United States Patent

[11] **3,586,095**

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[54] **DIECASTING APPARATUS**
5 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **164/316,** 164/410
[51] **Int. Cl.** **B22d 17/04**
[50] **Field of Search** 164/312, 314, 316, 318; 92/165, 171; 417/490; 222/385; 18/DIG. 62

[56] **References Cited**
UNITED STATES PATENTS

2,390,263	12/1945	Mills	164/316
3,209,418	10/1965	Smith	164/318
3,319,702	5/1967	Hartwig	164/316
3,467,171	9/1969	Fulgenzi	164/316

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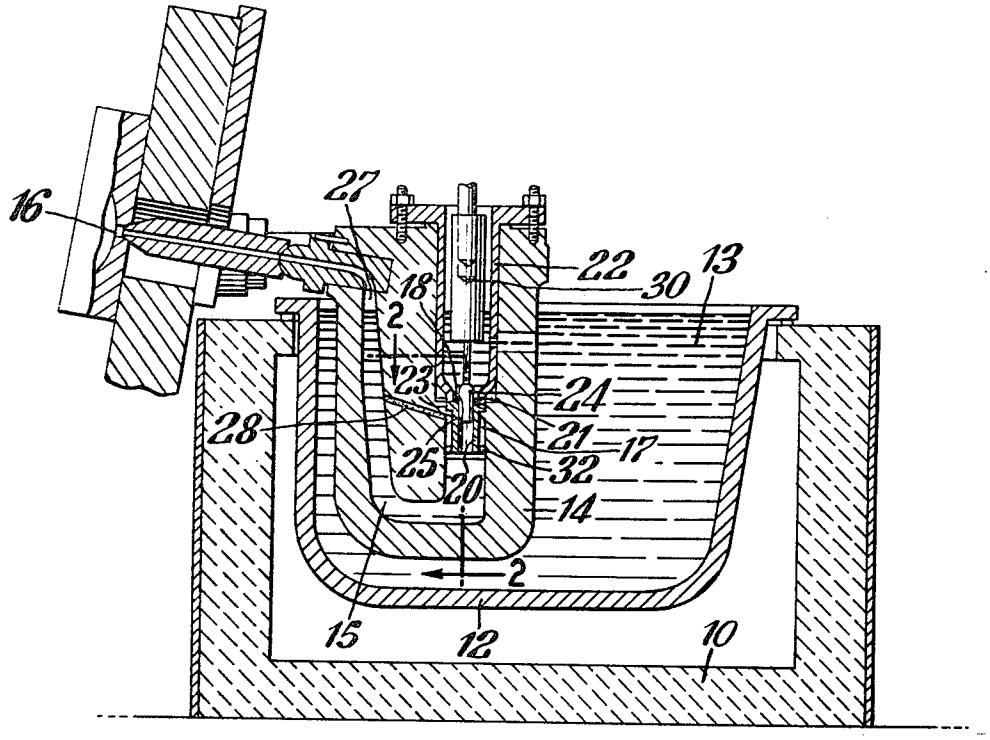
ABSTRACT: The subject invention relates to a novel shot cylinder-gooseneck assembly for diecasting pump wherein a vent passage is formed in the gooseneck wall so as to communicate between the discharge passage of the pump and the space between the shot cylinder and gooseneck wall in which the shot cylinder is mounted. A further improvement consists in the addition of a gasket at the base of the above-mentioned space for sealing off the lower end thereof from the gooseneck passage.



