Feb. 22, 1949. W. H. WALTER 2,462,794

APPARATUS FOR CENTRIFUGAL CASTINGS

Filed Nov. 5, 1945

Fig 1

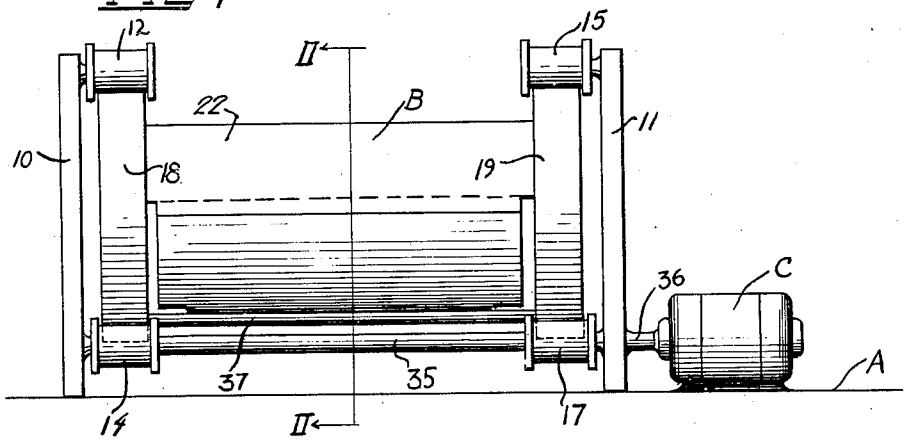


Fig 2

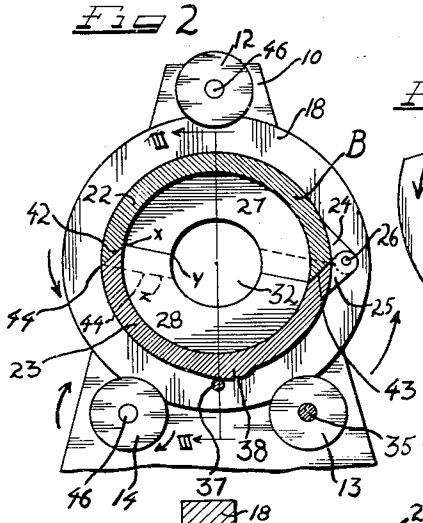


Fig 4

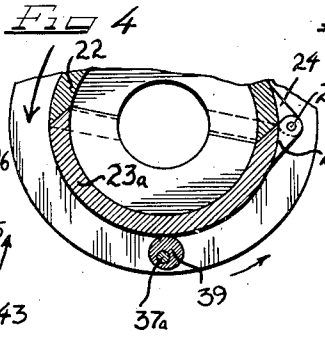


Fig 5

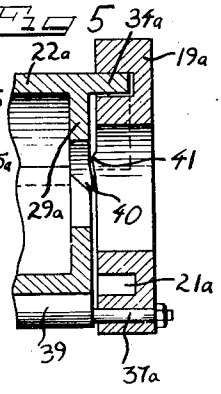
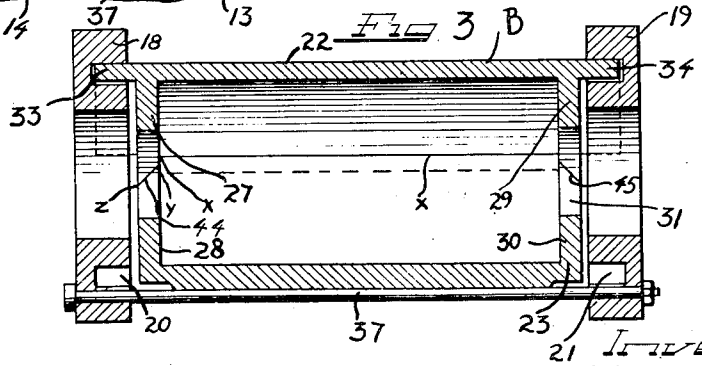


Fig 3



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APPARATUS FOR CENTRIFUGAL CASTING

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4 Claims. (Cl. 22—65)

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The present invention relates to apparatus for centrifugal casting and more particularly to an apparatus including a segmental casting cylinder having novel means for rotating it and novel means for maintaining the segments closed in casting relation.

