United States Patent

[11] 3,612,153

[72] Inventor **Byron W. Koch**
Toledo, Ohio

[21] Appl. No. **855,638**
[22] Filed **Sept. 5, 1969**
[45] Patented **Oct. 12, 1971**
[73] Assignee **National Lead Company**
New York, N.Y.

[54] **METHOD AND APPARATUS FOR DIECASTING INCLUDING A FLASH CAVITY**
10 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **164/113,** 18/DIG. 18, 164/303
[51] **Int. Cl.** **B22d 17/00**
[50] **Field of Search** ..... 164/113, 119, 120, 303–318; 18/DIG. 18, DIG. 42, DIG. 47

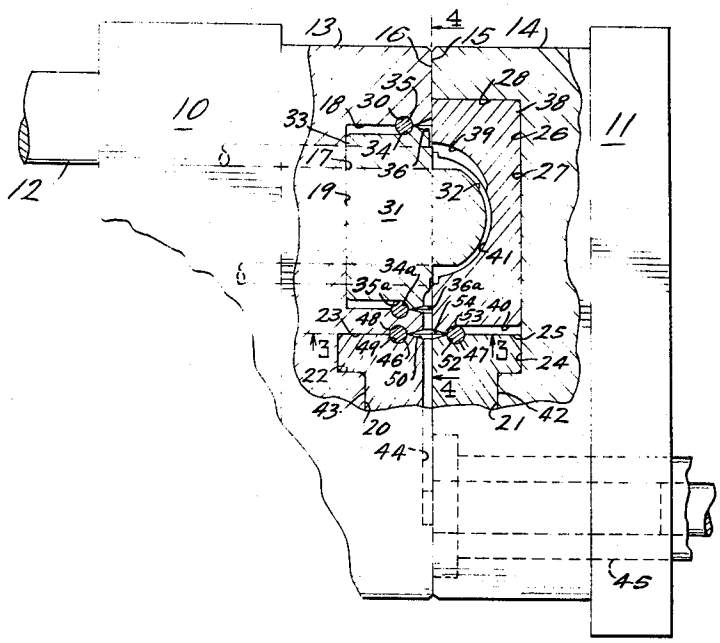
[56] **References Cited**

UNITED STATES PATENTS

3,106,002	10/1963	Bauer	164/120
2,724,865	11/1955	Mills et al.	18/DIG. 42
3,387,646	6/1968	Lauth	164/120

Primary Examiner—J. Spencer Overholser
Assistant Examiner—John E. Roethel
Attorney—Owen and Owen

ABSTRACT: The present invention is a diecasting method and apparatus. The apparatus includes a dieholder having an opening defined in one surface. A recess portion is provided in the sidewall of the dieholder opening. A die block is removably positioned in the dieholder opening. The die block surface is complementary with the sidewall recess portion for forming a flash stop. In one embodiment, the dieholder defines a shoulder and the die block has a complementary flange. In another embodiment, the die block and dieholder define complementary openings which receive a separable flash stop member. In both embodiments, a flash groove or chamber is located adjacent the flash stop and is in communication with the die casting cavity. The flash chamber is in liquid communication with the die cavity. When molten metal solidifies it forms an integral casting having flash thereon of a predetermined configuration.



