June 13, 1967 J. F. VOSBURG 3,324,937

PROGRESSIVELY COLLAPSIBLE MOLD TO ACCOMMODATE SHRINKAGE IN CASTING

Original Filed Oct. 10, 1963 2 Sheets-Sheet 1

FIG. 1.

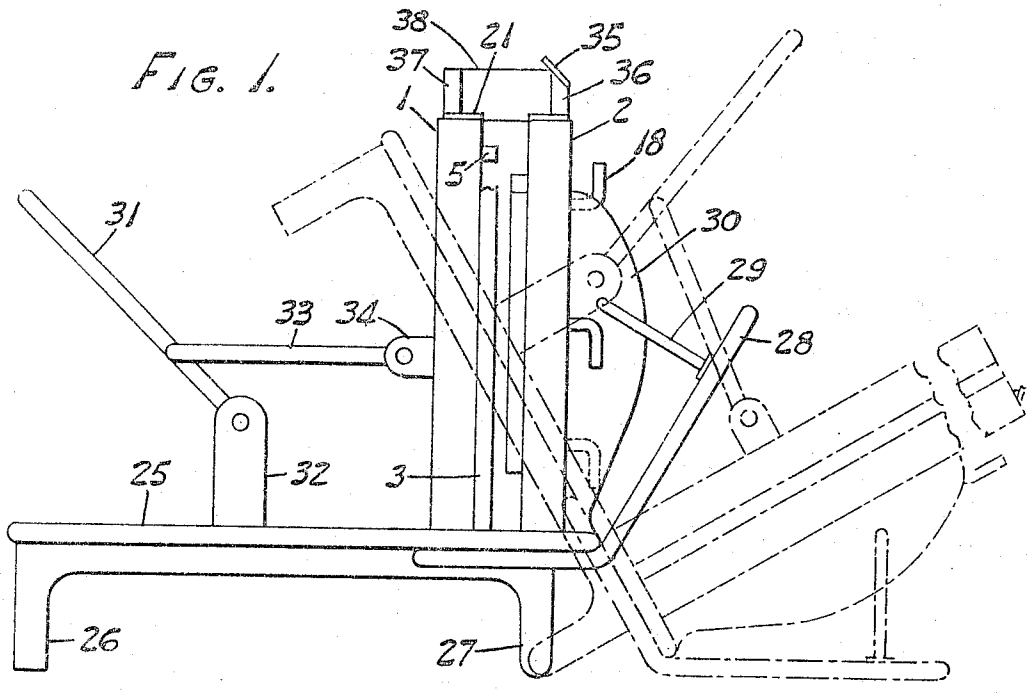
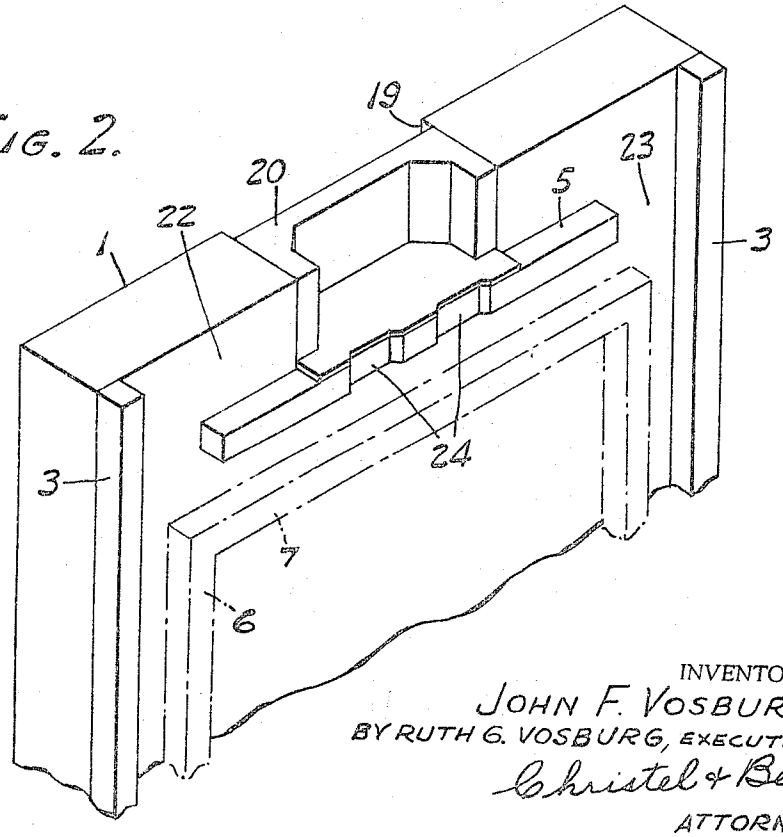