An object of the present invention is to provide a centrifugal casting apparatus wherein the cylindrical casting die may be freed of the finished casting without removing the cylinder from the apparatus.

Another object of the invention is to provide a centrifugal casting apparatus in which the casting cylinder is rotated by rotating end rings which support the cylinder.

A further object of the present invention is to provide a segmental cylindrical casting die having the joints thereof sealed in a novel manner.

A still further object of the present invention is to provide a segmental casting cylinder which is locked closed by means out of contact with the joints between the segments.

The invention has for an additional object the provision of a segmental cylindrical casting die in which one of the segments is supported by end rings and another segment is hinged to the said one segment for discharging the casting when open, and contemplates novel means for locking the segments together in casting relation.

Another and further object of the present invention is to provide a segmental casting die of cylindrical shape, supported by end rings, and novel means for locking the segments in casting relation and connecting the cylinder to the rings for rotation.

The invention has for a further object the provision of a two-part segmental cylindrical casting die having end rings for supporting it, with one of the segmental parts having flanged ends engaging with the rings, and the other part being hinged to the said one part free of the rings, and includes means carried by the rings for locking the two parts together and rotating the cylinder with the rings.

An additional object of the present invention contemplates a two-part segmental cylindrical casting die with the joints between the segments diagonally disposed to increase the sealing effect at the joints.

The above, other and further objects of the present invention will be apparent from the following description and accompanying drawing.

Embodiments of the present invention are illustrated in the accompanying drawing, and the views thereof are as follows:

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Figure 1 is a side elevational view of a centrifugal casting apparatus involving the principles of the present invention, showing the segmental cylinder in casting position.

Figure 2 is a vertical sectional view taken in the plane of line II—II of Figure 1;

Figure 3 is a vertical sectional view taken in the plane of line III—III of Figure 2;

Figure 4 is a fragmental sectional view, similar to Figure 2, showing a second form of locking and driving means for the cylinder; and

Figure 5 is a fragmental vertical sectional view, similar to Figure 3, showing operating cam means on a segment of the cylinder and an end ring for augmenting the locking means.

The drawing will now be explained.

The apparatus of the present invention rests on a suitable base A, such as a floor or a bench, and includes end posts 10 and 11 rising from the base and each post supporting a plurality of rollers 12, 13, 14, 15, 16 and 17, arranged with three rollers per post and angularly spaced, in the preferable arrangement, as illustrated in Figure 2.

Rotatably supported by the rollers 12, 13 and 14, of the end post 10, is a ring 18, while a similar ring 19 is supported by the rollers 15, 16 and 17 of the end post 11. The inner face of each ring has an annular channel formed in it, the ring 18 having the channel 20 and the ring 19 having the channel 21. These channels face each other for a purpose to be later explained.

The horizontally disposed casting cylinder B is shown as consisting of two semicylindrical parts 22 and 23 hinged together along one joint between them by hinge members 24 and 25 pivoted together at 26, as may be noted in Figure 2.

Each of the parts 22 and 23 is provided with end walls, the end walls at the left-hand end of Figure 3 being designated as 27 and 28, of the parts 22 and 23 respectively, while the end walls at the right-hand end are designated as 29 and 30. The end walls are formed to provide axial openings, the axial opening 31, at the right-hand end of Figure 3, being used, preferably, as the charging opening through which molten metal is delivered to the interior of the cylinder. An axial opening 32 is formed in the end members 27 and 28.

The semicylindrical portion 22 of the cylinder is formed with overhanging arcuate end flanges 33 and 34 with the flange 33 entered in the channel 20 of the ring 18 and the flange 34 entered in the channel 21 of ring 19, as may be observed in Figure 3. The overhanging flanges 33 and 34,

of the segment 22, support the cylinder in the end rings.

