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(54) **Gas-fired nozzle for zinc die casting apparatus.**

(57) A nozzle (10) for use in zinc casting operations wherein it is necessary to heat the nozzle with a gasfired torch (20) to prevent the zinc from freezing in the nozzle. Heat from the local area heated by the nozzle is conducted away from such area to be distributed through the balance of the nozzle body by means of a copper filled channel in the exterior surface of the nozzle body. In one embodiment the channel includes a wide band portion which extends around the nozzle body and includes the locally heated area and which feeds into a thinner helical groove. An insulative sleeve (46) covers the nozzle but has an opening for a torch flame. In another embodiment the groove is more uniform over the nozzle body and further is covered by an insulated stainless steel jacket (17).

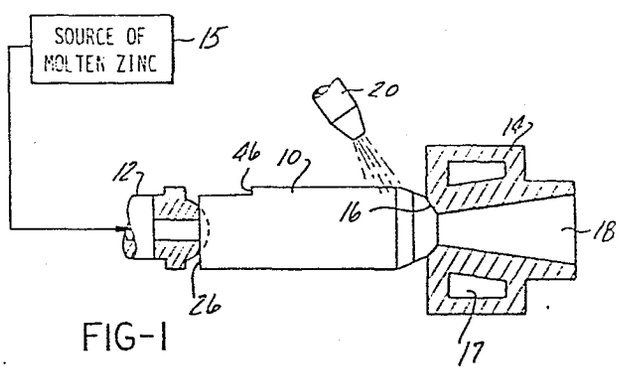

FIG-1

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CASTING NOZZLE

Introduction

This invention relates to apparatus for casting molten metals and particularly to a nozzle type conduit which is used to transfer the molten metal from a source to a mold.

Background of the Invention

Casting operations, particularly those involving molten zinc and molten zinc alloys, are often carried out using a transfer conduit, commonly called "nozzle", which is trapped in a mechanical combination between a gooseneck spout and a mold or mold bushing. The nozzle is heated to prevent freezing of the molten zinc in the interior bore thereof, such heating typically being accomplished by a gas-fired torch which is trained upon a localized area of the nozzle. In order to maintain the body of the nozzle, typically made of steel, at a sufficiently high temperature to prevent freezing, the temperature of the locally heated area is necessarily very high. Several problems can result from this localized heating; one is the increased possibility of developing a hole from the through-bore to the exterior of the nozzle body due to rapid erosion of the nozzle body along grain boundaries. Since the molten zinc on the interior is under pressure, a potentially dangerous situation is produced by such holes and the high-pressure stream of molten metal which can emanate therefrom. Another problem is the mechanical distortion of the nozzle body which can result due to the localized high heating and the compression forces that the nozzle must withstand when placed in the aforementioned combination with the spout and mold or mold bushing.

Brief Summary of the Invention

In summary the present invention provides an improved casting nozzle adapted to be torch-heated but designed to provide an even heat distribution throughout

the nozzle body thereby to increase nozzle life and eliminate the problems associated with high-temperature localized heating of prior art devices. In general this is accomplished by providing a channel of high conductivity material in the nozzle body, such channel extending through the locally heated area and extending out to other parts of the nozzle body to rapidly and efficiently transfer heat away from the locally heated area and into the bulk of the nozzle body over substantially its entire length.

Brief Description of the Drawing

Figure 1 is a sideview, partly in section, of a zinc die-casting apparatus having a first form of the nozzle located between a gooseneck and a die bushing;

Figure 2 is a longitudinal section through the nozzle of Figure 1;

Figure 3 is a prespective view of the nozzle of Figure 1 with the jacket and insulation removed;

Figure 4 is a prespective view of a second embodiment of the invention; and

Figure 5 is a sideview, in section, of the nozzle embodiment of Figure 4.

