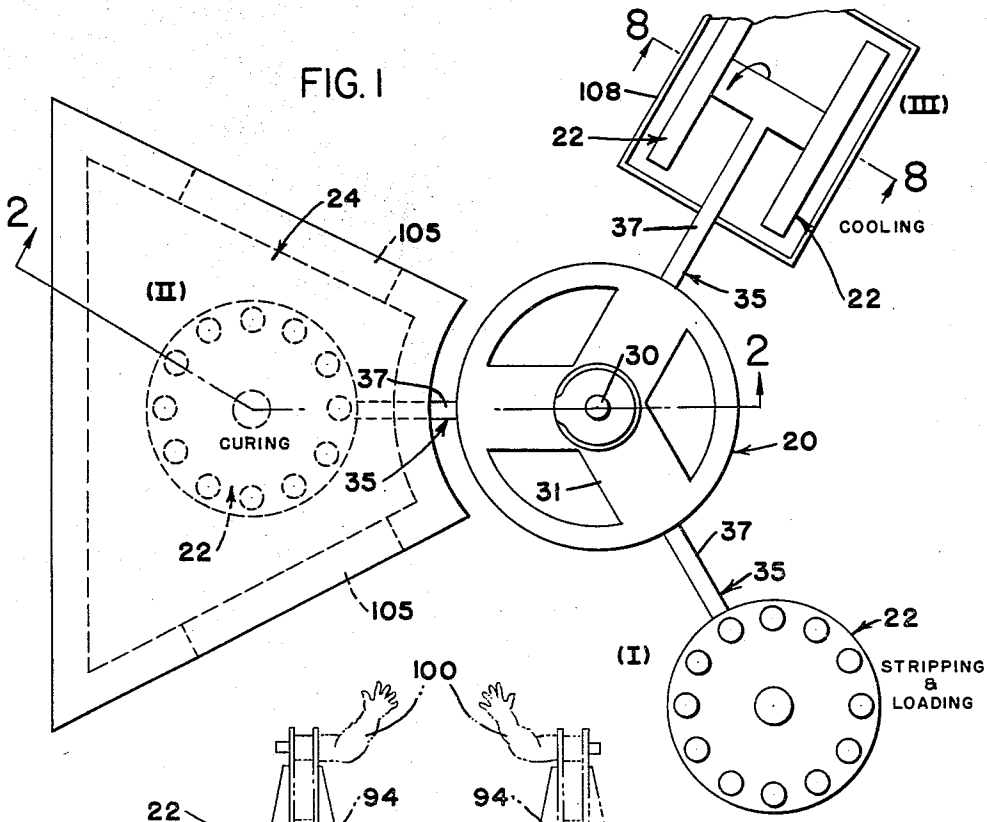
Oct. 25, 1960 P. REKETTYE 2,957,202

ROTATIONAL CASTING APPARATUS

Filed Sept. 5, 1957 6 Sheets-Sheet 1

FIG. 1



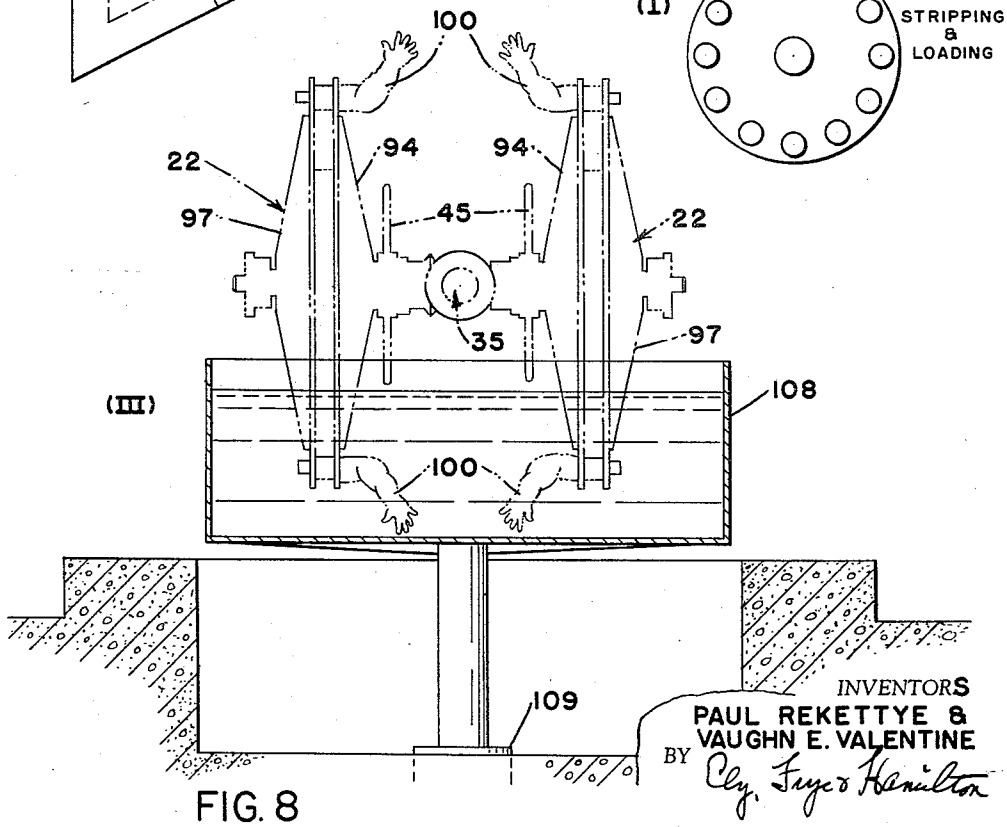


FIG. 8

INVENTORS
PAUL REKETTYE &
VAUGHN E. VALENTINE
BY Cly, Fryer & Hamilton
ATTORNEYS

