Feb. 27, 1951 G. A. RUBISSOW 2,543,303

GYROCASTING MACHINE

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Fig. 1

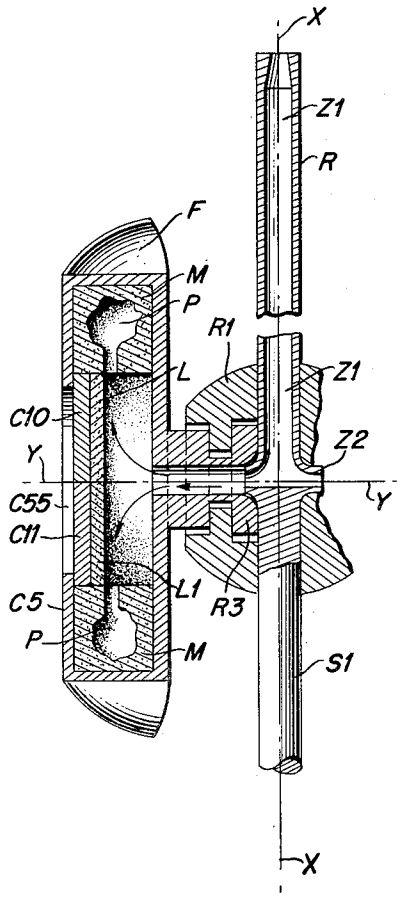
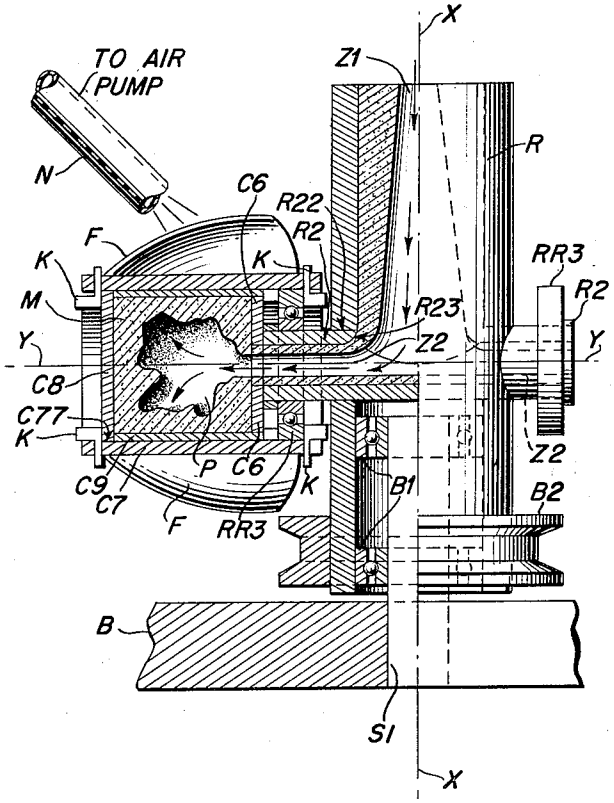


Fig. 2



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GYROCASTING MACHINE

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5 Claims. (Cl. 18—26)

1

This is an invention where a mold is rotated simultaneously around two independent axes of rotation, i. e. is subjected to two simultaneously exercised rotations, first rotation imparted to the mold-casing, in which the mold is placed, by means of a motor or by hand, and a second rotation is imparted to the same mold-casing and mold automatically by means of air-fins, provided on the exterior of said mold-casing, and this due to the friction of these air-fins against the air of the surrounding atmosphere. Another aspect is to direct an air jet under pressure against the direction of the path or in the direction of the path in which the mold-casing is rotated, thereby augmenting the efficiency, i. e. the R. P. M. of the second rotation.

Like references throughout the description and figures are used for same subject.

Figures 1 and 2 are schematical simplified side-views, partly in cross-section with parts broken out of two embodiments of this invention.

Figure 1 shows a gyrocasting apparatus for casting of molten material such as metal, metal alloy, plastic, glass, wax and other suitable materials.