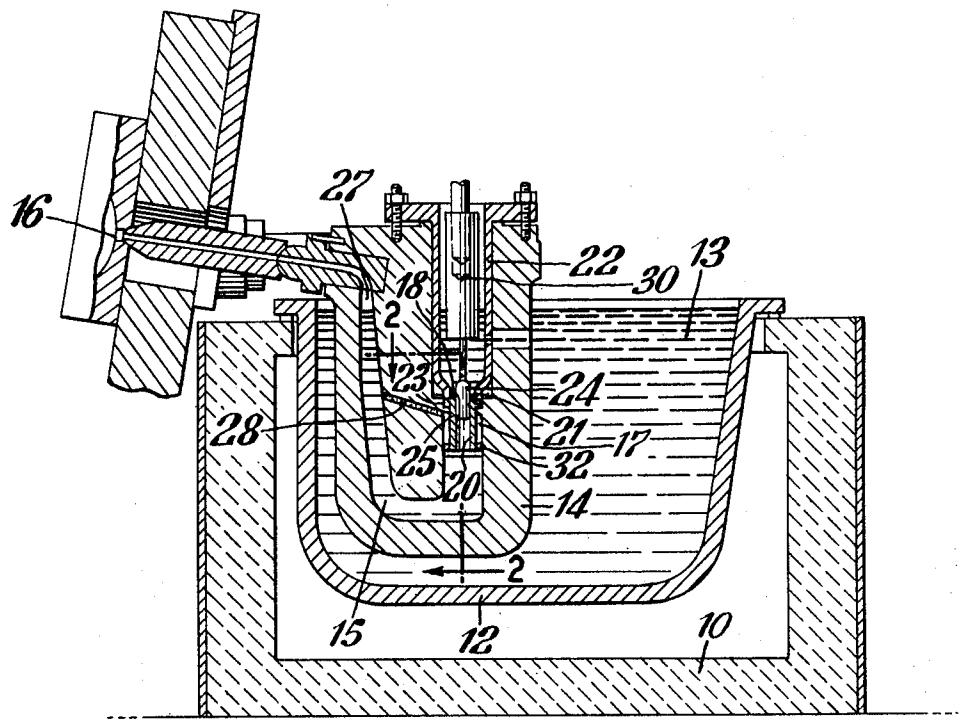


Fig. 1.

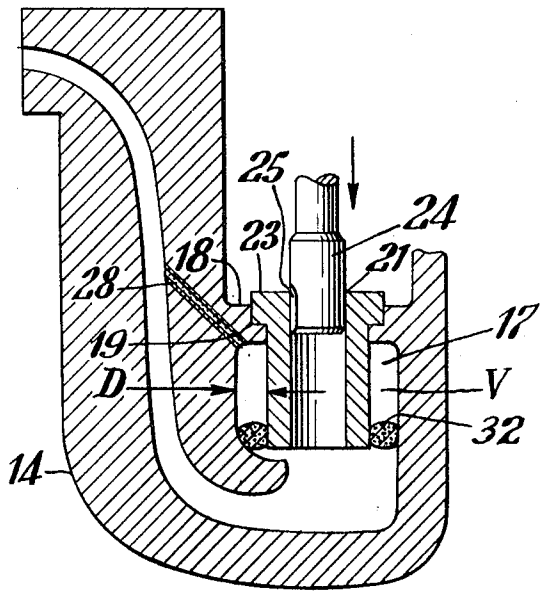


Fig. 2.

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DIECASTING APPARATUS

This invention relates to hot chamber diecasting of molten metals and particularly to an improved novel shot cylinder-gooseneck assembly for a hot chamber molten metal diecasting pump.

The apparatus of the invention is particularly well suited for use in the diecasting of high melting point metals such as aluminum and magnesium. While the diecasting of low melting point metals such as lead, tin and zinc has been in commercial use for many years, it is only recently, since the advent of the hot chamber diecasting system, that the diecasting of the higher melting point metals has become commercially practical. The present invention is directed to a major improvement in this area of use in that it enables the pump service life to be greatly extended over prior art hot chamber diecasting systems, as exemplified for example in U. S. Pat. No. 3,319,702.