Oct. 25, 1960 P. REKETTYE 2,957,202

ROTATIONAL CASTING APPARATUS

Filed Sept. 5, 1957 6 Sheets-Sheet 2

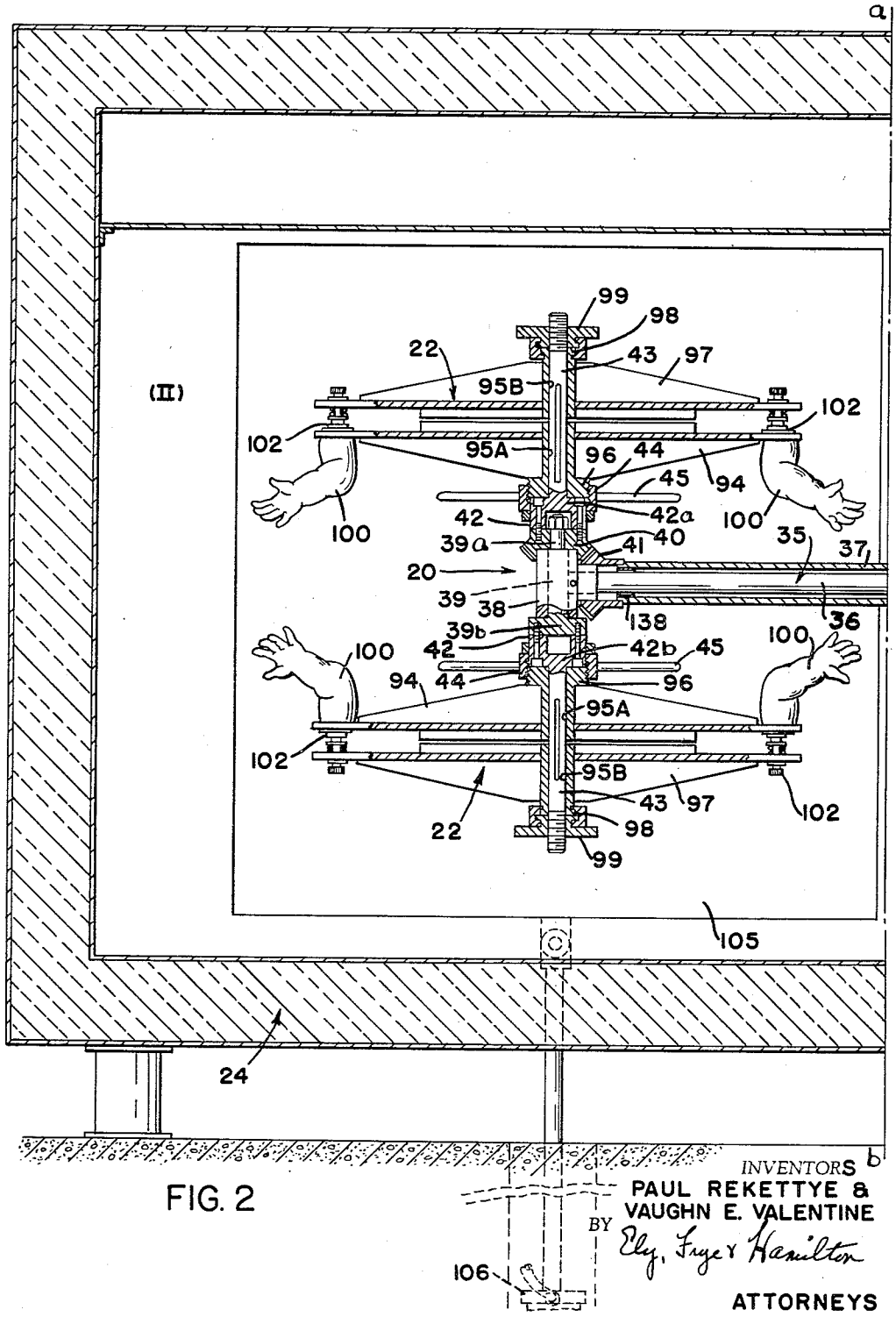


FIG. 2

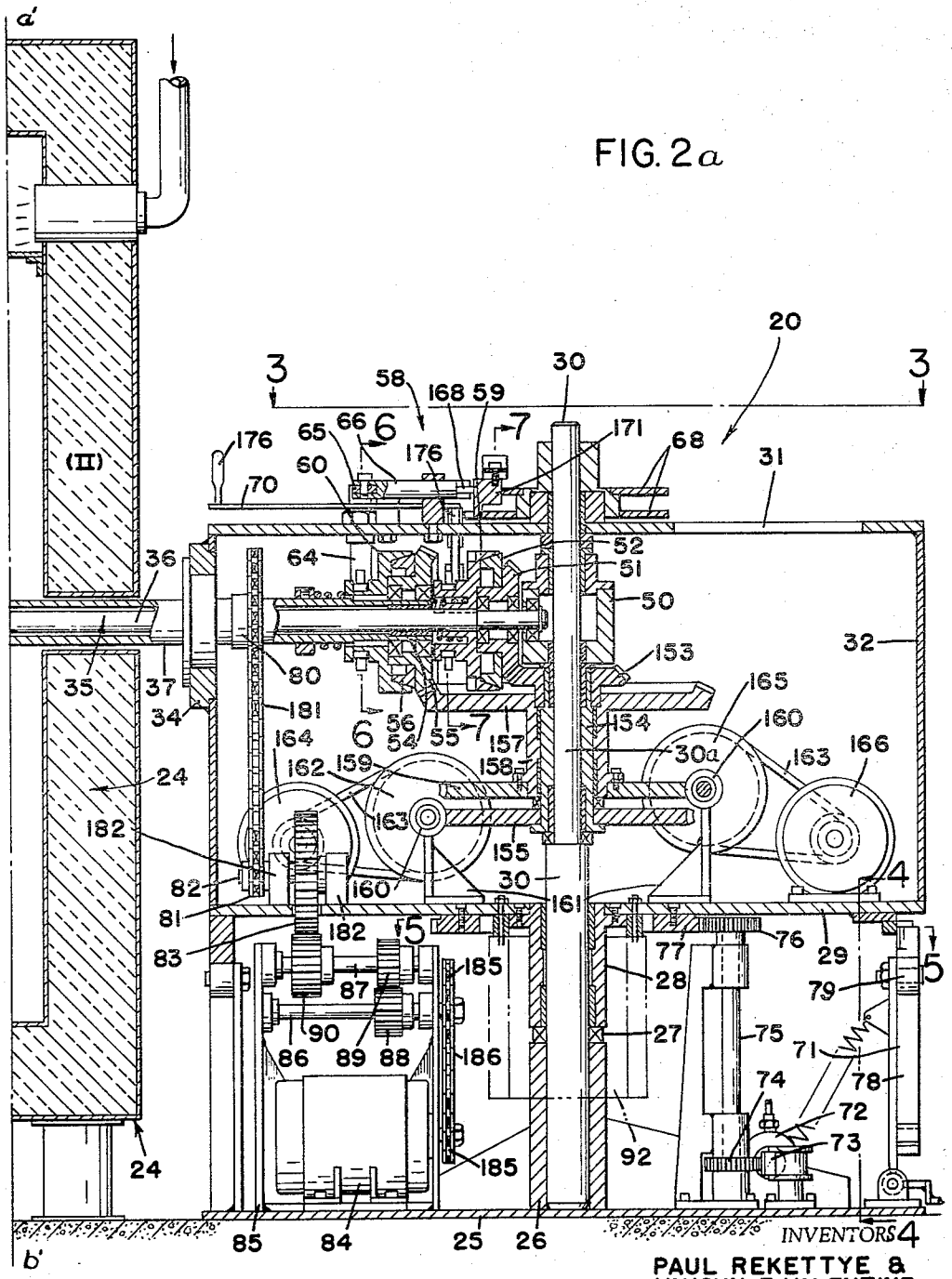
INVENTORS
PAUL REKETTYE &
VAUGHN E. VALENTINE
BY Ely, Fryer & Hamilton
ATTORNEYS

