIGURE 1. The opposite end of the hand lever is pivotally connected to a bracket 28 extending upwardly from the margin of the crucible.

Operation of the metal casting means shown in FIGURES 1 through 3 is as follows:

The metal to be cast is placed in the crucible 1 and heated by the heating elements 5 to a molten state. During this time the valve rod 25 closes the valve seat 14. When it is desired to cast an object, a conventional mold is placed under the nozzle tip 11 with its sprue opening in sealing engagement with the beveled portion 16 thereof.

The valve rod 25 is then lifted, permitting the molten metal to flow downwardly into the mold. Simultaneously, air entrapped in the mold is permitted to escape through the vent port passages 15. To ensure a solid casting the metal may be allowed to flow until excess metal flows upwardly through the vent passages 15. If the amount of excess metal is greater than the volume of the vent chamber 17, the excess metal flows into the collector chamber 21.

The excess metal accumulates in the collector chamber 21 until the metal is observed to be flowing from the duct 22, whereupon the collector chamber may be drained through the drain valve 24. When the mold is removed from the nozzle tip 11, any molten metal in the bore 13 below the valve seat 14, as well as in the vent passages 15 and vent chamber 17, empties therefrom. In most cases the open funnellike end of the conventional sprue passage in the mold is sufficient to accommodate the excess metal.

The structure shown in FIGURES 1, 2, and 3 is intended primarily for experimental or amateur use as distinguished from professional or commercial use, and the metals cast are lead and low-melting alloys thereof, although the crucible 1 may be utilized for aluminum, copper, and their alloys. One widespread use of a casting means of this general type is the casting of bullets by hobbyists who prepare their own ammunition.

The invention, however, is adapted to commercial operation such as die-casting machines, particularly those utilized for the casting of low-melting alloys of lead, zinc, aluminum, or copper, and in this regard reference is directed to FIGURES 4 and 5. FIGURE 4 illustrates a cylinder body 29 which is commonly mounted within a crucible or melting pot of a die-casting machine. The cylinder body 29 is provided with a bore 30 and receives a plunger 31. The lower end of the cylinder body 29 is connected to an upwardly arched neck 32 having a passageway 33 communicating with the lower end of

the bore 30. The upper end of the neck 32 clears the crucible or melting pot. The structure thus described is conventional.

In the exercise of the present invention, the extremity of the neck 32 is provided with a nozzle tip 34 similar to the nozzle tip 11. The nozzle tip 34 may be screw-threaded to the neck 32 and is provided with a discharge bore 35 communicating with the passageway 33. The extremity of the nozzle tip 34 is beveled, as indicated by 36, so as to fit a sprue opening of a mold, not shown. The extremity of the nozzle tip is intersected by rearwardly diverging vent passages 37 surrounding the discharge bore 35. The rearward end of the nozzle tip 34 is provided with a stem 38 which sealingly fits the confronting end of the passageway 33. Surrounding the stem and communicating with the vent passages 8 is an annular vent chamber 39.

The neck 32 is provided with a return port 41 communicating with the lower side of the vent chamber 39. The return port 41 is connected with a return line or tube 42 which leads back into the crucible or melting pot. The return line or tube 42 is surrounded by a heater element 43 and insulation 44 so that the returning metal is maintained in a fluid condition.

Operation of the construction shown in FIGURES 4 and 5 is essentially the same as that shown in FIGURES 1, 2, and 3; that is, the nozzle tip 34 is placed in sealing engagement with the mouth of the sprue opening in the mold. The plunger 31 is operated to discharge molten metal through the nozzle tip into the mold cavity. Initially, air vents backward through the passages 37 and then, as the mold is filled, excess molten metal returns through the vent passages 37 and return line 32. The stroke of the plunger 31 may be arranged to ensure a predetermined excess of molten metal.

While particular embodiments of this invention have been shown and described, it is not intended to limit the same to the exact details of the constructions set forth, and it embraces such changes, modifications, and equivalents of the parts and their formation and arrangement as come within the purview of the appended claim.

What is claimed is:

A metal casting machine, comprising:

a. a crucible for molten metal defining a main chamber for molten metal and a collector chamber disposed below the main chamber;

b. a nozzle structure extending downwardly from said main chamber through and sealed from said collector chamber and terminating in a nozzle tip adapted for connection to a mold to receive the metal to be cast;

c. said nozzle structure defining a molten metal discharge bore leading downwardly from the bottom of said main chamber to said nozzle tip, and vent passages leading upwardly from said nozzle tip to the upper side of said collector chamber, whereby molten metal, in excess of the combined volume of the metal to be cast and said vent passages, spills from said vent passages into said collector chamber;

d. and valve means for controlling flow through said molten metal discharge bore.

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