MOLDING OF DIE-CAST PRODUCT AND METHOD OF

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ABSTRACT

A system and method of preventing surface imperfections of die-cast products with the method comprising the steps of loading a volume of molten zinc from a source of molten zinc into a chamber of a dispenser station, dispensing the molten zinc from the dispenser station through a hot runner and into a mold cavity, continually maintaining the molten zinc in a molten state from the source of molten zinc to the mold cavity, interrupting the flow of the molten zinc to the mold cavity, following the contraction of the molten zinc in the mold cavity as the molten zinc solidifies therein; and removing the solidified die-cast zinc product from the mold cavity.
MOLDING OF DIE-CAST PRODUCT AND
METHOD OF

CROSS REFERENCE TO RELATED
APPLICATIONS

STATEMENT REGARDING FEDERALLY
SPONSORED RESEARCH OR DEVELOPMENT

REFERENCE TO A MICROFICHE APPENDIX

FIELD OF THE INVENTION

This invention relates generally to die-casting
devices, and more specifically, to a system for die-casting
products having reduced surface imperfections and a method
of improving the surface properties and inhibiting or preventing
surface imperfections and cracking of die-cast products
such as zinc products.

BACKGROUND OF THE INVENTION

Die-casting of parts is known in the art and generally
has been adequate for most of their intended purposes. How-
ever, conventional die-casting methods have been known to
produce die-cast products that are prone to develop surface
imperfections when the user attempts to place a finish surface
treatment on the die-cast product.

In order to solve the above problem, the inventor has
discovered that when die-cast zinc products are manufactured
in which the molten zinc is continually maintained in a molten
state from a source of the molten zinc to a die-casting mold,
the resultant solidified die-cast product can be subsequently
surface treated, such as by electroplating, without development
of surface imperfections in the coating on the product.

The process for forming solidified die-cast products without
surface imperfections in the coating on the product involves
maintaining a molten zinc source, a zinc-dispenser station, a
portion of a mold station and a runner connecting the dis-
penser station and the mold station at a temperature that
maintains the molten zinc in a molten state until the molten
zinc reaches a cavity of the mold station in which the molten
zinc is allowed to cool and solidify to form the die-cast
product. After the die-cast product is cooled and removed
from the mold, a surface finish is applied to the product to
create a product free or substantially free of surface blemishes
or imperfections.

SUMMARY OF THE INVENTION

The present invention comprises a system for die-
casting products free or substantially free of surface blemishes
or imperfections. The system includes a source of mol-
ten zinc connected to a dispenser station, a hot runner, and a
mold station comprising a mold cover and a mold housing
that can provide a closed system for delivery of molten zinc to
a mold cavity with minimal or no air contact with the molten
zinc as it flows from the dispenser station to the mold cavity.
The dispenser station supports a volume of molten zinc from
the source of molten zinc and includes a pressure cylinder for
loading the molten zinc into the dispenser station and dis-
pensing the molten zinc from the dispenser station. The hot
runner connects the dispenser station to the mold cover to
transfer the molten zinc from the dispenser station to the mold
cavity with the dispenser station, the hot runner, and the mold
cover continually maintaining the molten zinc supported
therein in a molten state during use. The mold cavity receives
the molten zinc and maintains the molten zinc therein at a
temperature suitable for molten zinc solidification.

The mold station includes a pathway connecting the
hot runner to the mold cavity. Located in the pathway of the
mold station is an actuating pin for controlling access of the
molten zinc to the mold cavity. Actuating pin also follows the
contraction of the molten zinc in the mold cavity as the molten
zinc solidifies. Once solidified in the mold cavity, the molten
zinc forms a solidified die-cast zinc product. The mold may
also includes an ejection pin for removing the solidified die-
cast zinc product from the mold. The above system may also
include a finishing station for applying a finishing surface
treatment on the solidified die-cast products after the die-
casting process has been completed.