FIG. 2.



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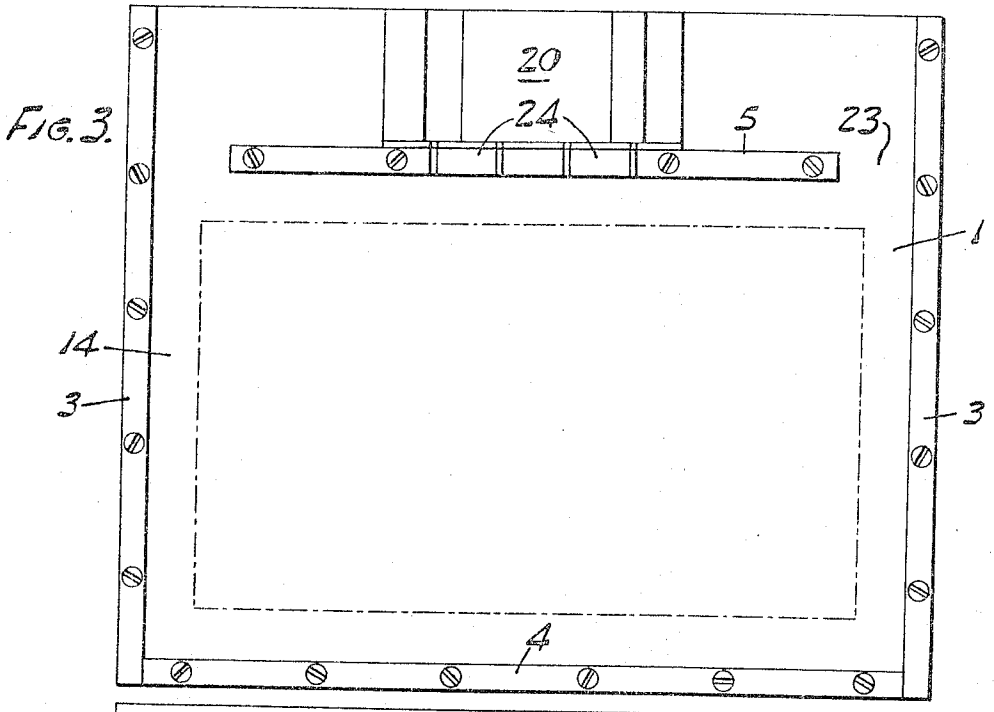
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2 Sheets-Sheet 2

FIG. 3.