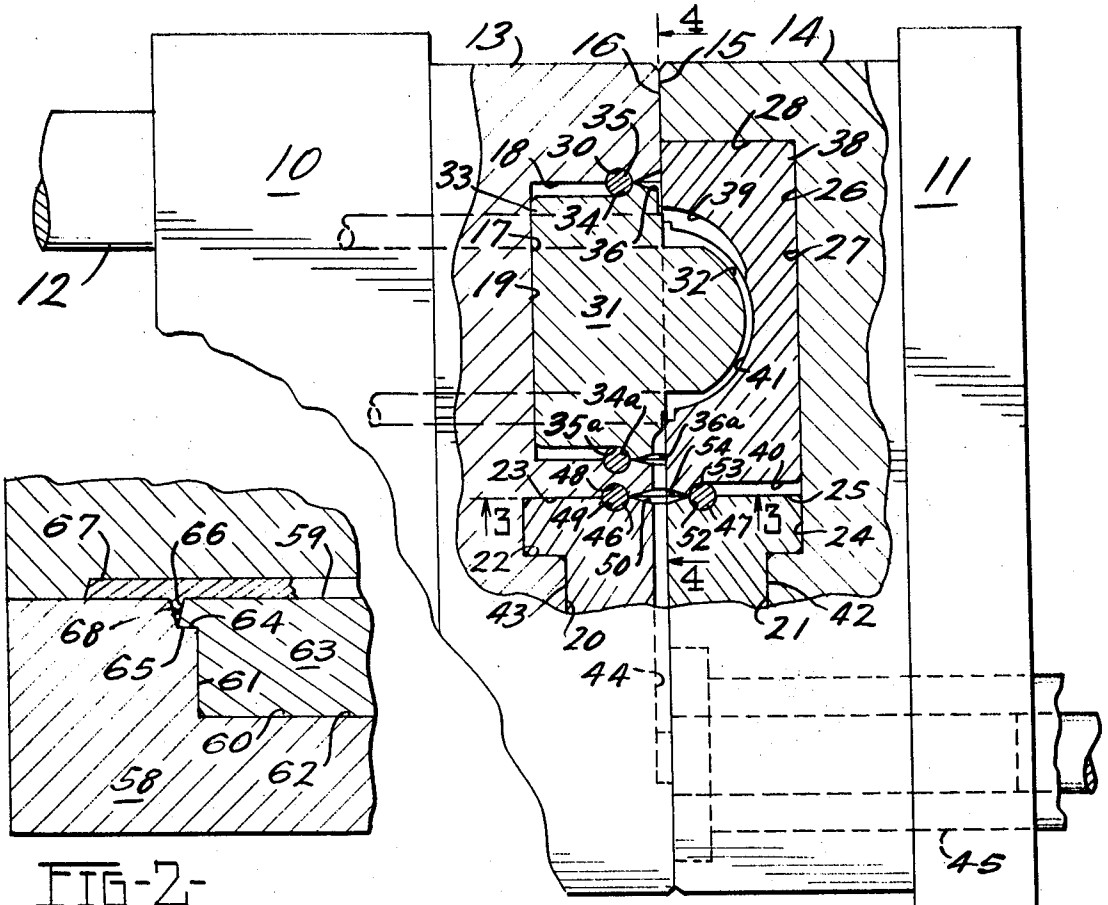


FIG-1-

FIG-2-

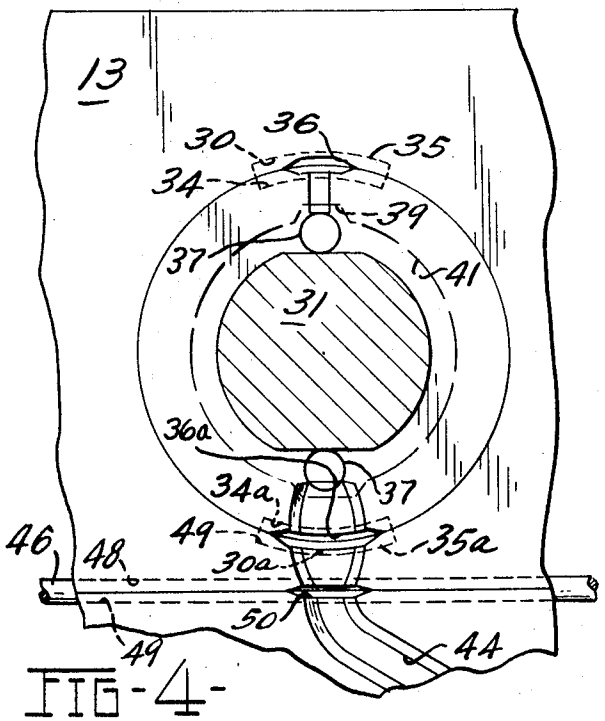


FIG-4-

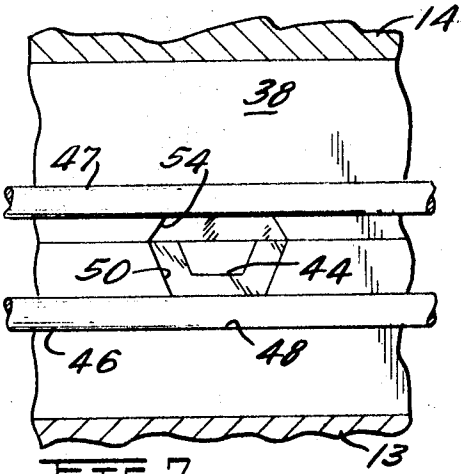


FIG-3-

INVENTOR:
BYRON W. KOCH.

BY

ATT'YS.

METHOD AND APPARATUS FOR DIECASTING INCLUDING A FLASH CAVITY

BACKGROUND OF THE INVENTION

This invention relates generally to diecasting. In a diecasting operation, when molten metal under high diecasting pressures flows across joints, for examples, the joints formed between dieholders and impression dies or dieholders and gate inserts, flash often forms in the joints. This situation is aggravated when the dieholder members and the die blocks are constructed of materials having different coefficients of thermal expansion, for example, where the dieholder member is constructed of steel and the die block is constructed of a refractory material or a refractory metal.

Even where the dieholders and impression dies are constructed of materials having the same or similar coefficients of thermal expansion, flash forms in the joints or die seals because of the differential temperature conditions which exist.

In prior art apparatus, the flash which formed in the joints or crevices during a diecasting operation reduced the production life of the die. If flash remains in the joints, cast overs are formed in subsequent diecastings. The present invention is particularly useful in Ferrous Diecasting where pouring temperatures of 2,800° F. and casting pressures of 4,000 p.s.i. are not unusual.

SUMMARY OF THE INVENTION

The present invention relates to a diecasting method and to diecasting apparatus having preformed flash chambers defined at the critical mating joints between the various die components. A flash stop is provided at the lower end of the flash chamber. A diecasting formed in diecasting apparatus, according to the present invention, has flash of a predetermined size which can easily be removed on a uniform production basis. In addition, the present invention provides diecasting apparatus which is suitable for use in a sustained production situation.

