July 21, 1953 W. H. JOHNSON 2,645,829

PATTERN FOR VERTICAL CASTING SYSTEMS

Filed May 4, 1950

FIG. 1

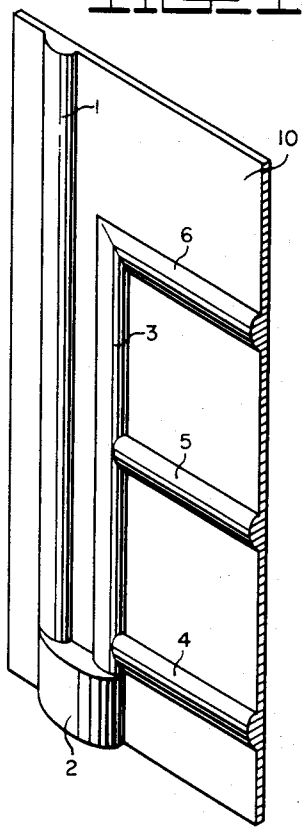


FIG. 2

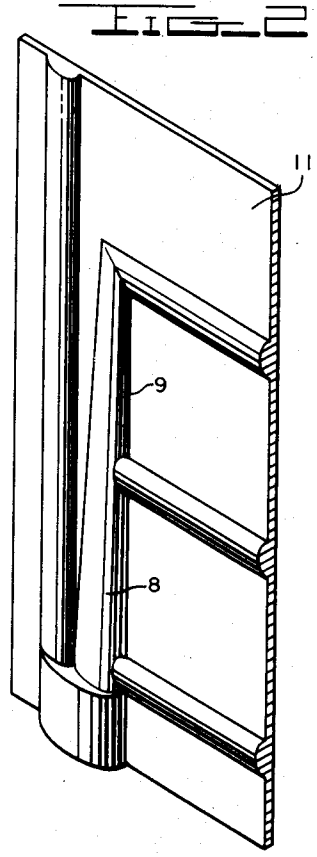


FIG. 1A

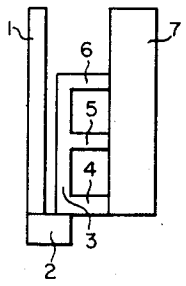
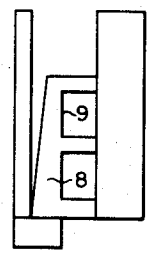


FIG. 2A



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PATTERN FOR VERTICAL CASTING SYSTEMS

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2 Claims. (Cl. 22—157)

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1

This invention relates to improvements in the casting of metals, more patricularly to new systems for the pouring of metal in vertical casting and to match plates for the molding of foundry cores which in the set up position in the foundry flask delineate or embody the new pouring systems of the invention.

Vertical casting as commonly carried out in the foundry involves a system including a vertical conduit or sprue with which is connected a series of horizontally arranged conduits, usually two, lying one above the other, called step gates, which lead into the casting cavity. The pouring system which is located in the foundry flask adjacent the casting cavity, is defined by forms which carry on their opposing faces, a mirror half of the sprue and the step gates. In operation of the system, the metal is poured into the sprue and enters through the first or lowermost step gate into the casting cavity. When the level of the metal in the casting cavity reaches the point of entry of the next higher step gate, flow of the metal from the sprue into the casting cavity takes place through this step gate, also. This is known in the art as sequence flow of the metal into the casting cavity. It has the advantages of shortening the pouring time and tending to produce sounder castings. However, with a single known exception based upon a particular metal, experience has shown that sequence flow of the metal in vertical casting systems can be had only with two step gates; no flow or only a dribbling of the metal into the casting cavity being had through the third step gate. In view of the advantages to be derived therefrom, it is obviously desirable to have a pouring system in which sequence flow of metals generally can be had through three rather than only two step gates, especially for the founding of the longer castings.

It is, accordingly, an object of the present invention to provide an improved system for the pouring of metals generally in vertical casting in which sequence flow into the casting cavity can be had through three step gates.

It is a further object of the invention to provide match plates from which can be molded foundry forms which when set up in the foundry flask define the metal pouring systems of the invention.

Other objects of the invention will become apparent from the description which follows:

Briefly stated, I have found that metals generally can be induced to flow sequentially through each of three step gates into the casting cavity of a vertical casting system by providing in combination, a vertical conduit or sprue, a reservoir connected therewith and with a second vertically

2

arranged conduit or reverse sprue, and a series of three step gates connected to the reverse sprue and leading into the casting cavity.

In the other aspect of my invention I have provided match plates for the new pouring systems from which, in the usual way, can be molded matching foundry cores which in their juxtaposed or operative position in the foundry flask define or delineate the new pouring systems. These match plates carry on a broad face thereof, a raised design in half longitudinal section of the new pouring systems, the raised design taking the form of a series of interconnected bosses in half longitudinal section of the several parts of the pouring system.

The invention will be more fully understood by reference to the following description taken in conjunction with the accompanying drawing in which like parts carry like numerals and in which:

Figure 1 is a perspective view of a match plate carrying a raised design for a pouring system in accordance with the invention,

Figure 2 is a perspective view of a match plate carrying a raised design for a modified pouring system in accordance with the invention, and,

Figures 1A and 2A are schematic showings, in operative set up with a casting cavity, of the new pouring systems which form the subject of the match plates of Figures 1 and 2.