It will be noted from Figure 3 that the semicylindrical portion 23 of the cylinder is in axial length less than the distance between the rings 18 and 19. It will also be noted that the axial distance between the end walls 27 and 29 of the semicylindrical portion 22 is less than the distance between the end rings.

The similar rollers 13 and 16 are connected by a shaft 35 which in turn is connected to the shaft 36 of a motor C so that when the motor is energized, the shaft 35 and the rollers 13 and 16 will be rotated. By reason of the fact that the end rings 18 and 19 rest on the rollers 13 and 16, and other rollers, these rings will be rotated whenever the shaft 35 is rotated.

Connected between the end rings 18 and 19, is a rod 37 arranged parallel to the axis of the cylinder. This rod connects the end rings 18 and 19 together for simultaneous rotation, it being rigidly secured to the end rings for this purpose.

It is an important object of the present invention to provide means for locking the two semicylindrical segments 22 and 23 together to provide the cylinder for casting. The means for locking together these segments, of the present invention, comprises means in which the segments are locked together without any contact of anything with the joints between the segments.

One form of locking means is illustrated in Figure 2 wherein the outer surface of the segment 23 is formed with a cam 38 against which the rod 37 strikes when the segment 23 has been closed against the segment 22 and the end rings 18 and 19 rotated relatively to the cylinder to bring about engagement of the rod 37 with the cam 38.

In addition to locking the segments together, in cylindrical form, the engagement of the rod 37 with the cam 38 constitutes the connection between the end rings 18 and 19 and the cylinder B for rotating the cylinder with the rings, as the motor is operated.

Figure 2 shows, by directional arrows, the direction of driving rotation of the shaft 35 and the rollers 13 and 16, and the counterclockwise rotation of the rings and cylinder. The cam 38 of the segment 23 is so fashioned that the pressure of the rod 37 against the cam 38 during the driving of the cylinder will tend to increase the locking effect between the rod and cam and thus assure tight closure of the joints of the segments against any tendency to open by reason of the centrifugal force developed in the operation of the casting machine.

By reason of the fact that the cylinder B is rotated at high speed and that the mass of the cylinder with the mass of the metal in it is sufficient to make it necessary that the rod 37 engage the cam 38 in driving relation, at all times, insures positive closure of the segment of the cylinder so that the outer surface of the casting is smooth and perfectly formed.

The optional locking means shown in Figure 4 includes an eccentric 39 on the rod 37*a*, the eccentric being substantially as long as the length of the semicylindrical segment 23*a*. The outer surface of the segment 23*a* is truly circular, as may be observed.

When this form of locking and driving means is utilized, after the segment 23*a* has been closed against the segment 22, the end rings are rotated relatively to the cylinder until the eccentric 39 is jammed into tight engagement with the outer surface of the segment 23*a*. Thereafter as the end rings are rotated, the cylinder will be driven by the rod 35*a* and eccentric 39, and at the same time the segment 23*a* will be locked in closed relation with respect to the segment 22.

When the casting apparatus of the present invention is made of heavy material, for producing heavy castings, additional means for holding the segments closed may be provided. Figure 5 illustrates one of such means wherein the end wall 29*a* of the segment 22*a* is provided with a cam 40 projecting outwardly of the end wall, while the adjacent face of the end ring 19*a* is provided with an inwardly projecting cam 41, the two cams to be in register when the cylinder is in driving engagement with the rod 37 or 37*a*. In this form of the invention, the end ring 19*a* is provided with an annular channel 21*a* which receives the overhanging arcuate flange 34*a* of this semicylindrical part 22*a*.