More specifically, the diecasting apparatus according to the present invention includes a dieholder member having an opening defined in one surface. The opening includes a sidewall which has a recess portion spaced from the surface of the dieholder member. A removable die block is positioned in the dieholder member opening and includes means complementary with the sidewall recess portion for forming a flash stop. In one embodiment, the sidewall recess portion comprises a shoulder and the die block means comprises a flange which is complementary with the shoulder. When the flange abuts the shoulder, it forms a flash stop. A flash groove or flash chamber is defined by the dieholder member and the die block, and is located adjacent the flash stop. The flash chamber is of a predetermined configuration and is in communication with the casting cavity.

In another embodiment, the sidewall recess portion of the dieholder member comprises a groove and the die block includes a surface complementary with the groove. The complementary surface and the groove receive a flash stop member. Again, in this embodiment, the sidewall of the dieholder member and the die block define a flash chamber adjacent the flash stop.

In the present method, the flash chambers of either embodiment are in liquid communication with the die cavity. When molten metal enters the flash chambers, the flash stops impede its flow. When the molten metal solidifies it forms an integral casting having flash thereon of predetermined configurations.

It is an object of the present invention to provide an improved diecasting method.

It is an object of the present invention to provide improved diecasting apparatus and more particularly a diecasting apparatus which has a flash chamber of a predetermined size.

Another object of the present invention is to provide diecasting apparatus which is suitable for the sustained production of diecastings.