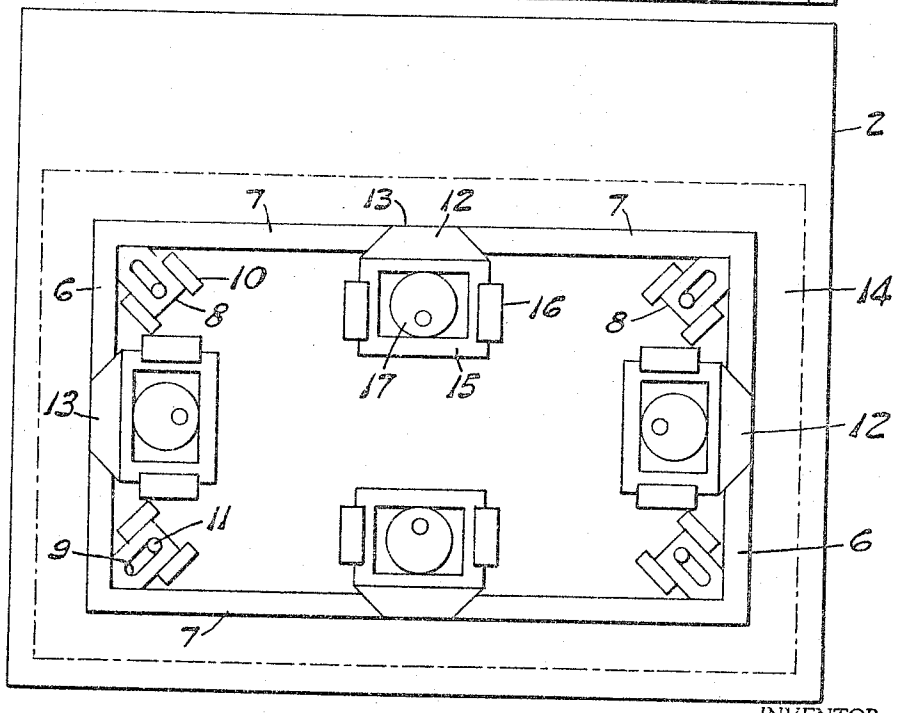


FIG. 4.

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United States Patent Office 3,324,937 Patented June 13, 1967

3,324,937

PROGRESSIVELY COLLAPSIBLE MOLD TO ACCOMMODATE SHRINKAGE IN CASTING

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Original application Oct. 10, 1963, Ser. No. 315,325, now Patent No. 3,276,081, dated Oct. 4, 1966. Divided and this application June 30, 1966, Ser. No. 561,961

7 Claims. (Cl. 164—342)

This application is a division of co-pending application Ser. No. 315,325 filed Oct. 10, 1963.

This invention relates generally to the casting art, and more specifically to a new and useful collapsible permanent mold and method of casting, and to a new and useful printer's chase.

The casting of hollow objects presents a problem, because the metal shrinks as it cools in the mold. Contraction in volume occurs as the metal passes from the liquid to the solid state, and also as it continues to cool in the solid state. This latter shrinkage is particularly troublesome because it usually starts to take place before pouring is completed, and if the casting shrinks onto an unyielding core the resulting contraction will damage the casting, ruining it beyond repair in most cases at least. It is not enough merely to collapse or remove the core element in its entirety, because of the necessity for continuing to pour while accommodating shrinkage.

Sand molds can be used when it is desired to cast such an object. However, sand casting often is not as desirable as permanent or chill casting, because of the much finer crystal structure produced by the latter. Indeed, sand casting is not suitable for many purposes.

Also in addition to producing sounder castings, those poured into a permanent mold are much cheaper because the handling of a considerable volume of sand is eliminated, which is in itself a saving in labor and subsequent costs. In addition to this, because of the much more rapid chilling in a permanent mold, casting can be produced at a much faster rate; all of this adding up to a much better casting which also is much cheaper.

Consequently, many objects which otherwise could be cast, are fabricated. Newspaper chases, for example, customarily are fabricated from frame members which are mortised and pinned and sometimes welded together. Intermittent strains on the fabricated chase during use cause wear, resulting in inaccuracies, which could be avoided if the chase were cast. A sand casting, however, would not possess the requisite properties, because of its crystal structure, in addition to being much more costly.

Accordingly, the primary object of my invention is to provide a permanent mold having a core which can be progressively collapsed, to accommodate linear shrinkage during cooling of the poured material in its solid state even while continuing to pour material into the mold.

Another important object of my invention is to provided a method of chill casting which compensates for linear shrinkage during cooling in the solid state while enabling continued pouring of the material to be cast.