The first axis of rotation X—X may be vertical, the second axis Y—Y may be at any suitable angle from 1° to 180°, for simplicity a 90° angle between X—X and Y—Y is used in Figures 1 and 2, not limiting this invention thereto.

The cavity P provided in the mold M may be either eccentric to each of the axes X—X and Y—Y, as shown in Figure 1, or may be eccentric to the axis X—X, but coaxial with axis Y—Y, as shown in Figure 2.

A mold M such as shown in Fig. 1 may be used with the device such as shown in Fig. 2.

In order to rotate the mold M, simultaneously around the axes X—X and Y—Y, a shaft, R Fig. 1 may be mounted in a housing R1 Fig. 2, rigid with it and in which housing is rotatably mounted a shaft R3, rigidly mounted in respect to the mold casing C5. The mold casing C5 may have a circular form and may be provided with a plurality of fins, F, such as for example provided on waterwheels, and the like. For simplicity of drawing only two such fins are shown. The fins may be of any shape. The fins F shown in Figure 1, face with their attack edges, the direction of rotation in respect to the axis X—X. Furthermore, the fins F may be gradually tapering toward the axis Y—Y in order to equally distribute the air pressure on such air fins, and that, in an ideal case, to provide the same amount of pressure per a given surface unit on

2

said fins, as a function of the radii in respect to the axis X—X and Y—Y surface units at other radii.

When the shaft R is rotated, the casing C5 is rotated around axis X—X and the air will thus hit the fins F, and will thus automatically rotate the casing C5 simultaneously around the axis Y—Y.

The shaft R is shown schematically, and in practice this shaft should be mounted on one or more bearings, coaxial with it, and which bearings are mounted on supports provided therefor.

The casing C5 may have an opening C55 into which a plate C10—C11, covered if desired with refractory layer L—L1 may be mounted, this plate may be composed of two or more parts, for instance of two half circles, C10 and C11. Such two halves of a plate C10—C11 may be easily removed through the circular opening C55 which should have a smaller diameter than the diameter of such plate.

On Figs. 1 and 2 are shown mold-casing C5 or C7, having a cylindrical form, provided respectively with a circular opening C55 or C77, this however, does not limit this invention thereto and any shape and form for them may be used.

The operation of this gyrocasting machine is as follows: the molten material is poured into the opening Z1, and this could be done either during the rotation of the main gate R, and mold-casing C5 or C6 around the axis X—X, or during its standstill. When the device is rotated, the molten material will be centrifugally distributed into the mold-cavities P through the exits of the distributing gates Z2—Z2. One such gate Z2 is provided per each mold casing.

A device, as shown in Figs. 1 and 2, is provided with two mold-casings mounted symmetrically at 180° one from another, the left and the right one. When looking on the Figs. 1 and 2, only the left one is illustrated.

For balance purposes of two or more mold casings, they should be distributed symmetrically around the axis X—X. When only one mold-casing is used, then a counterbalance weight should be provided to centrifugally balance the rotating system.

In Figure 2, the central pouring gate casing R is mounted rotatably on bearings B1, which bearings are mounted on a non-rotatable shaft S1, which is mounted on a support.

A circular opening R22 is provided in the gate casing R, coaxially with the axis Y—Y, and a tubular member R2, of same diameter as the opening R22 is mounted rigidly in said opening as shown in Fig. 2.

The tubular member R2, is provided in its upper part with an opening R23, concentric with the axis X—X in order to permit the bottom part of the gate Z1 to pass therethrough as shown in Fig. 2. The distributing gates Z2—Z2 are provided in the tubular member R2 and intercommunicate the bottom of the gate Z1 with the mold cavities P or the molds M mounted in mold casing C6—C6. By this means, the molten material when introduced in the opening Z1 will be distributed in substantially equal amounts through the distributing gates Z2—Z2, and from there to be poured in under the action of centrifugal force into the molds M provided in the mold-casings C5. On the two outer ends of the member R2, are mounted two bearings RR3—RR3, so that their inner rings are rigidly mounted on the member R2 while their outer rings are freely rotatable. The bearings may be of any suitable type and design so that they may take simultaneously the required radial and thrust loads. A plurality of bearings may be used to carry the required loads.