In applicant's copending application, Ser. No. 582,848, now U. S. Pat. No. 3,469,621 a diecasting apparatus suitable for use with high melting point metals is described. Briefly, the apparatus described therein includes a piston actuated apparatus having a shot cylinder-gooseneck assembly for diecasting molten metal into a die cavity. The assembly comprises a substantially U-shaped gooseneck having a continuous passage therethrough. The passage has an inlet end and a discharge end, the discharge end being adapted to be connected in communication with the die cavity. The inlet end has a protrusion extending from the inner surface thereof so as to engage a hollow shot cylinder. The hollow shot cylinder extends from the protrusion into the opening in the gooseneck so as to define a void space therebetween. The void space preferably has a radial dimension of 0.05-inch minimum. The purpose of the void space is to permit molten metal to enter the same so as to transmit the forces resulting from each pressurized shot of metal discharged through the shot cylinder to the outer wall surface thereof. This practice has been found to result in a substantial decrease in shot cylinder breakage. It should be noted that many shot cylinders are formed of materials such as titanium diboride which are very resistant to high-temperature corrosion. A difficulty with this material, however, is that it is extremely brittle and hence tends to break in service under normal operating conditions wherein sudden high-pressure surges of hot metal are inherent in the diecasting process. Often, these surges are of such magnitude as to exceed the strength of the shot cylinder. By forming a space for the metal to enter adjacent the outside wall surface of the shot cylinder, however, a substantial portion of the pressure surges can be made to act upon both the inner and outer surfaces simultaneously thus tending to equalize same.

While the use of a gooseneck-shot cylinder assembly employing a void space as above mentioned is a definite improvement from a service life standpoint, it is still not entirely satisfactory. It has been found that although the shot cylinder will no longer break easily in service, the incidence of gooseneck failure due to erosion at a point adjacent the protrusion is increased.

It is believed that the erosion of the gooseneck areas adjacent the shot cylinder can be reduced by sizing the shot cylinder and gooseneck so that the space therebetween is very small, e.g., that space which would be inherent in a machinist's free-fit. When this space is decreased, however, so as to be less than about 0.05-inch radial, the rate of shot cylinder failure due to breaking from pressure surges tends to increase markedly.

It is accordingly an object of the invention to provide a shot cylinder-gooseneck assembly affording greatly increased service life as compared with prior art assemblies.

Another object is to provide a shot cylinder-gooseneck assembly wherein the shot cylinder is substantially unaffected by pressure surges of metal and wherein the gooseneck will not be prone to failure by erosion.

Yet another object is to provide a shot cylinder-gooseneck assembly having a space formed between the gooseneck wall and the shot cylinder wall but wherein the width of the space is not critical.

In the drawing:

FIG. 1 is an elevational sectional view of a conventional diecasting apparatus embodying the present invention;

FIG. 2 is an enlarged sectional view of the shot cylinder-gooseneck assembly shown in FIG. 1.

In accordance with applicant's invention, in a shot cylinder-gooseneck assembly for a diecasting pump, a vent passage is formed in the gooseneck wall in which the shot cylinder is mounted so as to communicate between the space formed therebetween and the discharge passage of the gooseneck. The vent passage extends through the gooseneck wall with its lower end terminating adjacent the space between the shot cylinder and gooseneck wall and with its upper end located above the highest point in such space. Preferably, the lower end of the space is at least partially sealed off by a gasket. The function of the gasket will be explained further hereinafter.

Referring now to the drawing, and particularly to FIG. 1, a conventional piston actuated apparatus of the hot chamber type for diecasting a molten metal into a die cavity is shown. Essentially, the apparatus consists of a holding furnace **10** which supports and maintains a melting basin or pot **12** which contains the molten metal **13** to be die-cast. A substantially U-shaped gooseneck **14** having a continuous passage **15** extending therethrough is suspended within the pot **12**. The gooseneck passage **15** has an inlet end **17** and a discharge end **27**. The discharge end **27** of the gooseneck is adapted to be connected in communication with a die cavity **16**. The die cavity is conventional in design and thus is not shown or described in detail. The inner wall of the gooseneck **14** is provided with a circumferential protrusion **18** adjacent the inner end **17** thereof, the same being notched at **19** so as to be adapted to receive and hold a hollow shot cylinder **20** which engages the protrusion via flange **23**. In mounted position as shown in the drawing, the shot cylinder **20** thus extends from the protrusion **18** into the opening in the gooseneck so as to define a space V therebetween. A pump assembly **30** is positioned inside the gooseneck **14** and on top of the shot cylinder **20**. The pump assembly comprises a housing **22** and a piston **24** adapted to move within the bore **21** of shot cylinder **20**. The means for actuating the piston are well known in the art and will not be described. The bore **21** is further provided with a fill port **25** for allowing molten metal to fill the shot cylinder-gooseneck assembly without requiring the piston to be completely withdrawn from the shot cylinder.