The present invention also includes a method comprising
the steps of loading a volume of molten zinc into a
chamber of a dispenser station, dispensing the molten zinc
from the chamber of the dispenser station through a hot run-
ner and into a mold cavity defined by a mold housing and a
mold cover, continually maintaining the molten zinc in a
molten state from a source of molten zinc to the mold cavity,
interrupting the flow of the molten zinc to the mold cavity,
following the contraction of the molten zinc in the mold
cavity by maintaining sufficient pressure on the molten zinc
as it solidifies therein to inhibit formation of air bubbles, and
removing the solidified die-cast zinc product from the mold
cavity. Once removed, a finishing surface treatment may then
be applied solidified die-cast zinc product.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a schematic diagram of an embodiment of a system for die-casting products with reduced surface
imperfections;

FIG. 2 shows mold station in a closed condition to
prevent the molten zinc located in hot runner from entering
the empty mold cavity;

FIG. 3 shows mold station located in an open condition
to allow for the movement of molten zinc located in the
hot runner to reach and fill the mold cavity;

FIG. 4 shows the actuating pin moved back to completely
block off the mold cover pathway after the mold cavity
has been filled with molten zinc; and

FIG. 5 shows the zinc die cast product being ejected
from the mold housing.

DESCRIPTION OF THE PREFERRED
EMBODIMENT

FIG. 1 shows a schematic diagram of an embodiment of a system 10 for die-casting products free or substan-
tially free of surface blemishes or imperfections. System 10
generally comprises a dispenser station 11 connected to both
a mold station 12 and a source of molten zinc 13 with the
dispenser station 11, mold station 12 and source of molten
zinc 13 linked to a control system 14 that controls the opera-
tions thereof. Mold station 12 is also shown connected to a
finishing station 26 that is also linked to control system 14,
which also controls the operations of the finishing station 26.
Finishing station 26 applies a finishing surface treatment to
the solidified die-cast products, for example by electroplating, painting or the like. The control system 14 may comprise a variety of devices, such as a computer or a microprocessor-based device, that is capable of monitoring and sending out operational commands to the dispenser station 11, the mold station 12, the source of molten zinc 13, and the finishing station 26. Dispenser stations for delivering and maintaining metal in a molten state are commercially available as are electroplating and painting devices.

[0016] Referring to FIGS. 2, 3, and 4, FIGS. 2, 3, and 4 each show a cross-sectional view of the mold station 12 and the dispenser station 11 of FIG. 1 connected to each other by a hot runner 15. The purpose of the hot runner 15 is to maintain a shot of molten zinc 17 therein in a molten state as successive shots of molten zinc are periodically dispensed from the dispensing station 11 to the mold station 12.

[0017] The dispenser station 11 generally comprises a dispenser housing 18 having a first end 18a and a second end 18b and a chamber 16 for supporting molten zinc 17 therein. A pressure cylinder 19 having a piston 19a can deliver a shot of molten zinc to the mold station 12. Chamber 16 is connected to the source of molten zinc 13 that has an inlet 27a located below the surface of the molten zinc so that air is inhibited or prevented from being drawn in with the molten zinc as it flows into chamber 16. It is noted that the shot of molten zinc is defined as a predetermined or pre-set amount or charge of molten zinc equaling proximal the volume of a cavity of the mold. In regards to the term "molten zinc," it should be noted that molten zinc or zinc in the molten state refers to zinc that is in a liquified state and zinc that is in a "slushy state." The slushy state can be defined as the state in which zinc is between the liquified state and solid state. Zinc in the slushy state is normally obtained when liquified zinc is lower to a temperature proximal but above the melting point or melting temperature of zinc which is about 420°C. The slushy state can also be obtained through heating zinc in the solid state to a temperature above the melting point or melting temperature of zinc.

[0018] In the slushy state the zinc still possesses some of the characteristics of the zinc in the liquified state, including the ability to flow through the system 10 without forming blockages in the system 10. That is, similar to zinc in the liquified state, the properties of the zinc in the slushy state still permits the pressure cylinder 19 to load the zinc 17 from the source of molten zinc 13 into the chamber 16 and dispensing the zinc 17 from the chamber 16 of the dispenser station 11 through hot runner 15 and into the mold station 12. Using the zinc in the slushy state provides the advantage of reducing the required time for solidification of the product since the temperature change of the zinc from the slushy state to the solid state is less than the temperature change of the zinc from the liquid state to the solid state.