Detailed Description of the Illustrative Embodiments

Referring to the drawing, a nozzle 10 is illustrated in Figure 1 connected between gooseneck 12 and die bushing 14. The gooseneck and the die bushing are conventional components of zinc die casting apparatus. The gooseneck is adapted to receive molten zinc from a source 15. The bushing 14 has a cooling water jacket 17 and a semi-spherical socket 16 for receiving the forward end of the nozzle for passing molten zinc into die opening 18, in the manner well known to those skilled in the art. Conventional gas-fired torch means 20 provide a flame located adjacent the forward end of the nozzle.

Referring to Figure 2, the nozzle 10 has an elongated steel body 22 having a longitudinal opening 24 for passing molten zinc from the rearward end 26 to the

forward end 28. The rearward end has a semi-spherical socket 30 for mating with the gooseneck. It is to be understood that other forms of conventional nozzles have a ball-shaped rearward end for engaging a complementary structure on a gooseneck.

Forward end 28 has an insert 32 forming the nose of the nozzle. The insert is made of a material harder than the body of the nozzle to provide a long wearing engagement with socket 16 of the die bushing. The insert 32 may be considered optional.

Copper ring 33 is welded in groove 33A adjacent the body nose. Nozzle body 22 has a helical groove 34 extending from ring 33, around the body, and toward the rear end of the body. The size and spacing between turns of the groove depends upon the length and diameter of the nozzle as well as the amount of zinc passing through longitudinal opening 24.

A core of copper 40 is welded or brazed into the groove 34. Copper is preferred because it has a greater heat conductivity than the steel body to form a heat-conducting path or channel so that the temperature of the nozzle along its length is relatively uniform.

Referring to Figure 2, a stainless steel jacket 42 is mounted over the outer, cylindrical surface of the nozzle, and an insulating sleeve 44 is disposed between jacket 42 and the surface of body 22. Jacket 42 and sleeve 44 are cut out at 47 to expose the steel body to the heat of torch 20. The after end of sleeve 44 terminates at 46. The jacket 42 and sleeve 44 are optional elements; i.e., the device 10 may be used effectively without them.

Referring now to Figure 4 and 5 of the drawing, a second embodiment of the invention is shown to comprise a nozzle 50 comprising a steel body 52 having a spherical end adapted to fit into a mold bushing such as that shown at 14 in Figure 1. Although not shown, the other end of nozzle 50 is configured, either concave or convex, to receive a source of molten metal under pressure. A longitudinal and axially centered bore 54 provides the passage for molten zinc and

extends from one end of the body 52 to the other. The body 52 is optionally covered or jacketed with a cylindrical sleeve 56 of insulative material such as ceramic fiber. The fit is a relatively loose one around the nozzle body 52 and the jacket or sleeve 56 projects slightly forward of the taper and the body 52 to come as close to abutting the exterior surface of the bushing 14 as possible when placed into the arrangement illustrated in Figure 1.

An oval shaped hole is cut or otherwise formed in the sleeve 56 to define the locally heated area, i.e., the area of the body 52 which is to receive the flame from the heating torch 20 when placed in the operative combination of Figure 1.

The nozzle body 52 is machined to provide a wide groove extending circumferentially around the nozzle body in the area immediately under the opening or hole 58 in the sleeve 56 and further to provide a helical groove 62 which winds around the balance of the nozzle body as best illustrated in Figure 5. The grooves, both the circumferential and helical portions thereof, are filled with copper by a welding or brazing operation so as to provide a wide band 64 of copper around the circumference of the nozzle body adjacent the nose or ball portion thereof and a helical band 66 which winds around the body toward the rearward end thereof. The location of the band 64 and the hole in the sleeve 56 may be varied along the length of the nozzle 50.

In actual practice the nozzles to which the subject invention may be applied range from relatively small devices of about 1 1/2 inches diameter by 6 inches in length to larger nozzles which are 3-4 inches in diameter and from 15-30 inches long. The copper band 64 in groove 60 is preferably on the order of about 1/4 inch in depth, depending upon the diameter of the nozzle, and may vary in pitch or longitudinal distance between turns in accordance with the particular requirements of the application.