It is also an object of my invention to provide a permanent mold which is progressively collapsible as aforesaid, and a method of casting, insuring the proper rate of pouring, to accommodate shrinkage occuring as the material cools from the liquid to the solid state, and eliminating depressed areas and undesired porosity.

Still another object of my invention is to provide a printer's chase which is chill cast and requires none of the aforementioned mortising and pinning or the like.

A collapsible permanent mold constructed in accordance with my invention is characterized by the provision of mold parts having inner and outer frame portions defining a cavity into which material to be cast is poured from one part to another thereof, together with means for progressively collapsing the inner frame portion inwardly from the other part of the cavity to the one part thereof.

The method of casting in accordance with my invention is characterized in one aspect thereof by the steps of pouring the material to be cast into a mold having a core, and progressively collapsing the core to accommodate shrinkage.

A printer's chase of my invention is characterized in one aspect thereof by the provision of a chill cast one-piece frame.

The foregoing and other objects, advantages and characterizing features of my invention will become clearly apparent from the ensuing detailed description of an illustrative embodiment thereof, considered in conjunction with the accompanying drawing showing a collapsible permanent mold of my invention, wherein like reference numerals denote like parts and wherein:

FIG. 1 is a side elevational view of a permanent collapsible mold constructed in accordance with my invention, mounted on a casting platform, the pouring position of the mold being indicated in phantom;

FIG. 2 is a fragmentary perspective view of one mold part, showing the pouring gate and static head reservoir, the gate hold down bar and the superposed retaining structure being omitted for ease of illustration;

FIG. 3 is an elevational view of the inner face of one mold part, showing the outer cavity defining frame, the inner side of the cavity being indicated in phantom, and the gate hold down bar and superposed retaining structure being omitted; and

FIG. 4 is a corresponding view of the other mold part, showing the core-like, inner cavity defining frame, the outer side of the cavity being indicated in phantom and the superposed retaining structure and pouring lip being omitted.

Referring now in detail to the accompanying drawings, there is shown a collapsible permanent mold of my invention comprising a first mold part 1 and a second mold part 2. Mold parts 1 and 2 are adapted to fit together, and between them provide inner and outer frames defining the mold cavity. In the illustrated example, the outer frame portion is carried by mold part 2. The outer frame portion comprises opposite side members 3, a bottom member 4, and a top member 5, which can be of bar stock or any other suitable material. Members 3, 4 and 5 are mounted on mold part 1 by any desired means, such as for example the fastening bolts illustrated. Bottom member 4 extends completely across the bottom of the mold, between side members 3, while top member 5 terminates short of the opposite side members 3, for reasons to become apparent.

It is a particular feature of my invention that the core-like inner frame is progressively collapsible. To this end, it is divided into independently movable sections. In the illustrated embodiment, the inner frame sections comprise integrally connected, right angularly related arms 6 and 7, the sections 6, 7 being four in number to define the four corners of a rectangle. Each frame section 6, 7 is provided with an obliquely inwardly extending corner bracket 8 having an elongated slot 9 therein, the brackets 8 slidably engaging between paired guide members 10 carried by mold part 2. Pins 11, also carried by mold part 2, extend into slots 9 of bracket 8, whereby each frame section 6, 7 is mounted for inward movement, away from the outer frame and the casting position shown in FIG. 4, guided by the parts 8–11.

The inner frame sections 6, 7 are releasably held in casting position, this being accomplished in the illustrated embodiment by wedges 12 having beveled side edges engaging the correspondingly beveled ends of the inner frame sections 6, 7 as shown in FIG. 4. Thus, a wedge 12 engages between each pair of adjacent legs 7, while the remaining two wedges 12 engage between the pairs of adjacent side legs 6. The front end faces 13 of wedges 12 form continuations of the inner faces of section legs 6, 7 when the sections are in casting position, and define therewith the inner wall of the mold cavity 14, the outer wall of which is defined by the outer frame members 3, 4 and 5.