[0019] In further regards to dispenser station 11, the piston 19a of pressure cylinder 19 includes a piston face 19b that is moveable between a first or up position (shown in FIG. 2) and a second or down position (shown in FIG. 3) for the dual purpose of loading the molten zinc 17 from the source of molten zinc 13 into the chamber 16 and dispensing the molten zinc 17 from the chamber 16 of the dispenser station 11. FIG. 2 shows piston face 19b situated in the first or up position with chamber 16 supporting the molten zinc 17 therein. FIG. 3 shows piston face 19b situated in the second or down position with the molten zinc 17 having been dispensed from chamber 16. Once the molten zinc 17 is dispensed from the chamber 16 of the dispenser station 11 by pressure cylinder 19, the molten zinc 17 flows through the hot runner 15 to the mold station 12. [0020] Mold station 12, shown in FIGS. 2, 3, and 4, generally comprises a mold housing 21 that is mateable with a mold cover 20 to define a mold cavity 22 for receiving the molten zinc 17 and allowing the molten zinc 17 to solidify therein. Mold cover 20 is connected to the hot runner 15 and includes a pathway 23 located within the mold cover 20 and connecting the hot runner 15 to the mold cavity 22. Mold cover 20 includes an actuating pin 24 that is axially slideable in the pathway 23 of the mold cover 20. Actuating pin 24 can be extended (see FIG. 4) to prevent flow of molten zinc into mold cavity 22 or retracted (see FIG. 3) to allow flow of the molten zinc 17 from hot runner 15 through pathway 23 and into the mold cavity 22. Actuating pin 24 includes a pin face 24a engageable with a portion of the molten zinc 17 located within pathway 23. Pin face 24a may have an insulating material thereon to inhibit transfer of heat from the pin to the molten zinc as it solidifies in the mold cavity 22.

[0021] The pressure p1 in pressure cylinder 30 is maintained at sufficient pressure so actuating pin 24 follows the contraction of the molten metal in the mold cavity without intensifying the pressure on the molten metal as it solidifies. By applying sufficient pressure to the actuating pin 24 to follow the contraction of the molten zinc without intensifying the pressure in the mold cavity 22 actuating pin 24 inhibits or prevents formation of air bubbles in the solidified die-cast zinc product. That is, actuating pin 24 has a diameter that blocks zinc molten zinc flow through passageway 24 with the volume of the molten zinc in the pathway 23 (see FIG. 4) such that length of travel of the pin 24 during the solidifying phase (see FIG. 5) allows the volume of molten zinc in the pathway 23 to flow into the mold cavity 22 during the volume shrinkage of the solidifying zinc in mold cavity 22 to thereby provide for a die cast zinc product having no or limited surface imperfections.

[0022] A feature of the present invention is that the source of molten zinc 13, the dispenser housing 11, the hot runner 15, and the mold cover 20, in use, collectively function to continually maintain the molten zinc 17 in the liquid or slushy state from the source of molten zinc 13 until the molten zinc 17 reaches the mold cavity 22 to form a die-cast product that is free or substantially free of surface blemishes or imperfections after a surface finish is applied to the product. Continually maintaining the molten zinc 17 in the liquid or slushy state from source of molten zinc 13 to the mold cavity 22 also provides that added benefit of preventing potential blockage in the flow of the molten zinc 17 in the system due to solidification of the zinc in the system 10 and also saves energy cost since reheating of the runner 15, mold cover 20, dispenser station 11, and source of molten zinc 13 is not required.

[0023] Molten zinc 17 may be maintained in the liquid or slushy state by maintaining an interior temperature of the dispenser housing 11, the hot runner 15, and the mold cover 20 at or above 420°C. (693 K, 788° F.), which is the melting point or melting temperature of zinc. The interior temperature of the source of molten zinc 13, the dispenser housing 11, the hot runner 15, and the mold cover 20 may be maintained at or above the melting temperature of zinc by any of a variety of heating means. For example, the hot runner 15 may include a heating element such as a wire or coiled heating element (not shown) extending throughout the entire length of the hot runner 15 for continually maintaining the molten zinc supported therein in a molten state throughout the entire length of
the hot runner 15. A layer of thermal insulation may surround the runner 15 to inhibit loss of heat to the atmosphere.

[0024] In regards to mold housing 21, a feature the present invention is that mold housing 21 is maintainable at a temperature suitable for the solidification of molten zinc and includes an ejection pin 25 for removing a solidified die-cast zinc product from the mold cavity obtained from the solidification of the molten zinc 17.

[0025] Since mold cover 20 is continually maintained at a temperature sufficient to maintain the molten zinc 17 in the molten state and mold housing 21 is maintainable at a temperature suitable for the solidification of molten zinc, mold station 12 is shown in the embodiment of FIGS. 2, 3, 4, and 5 as including a thermal-insulating barrier 29 located between the mold housing 21 and the mold cover 20 to limit heat transfer from the mold cover 20 to the mold housing 21 so the mold housing 21 can be maintained at a temperature that allows solidification of the molten zinc therein while the mold cover 20 is maintained at a temperature that is above the melting point of the molten zinc. The presence of thermal-insulating barrier 29 also functions to reduce potential spikes in temperature changes in both the mold housing 21 and the mold cover 20 during their mating.

