Dec. 23, 1941. J. J. MADER 2,266,978

MOLD

Filed Feb. 29, 1940 2 Sheets-Sheet 1

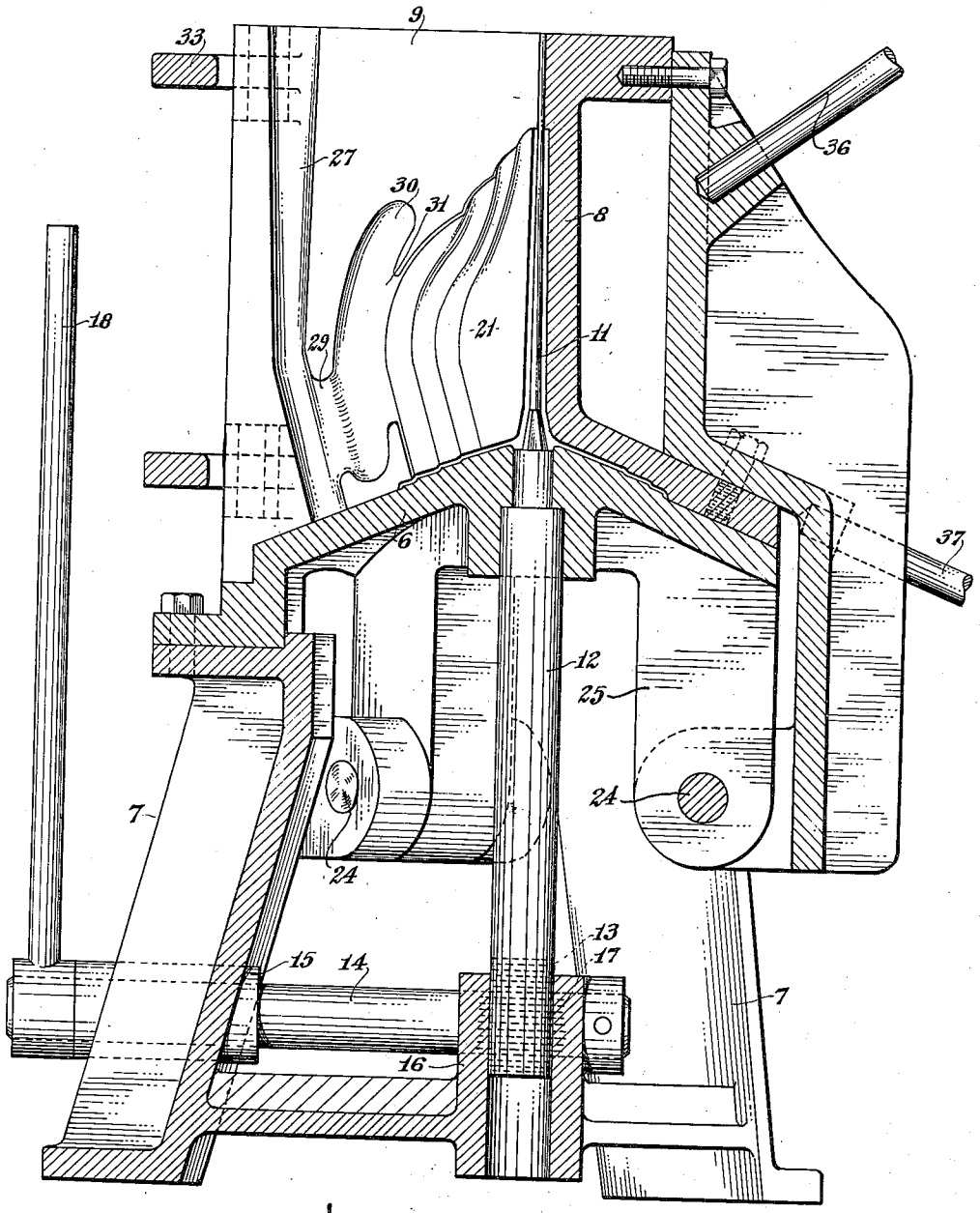

Fig. 1

INVENTOR.
JOHN J. MADER.
BY Donald W. Barrington
Attorney

Dec. 23, 1941. J. J. MADER 2,266,978

MOLD

Filed Feb. 29, 1940 2 Sheets-Sheet 2

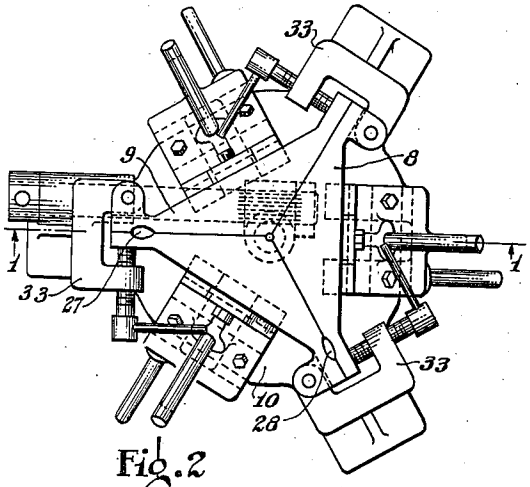

Fig. 2

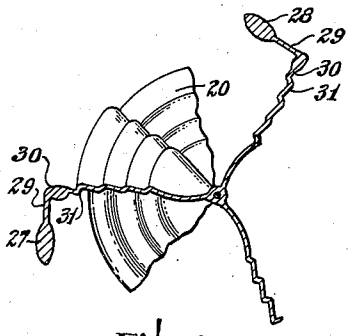

Fig. 3

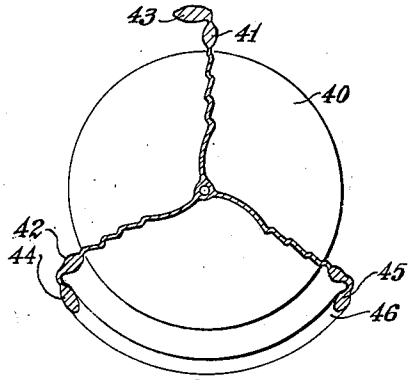

Fig. 5

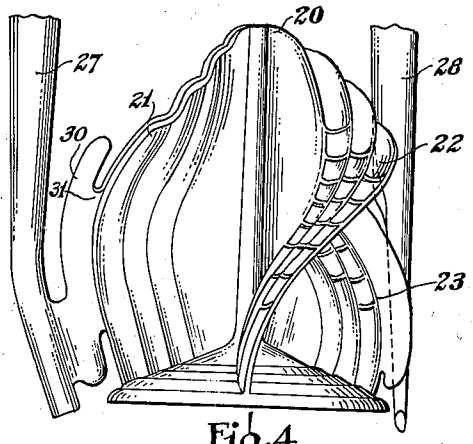

Fig. 4

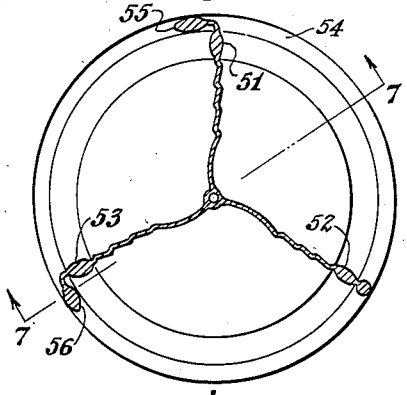

Fig. 6

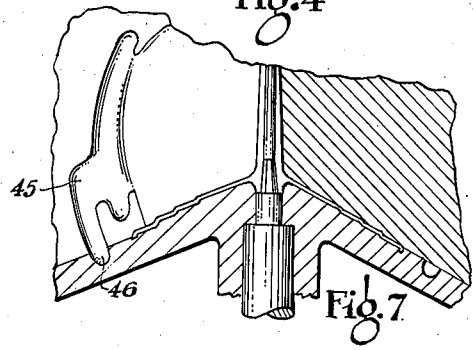

Fig. 7

INVENTOR.
JOHN J. MADER.
BY
Donald W. Farrington
Attorney

Patented Dec. 23, 1941 2,266,978

UNITED STATES PATENT OFFICE

2,266,978

MOLD

John J. Mader, Parma, Ohio, assignor to The Apex Electrical Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

Application February 29, 1940, Serial No. 321,525

4 Claims. (Cl. 22—155)

This invention relates to a method and apparatus for making washing machine agitators or the like.