In accordance with the invention, vent passage means **28** is provided in communication between the space V and the discharge end **27** of the gooseneck passage **15**. The vent passage means preferably extends from a position in the space V which is closely adjacent the underside of the protrusion **18** to a position in the passage **15** which is located above the highest point in space V. In this manner, entrapped gases which may accumulate in the space V during each stroke of the piston **24** are quickly vented therefrom. This results in a substantial lessening of erosion at the shot cylinder-gooseneck interface. It has also been found that by providing the vent means **28**, that the width of space V can be reduced to that which would be inherent in a normal machinist's "free-fit," and still maintain acceptable shot cylinder service life. It is preferable, however, that the space V be formed so as to be a minimum of 0.05-inch radial as shown in FIG. **2** as distance D. The vent means **28** may be formed in the gooseneck wall as a drilled hole, a cast port or a lined hole. Preferably, the same comprises a cast in place hollow graphite tube. Each has been used successfully in carrying out the invention. In practice of the invention under commercial production conditions a vent passage having a ⅜-inch diameter has been found well suited. The use of the vent passage means **28** has enabled a molten aluminum diecasting pump to operate without failure to a level of about 50,000 cycles, which is considered by many skilled in the art to be the minimum required to consider the process commercially practical.

Another improvement embodied in the present invention consists in the addition of a gasket 32 disposed between the gooseneck and the shot cylinder at the lower portion of space V, for at least partially sealing off the lower end of space V from the continuous passage 15. The gasket is preferably formed of expanded graphite material such as Grafoil (a registered trademark of Union Carbide Corp.) in order to withstand the high-temperature corrosive conditions normally encountered in service. The purpose of gasket 32 is to stop or at least retard molten metal from flowing upwardly from its point of discharge from the shot cylinder into the space V. Instead, the desired transmission of pressure to the outer wall of the shot cylinder as previously discussed is accomplished via the vent passage means 28. In this manner the space V can be made to act as a holding zone for molten metal and pressure transmission can be accomplished as in a hydraulic system with little or no molten metal flow in the space V. This embodiment has been found to still further lessen the erosion condition heretofore described. As a result of the use of this embodiment in combination with the vent passage means 28, it is believed possible to extend the service life of the apparatus to about 100,000 cycles or more.

While the invention has been described in connection with the specific system shown in the drawing it should be understood that many changes can be made to the system without departing from the spirit and scope of the invention as defined by the following claims.

What I claim is:

1. In a shot cylinder-gooseneck assembly for use in a piston

actuated apparatus for diecasting a molten metal into a die cavity and comprising:

a. a substantially U-shaped gooseneck having a continuous gooseneck passage therethrough, said gooseneck passage having an inlet end and a discharge end, said discharge end being adapted to be connected in communication with the die cavity, said inlet end having a protrusion extending from the inner surface thereof;

b. a hollow shot cylinder engaging said protrusion and extending therefrom into the opening in the gooseneck so as to define a space therebetween,

the improvement comprising vent passage means communicating between the space and the discharge end of said gooseneck passage for venting entrapped gases accumulated in said space.

2. The improvement in a shot cylinder-gooseneck assembly as claimed in claim 1 wherein said vent passage means extends from a position in said space closely adjacent the underside of said protrusion to a position in said gooseneck passage located above the highest point in said space.

3. The improvement claimed in claim 2 further including a gasket disposed between the gooseneck and the shot cylinder for at least partially sealing off the lower end of the space from the gooseneck passage.

4. The improvement claimed in claim 3 wherein said gasket is formed of expanded graphite material.

5. The improvement claimed in claim 1 wherein the vent passage means comprises a cast in place hollow graphite tube.