Oct. 25, 1960 P. REKETTYE 2,957,202

ROTATIONAL CASTING APPARATUS

Filed Sept. 5, 1957 6 Sheets-Sheet 3

FIG. 2a



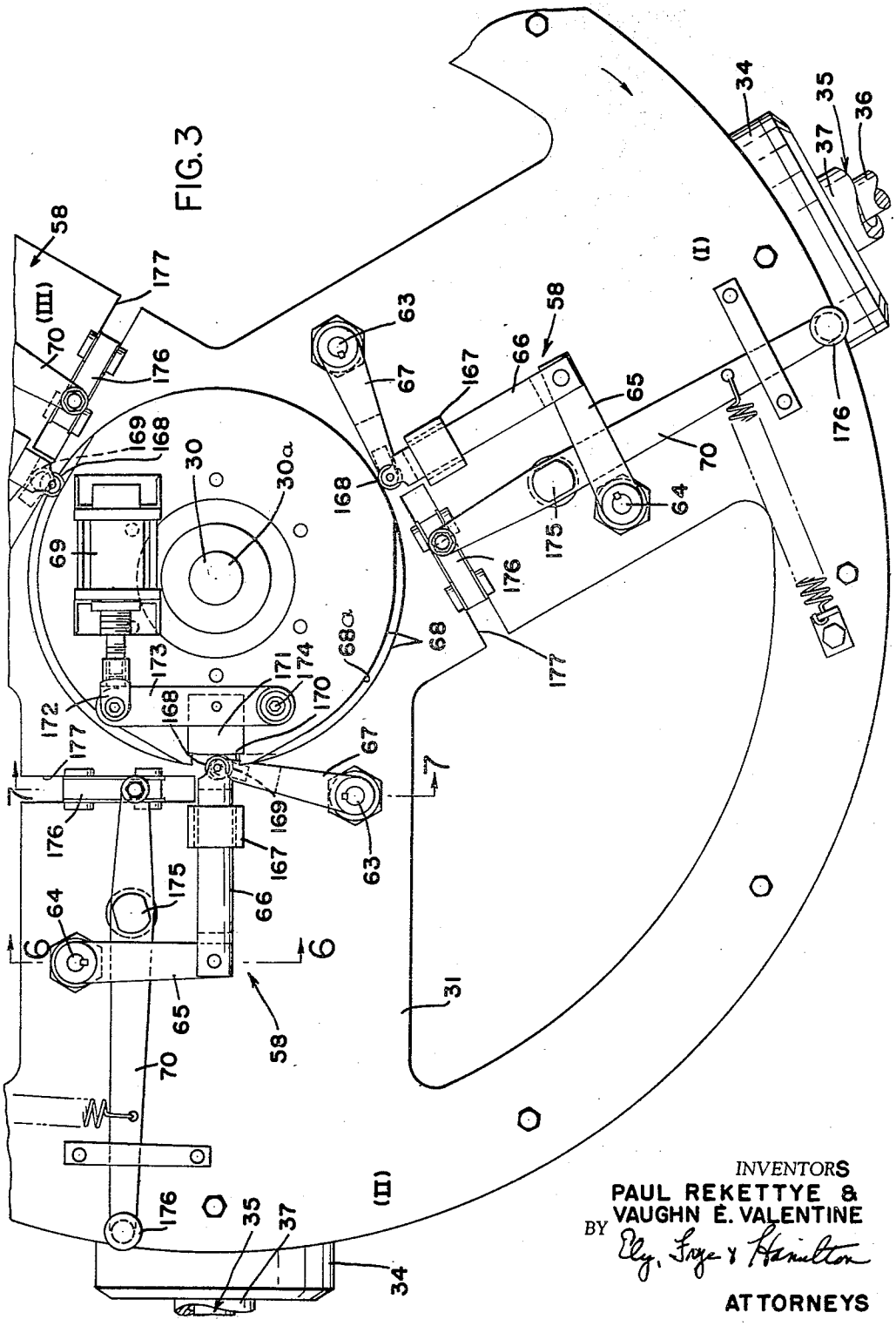
INVENTORS
PAUL REKETTYE &
VAUGHN E. VALENTINE
BY Ely, Frye & Hamilton
ATTORNEYS

