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

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Description

This invention relates to a diecasting apparatus for casting molten metals and particularly to a nozzle according to the first part of claim 1 (DE—A—2716950) which is used to transfer the molten metal from a source to a mold.

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 fron 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.

These problems are solved by the invention specified in the main claims. Further developments are subjects of the subclaims.

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.

Two embodiments of the invention will now be described with reference to the drawings in which

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 perspective view of the nozzle of Figure 1 with the jacket and insulation removed;

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

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

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 semispherical 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 gasfired 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 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 the 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 58 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 3,8 cm diameter by 15 cm in length to larger nozzles which are 7,5—10 cm in diameter and from 15—30 inches long. The copper band 64 in groove 60 is preferably on the order of about 6,35 mm 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 454 degrees C. 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. Nozzle (10) of a die casting apparatus for casting molten metal, especially zinc or alloys thereof, comprising an elongate body (22) of rigid metal having an axial through-bore (24) and a local area to be heated, characterized by means defining a channel (34) in the body (22) from said local area of the body (22) to be heated over the remainder of the body (22), said channel (34) being filled with a metal (40) of higher 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 (22).

2. Nozzle as defined in Class 1 further including an insulative sleeve (44) disposed over at least a portion of the nozzle body (22) and having an opening (47) there through to allow heat to be played upon the local area.

3. Nozzle as defined in Claim 2 wherein the sleeve (44) is made of a ceramic material.

4. Nozzle as defined in Claim 1 wherein the channel (34) comprises a helical groove in the circumference of the nozzle body (22) and copper (40) filling said groove.

5. Nozzle as defined in Claim 4 wherein the channel means includes, in addition to said helical groove (62), a circumferential band (64) of copper which passes through the locally heated area.

6. Nozzle as defined in Claim 5 wherein the band (64) is wider than the groove (62).

7. Nozzle as defined in Claim 6 wherein the band (64) is close to the outlet end of the nozzle (10).

8. Die casting apparatus for casting molten metal such as zinc, comprising

a source (15) of molten metal:

die means (14) having an opening (16) for receiving the molten metal;

a nozzle (10) for transferring the metal from the source (15) to the die means (14), and means (20) for heating the nozzle (10) to maintain the metal in a molten state as it is being transferred; said nozzle (10) comprising:

an elongated metal body (22) having a forward end (28) a rearward end (26), and a longitudinal opening (24) extending from the rearward end (26) to the forward end (28) for passing metal therethrough, the forward end (28) having a partially spherical nose (32) for engaging the opening (16) in the die means (14), characterized by

The body (22) having longitudinally extending groove means (34) extending over the surface of said body (22) from the rearward end (26) to the forward end (28), the body (22) being formed of a metal having a first heat conductivity;

a second metal (40) of a second, greater heat conductivity disposed in said groove means (34) to form a heat conducting path along the body (22) whereby heat from the heating means (20) received at one location on the body (22) is transferred along said path to the remainder of the body (22).

9. Apparatus as defined in Claim 8, in which the groove means (34) comprises a helical groove formed around the body (22) from one end (26) toward the opposite end (28).

10. Apparatus as defined in Claim 8, in which the nozzle (10) has a steel body (22), and the second metal (40) comprises copper welded into said groove means (34).

11. Apparatus as defined in Claim 8, wherein the groove means (34) includes a circumferential ring portion (33) coextensive with said one location.

12. Apparatus as defined in Claim 8, in which the body (22) is heated to maintain the metal passing through the longitudinal opening (24) a temperature greater than 454°C.

13. Apparatus as defined in Claim 8, including insulator means (44) covering at least a portion of the body (22).

Patentansprüche

1. Düse (10) einer Druckgußeinrichtung zum Gießen geschmolzenen Metalls, insbesondere von Zink oder dessen Legierungen, mit einem länglichen Körper (22) aus starrem Metall mit einer axialen Durchbohrung (24) und einem lokalen zu heizenden Bereich, gekennzeichnet durch Mittel zur Begrenzung eines Kanals (34) in dem Körper (22) der sich von dem lokalen zu heizenden Bereich des Körpers (22) über den Rest des Körpers (22) erstreckt und mit einem Metall (40) mit höherem Wärmeleitfähigkeitskoeffizienten als das Körpermetall gefüllt ist, wodurch er Wärme von dem lokalen Bereich aufnimmt und sie über den Rest des Düsenkörpers (22) verteilt.

2. Düse nach Anspruch 1, ferner umfassend eine isolierende Hülse (44), die auf mindestens einem Teil des Düsenkörpers (22) angeordnet ist und eine sie durchsetzende Öffnung (47) hat, die eine Wärmeeinwirkung auf den lokalen Bereich erlaubt.