Referring to Figure 2, axial or longitudinal joints between the segments 22 and 23 are designated as 42 and 43. Simply for the purpose of convenience of description, the joint 42 will be designated as the front joint, while the joint 43 will be designated as the rear joint. It will be noted that the joints 42 and 43 are inclined with respect to the radius of the cylinder. The faces of the segments forming these joints lie in planes which are parallel to each other and to the axis of the cylinder but which are inclined relatively to the radius of the cylinder. The inclination of the surfaces of the joints is such that the sharpened edges 44 of the overlying or overlapping parts of the joint lead in the direction of rotation of the cylinder. Regarding the joints between the end portions 27 and 28 of the semicylindrical segments, the meeting faces thereof are inclined in like manner, as may be observed in Figures 2 and 3. The joint 44 between the end portions 27 and 28 of the segments is inclined with respect to the axis of the cylinder and arranged so that the sharpened edge of the face of the joint 27 leads in the direction of rotation of the cylinder. In like manner the joint 45 between the end portions 29 and 30 of the semicylindrical segment is formed.

Referring to Figure 2, it will be noted that the joint between the end portions 27 and 28 to the right of the center of the cylinder is formed with its surfaces inclined in a direction opposite to the inclination of the surfaces of the joint 44. In like manner the joint in the end portions 29 and 30 would be formed with its inclination opposite to the inclination of the joint 45.

Inclining the faces forming the joints, in the manner stated, improves the sealing effect between the joints when the segments are in closed casting relation. Furthermore, formation of the joints in this manner prevents tendency of the front joint to open under centrifugal force as the cylinder is rotated. By reason of the inclination of the surfaces forming the front joint 42, some reliance may be placed on such inclined formation for keeping the joint closed, although the front joint will remain tightly closed by reason of the engagement of the rod 37 against the cam 38 during rotation of the cylinder.

The operation of the casting apparatus is as follows:

Assuming that the cylinder has been opened to discharge a finished casting, in which event the end rings would be rotated relatively to the cylinder to move the rod 37 clockwise past the front

joint 42 so that the segment 23 might be dropped and opened, with the parts arranged as shown in Figure 2. The cylinder, with the segment 23 open, may be rotated counter-clockwise as viewed in Figure 2 until the hinge 26 is at the top of the cylinder thus causing the segment 23 to gravitationally close against the segment 22. The cylinder may be rotated as described by attaching a strap to the hinge, passing over the segment 22, and the cylinder pulled in counter-clockwise direction, by the operator. The parts are so designed and arranged as to offer but little resistance to such manual movement of the cylinder to close it. The motor C is then energized and rotated at slow speed which will thus rotate the rings counterclockwise as observed in Figure 2, bringing the rod 37 into tight engagement with the cam 38 to hold the segments closed. While the cylinder is being rotated at low speed, the molten metal is introduced to its interior through either of the openings in the end portions, whereupon after a sufficient charge has been delivered to the cylinder, the motor is speeded up to rotate the rings and with it the cylinder, at high speed for such length of time as is necessary to form the casting by centrifugal action. When such time has elapsed, the speed of the motor is reduced gradually so that in reducing the speed of rotation of the cylinder B to a point where it will stop, the cam 38 will not travel ahead of the rod 37. Should, however, the cylindrical die tend to run away from the rod, as the cylinder is coming to rest, a simple form of braking mechanism could be applied to prevent such occurrence.

After the casting is formed in the cylinder and the time comes to release it, the speed of rotation is reduced, and suitable brake mechanism may be provided to stop the rotation of the rings so that the rod 37 will be at or above the transverse horizontal axis of the cylinder, the cylinder continuing its rotative movement, with the result that as soon as the rod 37 is removed from underneath the segment 23 the segment will drop and the casting roll out of the cylinder onto the floor. It is to be understood that the apparatus is so designed that the cylinder B will be far enough above the base A to allow the finished casting to drop on the base and clear the segment 22. By reason of the fact that the casting would drop in front of the shaft 35, then may be rolled to the left as viewed in Figure 2, away from the cylinder, whereupon the segment 23 would be closed against the segment 22 as heretofore described, and the rings rotated counterclockise to bring the rod 37 against the cam 38 to close the cylinder for a succeeding casting operation.