Oct. 25, 1960 P. REKETTYE 2,957,202

ROTATIONAL CASTING APPARATUS

Filed Sept. 5, 1957 6 Sheets-Sheet 4

FIG. 3



INVENTORS
PAUL REKETTYE &
VAUGHN E. VALENTINE
BY Ely, Fraze & Hamilton
ATTORNEYS

Oct. 25, 1960 P. REKETTYE 2,957,202

ROTATIONAL CASTING APPARATUS

Filed Sept. 5, 1957 6 Sheets-Sheet 5

FIG. 4

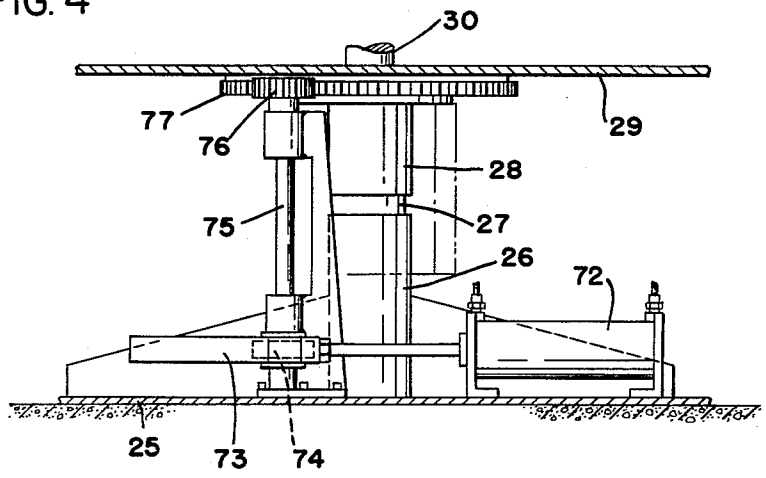
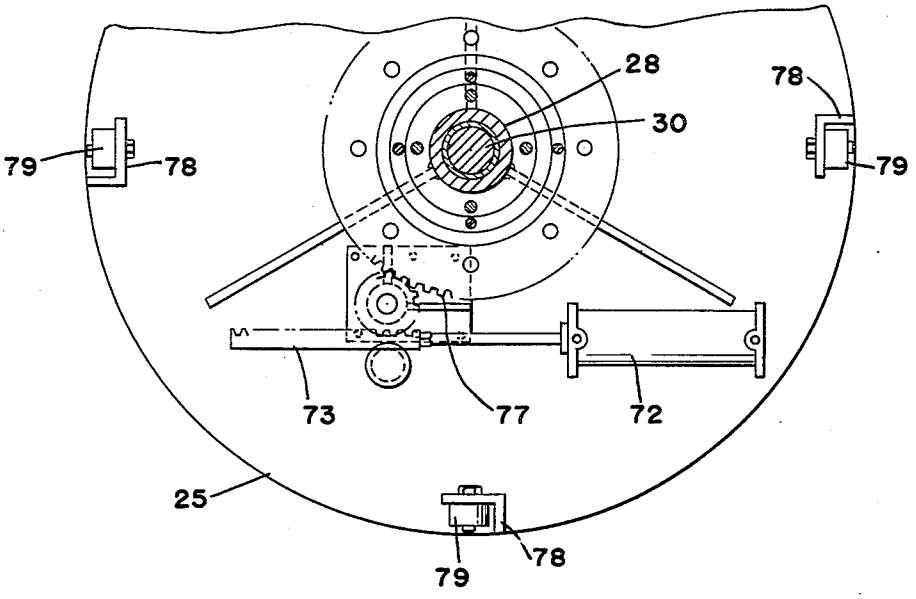


FIG. 5



INVENTORS
PAUL REKETTYE &
VAUGHN E. VALENTINE
BY Oby, Fryer & Hamilton
ATTORNEYS

Oct. 25, 1960 P. REKETTYE 2,957,202

ROTATIONAL CASTING APPARATUS

Filed Sept. 5, 1957 6 Sheets-Sheet 6

FIG. 7

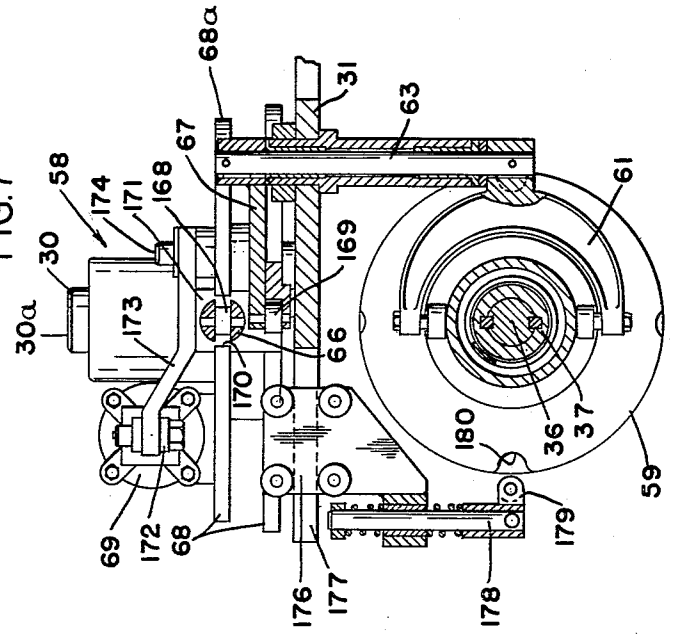
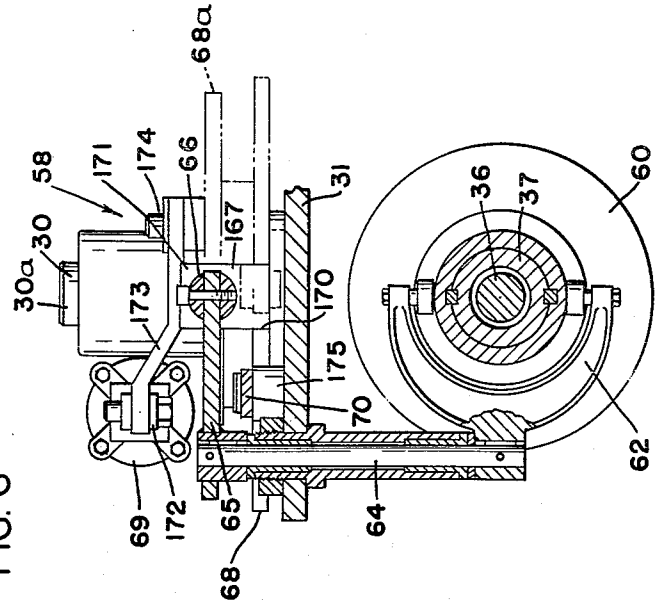


FIG. 6



INVENTORS
PAUL REKETTYE &
VAUGHN E. VALENTINE
BY Fly Fryer & Hamilton
ATTORNEYS

United States Patent Office

2,957,202

Patented Oct. 25, 1960

2,957,202

ROTATIONAL CASTING APPARATUS

Paul Rekettye, Akron, Ohio, assignor to The Sun Rubber Company, Barberton, Ohio, a corporation of Ohio

Filed Sept. 5, 1957, Ser. No. 682,099

12 Claims. (Cl. 18—26)

The present invention relates to improvements in the rotational casting of synthetic resins such as vinyl plastisols and similar materials. More particularly, the invention relates to improved forms of rotational casting apparatus.

In the rotational casting of intricate articles, e.g. the arms or legs of a play doll, it has been found that conventional techniques are not completely satisfactory. During the early stages of this art, much effort was expended in perfecting apparatus and methods for the casting of even uncomplex shapes such as play balls or footballs. As this phase was perfected, increasing attention was paid to the problems of casting more intricate shapes. Apparatus then in use was modified in an effort to achieve the desired versatility. However, these efforts have met with only limited success.

Therefore, it is an object of the present invention to provide improved apparatus for the rotational casting of intricate articles having superior properties and appearance; such invention also being applicable to improved production of relatively uncomplex shaped articles.

Some further objects are: to provide novel apparatus for rotating mold carriers on their "major" and "minor" axes at different speeds and in selective sequence and to provide a more efficient apparatus for simultaneous loading, curing and cooling of a series of molds to produce an article having superior physical properties and appearance.