3. Düse nach Anspruch 2, bei der die Hülse (44) aus einem keramischen Material besteht.

4. Düse nach Anspruch 1, bei der der Kanal (34) eine schraubenförmig gewundene Nut im Umfang des Düsenkörpers (22) ist, die mit Kupfer (40) gefüllt ist.

5. Düse nach Anspruch 4, bei der der Kanal zusätzlich zu der schraubenformig gewundenen Nut (62) ein Umfangsband (64) aus Kupfer aufweist, das durch den lokal geheizten Bereich läuft.

6. Düse nach Aspruch 5, bei der das Band (64) breiter als die Nut (62) ist.

7. Düse nach Anspruch 6, bei der das Band (64) nahe dem Austrittsende der Düse (10) vorgesehen ist.

8. Druckgußeinrichtung zum Gießen geschmolzenen Metalls wie Zink, umfassend

eine Quelle (15) geschmolzenen Metalls;

Formmittel (14) mit einer Öffnung (16) zur Aufnahme des geschmolzenen Metalls;

eine Düse (10) zum Übertragen des Metalls von der Quelle (15) zu den Formmitteln (14) und Mittel (20) zum Heizen der Düse (10), um das Metall bei seiner Übertragung im geschmolzenen Zustand zu halten; wobei die Düse umfaßt:

einen länglichen Metallkörper (22) mit einem vorderen Ende (28), einem hinteren Ende (26) und einer länglichen Öffnung (24), die vom hinteren Ende (26) zum vorderen Ende (28) verläuft und zur Durchleitung von Metall dient, wobei das vordere Ende (28) eine teilkugelige Nase (32) hat, die zum Ansetzen an die Öffnung (16) in den Formmitteln (14) dient, dadurch gekennzeichnet, daß

der Körper (22) eine in Längsrichtung vom hinteren Ende (26) zum vorderen Ende (28) verlaufende Nut (34) auf seiner Oberfläche hat und aus Metall mit einer ersten Wärmeleitfähigkeit besteht;

und daß ein zweites Metall (40) mit einer zweiten, größeren Wärmeleitfähigkeit in der Nut (34) angeordnet ist und einen wärmeleitenden Weg längs des Körpers (22) bildet, wodurch Wärme, die von den Mitteln (20) zum He zen an einer Stelle auf dem Körper (22) übernommen wird, längs dieses Weges auf den Rest des Körpers (22) übertragen wird.

9. Einrichtung nach Anspruch 8, in der die Nut (34) eine von dem einen Ende (26) zum anderen Ende (28) schraubenförmig um den Körper (22) gewundene Nut ist.

10. Einrichtung nach Anspruch 8, in der die Düse (10) einen Stahlkörper (22) hat und das zweite Metall (40) in die Nut (34) geschweißtes Kupfer ist.

11. Einrichtung nach Anspruch 8, bei der die Nut (34) einen als Umgangsring ausgebildeten Teil (33) aufweist, der von gleicher Ausdehnung wie die genannte Stelle ist.

12. Einrichtung nach Anspruch 8, in der der Körper (22) erwärmt wird, um das durch die längliche Öffnung (24) hindurchtretende Metall auf einer Temperatur von mehr als 454°C zu halten.

13. Einrichtung nach Anspruche 8, mit Isoliermitteln (44), die mindestens einen Teil des Körpers (22) bedecken.

Revendications

1. Buse (10) d'un appareil de moulage sous pression pour mouler du métal fondu, plus particulièrement du zinc ou des alliages de celui-ci, comprenant un corps allongé (22) en métal rigide ayant un alésage axial traversant (24) et une zone locale devant être chauffée, caractérisée par des moyens définissant un conduit (34) dans le corps (22) depuis la zone locale devant être chauffée du corps (22) le long du reste du corps (22), ce conduit (34) étant rempli avec un métal (40) de coefficient de conductibilité à la chaleur plus élevé que le métal du corps de façon à recevoir de la chaleur de la zone locale et distribuer cette chaleur sur l'ensemble du corps de buse (22).

2. Buse selon la revendication 1 comportant en outre un manchon isolant (44) disposé sur au moins une portion du corps de buse (22) et ayant une ouverture (47) à travers celui-ci pour permettre une application de chaleur sur la zone locale.

3. Buse selon la revendication 2 dans laquelle le manchon (44) est en matériau céramique.

4. Buse selon la revendication 1 dans laquelle le conduit (34) comprend une gorge hélicoïdale à la circonférence du corps de buse (22), et du cuivre (40) remplit cette gorge.

