

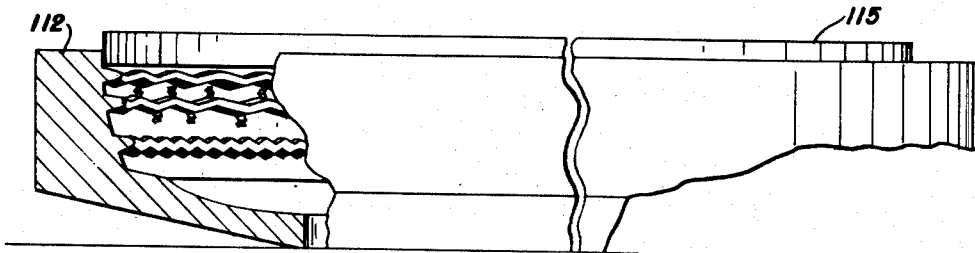
Oct. 27, 1953

J. C. HEINTZ

2,656,593

COOLING CASTINGS OVER SIZING FORMS

Filed Sept. 21, 1951



INVENTOR.

JAMES C. HEINTZ

BY

Forrest C. Lusk

ATTORNEY

UNITED STATES PATENT OFFICE

2,656,593

COOLING CASTINGS OVER SIZING FORMS

James C. Heintz, Lakewood, Ohio; The Cleveland Trust Company, executor of the said James C. Heintz, deceased

Application September 21, 1951, Serial No. 247,729

3 Claims. (Cl. 29—148)

1

This invention relates to the production of metal castings, and more particularly to cooling a hot and shrinkable, freshly cast object having an opening in it, over a sizing form which is smaller than the opening. By cooling the object and shrinking the opening onto the form, the ultimate shape of the opening is controlled. It relates more particularly to the production of a cast tire matrix, especially an aluminum matrix. It relates more generally to the production of castings from magnesium, brass, and other metals and alloys.

The mold in which the metal is cast is made partly of metal and the balance may be plaster of Paris.

The metal portion of the mold, which will be referred to herein as the "chill element" (or the "chill ring" of a matrix mold) will be made of a metal which has a higher melting point than the metal which is being cast, so that it will not be affected by it. Generally cast iron will be most suitable. The chill element will ordinarily be relatively thin so that it can expand and contract readily and so that it will not store up heat which will prevent its frequent reuse. Thus, a chill element or chill ring which can be reused at intervals of a half hour or an hour will be found more efficient than elements which must stand twenty-four hours or longer after using in order to cool down to a temperature at which they may be reused.

In the manufacture of tire matrices, I prefer to form the intricate tread and sidewall design in a plaster of Paris form with a flexible pad which can be made of rubber or a vinyl composition, or any flexible setting plastic. The material known as Perma-Flex cold molding compound, sold by the Perma-Flex Mold Company of Columbus, Ohio, has proved very satisfactory. The flexible forming pad is formed from any suitable pattern such as a pattern carved from hard plaster, and the plastic is brought into contact with this pattern surface and set in any usual manner, as by being poured into a cavity formed next to the surface just prior to setting. The use of flexible forming pads is not new in the art and the pad may be made in any known or novel manner.

The chill ring for molding a tire matrix forms the outer surfaces of the matrix which contact the shell of the tire mold. Its cooling action on the cast metal is advantageously dampened or retarded by coating its inner surface with a heat-insulating composition, e. g., a granular earthen material such as china clay or the like. All

2

metal surfaces exposed to contact with the molten metal are advantageously insulated in this manner. By retarding the solidification of the molten metal in this manner, the metal which is still molten feeds in against the plaster surface to make up for shrinkage. The molten metal is first fed on the plaster of Paris surface. As the molding cavity fills with the molten metal the area of contact with the "dampened" or insulated chill increases. There is little disturbance of the metal in contact with the plaster of Paris because the direction of flow is toward the surface of the chill. Bubbles rise from the plaster of Paris surface and collect on the surface adjacent the chill before solidification.

This application is a continuation-in-part of my application Serial No. 183,810, filed September 8, 1950, in which the core box and its operation are claimed. The method of casting with a plaster of Paris sprue and runner, and with a design in a plaster of Paris mold and a metal chill element, and apparatus therefor are claimed in my application Serial No. 247,728, filed September 21, 1951. The method of siping and siping equipment are claimed in my application Serial No. 247,727, filed September 21, 1951.

The invention will be further described in connection with the drawing which is an elevation, partly broken away, of a finished tire matrix, inverted, and with the sizing ring in place.