These and still other objects of the invention will be apparent in view of the following detailed disclosure including the drawings.

In the drawings:

Fig. 1 is a plan view showing schematically the operation of the casting apparatus;

Figure 2 is a sectional elevation showing the outer end of a mold carrying arm within a curing oven;

Fig. 2*a* is a continuation of Fig. 2 showing the interior of the turret-like body of the casting apparatus; both Figs. 2 and 2*a* being taken substantially as indicated on line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary plan view taken substantially on line 3—3 of Fig. 2*a*;

Fig. 4 is a fragmentary elevation taken substantially on line 4—4 of Fig. 2*a*;

Fig. 5 is a fragmentary plan view taken substantially on line 5—5 of Fig. 2*a*;

Figs. 6 and 7 are enlarged sectional views taken substantially on lines 6—6 and 7—7, respectively, of Figs. 2*a* and 3; and

Fig. 8 is a section taken substantially as indicated on line 8—8 of Fig. 1.

Throughout the drawings, a preferred form of casting apparatus according to the invention is indicated generally by the numeral **20**. The mold carriers are indicated generally by the numeral **22**. The curing oven is indicated generally by the numeral **24**.

Referring to Fig. 2*a*, the casting machine **20** includes a base plate **25** having an axially located vertical sleeve **26** supporting a vertically aligned bearing **27**. A sleeve bushing **28** is carried atop the bearing **27** and carries the turret bottom plate **29**. A vertically aligned axial post shaft **30** having a reduced diameter upper portion **30***a* is supported by the sleeve **26** and extends upwardly from the base plate **25**, through the bearing **27**, bushing **28** and the bottom plate **29**, to a point above the turret top plate **31**. Between the parallel bottom plate **29** and top plate **31**, the wall of the casting machine turret is formed by an annular side plate **32**.

In the form of the machine **20** as shown, there are provided three equally spaced (120° apart), bearing blocks **34** on the side plate **32**. Extending through the side plate **32** and rotatably journaled in a bearing block **34** are the three mold-carrying arms, indicated generally by the numeral **35**. Each arm **35** includes a solid shaft **36** coaxially enclosed within or by a tubular shaft **37**. The shaft **36** is driven to rotate the mold carriers **22** on their "major axis." The shaft **37** is driven to rotate the mold carriers on their "minor axis."

Referring to Fig. 2, the outer end of each shaft **36** carries a transmission block **38** which is substantially T-shaped in cross-section. A short cross-shaft **39** is rotatably journaled within the block **38** transversely of the shaft **36**. At one end, the cross-shaft **39** has an extension **39***a* to which a mitre gear **40** is affixed. The outer end of the shaft **37** is journaled around a bearing **138** carried on the shaft **36** and carries a mitre gear **41** which meshes with the gear **40**. Thus, rotation of the inner shaft **36** causes the block **38** to rotate on the same or the "major axis." Rotation of the outer shaft **37**, through gears **41** and **40**, causes the cross-shaft **39** to rotate on a transverse or "minor axis."

On opposite sides of the block **38** are similar mold carrier mounting studs **42**. At one end, a stud **42***a* is carried by the gear **40**. At the other end, a stud **42***b* is carried by the enlarged end **39***b* of the cross-shaft. Each stud **42** carries a long keyed shaft **43** which serves as the axis for assembling of the two sections of each mold carrier **22**. When assembled on a shaft **43** as described in detail below, a mold carrier **22** is secured to a stud **42** by a threaded locking ring **44** having handles **45**.

Referring again to Fig. 2*a*, the inner end of each major axis drive shaft **36** is journaled in a hub block **50** carried by the post shaft **30**. Outwardly of the block **50**, a gear **51** carrying a friction clutch cone **52** is journaled on the shaft **36**. The gear **51** is driven by a gear **153** carried on the upper end of a sleeve **154** which is rotatably mounted on the upper portion **30***a* of the post shaft. The lower end of the sleeve **154** carries a large gear **155**.

The inner end of each minor axis shaft **37** is journaled around a bearing sleeve **54** carried on the shaft **36**. In the area of the sleeve **54**, a gear **55** carrying a friction clutch cone **56** is journaled on the shaft **37**. The gear **55** is driven by a gear **157** having a hub portion **158** rotatably mounted on the sleeve **154**. The lower end of the hub **158** carries a large gear **159**.

The major axis drive gear **155** is driven by a worm gear **160** mounted in a bracket **161** extending upwardly from the turret bottom plate **29**. The gear **160** is driven by a V-belt pulley **162** connected by the belts **163** to an electric motor **164** mounted on the bottom plate **29**. The minor axis drive gear **159** is driven in a similar manner by a similar V-belt pulley **165** driven by an electric motor **166**. The motors **164** and **166** are preferably conventional D.C. motors having a variable output r.p.m.

The rotation of shafts **36** and **37** is controlled by a clutch assembly indicated generally by the numeral **58**. The clutch assembly includes a spring-biased "major axis" clutch plate **59** keyed on shaft **36** and normally slidable longitudinally thereon into engagement with the clutch cone **52** and a spring-biased "minor axis" clutch

plate 60 keyed on shaft 37 and normally slidable longitudinally thereon into engagement with the clutch cone 56.

As best shown in Figs. 6 and 7 engagement of the "major axis" clutch plate 59 is controlled by a clutch yoke 61. The "minor axis" clutch plate 60 is controlled by a similar clutch yoke 62. The clutch yoke 61 is carried by a shaft assembly 63 depending through the top plate 31. The clutch yoke 62 is carried by a similar shaft assembly 64.

Selective rotation of the shaft assembly 64 to engage clutch plate 60 and drive the "minor axis" shaft 37 may be effected by a linkage including a lever 65 pivotally connected to a shaft 66 slidably supported by a block 167 mounted on the top plate 31. The inner end of shaft 66 has a cam follower 168 (see Fig. 3) thereon. Rotation of the shaft assembly 63 to engage clutch plate 59 and drive the "major axis" shaft 36 may be effected by a lever 67 also having a cam follower 169 (see Fig. 3) at its inner end.

The clutch yoke actuating linkages may be controlled automatically by a stationary double cam 68 having specially contoured peripheries and mounted on post 30 above top plate 31. An indexing mechanism, described below, is used to successively rotate the turret and the mold-carrying arms 35 through the stripping and loading (I), the curing (II) and the cooling (III) stations.