Other objects and advantages of the present invention will become apparent from the following detailed description, reference being made to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary, partially sectional and partially diagrammatic view of one embodiment of diecasting apparatus constructed according to the present invention;

FIG. 2 is a fragmentary sectional view of another embodiment of diecasting apparatus constructed according to the present invention;

FIG. 3 is a view taken along the line 3—3 of FIG. 1 and shown on an enlarged scale; and

FIG. 4 is a partially sectional view taken along the line 4—4 of FIG. 1 and shown on a slightly enlarged scale.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a portion of a typical diecasting machine is shown. In a conventional manner, the diecasting machine includes a sliding platen **10** and a front platen **11**. The sliding platen **10** is mounted for movement on horizontal machine bars **12**. An ejector die holding block **13** is attached to the sliding platen **10** and cooperates with a stationary cover die holding block **14** which is attached to the front platen **11**. The ejector die holding block **13** has a generally planar surface **15** which abuts a similar surface **16** of the cover die holding block **14**, when the machine is in the casting position shown in FIG. **1**.

Each of the die holding members or blocks **13** and **14** have openings defined in their surfaces **15** and **16**. The exact number of openings is, of course, determined by the particular die design required for a particular casting. In the design shown in FIG. **1**, an opening **17** having a sidewall **18** and a bottom **19** is defined in the surface **15** of the holding block **13**. Opposed and cooperating openings **20** and **21** are defined in the ejector die holding block **13** and the cover die holding block **14** respectively. The opening **20** has a bottom **22** and a sidewall **23**. Similarly, the opening **21** has a bottom **24** and a sidewall **25**.

In the FIG. **1** embodiment, another opening **26** is defined in the cover die holding block **14**. The opening **26** has a bottom **27** and a sidewall **28**. As seen in FIG. **1**, the openings **21** and **26** overlap at one point.

The opening **17** in the ejector die holding block **13** has a recess portion comprising a semicircular groove **30** which is spaced from and has a major axis which is generally parallel to the planar surface **15**. The opening **17** removably receives a die impression block **31** having a casting surface **32** and a body portion **33**. The body portion **33** is inserted in the opening **17**. The die block **31** includes a curved surface portion **34** which is opposed to and complementary with the semicircular groove **30**. A flash rod **35** is received by the semicircular groove **30** and the curved surface portion **34**. A generally V-shaped groove or flash chamber **36** extends between the flash rod **35** and the surface **15** and is defined by tapered surface portions of the sidewall **18** and the die block **31**. In the present embodiment, the flash rod **35** is arcuate in configuration and is relatively short. The ejector die block **13** and the die block **31** include conventional ejector pins **37** (see FIGS. **1** and **4**).

Referring to FIGS. **1** and **4**, a second semicircular groove **30*a*** is formed in the sidewall **18** of the holding block **13**. The groove **30*a*** and a second curved surface portion **34*a*** of the die block **31** receive a flash rod **35*a***. Tapered portions of the sidewall **18** and the outer surface of the die block **31** define a V-shaped groove or flash chamber **36*a***.

The opening **26** in the holding block **14** receives a cover die impression block **38** having a casting surface **39** and an outer sidewall surface **40**. When in the casting position shown in FIG. **1**, the casting surfaces **32** and **39** of the die blocks **31** and **38** define a casting cavity **41**. It will be noted that the V-shaped grooves or flash chambers **36** and **36*a*** are in communication with the casting cavity **41**.

The openings 20 and 21 defined in the holding blocks 13 and 14 receive mating gate blocks 42 and 43 which in the present specification are also termed "die blocks." The gate blocks 42 and 43 define a gate runner 44 which is in communication with a conventional plunger sleeve assembly 45.