In the illustrated embodiment there is provided a rectangular cavity, the shape of which is apparent from the drawings, for casting a printer's chase.

Each wedge 12, has an open, rectangular frame 15 connected thereto, the frames 15 slidably engaging between and beneath angle guide brackets 16 which guide wedges 12 during advancement and retraction thereof into and out of the casting position shown in FIG. 4. Each wedge 12 is arranged for independent actuation, this being accomplished in the illustrated embodiment by eccentrics 17 rotatable in frames 15 which act as cam followers. Eccentrics 17 are rotated in opposite directions by operating handles 18 extending through mold part 2.

Mold part 1 contains an opening 19 in its top wall, to receive a pouring gate 20 which is removable therefrom. Gate 20 can be dovetailed or otherwise keyed to mold part 1, and opens into a reservoir 22 comprising the space above outer frame member 5 between mold parts 1 and 2, the outer side frame member 3 extending above member 5 to define the ends of reservoir 22. A hold down plate 21 can be bolted or otherwise fastened to the top wall of mold part 1 over gate 20 to hold gate 20 in place.

A pair of sprue passages 23 open from reservoir 22 directly into the side leg portions of cavity 14, being provided by the inward spacing of the ends of top frame member 5 from side frame members 3. Smaller sprue passages 24 are provided through member 5 into the top cross portion of mold cavity 14.

For good casting, I tilt the mold when pouring. This can be conveniently accomplished by mounting the mold on a tiltable platform having a base 25 supported adjacent its four corners by legs 26 and 27. Legs 27 act as a fulcrum, about which the platform can be tilted to a pouring or casting position in which it rests on a normally upwardly and outwardly inclined extension 28. A brace 29 extends between extension 28 and a plate 30 on the back of mold part 2, to support the mold in its pouring position. An actuating lever 31 is pivoted on an upstanding bracket 32, carried by base 25, and is connected to mold part 1 by a link 33 pivoted to a bracket 34 thereon and pivoted to handle 31 between its ends.

In operation, the handles 18 are manipulated to rotate eccentrics 17 in a direction driving wedges 12 and with them the inner frame sections 6, 6 to the casting position shown in FIG. 4. Handle 31 is raised, to slide mold part 1 along platform base 25 into mating engagement with mold part 2. The platform then is tilted to the position shown in phantom in FIG. 1, which is the casting position.

The molten metal is poured through gate 20 into reservoir 22. To retain the metal as it is poured into the gate, a lip 35 is provided on an upstanding wall 36 on top of mold part 2. Wall 36, together with an opposite wall 37 and end walls 38 provide a retaining structure. Walls 38 can be carried by either mold part 1, 2 or associated wall 36, 37 the other of which is slidable between end walls 38.

The molten metal is poured through gate 20 into reservoir 22, flows primarily through sprues 23 down the cavity side legs to the horizontal bottom of the cavity, which thereby fills and cools first. Pouring of the metal

is continued, at a rate compensating for the contraction in volume as the cast material cools. Meanwhile, linear shrinkage due to cooling in the solid state, such as would otherwise cause the bottom of the casting to crack, is instead accommodated by retracting the bottom wedge 12. This releases the two lower sections 6, 7 which collapse, with both arms 6 and 7 moving inwardly. The fit between bracket 8 on the one hand, and pins 11 and brackets 10 on the other, is loose enough to permit a degree of swivelling about the side wedges 12 as a fulcrum. This produces the greatest initial collapsing movement at the ends of arms 7, where cooling first occurs.

The rate of pouring is continued, filling the side legs of the cavity and finally the top of the cavity. As the cast material in the side legs of the cavity solidifies, and is about to shrink in the solid state, which action starts at the lower ends of the side legs and progresses upwardly, the side wedges 12 are retracted, permitting the upper sections 6, 7 to collapse about the top wedge 12 as a fulcrum, and permitting the arms 6 of the lower sections to collapse throughout. Similarly, as the cast material in the top of the cavity solidifies and is about to shrink onto the inner frame, top wedge 12 is retracted, permitting the upper sections to collapse completely.