5. Buse selon la revendication 4 dans laquelle le conduit comporte, en plus de la gorge hélicoïdale

(62), une bande circonférentielle (64) de cuivre qui passe à travers la zone locale chauffée.

6. Buse selon la revendication 5 dans laquelle la bande (64) est plus large que la gorge (62).

7. Buse selon la revendication 6 dans laquelle la bande (64) est proche de l'extrémité de sortie de la buse (10).

8. Dispositif de moulage pour mouler du métal fondu, tel que du zinc, comprenant:

une source de métal fondu (15);

un moule (14) ayant une ouverture (16) pour recevoir le métal fondu;

une buse (10) pour transférer le métal depuis la source (15) jusqu'à la matrice (14), et des moyens (20) pour chauffer la buse (10) pour maintenir le métal à l'état fondu pendant qu'il est transféré; cette buse comprenant:

un corps métallique allongé (22) ayant une exrémité avant (28) et une extrémité arrière (26), et une ouverture longitudinale (24) s'etendant depuis l'extrémité arrière (26) jusqu'à l'extrémité avant (28) pour passer le métal à traverse celle-ci, l'extrémité avant (28) ayant un nez (32) partiellement sphérique pour s'engager dans l'ouverture (16) de la matrice (14), caractérisé en ce que:

le corps (22) comprend un conduit (34) s'étendant longitudinalement sur la surface du corps (22) depuis l'extrémité arrière (26) jusqu'à l'extrémité avant (28), le corps (22) étant formé d'un métal ayant une première conductivité à la chaleur;

un second métal (40) ayant une seconde conductivité à la chaleur, plus élevée, disposé dans le conduit (34) pour former un chemin conducteur de chaleur le long du corps (22) de sorte que la chaleur provenant des moyens de chauffage (20) reçue en un endroit sur le corps (22) est transférée le long du chemin au reste du corps (22).

9. Dispositif selon la revendication 8 dans lequel le conduit (34) comprend une gorge hélicoïdale formée autour du corps (22) depuis une extrémité (26) jusqu'à l'autre extrémité (28).

10. Dispositif selon la revendication 8 dans lequel la buse (10) a un corps (22) en acier, et le second métal (40) comprend du cuivre soudé dans la gorge (34).

11. Dispositif selon la revendication 8 dans lequel la gorge (34) comporte une portion annulaire circonférentielle (33) coextensive audit un endroit.

12. Dispositif selon la revendication 8 dans lequel le corps (22) est chauffé pour maintenir le métal passant à travers l'ouverture longitudinale (24) à une température supérieure à 454°C.