As best shown in Fig. 3, the contoured peripheries of the cam 68 are such that at the stripping and loading station (I), the cam followers 168 and 169 cause the clutch plates 60 and 59, respectively, to be disengaged and the arm 35 at that station is stationary. As the turret and loaded arm 35 are indexed toward the curing station (II), surface 68*a* of the cam causes the clutch plate 60 to be engaged driving the "minor axis" shaft 37.

When the arm 35 is fully indexed to station (II), the cam followers 168 and 169 will be aligned with a radial slot 170 in the upper surface of the cam 68. Slidable in the slot 170 is a cam block 171 which is selectively actuated by a cylinder 69 to disengage clutch plate 60, stopping rotation of the "minor axis" shaft 37, and to maintain disengagement of clutch plate 59 so that the "major axis" shaft 36 remains motionless. The cylinder 69 actuates the cam block 171 through a linkage including a piston shaft clevis 172 pivotally connected to a lever arm 173 mounted as at 174 above the cam plate 68.

While at station (II), when the cylinder 69 is actuated disengaging the clutch plates 59 and 60, the "minor axis" shaft 37 is rotated at high speed by a spinning mechanism described below. After a predetermined period of high speed rotation, the piston of cylinder 69 is retracted and both shafts 36 and 37 are rotated.

When the arm 35 is fully indexed to the cooling station (III), the "major axis" shaft 36 is stopped and surface 68*b* of the cam causes the "minor axis" shaft 37 to rotate at a low speed. As shown in Fig. 8, while the mold carriers 22 are rotated in a cooling bath, the "minor axis" is preferably maintained in a horizontal plane.

Referring to Figs. 7 and 3, the clutch plate 59 is positioned with the "minor axis" in a horizontal plane by a spring-biased lever arm 70 pivotally mounted as at 175 above the top plate 31. The outer end of arm 70 has a cam follower 176 actuated by a suitable means (not shown) located proximate to station (III). The inner end of arm 70 is pivotally connected to a roller carriage 176 movable in a slot 177 in the top plate 31 extending transversely of the arm 35. The lower portion of the carriage 176 has a vertically slidable latch rod 178 extending therethrough. The rod 178 is spring-biased to maintain an approximate position and carries on its lower end a latch dog 179 adapted for engagement with a notch 180 on the periphery of the clutch plate 59.

The turret of the casting apparatus 20 may be rotated or indexed from one station to the next either manually or by suitable mechanical means (described below). Referring to Fig. 2*a*, an indexing block 71 is mounted on the base plate 25 and engages the underside of the bottom plate 29 to lock the turret in the indexed position.

Referring to Figs. 4 and 5, the indexing mechanism includes a cylinder 72 mounted on the base plate 25. The extensible shaft of cylinder 72 carries a rack 73 on the end thereof which meshes with a ratchet pinion 74 on the lower end of a vertical shaft 75. At the upper end of shaft 75 a pinion 76 meshes with a bull gear 77, mounted on the under surface of the bottom plate 29. Suitably located stands 78 carry bearings 79 which contact the bottom plate 29 and assist in the rotational movement of the turret.

Referring to Fig. 2*a* the spinning mechanism for the high speed rotation of the "minor axis" shaft 37 is located on the base plate 25, between the post 30 and the center line of the oven 24. Each of the three shafts 37 are fitted with a sprocket 80. Each sprocket is connected by a chain 181 to a lower sprocket 81 mounted atop the bottom plate 29 on one end of a horizontal shaft 82 rotatably journaled in bearing blocks 182. A gear 83 is fitted on each shaft 82.

The spinning drive, powered by a conventional A.C. motor 84 having a high output r.p.m. and mounted on the base plate 25, includes a stand 85 supporting horizontally mounted lower and upper shafts 86 and 87. The lower shaft 86 is driven by the motor 84 through sprockets 185 and chain 186 and has fitted thereon a gear 88 meshing with a gear 89 on the upper shaft 87. The upper shaft 87 also has a gear 90 fitted thereon, which selectively meshes with the gear 83 to rotate the shaft 37.

Electrical connections for the several motors, as well as for the various electrical controllers and solenoids employed in the operation of the casting machine 20, are mounted in and carried by a conventional drum type slip ring assembly 92 (shown in dotted lines in Fig. 2*a*) mounted on the post 30 beneath the bottom plate 29.

Referring to Fig. 2, each mold carrier 22 includes two main components. Each inner section 94 has an axial bore 95A for mounting on the shaft 43 and a threaded hub 96, which when in abutting relation to a stud 42, is secured thereto by a locking ring 44. Each outer mold carrier section 97 also has an axial bore 95B for mounting on the shaft 43 and a threaded hub 98. A locking assembly 99 engaging the hub 98 secures the carrier sections 94 and 97 on the shaft 43.

The molds 100 are carried on the periphery of each inner section with their remote ends directed outwardly of the "minor axis" of rotation. The spring-biased mold caps 102 are carried on the periphery of the outer section 97. After the molds 100 have been charged with a predetermined amount of liquid plastisol, the outer section 97 is fitted on the shaft 43, a cap 102 is aligned with each mold 100, and the locking assembly 99 is tightened.

As used herein, the terms "plastisol charge" or "resinous plastisol" are intended to mean a mixture of synthetic resin(s) and plasticizers which: can be molded, cast or converted to continuous films by the application of heat. The term "synthetic resins(s)" is intended to mean a thermoplastic, complex, substantially amorphus organic semi-solid or solid material (usually a mixture) built up by chemical reaction of comparatively simple compounds, approximating the natural resins in luster, fracture, comparative brittleness, insolubility in water, fusibility or plasticity, and some degree of rubber-like extensibility; but commonly deviating widely from natural resins in chemical constitution and behavior with reagents. More specifically, the terms include the vinyl polymers and copolymers such as polyvinylchloride (p.v.c.).

Without in any sense limiting the scope of the invention to the proportions set forth, the following is a detailed description of one suitable formula for use in the manufacture of articles according to the invention, the compound formulation being known as a vinyl plastisol.

To 100 parts of a conventional polyvinyl chloride polymer, such as is well known to those skilled in the art, for example, the compound Geon 121, obtainable from the B. F. Goodrich Chemical Co., is added: 80 parts of a conventional plasticizer, such as di-(2-ethylhexyl) phthalate (DOP), also well known to those skilled in the art; 2 to 6 parts of a liquid barium-cadmium stabilizer; such as Advastab X23–30 obtainable from the Advance Solvents & Chemical Corp., also well known to those skilled in the art, and inert pigment as required depending upon the color desired for the plastisol. A plastisol having this formulation gels at about 130° F., fuses at about 340° F. and chars at about 370° F. (maintained in excess of 5 minutes).