It is among the objects of my invention to provide a mold for making a washing machine agitator wherein the base of the agitator will be free of gates, sprues, risers, or the like.

It is a further object of my invention to provide a method of making an aluminum agitator in a permanent mold wherein the molten metal is conducted to the agitator casting cavity in a manner which will rapidly fill the casting cavity with an even flow of metal free of impurities, gas pockets and turbulence.

It is a further object of my invention to provide a method of making washing machine agitators having vanes wherein the molten metal is conducted into the agitator casting cavity solely through the vane portions thereof, so that the casting upon removal from the mold is free of gates in the base portion thereof and the casting is characterized as being free of hot spots, air pockets and the like.

It is a further object of my invention to provide a method of making a washing machine agitator having a plurality of vanes wherein the molten metal is led into the casting cavity by gates along the edges of the vanes and such gates are connected by a horizontally extending branch of a vertical pouring sprue.

It is a further object of my invention to provide a mold apparatus to carry out the methods of the preceding objects wherein the agitator is cast with its axis vertical and the base of the mold forms the base of the casting cavity, and such mold base is free of gates along the base of the agitator.

Further objects and advantages relating to economies in manufacture and uniformity in castings will appear from the following description and appended drawings; wherein

Figure 1 is a sectional elevation of an agitator mold made according to my invention;

Figure 2 is a plan view of the agitator mold;

Figure 3 is a plan view with parts in section showing a casting made according to the method and apparatus of my invention;

Figure 4 is an elevation of the agitator casting showing the gates and sprues attached;

Figure 5 is a plan view of an agitator casting showing a modified form of the invention;

Figure 6 illustrates a further modified form of the invention; and

Figure 7 is a sectional elevation taken along the line 7—7 of Figure 6.

The agitator type of washing machine has enjoyed wide use and numerous methods have been proposed for casting the agitators of aluminum in permanent molds. Among the successful methods of casting such agitators is that method disclosed in the patent to Fahlman 1,770,368, wherein the agitator is cast in a vertical position with the base of the agitator resting on the base of the mold, and wherein the molten metal is conducted into the casting cavity through a ring gate surrounding the base of the casting cavity. This method, although generally productive of good castings, results in a casting requiring a large volume of metal in the gate, which metal must be removed from the base of the agitator and the base machined throughout its gate area. Since the gate and pouring sprues are scrap metal, the use of the Fahlman method results in considerable waste due to the arrangement and proportions required in the gate.

According to my invention, I propose to eliminate any gate around the periphery of the base of the agitator casting and thus reduce the volume of scrap metal and the attendant machining costs on the base of the agitator following the removal of the gate.

I have obtained the objects above enumerated by leading the molten metal into the casting cavity in the vaned portions thereof through relatively-small, vertically-disposed gates, so shaped and proportioned that the molten metal flows quietly and smoothly into the casting cavity. The gating arrangement along the vanes of the agitator is so proportioned and arranged with respect to the pouring sprue and the casting cavity that any impurities which may be carried in the molten metal are trapped in the gate and the molten metal is so conditioned prior to its entrance into the casting cavity that the resulting casting is free of hot spots, bubbles or other defects.

My invention contemplates the use of a permanent mold such as that shown in Figure 1 of the drawings, wherein the base 6 of the mold is supported by a plurality of legs 7 and a plurality of movable mold sections 8, 9 and 10 are pivotally carried by the base 6. A reciprocable core 11 projects upwardly through the center of the mold base 6 and the movement of the core 11 is controlled by a shaft 12 having a rack 13 thereon at its lower end. A horizontal shaft 14 mounted in bosses 15 and 16 in the supporting structure of the mold is provided with gear teeth 17 adapted to mesh with the teeth of the rack 13 on the vertically-reciprocable core shaft 12. Movement

of the core member 11 is thus effected by a manual movement of the handle 18 producing rotation of the horizontal shaft 14. The movable core sections 8, 9 and 10 are shaped along their abutting faces to follow the contour of the spiral vanes 21, 22 and 23 of the agitator casting indicated in its entirety as at 20.