On each of these two outer rings of the two bearings RR3—RR3, are mounted respectively two mold-casings C7. In a device in which only one mold-casing is used only one bearing RR3 will be used. Such mounting may be done by any suitable means, for instance, by a bayonet system, by threading or for instance, by means of a plurality of keys K which are inserted in keyholes provided in said casing C7. Only two of such keys K are shown in Figure 2. The keys may be provided with enlargements or stoppers so that when they are pressed by the centrifugal force against the mold-casing C7, the enlargements or stoppers keep them in a required position on the inner surface of the mold-casing, and a safe operation of the device is thus insured.

The furthest away from X—X axis end of the mold casing C7 may be provided with an end plate C8 which also may be mounted in the mold-casing by any suitable means, for instance, by means of a plurality of keys K—K not however limiting this invention to this form of mounting. When the keys K—K are pulled out then the plate C8 may be removed, and the mold M or the mold wrapper C9 together with the mold M may be easily removed from the mold-casing C7. The mold-casing is provided according to this invention with a plurality of fins F—F of any suitable design and shape, and in any desirable number, and placed in any desirable plane or curved plane to provide the best suitable efficiency of the operation. Only two such air-fins F—F are shown for simplicity of the representation in Figures 2 and 1. When the mold M is subjected during the casting to a high hydraulic pressure of the molten material due to the action of two centrifugal forces (around axes X—X and Y—Y) then the end plate C8 may be tightly mounted in the mold-casing on the top part of the mold (that part of the mold which is closer to the axis X—X). If desired, means to compress the mold M in between the end plates C8 and C6 Fig. 2 may be provided in the mold-casing C5 in order to withstand the beforementioned hydraulic pressure of molten material. The gate casing R may be rotated around the axis X—X by a motor or by hand, thus providing a first rotation of the mold casing and mold around the axis X—X, and thereby automatically and simultaneously imparting to the mold-casing C7, and the mold M mounted in it, second rotation around axis Y—Y, and this due to the

air friction of the fins F—F against the atmosphere. To augment the second rotation i. e. to increase the R. P. M. around Y—Y an air stream may be directed against the fins while they rotate around X—X and Y—Y. This may be done according to this invention by providing one or more air nozzles N placed in the vicinity of the mold-casing C7 and by providing pumping means to supply a jet of air. Should it be desired to control the direction of the jet of air coming out from the nozzle, then means may be provided to position nozzle in any desirable position in regard to the axis X—X and/or Y—Y. This is not shown on the drawing, and is self-explanatory.

The devices as described and shown in Figures 1 and 2 are only given as examples of embodiments of this invention not limiting thereto the broad scope of this invention.

This device is extremely economical in use and structure and its application to various industries are most efficient and beneficial in particularity but not limiting thereto this device may be used for precision casting, for dental work castings, for lost wax process castings, for manufacturing of compact ingots, etc.

This casting device may also be used for other purposes than casting, for instance be used as a separator, in which latter case instead of the molten material poured into the cavities P in the mold M, there should be used a fluid to be separated, which fluid should be placed in metal or glass tube, placed in the same mold-casing. When subjected to the two simultaneous rotations around the axis of X—X and Y—Y an effective separation or segregation or other required work will be exercised upon the fluid.

What I claim is:

1. A centrifugal casting machine having at least one mold-casing carrying a mold, both rotated simultaneously around two independent axes of rotation, a first axis and a second axis, a frame, means to rotate said frame around said first axis, said mold-casing being coaxial with said second axis and being mounted rotatably on said frame on bearing means provided coaxially with said second axis, in combination with a plurality of air fins provided on the exterior of said mold-casing whereby, said mold-casing, when rotated around said first axis, will automatically rotate around said second axis, due to the air friction of said air fins against the atmosphere.