[0026] Referring back to FIGS. 2, 3, 4, FIG. 2 shows mold station 12 in a closed condition identified by actuating pin 24 being positioned within passageway 23 in a condition in which a portion of the outer cylindrical surface of actuating pin 24 seals against an end of hot runner 15 to prevent the molten zinc 17 located in hot runner 15 from entering passageway 23 and moving into the empty mold cavity 22.

[0027] FIG. 3 shows mold station 12 located in an open condition identified by actuating pin 25 in a retracted position within passageway 23 to allow a shot of molten zinc 17 located in hot runner 15 to flow through passageway 23 and into mold cavity 22. FIG. 4 shows the actuating pin 15 in an extended condition within passageway 23 with a portion of the outer cylindrical surface of actuating pin 24 blocking hot runner 15 to prevent further molten zinc located in hot runner 15 from entering the mold cavity 22.

[0028] In the operation of the system 10, as shown in FIG. 2, the pressure cylinder 19 is initially situated in the first or up position with chamber 16 supporting the molten zinc 17 therein and the mold station 12 is in a closed condition with actuating pin 24 completely blocking pathway 23 to prevent the molten zinc 17 from entering the empty mold cavity 22.

[0029] At the initiation of the die-casting process, the control system 14 sends a signal to the mold station 12 to bring the mold station 12 from the initial closed condition to the open condition by moving the actuating pin 15 to a position that unblocks the access of the molten zinc 17 to the mold cover pathway 23. The control system 14 then sends a signal to the dispenser station 11 to initiate the dispensing of the molten zinc 17 supported within chamber 16 through displacement of the piston face 19b of pressure cylinder 19 from the first or up position (shown in FIG. 2) to the second or down position (shown in FIG. 3 causing the molten zinc 17 to be pushed from the chamber 16 of the dispenser station 11 into the hot runner 15 through mold cover pathway 23 and into mold cavity 22 as shown in FIG. 3.

[0030] Although not required, mold station 12 is shown in FIGS. 2 and 3 as including a mold passage 30 for venting air in the mold cavity 22 as the molten zinc 17 enters the mold cavity 22. Mold passage 30 allows air to escape but when a portion of the molten zinc 17 engages mold passage 30, the portion of the molten zinc 17 that initially engages mold passage 30 solidifies sufficiently quick to form a spigot-like seal and close off mold passage 30 to prevent molten zinc 17 inside the mold cavity from escaping therethrough.

[0031] Referring to FIG. 4, once mold cavity 22 has been filled with the molten zinc 17, the control system 14 then sends a signal to the mold station 12 to bring the mold station 12 back to the closed condition through the axial displacement of the actuating pin 15 to the position that completely blocks off access of the molten zinc 17 to pathway 23 thereby preventing molten zinc located in hot runner 15 from further entering the mold cavity 22.

[0032] The control system 14 then sends a further signal to the mold station 12 to maintain sufficient pressure p1 on actuating pin 24 so that pin 24 follows the solidification contraction of the molten zinc 17 in the mold cavity 22 without intensifying the pressure of the molten zinc therein. Having pin face 24 engaging a portion of the molten zinc 17 during the solidification process of the molten zinc 17 provides for a solidified die-cast zinc product 28 free or substantially free of surface imperfections.

[0033] The control system 14 then sends a signal to the dispenser station 11 to initiate the reloading process of molten zinc in chamber 16 through the displacement of the piston face 19a of pressure cylinder 19 from the second or down position (shown in FIG. 4) back to the first or up position (shown in FIG. 5). Since chamber 16 comprises an air-free chamber, as the piston face 19a of pressure cylinder 19 moves from the second or down position back to the first or up position a vacuum is formed within chamber 16. Molten zinc located in the hot runner 15 is prevented from moving back into the chamber 16 of the dispenser station 11 through the blockage of one of the ends of the hot runner 15 by actuating pin 23. As the piston face 19a of pressure cylinder 19 moves the inlet 27a of molten zinc line 27 towards the first or up position the vacuum formed in chamber 16 pulls molten zinc from the source of molten zinc 13 into chamber 16 to refill chamber 16 with a fresh shot of molten zinc 17.