The mold sections may be swung outwardly away from the base 6 of the mold upon the pivot pins 24 which are carried in depending brackets 25, integral with the mold base. The base of the mold 6 is conical in form so as to provide a conical base for the agitator and since the agitator includes 3 vanes, each of the three mold parts 8, 9 and 10 are cut away at their abutting surfaces to provide the casting cavities for the vanes.

In the preferred form of my invention, two pouring sprues 27 and 28 are provided, a complementary half of the pouring sprue 27 being formed in each of the abutting surfaces of the mold sections 9 and 10 and the complementary portions of the sprue 28 are formed in the abutting surfaces of the mold sections 8 and 10. The pouring sprues terminate at their lower ends at the top surface of the base 6 of the mold and extending laterally from the pouring sprue at a point spaced from the base of the mold is a gate comprising three adjoining sections 29, 30 and 31. The section 29 is narrow in cross section and leads the molten metal into the section 30 which has a greater vertical extent and a much larger cross section than the section 29. The section 31 is relatively thin and one of the advantages of this construction is that it facilitates the removal of the gate and pouring sprue from the vane of the agitator casting.

When the mold has been conditioned by heating to appropriate casting temperature, the mold sections are secured to each other by mold clamps 33 and the molten metal introduced to the casting through the pouring sprues 27 and 28. The first metal out of the ladle into the sprue fills the lower end of the pouring sprue up to the restricted gate section 29. The restricted flow of the metal through section 29 eliminates turbulence and splashing resulting from the vertical drop of the metal down the pouring sprue. The level of the molten metal rises in the sprue and in the lower end of the gate section 30 until it reaches the lower end of the restricted section 31. The volume of molten metal in the sprue 27 and in the lower end of the gate section 30 is sufficient to properly condition the molten metal introduced into the agitator casting when the molten metal rises to the lower end of the restricted section 31.

The two spaced restricting passageways 29 and 31 operate to quiet the metal and insure that the molten metal flowing through the lower portion of section 31 into the casting cavity is free of bubbles and impurities. Such metal, being heated by the molten mass in the gate, flows evenly downwardly from section 31 to fill the base portion of the casting cavity. As the casting cavity continues to fill, the metal rises evenly therein and the gate 29—30—31 carries sufficient molten metal at the proper temperature to compensate for the crystallization shrinkage characteristic of aluminum and other light metal alloys. The air in the casting cavity is gradually forced out of the cavity through the parting lines of the mold sections as the metal rises in the cavity.

After the casting has been poured and set, the mold clamps 33 are freed of the mold sections and each mold section swung outwardly by means of the handles 36 and 37 about the pivot axis 24. A rocking of the handle 18 effects a withdrawal of the core 11 to free the same of the casting. The casting, including the sprues and gates, is removed from the mold and the sprue and gate removed from the vane in the weakened or restricted section 31.

Although I have found that a three-vane agitator of the type illustrated may be satisfactorily poured with two pouring sprues and two gate arrangements, I am aware that the pouring of other types of agitators may require additional gating arrangements. To facilitate the casting of agitators requiring additional gating metal, I have shown a modification in Figure 5 wherein a three-vane casting indicated in its entirety at 40 is provided with a gate of the type shown in the preferred form along each of the agitator vanes. Two of the gates, namely 41 and 42, are provided with pouring sprues 43 and 44. The third gate 45 lacks a vertical pouring sprue but is connected to the pouring sprue 44 by a branch 46 leading therefrom. The branch or conduit 46 connecting the gates 42 and 45 to each other is formed by an arcuate groove in the mold base as indicated in Figure 7. By this arrangement molten metal from the pouring sprue 44 flows laterally through the groove 46 around the base of the agitator to the gate 45. The gate 45 being proportioned to have the two restricted sections filled in the manner heretofore described in connection with the preferred embodiment.