2. A centrifugal casting machine having at least one mold-casing carrying a mold, both rotated simultaneously around two independent axes of rotation, a vertical axis and an inclined axis forming with said vertical axis an angle of 1 to 180°, a frame, means to rotate said frame around said vertical axis, said mold casing being coaxial with said inclined axis and being mounted rotatably on said frame on bearing means provided coaxially with said inclined axis, a central pouring gate with an opening on its top provided in said frame coaxially with said vertical axis, an inner gate surface flaring downwardly from said opening towards a bottom plate provided in said gate, a distributing gate, one per each mold-casing provided in said frame and interconnecting said bottom-plate with a mold-gate provided in said mold, said distributing-gate passing through an opening provided inside of said bearing means, said centrifugal casting machine as hereinbefore defined in combination

with a plurality of air fins provided on the exterior of said mold-casing, whereby said mold casing, when rotated around said vertical axis will automatically rotate around said inclined axis, due to the air friction of said air fins against the atmosphere.

3. A centrifugal casting machine having at least one mold-casing carrying a mold, both rotated simultaneously around two independent axes of rotation, a first axis and a second axis, a frame, means to rotate said frame around said first axis, said mold-casing being coaxial with said second axis and being mounted rotatably on said frame on bearing means provided coaxially with said second axis, in combination with a plurality of air fins provided on the exterior of said mold-casing, said mold casing having at least one removable end-plate and means to interlock and unlock said end-plate in respect to said mold-casing, whereby, said mold-casing, when rotated around said first axis, will automatically rotate around said second axis, due to the air friction of said air fins against the atmosphere.

4. A centrifugal casting machine having at least one mold-casing carrying a mold, both rotated simultaneously around two independent axes of rotation, a vertical axis and an inclined axis forming with said vertical axis an angle of 1° to 180°, a frame, means to rotate said frame around said vertical axis, said mold-casting being coaxial with said inclined axis and being mounted rotatably on said frame on bearing means provided coaxially with said inclined axis, a central pouring gate with an opening on its top provided in said frame coaxially with said vertical axis, an inner gate surface flaring downwardly from said opening towards a bottom plate provided in said gate, a distributing gate, one per each mold-casing provided in said frame and interconnecting said bottom plate with a mold-gate provided in said mold, said distributing gate passing through an opening provided inside of said bearing means, said centrifugal casting machine as hereinbefore defined in combination with a plurality of air fins provided on the exterior of said mold-casing, said mold casing having two removable end plates, a first end-plate closest to said vertical axis, and a second end plate furthest away from said vertical axis, means to interlock and unlock said

end plates in respect to said mold-casing, means to compress and to hold tightly said mold in-between said first and said second end plates, whereby said mold-casing, when rotated around said vertical axis will automatically rotate around said inclined axis, due to the air friction of said air fins against the atmosphere.

5. A centrifugal casting machine having at least one mold-casing carrying a mold, both rotated simultaneously around two independent axes of rotation, a vertical axis and an inclined axis forming with said vertical axis an angle of 1° to 180°, a frame, means to rotate said frame around said vertical axis, said mold-casing being coaxial with said inclined axis and being mounted rotatably on said frame on bearing means provided coaxially with said inclined axis, a central pouring gate with an opening on its top provided in said frame coaxially with said vertical axis, an inner gate surface flaring downwardly from said opening towards a bottom plate provided in said gate, a distributing gate, one per each mold-casing provided in said frame and interconnecting said bottom plate with a mold-gate provided in said mold, said distributing-gate passing through an opening provided inside of said bearing means, said centrifugal casting machine as hereinbefore defined in combination with a plurality of air-fins provided on the exterior of said mold-casing, a nozzle mounted in the vicinity of said machine for supplying through it a jet of air under pressure directed on said air fins, whereby said mold-casing, when rotated around said vertical axis will automatically rotate around said inclined axis, due to the air friction of said air fins against the amosphere.

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