[0034] At the completion of the die-casting process, identified by the solidification of the molten zinc 17 to a die-cast zinc product 28, the mold cover 20 is removed from the mold housing 21 and the solidified die-cast product 28 is removed from the mold housing 21. The portion of the molten zinc 17 that had solidified to close off mold passage 30 may also be removed during the removal stage of the solidified die-cast product 28 from the mold housing 21. Although the solidified die-cast product 28 may be removed from the mold housing 21 by a variety of methods, FIG. 5 shows the actuation of ejection pin 25 to induce removal of the die-cast zinc product 28 from the mold housing 21. Use of the ejection pin 25 allows for the expedited removal of the die-cast zinc product 28 from the mold housing 21 thereby reducing the time of the production process.

[0035] Once die-cast zinc product 28 is removed from the mold housing 21 die-cast zinc product 28 is moved to finishing station 26, where a surface finish is applied to the die-cast zinc product 28, with the surface finish of the product 28 being free of blemishes or imperfections. Examples of finishing the surface include the step of electroplating, painting or the like of the die-cast product.

[0036] Once the die cast product 28 is removed from the mold housing 21 the mold cover 20 is then mated back to the mold housing 21 and the procedure is then repeated to form another die-cast zinc product without allowing the molten
zinc between the source of molten zinc 13 and the mold cavity 22 to solidify. While the invention has been described with regard to molten zinc 17, other metals such as magnesium, aluminum, tin or an alloy thereof may be die cast by the same process with the interior temperature of the source of the molten metal, the dispenser housing 11, the hot runner 15, and the mold cover 20 maintained at or above the melting temperature of the particular metal or alloy used. For example, in die-casting magnesium products, the interior temperature of the source of the molten magnesium, the dispenser housing 11, the hot runner 15, and the mold cover 20 would be maintained at or above 650 °C (650 K, 1202 °F), which is the melting temperature for magnesium.

[0037] The present invention also includes a method of improving the surface properties and preventing surface imperfections and cracking of die-cast products comprising the steps of (1) loading a volume of molten metal 17 from a source of molten metal 13 into a chamber 16 of a dispenser station 11; (2) dispensing the molten metal 17 from the chamber 16 of the dispenser station 11 through a hot runner 15 and into a mold cavity 22 defined by a mold housing 21 and a mold cover 20; (3) continually maintaining the molten metal 17 in a molten state from the source of molten metal 13 to the mold cavity 22; (4) interrupting the flow of the molten metal in the mold cavity such as by initiating an actuating pin 24 to close off access of the molten metal to the mold cavity 22; (5) following the contraction of the molten metal 17 in the mold cavity 22 by maintaining sufficient pressure on the molten metal as the molten metal solidifies therein to inhibit formation of air bubbles; and (6) removing a solidified die-cast product 28 from the mold cavity 22 of the mold station 12.

[0038] The above method may further include the step of (7) applying a finishing surface treatment on the solidified die-cast product 28; (8) using an ejection pin 25 located on the mold housing 21 to remove the solidified die-cast product 28 from the mold housing 21; (9) using a pressure cylinder 19 to load the molten metal 17 from the source of molten metal 13 into the chamber 16 of dispenser station 11 and using the pressure cylinder 19 to dispense the molten metal 17 from the chamber 16 of the dispenser station 11; (10) loading molten zinc 17, molten magnesium, molten aluminum, molten tin or an alloy thereof into the chamber 16 of the dispenser station 11; (11) continually maintaining the molten metal 17 in a slushy state from the source of molten metal 13 to the mold cavity 22; (12) continually maintaining the temperature within the dispenser station 11, the hot runner 15, and the mold cover 20 at or above 420 °C; (13) maintaining the temperature of the actuating pin 24 above 420 °C; (14) placing a thermal-insulating barrier 29 between the mold housing 21 and the mold cover 20 to isolate the temperature difference between the mold housing 21 and the mold cover 20; and (15) venting air inside the mold cavity 22 through a mold passage 30 as the mold cavity 22 receives the molten metal 17.

I claim:
1. A system for die-casting products with reduced surface imperfections comprising:
a source of molten zinc;
a dispenser station having a molten zinc chamber and a piston for loading and dispensing molten zinc from the dispenser station;
a mold cover continually maintaining the molten zinc supported therein in a molten state;
a hot runner for transferring the molten zinc from the dispenser station to the mold cover;
a mold housing mateable with the mold cover to define a mold cavity therein for receiving the molten zinc, the mold cover having a pathway connecting the hot runner to the mold cavity;
an actuating pin located in the pathway of the mold cover for controlling access of the molten zinc to the mold cavity and the contraction of the solidification of molten zinc in the mold cavity without intensifying the pressure of the molten zinc in the mold cavity; and
a thermal-insulating barrier located between the mold housing and the mold cover to thermally isolate the temperature difference between the mold housing and the mold cover to enable the zinc in the mold cavity to solidify while the zinc in the mold cover remains in a molten state.