Thus it is to be understood that I have described an improved nozzle for transferring zinc by providing helical grooves filled with a metal core of a greater heat conductivity than the body of the nozzle.

This structure permits a gas-fired torch to maintain a relatively uniform temperature along the nozzle, requires less gas consumption while maintaining the temperature of the zinc at a molten state above 850 degrees F. as it passes through the nose, and reduces any hot spots tending to burn out the nozzle body. The invention is not limited to gas-heated devices but may also be used with, for example, electric heater cartridges which also produce localized heating to be advantageously distributed over the nozzle body by the subject invention.

CLAIMS

1. A nozzle device for use in casting procedures comprising an elongate body of rigid metal having an axial through-bore, and means defining a channel in the body from a local area of the body to be heated and from said local area over the remainder of the body, said channel being filled with a metal of higher heat conductivity coefficient than the body metal thereby to receive heat from the local area and distribute said heat over the balance of the nozzle body.

2. Apparatus as defined in Claim 1 further including an insulative sleeve disposed over the nozzle body and having an opening there through to allow heat to be played upon the local area.

3. Apparatus as defined in Claim 2 wherein the sleeve is made of a ceramic material.

4. Apparatus as defined in Claim 1 wherein the channel comprises a helical groove in the circumference of the nozzle body and copper filling said groove.

5. Apparatus as defined in Claim 4 wherein the channel means includes, in additional to said helical groove, a circumferential band of copper which passes through the locally heated area.

6. Apparatus as defined in Claim 5 wherein the band is wider than the groove.

7. Apparatus as defined in Claim 6 wherein the band is close to the outlet end of the nozzle.

8. A combination comprising:

a source of molten zinc;

die means having an opening for receiving the molten zinc;

a nozzle for transferring the zinc from the source to the die means, and torch means for heating the nozzle to maintain the zinc in a molten state as it is being transferred; said nozzle comprising:

an elongated metal body having a forward end, a rearward end, and a longitudinal opening extending from the rearward end to the forward end for passing zinc therethrough, the forward end having a partially spherical nose for engaging the opening in the die means;

the body having longitudinally extending groove means extending from the rearward end to the forward end, the body being formed of a metal having a first heat conductivity;

a second metal of a second, greater heat conductivity disposed in said groove means to form a heat conducting path along the body whereby heat from the torch means received at one end of the body is transferred along said path to the opposite end thereof.

9. A combination as defined in Claim 8, in which the groove means comprises a helical groove formed around the body from one end toward the opposite end.

10. A combination as defined in Claim 8, in which the nozzle has a steel body, and the second metal comprises copper welded into said groove means.

11. A combination as defined in Claim 8, including a ring mounted on the body adjacent the forward end thereof.

12. A combination as defined in Claim 8, in which the body is heated to maintain the zinc passing through the longitudinal opening a temperature greater than 850 degrees F.

13. A combination as defined in Claim 8, including a stainless steel jacket mounted on said body and insulation means disposed between the jacket and the body.