Thus, the inner frame is progressively collapsed in accordance with the pattern of shrinkage as successive portions of the casting solidify and cool. Shrinkage in the liquid phase is compensated for by the rate of pouring and the filled reservoir 22 creates a static head eliminating depressed areas and porosity in the casting. The relatively small size of sprues 24, as contrasted with sprues 23, ensures filling of the bottom and sides of cavity 14 before the top fills and begins to solidify.

Thus, the progressive collapsing of the inner frame core accommodates shrinkage of the casting as it occurs, which is not instantaneously but takes place over a period of time as the material is being cast and before the mold can be opened.

Tilting of the mold when pouring is important, because it causes the metal to flow along the sides of the mold instead of dropping quite a distance therein. Such flow eliminates occluded air bubbles, and the like which would otherwise occur because of the turbidity resulting from the metal falling straight down.

After opening the mold and removing the casting, the cast frame is machined to the requisite trueness and is thereupon ready for use. Because it is cast, it will not loosen in use, and because it is chill cast in the manner described above it will possess the necessary strength and other properties required in a chase.

Thus, my invention makes possible a one-piece, chill cast printer's chase, hithereto unavailable to the trade.

Accordingly, it is seen that my invention fully accomplishes its intended objects. While I have disclosed and described in detail only one embodiment of my invention, that has been done by way of illustration only. Various modifications and variations will be apparent to those skilled in the art, and are intended to be included within the scope of the appended claims. For example, the collapsible inner frame can comprise a greater or lesser number of sections, the cavity can assume other shapes, and objects other than printer's chases can be cast with the mold and method of my invention.

Having fully disclosed and completely described my invention, together with its mode of operation, what I claim as new is:

1. A collapsible permanent mold comprising mold parts having inner and outer frame portions defining a mold cavity into which material to be cast is poured, said inner frame portion comprising segments mounted for independent movement into and out of predetermined casting position toward and away from said outer frame portion, wedge means engaging said inner frame segments in said casting position, and means for progressively collapsing said inner frame portion relative to said outer frame por-

tion, said collapsing means including means for advancing and retracting said wedge means toward and away from said outer frame portion to selectively hold said segments in casting position and release the same to progressively collapse inwardly from said outer frame portion.

2. A mold according to claim 1, wherein said wedge means includes wedges engaging adjacent ones of said inner frame segments and said advancing and retracting means comprises eccentrics and means for moving the same, together with followers engaging said eccentrics and connected to said wedges for moving the same in response to movement of said eccentrics.

3. A mold according to claim 1, wherein said wedge means includes wedges equal in number to the number of said segments, there being a wedge interposed between each pair of adjacent segments and means for selectively independently advancing and retracting each of said wedges toward and away from said outer frame portion, said wedges when advanced holding said segments in said casting position and when retracted enabling collapsing of said segments.

4. A mold according to claim 3, wherein said inner frame segments are mounted for swivelling movement during collapsing thereof.

5. A mold according to claim 1, said collapsing means being operable exteriorly of the mold parts.

6. A mold according to claim 1, wherein said cavity has generally upright side portions and a normally horizontal cross portion, a pouring gate above said cross portion, said outer frame portion having a section extending along said cross portion, together with first sprue openings through said outer frame section above said cavity side portions and smaller second sprue openings through said outer frame section into said cross portion, the portion of said mold above said outer frame section providing a static head reservoir communicating with said sprue openings and said gate.

7. A mold according to claim 1, wherein said mold further comprises a platform having a base and an extension inclined upwardly and outwardly therefrom, said mold parts being mounted on said base, and means for moving one of said mold parts along said base toward and away from another of said mold parts for closing and opening said mold, said platform being tiltable onto said extension for casting.

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