Referring to FIGS. 1 and 3, a pair of flash rods 46 and 47 extend through the holding blocks 13 and 14. The flash rod 46 is received by a semicircular opening 48 defined in the sidewall 23 of the opening 20 and a cooperating semicircular opening 49 defined in the adjoining surface of the gate block 43. A generally V-notch groove or flash chamber 50 extends above the flash rod 46 and is defined by the sidewall 23 of the opening 20 and the adjoining surface of the gate block 43.

In a similar manner, the flash rod 47 is received by a semicircular opening 52 defined in the surface of the gate block 42 and a complementary surface portion 53 of the sidewall 40 of the cover die block 38. A V-notch groove or flash chamber 54 extends from the flash rod 47 to the surface of the cover die block 38.

The present invention is particularly adaptable to a situation where, for example, the holding blocks 13 and 14 are constructed of steel and the die blocks 31, 38 and 43 are constructed of a refractory material, for example, a refractory metal such as a molybdenum refractory. Because of the high pressures involved in diecasting, sometimes in the neighborhood of 10,000 p.s.i. when diecasting aluminum, molten metal forces its way into the joints between abutting components. In prior art diecasting apparatus, the joints tend to widen and the resulting flash was nonuniform. Flash sometimes remained with the die blocks rather than being ejected with the casting. When this occurred, cast overs were formed in subsequent castings. By utilizing the diecasting apparatus according to the invention, the molten metal is forced into preformed flash chambers, for examples, the V-notch grooves or flash chambers 36, 36*a*, 50 and 54. As the molten metal travels inwardly into the respective flash chambers, it encounters the flash stops, for examples, the flash rods 35, 35*a*, 46 and 47. An important feature of the present invention is that the flash formed in the respective flash chambers is ejected with each casting, thus minimizing cast over defects.

In the present embodiment, the flash rods 35, 35*a*, 46 and 47 are metallic rods which stop the travel of the molten metal because of their heat sink properties and also because they form physical barriers to the further travel of the molten metal. Eutectic rods may also be utilized as flash rods. Furthermore, the flash rods 35, 35*a*, 46 and 47 may have other geometrical configurations. It has been found that when the flash rods extend through the die blocks, for example, in the manner that the flash rods 46 and 47 extend through the holding blocks 13 and 14, that the flash rods may be tubular and a cooling fluid circulated therethrough.

The casting and its attached flash is removed by the conventional ejector pins 37 in a direction away from the apexes of the wedge-shaped flash chambers 36, 36*a*, 50 and 54. As is well known in the art and shown in U.S. Pat. No. 3,106,002, the die block 31 remains stationary in the opening 17 of the ejector die block 13 as the casting is ejected.

The flash which is formed in the flash chambers 36, 36*a*, 50 and 54 may be easily removed from a diecasting after it is ejected from the diecasting machine. The flash which is formed is uniform and may be removed on a production basis. It has been found that when using the diecasting apparatus according to the present invention, which has the flash chambers, that the die life is longer, sustained diecasting production may be achieved, and cast over defects are substantially eliminated.

Another embodiment of the present invention is shown in FIG. 2. In this embodiment, a dieholder member 58 has an upper planar surface 59. An opening 60 is defined in the surface 59 and has a sidewall 61 and a bottom 62. A die block 63 is removably received in the opening 60. The sidewall 61 of the die holder member 58 includes a sidewall recess portion or shoulder 64. The die block 63 includes a flange 65 which is complementary with the shoulder 64. The flange 65 and the shoulder 64 form a flash stop when the die block 63 is inserted in the opening 60 of the dieholder member 58, as shown in FIG. 2.

Immediately above the shoulder 64 and the flange 65, a portion of the sidewall 61 and a portion of the side of the die block 63 define a generally V-notch groove or flash chamber 66. When the molten metal, illustrated by the reference number 67 in FIG. 2, is forced into the die cavity, it enters the flash chamber 66, solidifies, and forms a flash projection 68. The flash stop formed by the shoulder 64 and the change 65 retards the movement of molten metal 67.

After a diecasting is removed from the diecasting machine, the flash projection 68 is removed.

