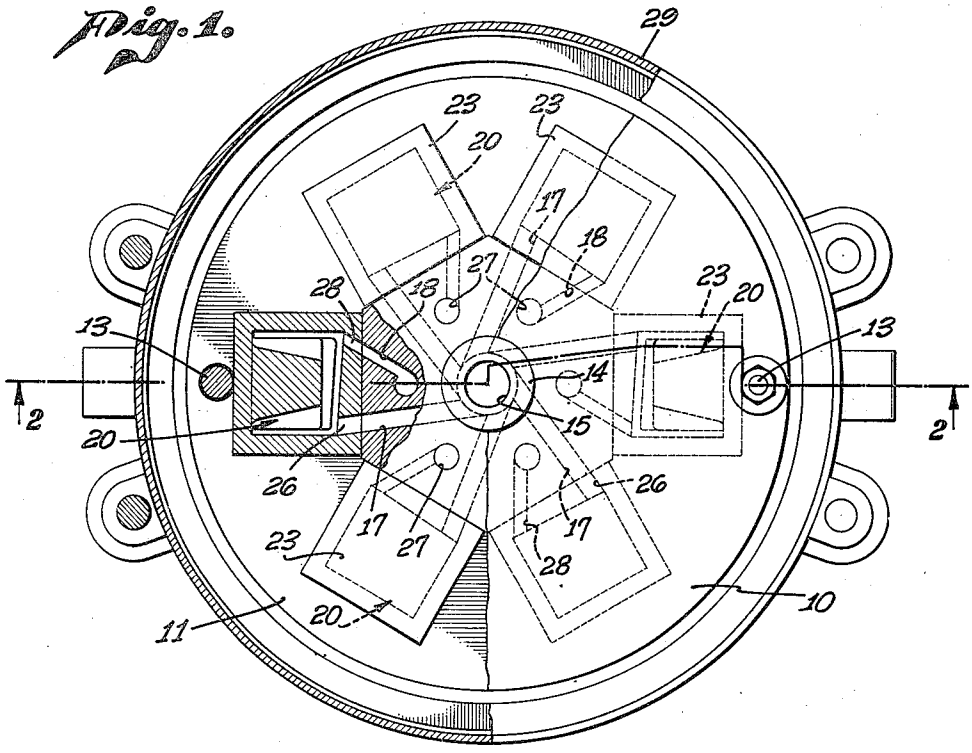
June 1, 1948. H. J. WOOCK 2,442,718

VENTING FOR MOLD CAVITIES IN CENTRIFUGALLY CASTING

Filed Jan. 22, 1943

Fig. 1.



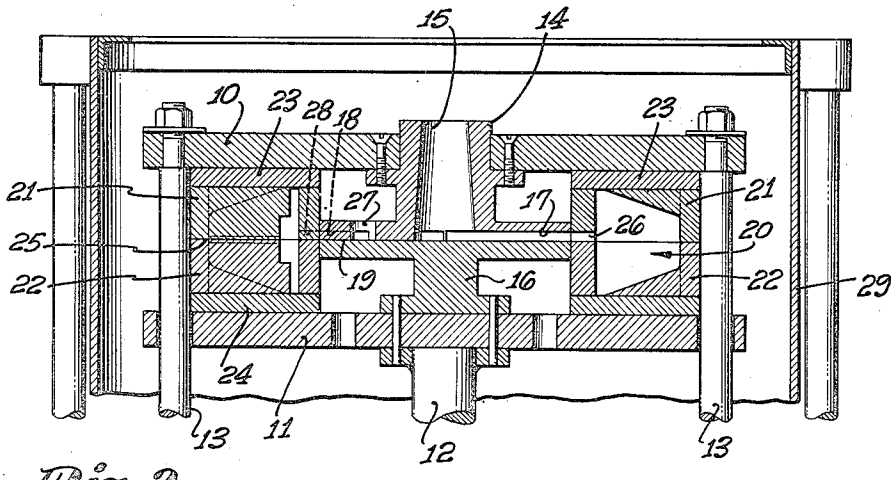


Fig. 2.

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Patented June 1, 1948 2,442,718

UNITED STATES PATENT OFFICE

2,442,718

VENTING FOR MOLD CAVITIES IN CENTRIFUGALLY CASTING

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Application January 22, 1943, Serial No. 473,215

7 Claims. (Cl. 22—65)

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This invention relates to venting the mold cavities in centrifugal casting operations. It may be considered as divisional of the subject matter disclosed in my applications Serial Numbers 473,213, now abandoned, and 473,214 now Patent No. 2,415,620, filed of even date herewith.

In the above-numbered applications I have disclosed a casting apparatus wherein the mold cavities are formed in individual dies each of which is composed of separable parts, such as a cope and a drag. The cope and drag of each die is secured to cope and drag retaining elements which are likewise separable so that when the cope and drag retaining elements are opened the parts of the die are opened or separated thereby. The cope and drag retaining elements are together rotatable about a vertical central axis coincident with which is a central pouring gate from which runners lead to the mold cavities in the individual dies. Inasmuch as the metal or other material that is poured into the pouring gate is caused to enter the mold cavities at high velocity due to the centrifugal action developed thereon it is important that an adequate vent be provided for the mold cavity, otherwise the air or gas initially present in the mold cavity cannot escape therefrom and would otherwise produce air pockets in the finished casting.

A primary object of the present invention is to provide a means and method whereby a centrifugal mold having mold cavities radially spaced from the axis of rotation has the metal fed thereto by the runners from the central pouring gate in such a manner that the air or gas initially in the mold cavity will be expelled by the incoming metal toward a vent without causing it to be included in the metal.

Another object of the invention is to provide a centrifugal mold having radially spaced mold cavities wherein there is a vent for each cavity so arranged that the mold cavity will first be filled by the incoming metal so as to completely expel the air therefrom before the metal is caused to enter the venting passage.

Still a further object of the invention is to provide a centrifugal mold having a cope and a drag separable from each other on a parting plane wherein the runners leading to the mold cavities and the vent passages leading therefrom will be located on or adjacent the parting plane so that metal solidifying in the runners and vent passages will not lock the cope and drag against separation.

With the foregoing and other objects in view, which will be made manifest in the following

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detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a top plan view of a centrifugal molding machine illustrating the mold cavities as being equipped with runners and vents in accordance with the present invention, part of this view illustrating the machine being broken away and shown in horizontal section; and

Fig. 2 is a partial view in vertical section taken substantially upon the line 2—2 upon Fig. 1.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the upper circular plate 10 together with associated structure constitutes a cope retaining element and the lower plate 11 together with associated structure constitutes a drag retaining element. The lower plate 11 is supported on a central vertical shaft 12 which can be raised and lowered to effect a vertical sliding of the drag retaining element 11 on rods 13. The cope retaining element and drag retaining element together with the rods 13 and the shaft 12 are rotatable in unison about the vertical central axis coincident with the longitudinal central axis through the shaft 12. In the cope retaining element 10 there is replaceably secured a gate providing member 14 having a gate 15 coincident with the axis of rotation. A barrier plate 16 is secured to the drag retaining element 11 and provides the bottom for the gate 15 as well as for the runners 17 leading therefrom and vent passages 18. The gate providing member 14 and the barrier plate 16 are normally in abutment but are separable from each other on a parting plane indicated at 19.

The mold cavities 20 are formed in individual dies each of which may comprise a cope 21 and a drag 22. The copes of the individual dies are secured to the cope retaining element 10 although there may be intervening spacers 23. Similarly the drags 22 are secured to the drag retaining element 11 although there may be intervening spacers 24. The spacers are employed so that the parting lines or parting planes 25 of the individual dies will be in the same plane with the parting plane 19 between the gate providing member 14 and the barrier plate 16. The runners 17 are preferably formed on the bottom surface of the gate providing member 14 although these runners may, if desired, be formed in the top of the barrier plate 16. At all events they should be exposed on the parting plane. Continuations of these runners are formed in the

dies, such continuations being indicated at 26. These continuations lead to the rear or trailing inner corners of the mold cavities. The exact points where the extensions 26 communicate with the mold cavities will vary considerably depending upon the size and shape of the mold cavity and its position in the die. The extensions however should communicate with the trailing side of the mold cavity. Thus, if the mold is considered as rotating in a clockwise direction as viewed in Fig. 1, the extensions 26 communicate with the mold cavities at their rear sides.

The vent passages 18 are likewise shown as being formed on the bottom surface of the gate providing member 14 so as to be in the same plane with the runners 17. This arrangement is not essential as the vent passages may be formed in the top surface of the barrier plate 16. However, these passages should also be exposed on the parting plane 19. They communicate with vertical apertures 27 leading to the atmosphere, it being understood that the dies are slightly spaced from one another as clearly shown in Fig. 1. Ordinarily, it is not necessary to form the apertures 27 with any draft, but if any draft is formed in these apertures or in the walls of the runners or the vent passages the draft should be such as to enable the barrier plate 16 which becomes a part of the drag of the mold to separate from the cope. The vent passages 18 have extensions 28 formed in the dies which communicate with the mold cavities 20 at their forward inner corners considered in relation to the direction of rotation of the mold. 29 indicates a shield which surrounds the rotatable mold and which can be lowered on opening the mold to enable removal of the finished castings.

In pouring the mold, the mold is first started rotating and the molten metal is introduced through the central gate 15 while the mold is rotating. This is fed to the individual mold cavities through the runners or feeder gates 17 and their extensions 26. As the metal passes out through these runners it is subjected to centrifugal action and is constantly being accelerated in a circular direction as it progresses radially from the center of rotation. The metal that is fed into the mold cavity quickly fills the mold cavity toward the extensions 28 of the vent passages 18. The initial air or gas that may be in the mold cavity is thus expelled by the incoming metal without any tendency of its being included or mixed with the metal filling the mold cavity which would otherwise result in blow holes and fissures therein. Ultimately, the mold cavities 20 are completely filled and any excess metal may flow out through the inwardly extending vent passages and may even fill and slightly overflow from the apertures 27. When the metal has solidified the mold is stopped rotating and the vertical shaft 12 is lowered lowering the master drag 11 and the individual die drags 22 from the master cope and the individual die copes.

Inasmuch as the vent passages and the runners or feeder gates are located on the same plane and are exposed on the parting planes of the cope and drag retaining elements and the individual die copes and drags that metal which may solidify in the vent passages and runners will not lock the parts of the mold against separation. When the mold is opened the shield 29 is lowered or otherwise removed to enable the removal of the casting which is usually in the form of a plurality of castings connected together in the form of a large spider, the connections being provided by the metal remaining in the runners or feeder gates 17. After the casting has been removed the mold can be again closed and the casting operation repeated.

It will be appreciated that by the present invention it is possible to centrifugally cast by running molten metal centrifugally into rotating mold cavities and enable the air or gas initially present in the mold cavities to escape therefrom without being included in the metal of the casting. Furthermore, metal soldifying in the runners or vent passages or both does not lock the cope and drag retaining elements against separation.

Although I have illustrated each individual die as being formed of merely a cope and drag it will be understood that the dies may be required to be made of three or more parts in order to effect or enable their being opened to remove the completed casting. If the die is formed of three or more parts the extensions 26 and 28 should be formed on one of its opening or parting planes wherever they may be located.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A centrifugal mold having mold cavities rotatable about a central axis of rotation and formed in parts separable upon a radially extending parting plane, there being inlets to the mold cavities exposed on the parting plane, and vents from the mold cavities exposed on the parting plane, the inlets communicating with the trailing sides of the mold cavities and the vents communicating with the leading sides of the mold cavities.

2. A centrifugal mold having mold cavities rotatable about a central axis of rotation and formed in parts separable upon a radially extending parting plane, there being inlets to the mold cavities exposed on the parting plane, and vents from the mold cavities exposed on the parting plane, the inlets communicating with the trailing sides of the mold cavities and the vents communicating with the leading sides of the mold cavities and extending inwardly therefrom.

3. A centrifugal mold having cope and drag retaining elements rotatable about a central axis, a gate providing member on the cope providing a central gate, means on the drag retaining element closing the bottom of the gate and defining a radially extending parting plane, means providing mold cavities having copes and drags secured to the cope and drag retaining elements having a parting plane in the same plane with the first mentioned parting plane, runners leading from the gate to the mold cavities exposed on said parting plane, and vents leading from the mold cavities to atmosphere exposed on the parting planes, the runners leading to the trailing sides of the mold cavities and the vents leading from the leading sides thereof.

4. A centrifugal mold having mold cavities rotatable about a central axis of rotation and formed in parts separable upon a parting plane, there being inlets to the mold cavities and vents from the mold cavities the inlets communicating with the mold cavities adjacent their inner sides and near the trailing sides thereof and the vents communicating with the mold cavities adjacent their inner sides and adjacent the leading sides thereof.

5. A centrifugal mold having mold cavities rotatable about a central axis of rotation and formed in parts separable upon a parting plane,

there being inlets to the mold cavities and vents from the mold cavities the inlet communicating with the mold cavities adjacent their inner sides and near the trailing sides thereof and the vents communicating with the mold cavities adjacent their inner sides and adjacent the leading sides thereof, the vents and inlets being exposed on the parting plane so as not to interfere with opening of the mold.

6. A centrifugal mold having mold cavities spaced from the axis of rotation of the mold, a central gate, runners leading from the gate to the mold cavities and communicating therewith on the innermost sides of the mold cavities, and vents for the mold cavities also communicating therewith on their innermost sides, said vents being arranged in advance of the runners leading to their respective mold cavities in respect to the direction of rotation of the mold.

7. A centrifugal mold having mold cavities spaced from the axis of rotation of the mold, a central gate, runners leading from the gate to the mold cavities and communicating therewith on the innermost sides of the mold cavities, and vents for the mold cavities also communicating therewith on their innermost sides, said vents being arranged in advance of the runners leading to their respective mold cavities in respect to the direction of rotation of the mold, said vents and

runners being exposed on the parting plane of the mold so that if they become filled with the material cast it would not prevent opening of the mold.

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