The drawing illustrates the use of a sizing ring with a tire matrix. If plaster of Paris forms are used in the assembly of the mold, it is necessary that they be correctly positioned in order to have an annular mold cavity. By correctly locating the forms and removing any excess plaster, as may be required, the surface of the tread of the matrix may be made circular with a variation of less than a ten thousandth of an inch. This is accomplished without any machining or other finishing of the matrix. The method of doing this and apparatus therefor are claimed in application Serial No. 379,949, filed September 14, 1953. In assembling the mold six segmental plaster of Paris forms may be used to form the inner wall of the annular mold cavity. The chill ring is lowered over these and forms the outer wall and top of the cavity. Suitable means is provided for supplying the molten aluminum or other metal to the cavity.

Various aluminum alloys are available for casting such objects as tire matrices. An alloy of 95 per cent aluminum and 5 per cent silicon has been used satisfactorily, but others may be used as satisfactorily.

The aluminum is melted and poured at about 1250° F. (Its melting point is about 1100° F.) This is a higher temperature than would be permissible if the mold were formed entirely of plaster of Paris. Using molds composed entirely of plaster of Paris the metal cools slowly, and the gas generated forms a porous product. Using a chill element or ring the metal is poured at a higher temperature and cools rapidly, and sets in a non-porous condition.

The metal may be poured simultaneously into opposite sides of the mold cavity from two different ladles. Eventually, as the cavity is filled, the whole under surface of the chill ring is contacted by the molten metal and heated by it. The metal rapidly dissipates the heat and chills the metal.

The chill ring is relatively expensive and it is desirable to reuse it several times each day. Therefore, after the aluminum has set, the chill ring is lifted from the cast matrix, and after standing a sufficient time to cool it is reused.

The plaster of Paris forms are then broken away from the matrix and with the use of an air hose all plaster of Paris adhering to the matrix is removed, such as that which may adhere to the sides or in the grooves in the tread. This is done before the contraction which accompanies cooling has been completed. To limit such contraction and to true up the matrix a cast iron sizing ring 115 or other circular object is inserted in the edge of the matrix, as illustrated in the drawing. The matrix contracts against this ring and as the circumference of the ring has been machined to a true circle, the matrix after cooling is exactly round. The sizing ring 115 can be removed by a mallet, or sledge, or other implement, or in any convenient manner. For cast objects which have non-circular openings, sizing forms of an appropriate shape and slightly smaller than the openings before shrinking, are employed and the cast objects are allowed to cool around them. After cooling, i. e. on completion of the contraction, the sizing forms are removed in any suitable way. The use of the sizing form prevents distortion of the cast object on cooling. It has not been customary to remove articles cast from aluminum, etc. from the mold until after they have cooled and there is no danger of subsequent contraction. The presence of the mold during cooling prevents or may limit contraction which would otherwise occur. Although the invention relates more particularly to the use of a sizing form in objects cast in a mold formed partly of plaster of Paris and partly of a metal chill element, the invention includes the use of the sizing form with freshly formed cast objects which are still shrinkable regardless of the type of mold in which they have been formed.

An advantage in the use of plaster of Paris forms in casting metals, is that the castings produced in contact with them are substantially

perfect in every detail and need little or no trimming or other machining. Any machining that is required may be done before or after the matrices are heated to prevent growth.

Although the invention has been described more particularly in connection with the production of tire matrices, especially from aluminum alloys, it is to be understood that it relates to the production of other objects and in general the chill ring, or chill element employed will be made of cast iron or other ferrous metal, and the metals which are to be cast will be metals with a melting point not over 1000° C.

What I claim is:

1. The method of forming a metal casting with an opening in it, which comprises casting the metal in a mold, removing the cast metal from the mold while still hot and shrinkable, putting a cool sizing form smaller than the opening in the opening in the casting, said sizing form exactly fitting the opening when the casting is cool, then shrinking the casting over the sizing form, thereby preventing the casting from becoming misshapen while shrinking during further cooling, and then separating the casting and the sizing form.

2. The method of casting the annular tread-forming element of a tire mold which comprises removing the cast element from its mold while still hot and before it has shrunk to its smallest dimensions, inserting a tight-fitting circular sizing form in the casting at about its largest inside diameter, the form being smaller than said diameter of the casting, allowing the casting to cool and shrink around this form, whereby the casting is prevented from becoming misshapen while shrinking during further cooling, and then separating the casting and the sizing form.

3. The method of forming a casting with an opening in it which comprises removing the casting from its mold while hot and shrinkable, placing in the opening a form of the same general shape as the opening but smaller than the opening when thus hot and shrinkable but larger than the opening when cooled, and then cooling the casting until the opening shrinks onto the form, and thereafter separating the form and the casting.

JAMES C. HEINTZ.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
178,044	Babcock et al.	May 30, 1876
606,675	Marcy	July 5, 1898
1,003,409	Alexander	Sept. 19, 1911
1,281,946	Griffin	Oct. 15, 1918
1,695,239	Norton	Dec. 11, 1928
1,776,145	Bungay	Sept. 16, 1930
2,284,346	Speck et al.	May 26, 1942
2,284,729	Dusevoir	June 2, 1942
2,572,064	Slinkard	Oct. 23, 1951