What I claim is:

1. Apparatus for diecasting, wherein a dieholder member has an opening defined in one surface, said opening having a sidewall, said sidewall having a recess portion spaced from such surface of such dieholder member, such recess portion comprising a groove of a predetermined configuration, said apparatus comprising a die block insertable in such opening of such dieholder member, said die block having a casting surface and means on said die block complementary with such sidewall recess portion for forming a flash stop, said forming means including a complementary surface portion on said die block and a rod having a mating configuration positioned between said groove and said complementary surface portion, and wherein a portion of the surface of said die block and a portion of such sidewall of such dieholder member define a flash chamber, said flash chamber extending from said flash stop toward such surface.

2. Apparatus for diecasting, wherein a dieholder member has an opening defined in one surface, said opening having a sidewall, said sidewall having a recess portion spaced from such surface of such dieholder member, said apparatus comprising a die block insertable in such opening of such die holder member, said die block having a casting surface and means on said die block complementary with such sidewall recess portion for forming a flash stop, a portion of a surface on said die block and a portion of such sidewall of such die holder member defining a flash chamber, said flash chamber extending from said flash stop toward such surface, said flash chamber being generally wedge shaped in cross section, wherein said flash chamber flares outwardly from said flash stop, and means for removing the casting in a direction away from the apex of the wedge-shaped flash chamber without separating said die block from said opening.

3. Apparatus according to claim 1, wherein such recess portion of such dieholder member sidewall defines a shoulder and said means on said die impression block comprises a flange complementary with such shoulder, said flange and such shoulder forming said flash stop, whereby said flash stop retards the movement of molten metal from said flash chamber.

4. Apparatus according to claim 1, wherein such groove is semicircular and said rod has a generally circular cross section.

5. A method of forming flash of a predetermined configuration on a diecasting to eliminate cast over defects in subsequent diecastings, wherein joints are defined between adjacent die parts, which are stationary during the casting operations, including providing a wedge-shaped flash chamber between said adjacent die parts, said flash chamber being in liquid communication with the die cavity, providing a flash stop in the flash chamber to impede the flow of molten metal, filling the die cavity and the flash chamber with molten metal, solidifying the molten metal within the die cavity and the flash chamber to form an integral casting having flash thereon of the predetermined configuration and removing the casting from the die parts, the casting being removed in a direction away from the apex of the wedge-shaped flash chamber.

6. Apparatus for diecasting comprising, in combination, a dieholder member having a die opening defined in one surface, said die opening having a sidewall and a bottom, said

sidewall defining a receiving groove, a die block removably mounted in said die opening, said die block having a surface complementary with said receiving groove, a separable flash member positioned in said groove and engaging said complementary surface of said die block, and a flash chamber defined by said dieholder member and said die block adjacent said flash member.

7. Apparatus according to claim 6, wherein said dieholder is constructed of steel and wherein said die block is constructed of a refractory material.

8. Apparatus according to claim 6, wherein said receiving groove has a semicircular cross section and wherein said flash member is a circular rod.

9. Apparatus for diecasting comprising, in combination, a dieholder member having a die opening defined in one surface, said die opening having a sidewall and a bottom, said sidewall defining a shoulder spaced from said surface, a die block removably mounted in said die opening, a flange on said die block engageable with said shoulder, said shoulder and said flange forming a flash stop, a flash chamber extending between said shoulder and said die opening surface defined by said dieholder and said die block, said flash chamber being generally wedge shaped in cross section, flaring outwardly from said flash stop, and means for removing the casting in a direction away from the apex of the wedge-shaped flash chamber without removing said die block from said die opening.

10. Apparatus according to claim 9, wherein said dieholder is constructed of steel and wherein said die block is constructed of a refractory metal.

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,612,153 Dated October 12, 1971

Inventor(s) Byron W. Koch

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 11, the word "change" should read
-- flange --; and
line 49, (claim 3), "claim 1" should read
-- claim 2 --.

Signed and sealed this 14th day of March 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents