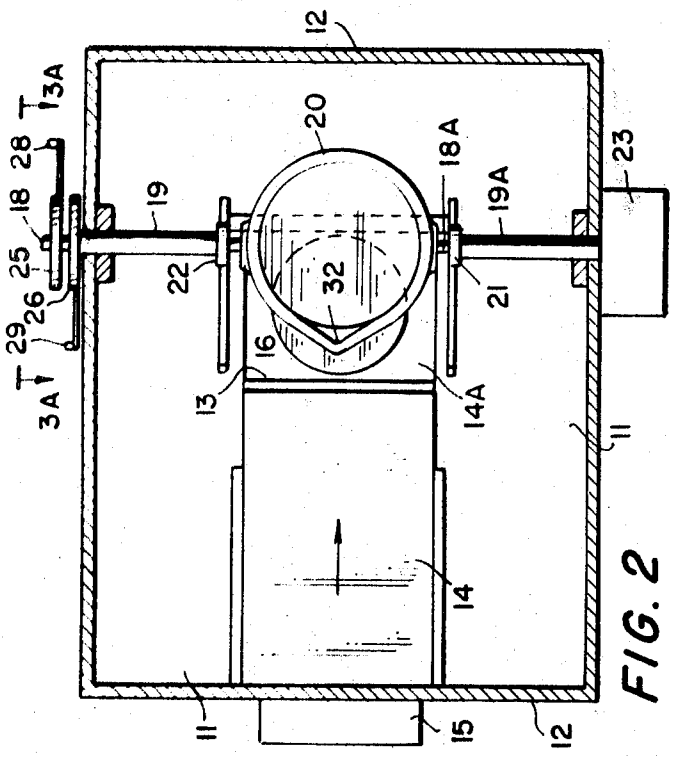


FIG. 2

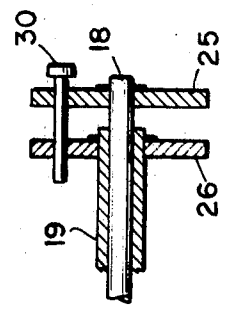


FIG. 3B

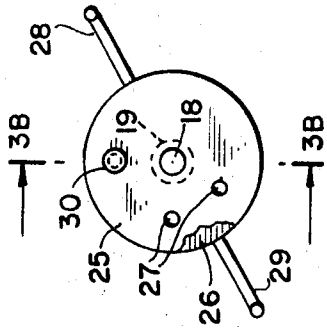


FIG. 3A

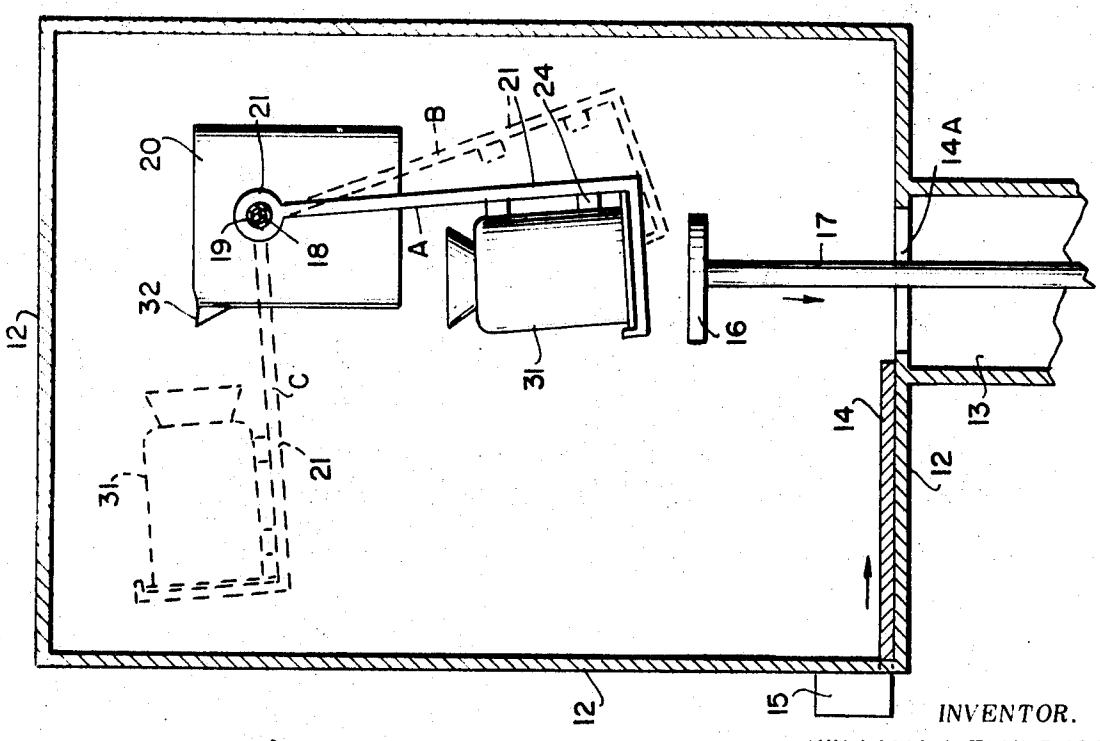


FIG. 1

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[54] **CASTING FURNACE MOLD MECHANISM**
4 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **164/256,** 164/61, 214/301, 164/336, 222/166, 141/377
[51] **Int. Cl.** **B22d 27/16**
[50] **Field of Search** ..... 164/254, 255, 256, 258, 259, 1, 4, 61, 66, 68, 335, 336; 266/36 P; 23/259; 214/300, 301; 222/164, 165, 166; 141/377

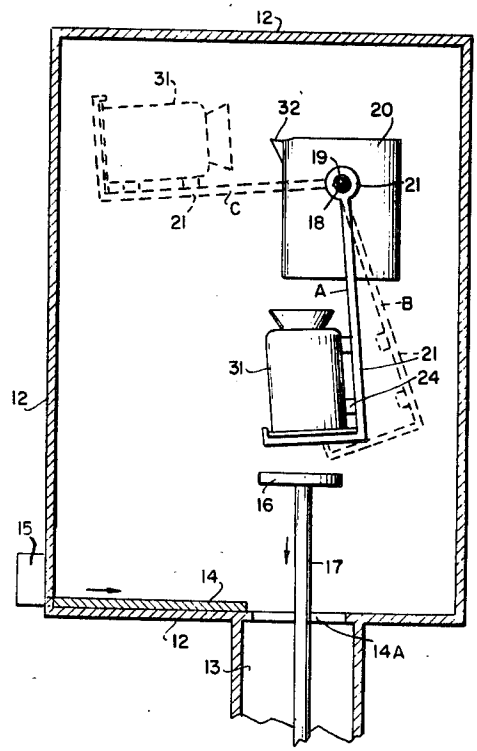
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ABSTRACT: An apparatus for casting, comprising a mold cradle and crucible pivotably but separately mounted to rotate around an axis and releasable means to back the crucible and mold cradle together for unitary movement around the common axis.



CASTING FURNACE MOLD MECHANISM

The present invention is concerned with an apparatus for casting and, more particularly, for an apparatus for casting metal in enclosed chambers containing an inert atmosphere (including vacuum) in contact with metal being cast.

One of the problems which is involved in the casting of metal is that the quality of a cast object is sometimes related to the speed with which the metal is cast into a mold. This is particularly true of castings made of nickel-chromium and cobalt-chromium base alloys used as structures in gas turbine engines. These alloys are conventionally cast into refractory molds made by investing a fugitive model with a hardenable refractory mix. It is highly advantageous with many castings of this character to pour metal into the hardened refractory mold as rapidly as possible. Furthermore, it is highly advantageous, from the point of view of consistent product quality, to be able to repeat, time after time, the exact conditions of metal pour. It has now been discovered that by means of use of a special apparatus, foundrymen are enabled to overcome many of the difficulties encountered heretofore.

It is an object of the present invention to provide a novel apparatus for casting metal.

Other objects and advantages will become apparent from the following description taken in conjunction with the drawing in which:

FIG. 1 illustrates, semischematically, the essential portions of the apparatus of the present invention with a mold in place;

FIG. 2 illustrates, in plan view, the apparatus of the present invention eliminating therefrom the mold shown in FIG. 1; and

FIGS. 3A and 3B show one simple shaft locking means useful as a portion of the apparatus of the present invention.

Referring now to the drawing, FIGS. 1 and 2 show an enclosure 11 bounded by walls 12 having abutting mold lock 13 which can be isolated from enclosure 11 by means of sliding valve 14 responsive to actuating means 15. In normal operation of the kind to which the present invention is applicable, enclosure 11 contains an atmosphere inert to molten metal. This atmosphere can be an inert gas such as helium, neon, argon or the like,. It can be, and advantageously is, a hard vacuum produced by conventional vacuum pumping equipment not illustrated. When sliding valve 14 is in its open position leaving port 14A open, as shown in FIG. 1, mold platform 16 can be raised into enclosure 11 and/or lowered into mold lock 13 by means of shaft 17 powered by any conventional hydraulic or other means not illustrated. Concentric and coaxial shafts 18 and 19 pass through one of walls 12 as does their complementary shafts 18*a* and 19*a*. The inner of said coaxial shafts 18 and 18*a* together support crucible 20 in enclosure 11. Crucible 20 is made of a refractory adapted to contain molten metal and is heated by any means conventional to the art, for example by induction, by arc, by electron beam, etc. Outer coaxial shafts 19 and 19*a* support mold cradle arms 21 and 22. Cradle arms 21 and 22 are affixed to shafts 19*a* and 19, respectively, by any suitable means, such as a weld, a key, a pin or the like. In like manner, crucible 20 is suitably affixed to shafts 18 and 18*a* so as to be rotatable around the axis of said shaft. Means 23 of any suitable construction is provided to automatically or manually rotate the coaxial shafts either separately or in unison. Cradle arms 21 and 22 have an L-shaped configuration and are supported on shafts 19*a* and 19 at the free tip end of the long arm of the L. As shown in FIG. 1 the support is centric with respect to shafts 19 and 19*a* but, if desired, this support can be positioned eccentrically. As shown in FIG. 2, mold cradle arms 21 and 22 are connected by stringer members 24 which are affixed at each end to the long arms of the L-shaped cradle.

A simple mechanical analog of means 23 is illustrated in FIGS. 3 and 3*a*. Essentially this mechanical means comprises discs 25 and 26 pinned near the ends of shafts 18 and 19, respectively. Both discs have holes 27 bored therethrough on a fixed radius from the center of each of the discs. The discs are rotatable around the axis of shafts 18 and 19 by means of handles 28 and 29. When it is desired that the discs and shafts shall rotate in unison, pin 30 is inserted into tow matching holes in discs 25 and 26. When individual rotation of the shafts is desired, pin 30 is merely removed from holes 27. Those skilled in the art will appreciate that means 23, which accomplishes the function of the mechanical analog as illustrated in FIGS. 3 and 3*a*, can be of any conventional construction—mechanical, electrical, hydraulic or the like. Those skilled in the art will also appreciate that means 23 can be made responsive to automatic command depending upon conditions and positioning in enclosure 11.

In operation of the apparatus of the invention, it is contemplated to raise a mold 31 from mold lock 13 on platform 16. Mold cradle arm 21 is at the time positioned in the position shown in FIG. 1 in dotted outlines as B. When the mold on platform 16 is raised above the lowest traverse arc of mold cradle arms 21, shafts 19 and 19*a* are rotated clockwise to pick up mold 21 from platform 16 and hold it as shown in noninterrupted line at position A in FIG. 1. Shafts 19 and 19*a* are further rotated clockwise to the position indicated in dotted outline in FIG. 1 as C. It is at this position that shafts 19 and 19*a* are locked to shafts 18 and 18*a*, respectively. While the mold is being positioned, metal is caused to become molten in crucible 20. For pouring, the locked concentric shafts are rotated roughly 90° counterclockwise causing metal to pour over lip 32 of crucible 20 into mold 31. The concentric shafts are then unlocked and shafts 18 and 18*a* are caused to rotate clockwise 90° to cause crucible 20 to come to its initial position. Mold 31 is then picked up by platform 16 from mold cradle 21 and lowered into mold lock 13. Valve 14 is then caused to close and thereby isolate lock 13 from enclosure 11 to enable removal of mold 31 and a new mold to be supplied. Of course, it will be obvious to those skilled in the art that metal is supplied to crucible 20 by any of the conventional means.

Those skilled in the art will appreciate that variations and modifications can be employed without departing from the spirit and scope of the invention. For example, although, as illustrated, mold 31 is caused to rise from a mold lock positioned below chamber 11, the molds could be supplied to chamber 11 by any other suitable mechanism; for example, a side-positioned lock operating in conjunction with an endless belt transport system within the chamber 11. Furthermore, it will be appreciated that, although walls 12 or enclosure 11 are shown merely as a boundary line, such walls in actual furnaces will be of double steel construction with provisions for water cooling. Likewise, sliding valve 14 has been shown schematically with no intent to limit the type of construction. It is merely the intent of the drawing to show a means for isolating chamber 11 from mold lock chamber 13.

While the present invention has been described in conjunction with advantageous embodiments, those skilled in the art will recognize that modifications and variations may be resorted to without departing from the spirit and scope of the invention. Such modifications and variations are considered to be within the purview and scope of the invention.

I claim:

1. An apparatus for casting comprising

A. Cradle means for receiving, holding and releasing a mold;

B. Pivot means associated with said cradle means to pivot said cradle means about an axis;

C. Crucible means for holding a charge of molten metal;

D. A second pivot means associated with said crucible means to pivot said crucible means about said axis and

E. Releasable means to lock said cradle means and said crucible means together for unitary movement about said axis.

2. An apparatus as in claim 1 including a vacuum-tight enclosure surrounding said apparatus.

3. An apparatus as in claim 2 including mold lock means abutting and communicable with said enclosure.

4. An apparatus as in claim 1 wherein said pivot means and said second pivot means are concentric shafts.