13. Dispositif selon la revendication 8 comportant des moyens isolants (44) couvrant au moins une portion du corps (22).

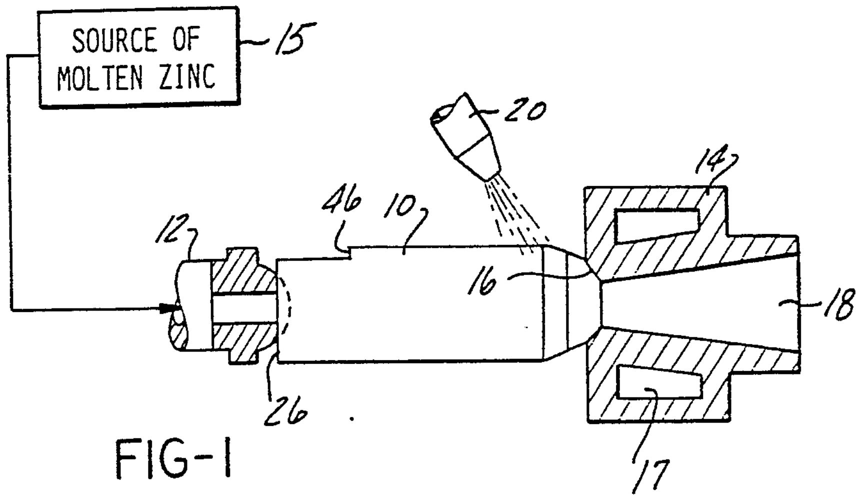

FIG-1

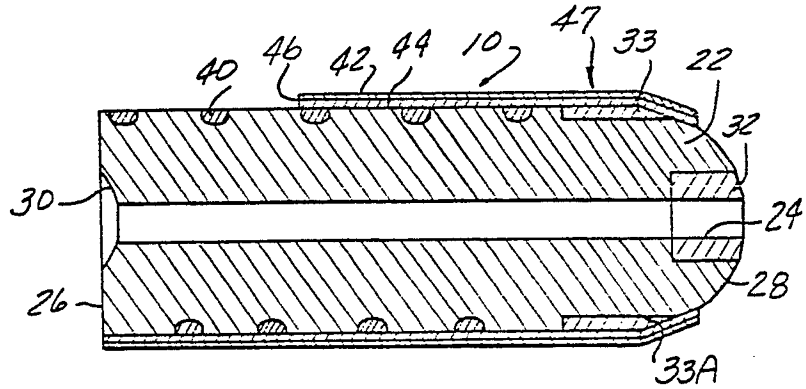

FIG-2

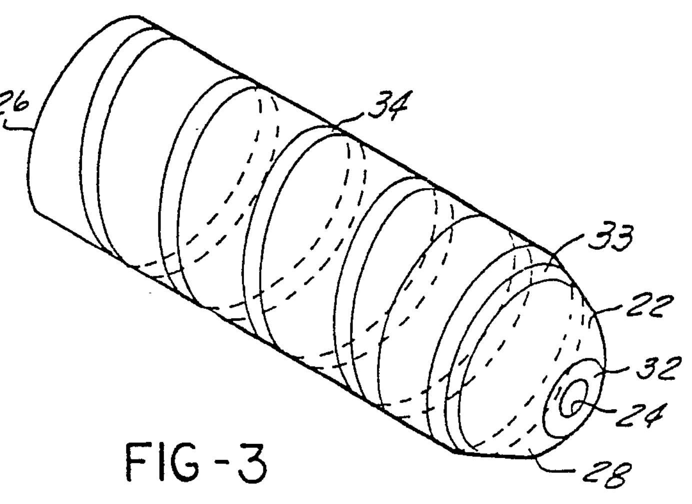

FIG-3

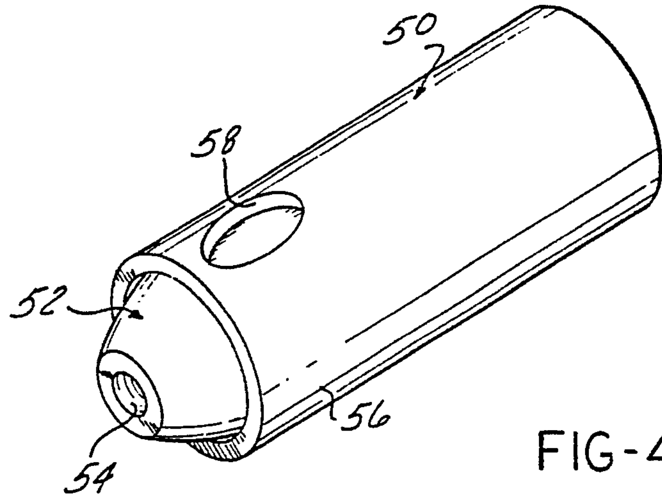

FIG-4

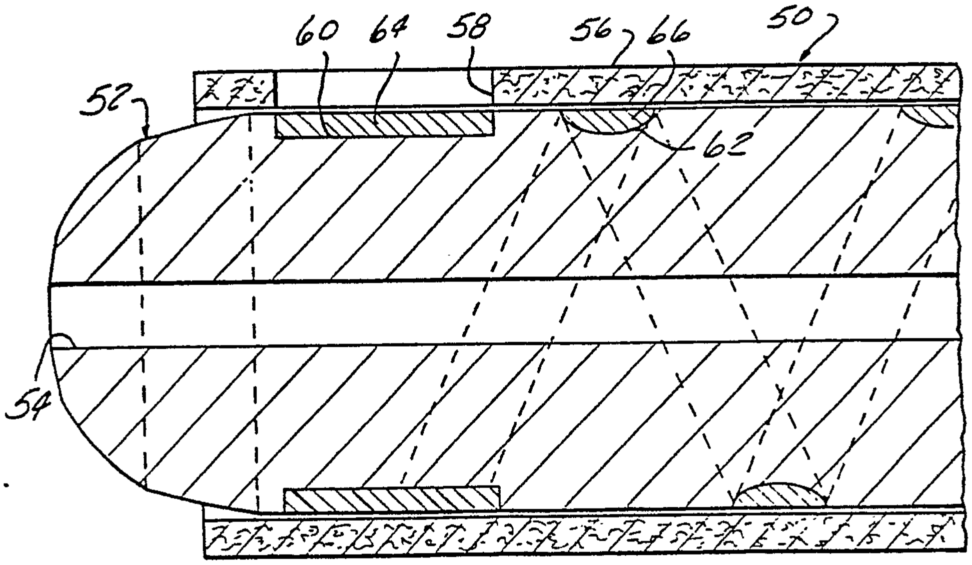

FIG-5