Referring to Figure 1A, the usual sprue 1 is shown connected to a reservoir 2 to which is also connected a reverse sprue 3. 4, 5 and 6 are step gates connected with the reverse sprue 3 and leading into the casting cavity 7 shown in conventionalized form.

The sprues and step gates are of equal diameter. The reservoir 2, as shown, is of circular cross-section but may be of any other configuration found suitable, such as rectangular or obloid, provided it has sufficient capacity to reduce to a substantial degree the momentum of the metal flowing into it from the sprue 1. The depth of the reservoir should be at least equal in magnitude to the diameter of the sprue 1 and preferably is greater, for example, two to three times greater. The width of the reservoir may be of about the same magnitude as its depth and the length thereof should be sufficient to at least accommodate the sprues 1 and 3 connected in side by side relationship to the top of the reservoir, but preferably is slightly greater.

In operation of the pouring system shown in Figure 1A, the metal, for example, steel, is poured into the sprue 1, filling the reservoir 2. The reservoir serves to substantially reduce the momentum of the metal arriving from the sprue 1. The metal rises upwardly from the reservoir into

the reverse sprue 3 and flows through the lowermost step gate 4 into the casting cavity 7. When the level of the metal in the cavity 7 rises to the point of entry of the second step gate 5, metal starts to flow into the casting cavity 7 from the reverse sprue 3 through step gate 5. Again, when the level of the metal in the casting cavity reaches the point of entry of the third step gate 6, metal flows from the reverse sprue 3 into the casting cavity 7 through step gate 6 to complete casting of the metal.

Figure 2A shows a pouring system similar in all respects to that shown in Figure 1A with the exception that the reverse sprue 8 is tapered in cross-section and connected at its base with the reservoir 2. The step gates 4, 5 and 6 are connected to the vertical side 9 of the tapered reverse sprue 8. The operation of the system is the same as that of Figure 1A. The enlargement of the base of the reverse sprue 8 serves to further reduce the momentum of the metal whereby spurting of the metal into the casting mold 7 through the second step gate 5 is minimized or avoided. At the top, the cross-sectional area of the tapered sprue 8 is equal to that of the sprue 1 and at the bottom it can be from about two to four times the same.

In Figure 1 match plate 10 is provided with a raised design in half longitudinal section of the pouring system shown in Figure 1A, and in Figure 2 match plate 11 is shown provided with a similar raised design of the pouring system of Figure 2A. The raised designs are constituted by a series of connected bosses which are identified with the respective elements of the pouring systems by means of like numerals. The match plates may be made of wood, metal or other suitable material and the raised design provided thereon in known manner.

Since various modifications and changes may be made in the invention without departing from the spirit or the scope thereof, it is not intended that it shall be limited to the herein described specific embodiments thereof but only as is required by the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A pattern plate for molding foundry pouring forms, said pattern plate having attached to a broad face thereof a system of bosses including a short vertical boss of generally rectangular cross-section having its outer vertical edges rounded off, a pair of adjacently disposed vertical half-round bosses, the first of which is longer than the second, the second is of upwardly tapering cross-section and both are of greater length than said short vertical boss, each of said pair of vertical bosses being attached at its lower end to the upper horizontal face of said short vertical boss, said horizontal face having a width slightly greater than is necessary to accommodate the ends of said pair of vertical bosses attached thereto, said short vertical boss having a length and depth equal to from twice to three times the magnitude of the diameter of said first vertical half-round boss, said tapered vertical half-round boss having a minimum cross-sectional area equal to that of said first vertical half-round boss and a maximum cross-sectional area of from about two to four times the same, a series of three horizontal bosses attached to said tapered vertical boss along the side thereof which is remote from the adjacent vertical boss and so arranged therealong that the lowermost of the three is located at the lower end and the highest at the upper end thereof, and the second is located intermediate of the other two, each of said three horizontal bosses having a cross-sectional area equal to that of said first vertical half-round boss.

2. A foundry pattern for molding pouring forms, said pattern comprising a system of solid elements having a flat surface each of which lies in a common plane, said system of solid elements including a short vertical bar of generally rectangular cross-section having its outer vertical edges rounded off, a pair of adjacently disposed vertical half-cylinders, the first of which is longer than the second, the second is of upwardly tapering cross-section and both are of greater length than said short vertical bar, each of said pair of vertical half-cylinders being attached at its lower end to the upper horizontal face of said short vertical bar, said horizontal face having a width slightly greater than is necessary to accommodate the ends of said pair of vertical half-cylinders attached thereto, said short vertical bar having a length and depth equal to from twice to three times the magnitude of the diameter of said first vertical half-cylinder, said tapered vertical half-cylinder having a minimum cross-sectional area equal to that of said first vertical half-cylinder and a maximum cross-sectional area of from about two to four times the same, a series of three horizontal half-cylinders attached to said tapered vertical half-cylinder along the side thereof which is remote from the adjacent vertical half-cylinder and so arranged therealong that the lowermost of the three is located at the lower end and the highest at the upper end thereof, and the second is located intermediate of the other two, each of said three horizontal half-cylinders having a cross-sectional area equal to that of said first vertical half-cylinder.

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