At the loading and stripping station (I), shafts **36** and **37** are stationary and the molds **100** are cooled to substantially room temperature, in any event less than 130° F. After the molds are charged, with a predetermined amount of plastisol, and closed, the casting machine turret is rotated toward the curing oven **24**.

The temperature of the oven **24** is so chosen as to provide sufficient heat energy to bring the walls of the cool molds up to the fusing temperature within the time allotted for the curing cycle. The exact temperature at which the oven is maintained will depend upon the oven insulation, the thickness and heat transfer rate of the mold walls, the size of the oven doors **105** (actuated by cylinders **106**), and other factors. Selection of the proper oven temperature is within the knowledge of those skilled in this art.

As the arm **35** enters the oven, shaft **37** is rotating at a rate selected from the range 2–30 r.p.m. Such rotation on the "minor axis" is of brief duration (2 to 5 seconds) and causes full distribution of the plastisol in the remote and intricate areas of the molds **100**. Such rotation also ensures that the cool molds will be heated at a uniform rate with no localized areas having significant temperature differences.

When the arm **35** is fully indexed to the curing station (II), cylinder **69** is actuated as described above and the clutch plates **59** and **60** are disengaged. Substantially simultaneously, the spinning drive gear **83** becomes engaged with gear **90**, and the drive motor **84** spins the shaft **37** at a rate selected from the range 50–150 r.p.m. Such high speed rotation on the minor axis is of longer duration (15 to 20 seconds) and continues until a very thin gelled layer of plastisol is formed on the walls of the mold. It has been found that the centrifugal force generated by the high speed rotation, while heating the mold so that the outermost layer of plastisol is gelled, will be sufficient to cause the plastisol to remain in the remote and intricate areas of the mold during the final curing and solidifying stages of the process.

Before the plastisol has gelled beyond the thin outer layer, the high speed rotation is stopped, clutch plates **59** and **60** are engaged and simultaneous rotation on both axes at a rate selected from the range 2–30 r.p.m. takes place for a period of about seven minutes, or until the plastisol has fully gelled and set. After the plastisol charge has fused, the arm **35** which has been in the furnace, is indexed to the cooling station.

At the cooling station (III), the "minor axis" shaft **37** only is rotated and the mold carriers **22** are first immersed in a water bath **108** carried by a lift cylinder **109** (see Fig. 8). The temperature of the bath **108** is approximately 150° F. and the molds are rotated therein for approximately 30 seconds. The temperature of the bath and the duration of rotation therein are so chosen as to ensure that the solidified plastisol is quickly lowered to a temperature significantly below the setting temperature, so that there can be no deterioration of the product. After immersion cooling in the bath, the mold carriers are further cooled by slow rotation in air for the balance of the cycle (7 minutes or less). At the end of the cooling period, the temperature of the products within the mold should be 120–130° F.

A specific form of the apparatus **20**, as well as specific operating times and temperature for a specific vinyl plastisol formulation, have been described. It will be apparent however, that minor changes could be made therein without departing from the basic concepts of the invention. Accordingly, the scope of the invention should be determined by the fairly implied scope of the subjoined claims.

What is claimed is:

1. Rotational casting apparatus comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, a plurality of equally spaced arms extending horizontally from within said turret through said side plate, each of said arms including an inner shaft coaxially enclosed by an outer shaft, a block on the outer end of an inner shaft, a cross shaft journaled in said block transversely of said inner shaft, meshed gears on said cross shaft and outer shaft, mold carrier mounting shafts extending longitudinally of said cross shaft, hub means on said post rotatably supporting an inner shaft, individual clutch means on said inner and outer shafts, gear means on said post separately driving each clutch means, individual drive means for powering said gear means, individual control means for selectively disengaging each of said clutch means, a dual cam on said post above said top plate, individual cam follower means above said top plate for actuating said control means, and means for spinning said outer shaft when both of said clutch means are disengaged by said control means.

2. Rotational casting apparatus comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, three equally spaced arms extending from within said turret through said side plate, each of said arms including an outer shaft coaxially rotatable upon an inner shaft, a block on the outer end of an inner shaft, a cross shaft journaled in said block transversely of said inner shaft, meshed gears on said cross shaft and outer shaft, mold carrier mounting shafts extending longitudinally of said cross shaft, hub means on said post rotatably supporting an inner shaft, individual clutch means on said inner and outer shafts, gear means on said post separately driving each clutch means, individual drive means for powering said gear means, individual control means for selectively disengaging each of said clutch means, a dual cam on said post above said top plate, individual cam follower means above said top plate for actuating said control means, and means for spinning said outer shaft when both of said clutch means are disengaged by said control means.

3. Rotational casting apparatus comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, a plurality of equally spaced arms extending horizontally from within said turret through said side plate, each of said arms including an inner shaft coaxially enclosed by an outer shaft, stud means on the end of an arm for detachably mounting a pair of mold carriers, power transmission means associated with said stud means whereby rotation of said inner and outer shafts rotates said mold carriers on their major and minor axes respectively, hub means on said post rotatably supporting an inner shaft, individual clutch means on said inner and outer shafts, gear means on said post separately driving each clutch means, individual drive means for powering said gear means, individual control means for selectively disengaging each of said clutch means, a dual cam on said post above said top

plate, individual cam follower means above said top plate for actuating said control means, and means for spinning said outer shaft when both of said clutch means are disengaged by said control means.

4. Rotational casting apparatus comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, a plurality of equally spaced arms extending horizontally from within said turret through said side plate, each of said arms including an inner shaft coaxially enclosed by an outer shaft, a block on the outer end of an inner shaft, a cross shaft journaled in said block transversely of said inner shaft, meshed gears on said cross shaft and outer shaft, mold carrier mounting shafts extending longitudinally of said cross shaft, hub means on said post rotatably supporting an inner shaft, individual clutch means on said inner and outer shafts, gear means on said post separately driving each clutch means, individual drive means for powering said gear means, individual control means for selectively disengaging each of said clutch means, a dual cam on said post above said top plate, individual cam follower means above said top plate for actuating said control means, a first pulley means mounted on said outer shaft, a second pulley means journaled on said bottom plate, belt means connecting said pulley means, and drive means powering said second pulley means for spinning said outer shaft when both of said clutch means are disengaged by said control means.