2. The system of claim 1 wherein in use the mold cover, hot runner, dispenser station, and source of molten zinc continually maintain the molten zinc supported therein in a slushy state.

3. The system of claim 1 including a mold passage for venting air from the mold cavity as the mold cavity receives the molten metal and an ejection pin for removing a solidified die-cast zinc product from the mold housing.

4. The system of claim 1 wherein in use the dispenser station, the hot runner, and the mold cover continually maintain a temperature therein at or above 420 °C.

5. The system of claim 1 including a control system for controlling the operations of the dispenser station and the mold station.

6. The system of claim 1 including a finishing station for applying a finishing surface treatment on the solidified die-cast zinc product.

7. A method of improving the surface properties and preventing surface imperfections and cracking of die-cast products comprising the steps of:
loading a volume of molten metal into a chamber of a dispenser station;
dispensing the molten metal from the chamber of the dispenser station through a hot runner and into a mold cavity defined by a mold housing and a mold cover;
continually maintaining the molten metal in a molten state from the source of molten metal to the mold cavity;
interrupting the flow of the molten metal to the mold cavity;
following the contraction of the molten metal in the mold cavity by maintaining sufficient pressure on the molten metal as the molten metal solidifies therein without intensifying the pressure of the molten metal to inhibit formation of air bubbles; and
removing a solidified die-cast product from the mold cavity of the mold station.

8. The method of claim 7 including the step of applying a finishing surface treatment on the solidified die-cast product.

9. The method of claim 7 wherein the step of removing the solidified die-cast product from the mold cavity comprises using an ejection pin located on the mold housing to remove the solidified die-cast product from the mold cavity.

10. The method of claim 7 wherein the step of loading the volume of molten metal from the source of molten metal into the chamber of the dispenser station and dispensing the molten metal from the chamber of the dispenser station comprises using a pressure cylinder to load the volume of molten metal from the source of molten metal into the chamber of the
dispenser station and using the pressure cylinder to dispense the molten metal from the chamber of the dispenser station.

11. The method of claim 7 wherein the step of loading the volume of molten metal comprises loading a volume of molten zinc, molten magnesium, molten aluminum, molten tin or an alloy thereof.

12. The method of claim 7 wherein the step of continually maintaining the molten metal in a molten state comprises continually maintaining the molten metal in a slushy state from the source of molten metal to the mold cavity.

13. The method of claim 7 wherein the step of continually maintaining the molten metal in a molten state from the source of molten metal to the mold cavity comprises continually maintaining the temperature within the dispenser station, the hot runner, and the mold cover above 420° C.

14. The method of claim 7 including the step of maintaining the temperature of the actuating pin above 420° C.

15. The method of claim 7 including the step of placing a thermal-insulating barrier between the mold housing and the mold cover to thermally isolate the temperature difference between the mold housing and the mold cover.

16. The method of claim 7 including the step of venting air inside the mold cavity through a mold passage as the mold cavity receives the molten metal.

17. A method of inhibiting or preventing surface imperfections and cracking of die-cast zinc products comprising the steps of:

continually maintaining a shot of molten zinc in a molten state from a source of molten zinc to a mold cavity;
temporarily closing off an access of the shot of molten zinc to the mold cavity;
maintaining sufficient pressure on the shot of molten zinc in the mold cavity without intensifying the pressure of the molten zinc in the mold cavity to inhibit formation of air bubbles therein; and removing a solidified die-cast zinc product from the mold cavity.

18. The method of claim 17 wherein the step of continually maintaining the shot of molten zinc in a molten state comprises continually maintaining the shot of molten zinc from the source of molten zinc to the mold cavity.

19. The method of claim 17 including the step of applying a finishing surface treatment on the solidified die-cast product.

20. The method of claim 18 wherein the step of continually maintaining the shot of molten zinc from the source of molten zinc to the mold cavity comprises continually maintaining the temperature of the shot of molten zinc above 420° C.

21. The method of claim 20 wherein the step of applying a finishing surface comprises electroplating a bubble free coating on the solidified die-cast product.

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