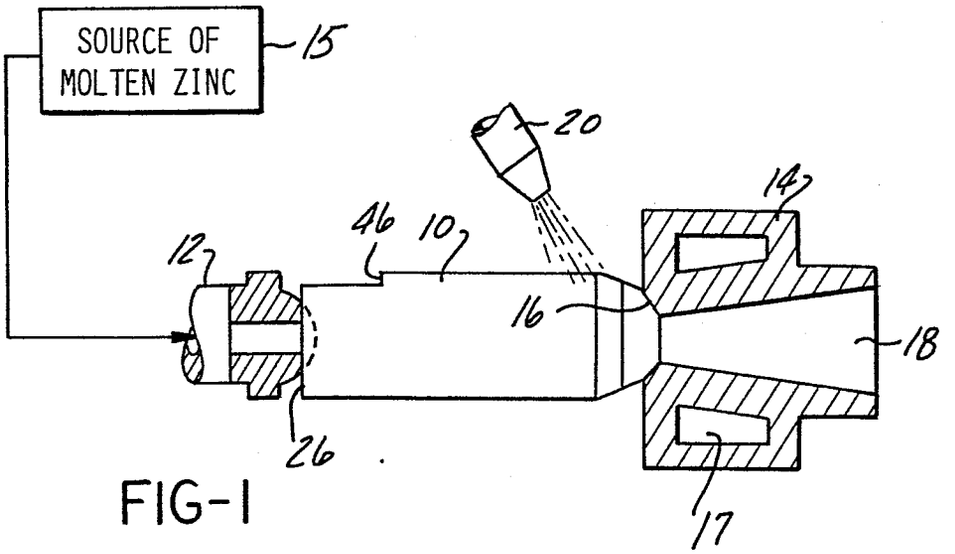

FIG-1

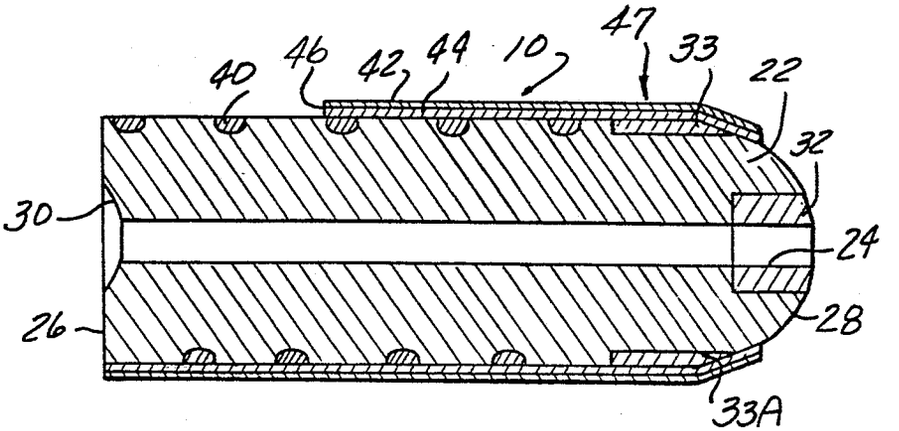

FIG-2

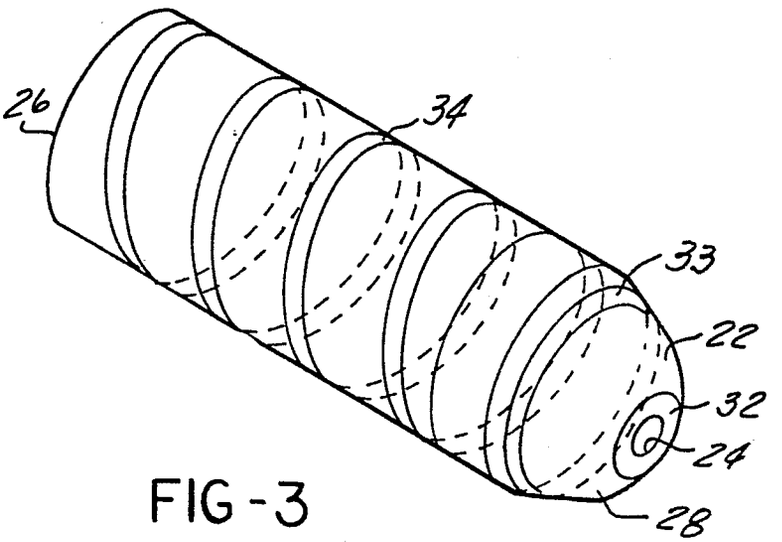

FIG-3

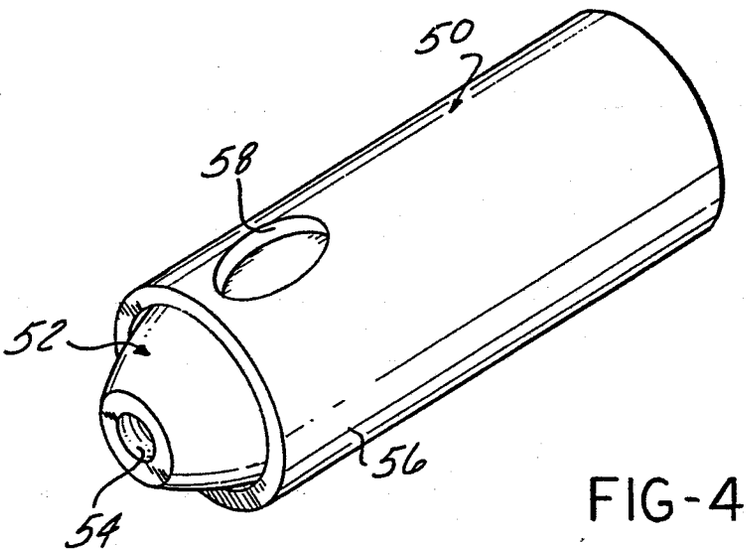

FIG-4

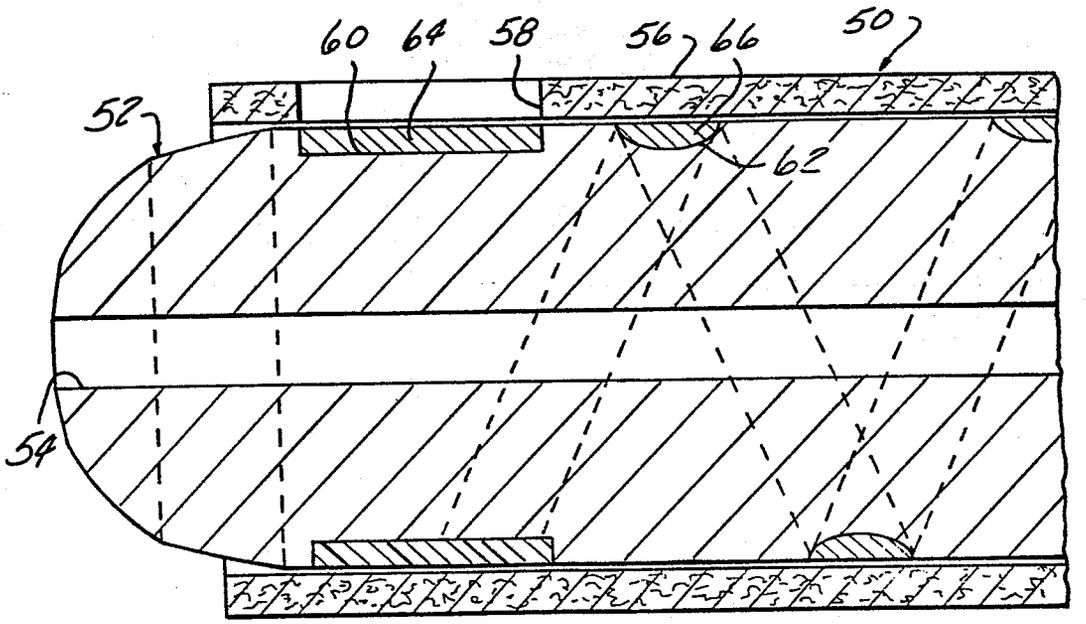

FIG-5

European Patent Office

EUROPEAN SEARCH REPORT

0124680
Application number

EP 84 10 0203

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl ³)
A	DE-A-2 716 950 (FAST HEAT ELEMENT) * Claim 12 *	3	B 22 D 17/20 B 22 D 17/22 B 29 F 1/03 B 29 F 3/04
A	DE-U-8 110 364 (ZH NORMALIEN GMBH) * Claim 1 *	1	
A	DE-A-2 949 637 (EISENWERK HENSEL) * Figure *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

B 22 D 17/00
B 29 F 1/00
B 29 F 3/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	05-07-1984	GOLDSCHMIDT G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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