5. Rotational casting apparatus comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, three equally spaced arms extending from within said turret through said side plate, each of said arms including an outer shaft coaxially rotatable upon an inner shaft, stud means on the end of an arm for detachably mounting a pair of mold carriers, power transmission means associated with said stud means whereby rotation of said inner and outer shafts rotates said mold carriers on their major and minor axes respectively, hub means on said post rotatably supporting an inner shaft, individual clutch means on said inner and outer shafts, gear means on said post separately driving each clutch means, individual drive means for powering said gear means, individual control means for selectively disengaging each of said clutch means, a dual cam on said post above said top plate, individual cam follower means above said top plate for actuating said control means, and means for spinning said outer shaft when both of said clutch means are disengaged by said control means.

6. Rotational casting apparatus comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, a plurality of equally spaced arms extending horizontally from within said turret through said side plate, each of said arms including an inner shaft coaxially enclosed by an outer shaft, a block on the outer end of an inner shaft, a cross shaft journaled in said block transversely of said inner shaft, meshed gears on said cross shaft and outer shaft, mold carrier mounting shafts extending longitudinally of said cross shaft, hub means on said post rotatably supporting an inner shaft, individual normally engaged clutch means on said inner and outer shafts, gear means on said post separately driving each clutch means, individual drive means for powering said gear means, individual control means for selectively disengaging each of said clutch means, a dual cam on said post above said top plate, said cam having a peripheral slot at a predetermined location thereon, individual cam follower means above said top plate for actuating said control means, a block slidable in said slot, actuating means to selectively project said block radially outward of said post to simultaneously contact both of said cam follower means whereby said clutch means are disengaged, and means for spinning said outer shaft when both of said clutch means are so disengaged.

7. Apparatus for use in rotational casting, wherein mold carriers are selectively subjected to low speed rotation on their major and minor axes and high speed spinning on the minor axis only, comprising, a rotatably mounted turret having substantially circular top and bottom plates connected by an annular side plate, a plurality of arms extending from within said turret through said side plate, each of said arms including an outer shaft coaxially rotatable upon an inner shaft, mounting means on the outer end of an arm for securing a plurality of mold carriers thereto, power transmission means associated with said mounting means whereby rotation of said inner and outer shafts rotates said mold carriers on their major and minor axes respectively, individual clutch means on said inner and outer shafts, individual drive means for said clutch means, individual control means for selectively disengaging said clutch means stopping rotation of said shafts at low speed, and means for spinning said outer shaft at high speed when both of said clutch means are disengaged by said control means.

8. Apparatus for use in rotational casting, wherein mold carriers are selectively subjected to low speed rotation on their major and minor axes and high speed spinning on the minor axis only, comprising, a rotatably mounted turret having substantially circular top and bottom plates connected by an annular side plate, a plurality of arms extending from within said turret through said side plate, each of said arms including an outer shaft coaxially rotatable upon an inner shaft, mounting means on the outer end of an arm for securing a pair of mold carriers thereto, power transmission means associated with said mounting means whereby rotation of said inner and outer shafts rotates said mold carriers on their major and minor axes respectively, individual clutch means on said inner and outer shafts, individual drive means for said clutch means, individual control means for selectively disengaging said clutch means stopping rotation of said shafts at low speed, latch means associated with the clutch means of said inner shaft for selectively positioning said mold carriers with their minor axis in a substantially horizontal plane, and means for spinning said outer shaft at high speed when the clutch means of said outer shaft is disengaged and the clutch means of said inner shaft is so positioned by said latch means.

9. Apparatus for use in rotational casting, wherein mold carriers are selectively subjected to low speed rotation on their major and minor axes and high speed spinning on the minor axis only, comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, a plurality of arms extending from within said turret through said side plate, each of said arms including an outer shaft coaxially rotatable upon an inner shaft, mounting means on the outer end of an arm for securing a plurality of mold carriers thereto, power transmission means associated with said mounting means whereby rotation of said inner and outer shafts rotates said mold carriers on their major and minor axes respectively, individual clutch means on said inner and outer shafts, individual drive means for said clutch means, individual control means for selectively disengaging said clutch means stopping rotation of said shafts at low speed, and means for spinning said outer shaft at high speed when both of said clutch means are disengaged by said control means.

10. Apparatus for use in rotational casting, wherein

mold carriers are selectively subjected to low speed rotation on their major and minor axes and high speed spinning on the minor axis only, comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, three equally spaced arms extending horizontally from within said turret through said side plate, each of said arms including an outer shaft coaxially rotatable upon an inner shaft, a block on the outer end of an inner shaft, a cross shaft journaled in said block transversely of said inner shaft, meshed gears on said cross shaft and outer shaft, mold carrier mounting shafts extending longitudinally of said cross shaft, individual clutch means on said inner and outer shafts, individual drive means for said clutch means, individual control means for selectively disengaging said clutch means stopping rotation of said shafts at low speed, and means for spinning said outer shaft at high speed when both of said clutch means are disengaged by said control means.

11. Apparatus for us in rotational casting, wherein mold carriers are selectively subjected to low speed rotation on their major and minor axes and high speed spinning on the minor axis only, comprising, a base having a vertically aligned post extending upwardly therefrom, a turret rotatably mounted on said post and having substantially circular top and bottom plates connected by an annular side plate, three equally spaced arms extending horizontally from within said turret through said side plate, each of said arms including an outer shaft coaxially rotatable upon an inner shaft, a block on the outer end of an inner shaft, a cross shaft journaled in said block transversely of said inner shaft, meshed gears on said cross shaft and outer shaft, mold carrier mounting shafts extending longitudinally of said cross shaft, individual clutch means on said inner and outer shafts, individual drive means for said clutch means, individual control means for selectively disengaging said clutch means stopping rotation of said shafts at low speed, latch means associated with the clutch means of said inner shaft for selectively positioning said mounting shafts in a substantially horizontal plane, and means for spinning said outer shaft at high speed when the clutch means of said outer shaft is disengaged and the clutch means of said inner shaft is positioned by said latch means.

12. Rotational casting apparatus comprising a plurality of mold carrying arms extending radially of a center, each of said arms having an outer shaft coaxially rotatable upon an inner shaft, mold carriers arranged symmetrically on the end of each arm, first means driving said outer shafts so that said mold carriers are rotated on their minor axis, second means driving said inner shafts so that said mold carriers are rotated on their major axis, individual clutch means selectively disengaging said first and second drive means, and a third means for driving one of said outer shafts on a selected arm when the clutch means therefor are disengaged.

References Cited in the file of this patent

UNITED STATES PATENTS

1,373,121	Emery	Mar. 29, 1921
2,603,836	Rempel	July 22, 1952
2,681,472	Rempel	June 22, 1954
2,696,024	Mobley et al.	Dec. 7, 1954
2,740,159	Berg	Apr. 3, 1956
2,834,986	Bailey et al.	May 20, 1958