The roller 16 on the post 11 is behind the roller 17 as viewed in Figure 1. The rollers 12, 14, 15 and 17 are supported on stub shafts designated generally as 46, while the rollers 13 and 16, as before stated, are keyed to the shaft 35 for the purpose of rotating the end rings 18 and 19 whenever the motor C is energized.

The eccentric 39 is rotatable on the rod 37a so that the eccentric may be moved into tight engagement with the segment 23a of the cylinder to hold the segment closed and to effect driving engagement between the end rings and the cylinder.

The invention has been described herein more or less precisely as to details, yet it is to be understood that the invention is not to be limited thereby, as changes may be made in the arrangement and proportion of parts, and equivalents may be substituted, without departing from the spirit and scope of the invention.

I claim as my invention:

1. A centrifugal casting machine comprising a generally horizontally disposed casting cylinder having an end opening for the reception of molten metal, said cylinder comprising two semi-cylindrical segments longitudinally hinged together to open and close by relative swinging movement about said hinge, two end rings roller-supported for rotation about a horizontal axis, said end rings being constructed against movement toward and away from each other and being axially spaced a distance greater than the length of one of said segments, said rings having annular grooves in their confronting faces, the other of said segments having projecting arcuate end portions entered in the grooves of said rings, and a rod carried by and rigidly connecting said rings and extending parallel to the cylinder axis and radially spaced outwardly from the outer surface of said other segment, said one segment having a radially protuberant part lying in the path of travel of said rod, said rod cooperating with said protuberant part to cause a camming action therebetween as said rod is moved in a circular path by rotation of said rings, to hold said one segment in closed relation to said other and to rotate the cylinder with the rings.

2. A centrifugal casting machine comprising a casting cylinder having an end opening for the reception of molten metal, said cylinder comprising two semi-cylindrical segments longitudinally hinged together to open and close by relative swinging movement about a common axis, two end rings roller supported for rotation about a common axis, said end rings being constrained against movement toward and away from each other and being axially spaced a distance greater than the length of one of said segments, said rings having annular grooves in their confronting faces, the other of said segments having projecting arcuate end portions entered in the grooves of said rings, and a rod carried by and rigidly connecting said rings and extending parallel to the cylinder axis and radially spaced outwardly from the outer surface of said other segment, there being cooperating surfaces on said rod and on said one segment to cause a camming action therebetween as said rod is moved in a circular path by rotation of said rings, said camming action causing said one segment to be moved into and held in closed relation to said other segment and to rotate therewith as a closed cylinder.

3. A centrifugal casting machine comprising a generally horizontally disposed casting cylinder having an end opening for the reception of molten metal, said cylinder comprising two semi-cylindrical segments longitudinally hinged together to open and close by relative swinging movement, two end rings roller-supported for rotation about a horizontal axis, said end rings being constrained against movement toward and away from each other and being axially spaced a distance greater than the length of one of said cylinder segments, said rings having annular grooves in their confronting faces, the other of said segments having projecting arcuate end portions entered in the grooves of said rings, and a rod carried by and axially connecting said rings and extending parallel to the cylinder axis and radially spaced outwardly from the outer surface of said other segment, said rod having a protuberant part thereon for camming engagement with the outer surface of said one segment as said rings are

rotated in driving direction for holding said segments closed and for rotating the cylinder with the rings.

4. A centrifugal casting machine comprising a generally horizontally disposed casting cylinder having an end opening for the reception of molten metal, two vertically disposed end rings laterally spaced apart and mounted for rotation and constrained against movement towards and away from each other, a rod connected to said rings parallel to the axis thereof, rollers supporting and guiding said rings, a motor having its shaft connected to certain of said rollers to rotate the rings, the confronting faces of said rings having annular grooves therein, said cylinder comprising a two-part cylindrical mold, one part of which mold is of less length than the distance between said rings, the other of said mold parts having endwise projecting arcuate flanges entered in the grooves of said end rings to thereby mount the mold on said rings, the first named of said mold parts and said rod having cooperating

cam means for jamming said rod against said cylinder to hold said mold parts closed and for rotating said mold in the same direction and about the same axis as said rings are driven by the motor.

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