A further modification of my invention is illustrated in Figure 6, wherein all three gates 51, 52 and 53 are connected to each other by a continuous ring 54. Two pouring sprues indicated at 55 and 56 are employed and metal from the pouring sprues 55 and 56 may flow laterally to the gate 52. The gate 52 being proportioned and arranged like the gate of the preferred embodiment, conditions and feeds the molten metal into the casting cavity in a manner like that described in connection with the preferred embodiment.

In all three forms of my invention, it will be observed that the base of the agitator casting is free of gates and requires no machining operations such as are required where the casting cavity is filled by introducing the molten metal around the base of the agitator.

It will also be observed that in the preferred embodiment of my invention, the scrap metal to be removed from the casting comprises only the two pouring sprues 27—28 and their associated gates. The reduction in the amount of metal required for each casting and the reduction in the machining operations results in high speed production of sound castings.

Although I have shown and described three forms of my invention in considerable detail, it will be appreciated that modifications may be made therein without departing from the scope of my invention as defined in the following claims.

Having thus described my invention, what I claim is:

1. A permanent mold for casting aluminum agitators having a base portion and upstanding impeller vanes, said mold having a casting cavity with the agitator base portion thereof horizontally disposed, a pouring sprue extending downwardly from the top of the mold to the plane

of said base portion and spaced laterally from said base portion, said base closing the lower end of said sprue, a single vertically disposed gate connecting said sprue and that portion of the casting cavity forming the vane, said gate comprising three sections, one section being a restricted section adjacent the sprue, a second section being a restricted section adjacent the vane and the third section being an enlarged section between the two restricted sections, said third section having a vertical extent greater than the vertical extent of the other two sections.

2. A permanent mold for casting aluminum washing machine agitators having a base and upstanding vanes comprising a mold base and a plurality of separable mold members recessed to define a casting cavity with the base portion of the agitator horizontally disposed, said mold members being further recessed to define a vertically disposed sprue cavity, said sprue cavity closed at its lower end by said base spaced laterally from the casting cavity and a vertically disposed gate between said sprue and a vane portion of said casting cavity, the juncture between said vane and gate being above the lower end of the sprue and above the base portion of that part of the casting cavity forming the base of the agitator, whereby impurities in the metal are trapped in the sprue and gate and the molten metal is conducted into the casting cavity without turbulence.

3. A permanent mold for casting aluminum agitators having a base and a plurality of upstanding impeller vanes, said mold having a casting cavity with the agitator base portion thereof horizontally disposed, a plurality of movable mold sections having abutting faces recessed to form a casting cavity for an impeller vane, said abutting faces being further recessed to provide a gate cavity, certain of the abutting faces of the mold sections being further recessed to provide pouring sprues and other of the abutting faces being free of pouring sprue recesses, a fixed mold section beneath said movable sections providing a support for the movable sections and forming the base of the agitator casting cavity, said fixed mold section provided with a groove extending about the base of the agitator casting cavity to provide a passageway to conduct molten metal from the pouring sprues laterally to a gate cavity formed in said other abutting mold faces which are free of pouring sprues.

4. A permanent mold for aluminum agitators having a base portion and a plurality of upstanding impeller vanes comprising a fixed mold base and a plurality of movable mold sections mounted thereon, the number of movable mold sections corresponding to the number of impeller vanes on the agitator casting, all of the abutting faces of the movable mold sections being recessed to provide vane portions of the casting cavity and gates along the vertical edges of said vanes, certain of the abutting faces of certain of the mold sections being further recessed to provide pouring sprues connected to said gates, and other of the abutting mold faces being free of pouring sprue recesses, an annular groove formed in the fixed mold section connecting said pouring sprues and gates, whereby molten metal is conducted laterally from the bottom of the pouring sprues to said other abutting mold faces which are free of pouring sprue recesses.

JOHN J. MADER.