May 19, 1931. W. B. SCOTT 1,806,000

MOLDING APPARATUS

Filed March 4. 1930 2 Sheets-Sheet 1

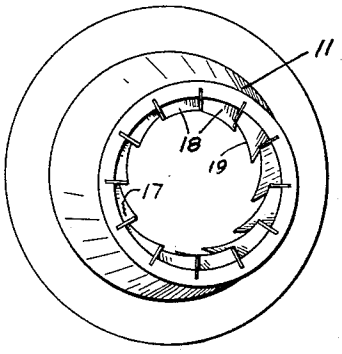


Fig. 1

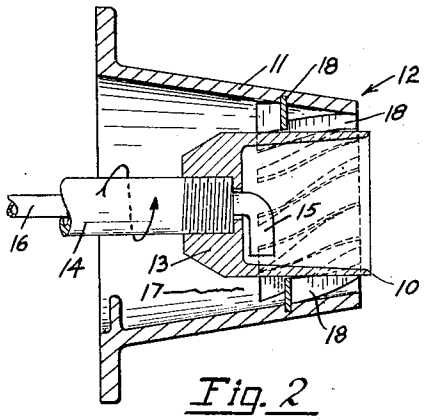


Fig. 2

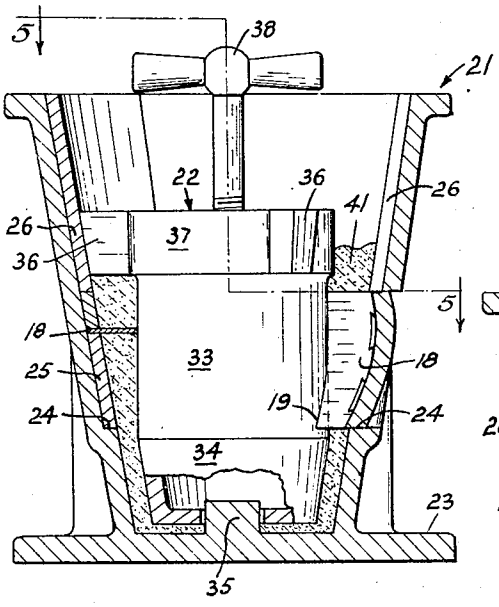


Fig. 3

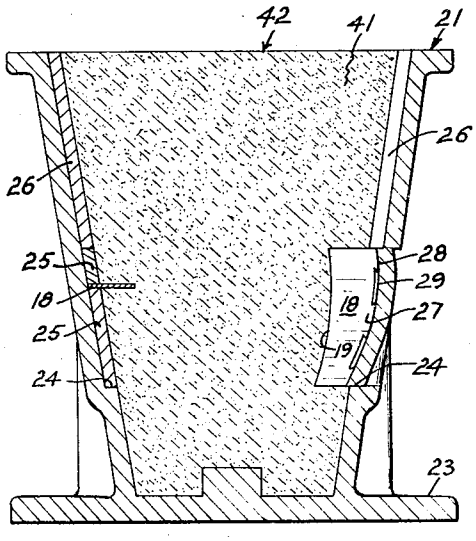


Fig. 4

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MOLDING APPARATUS

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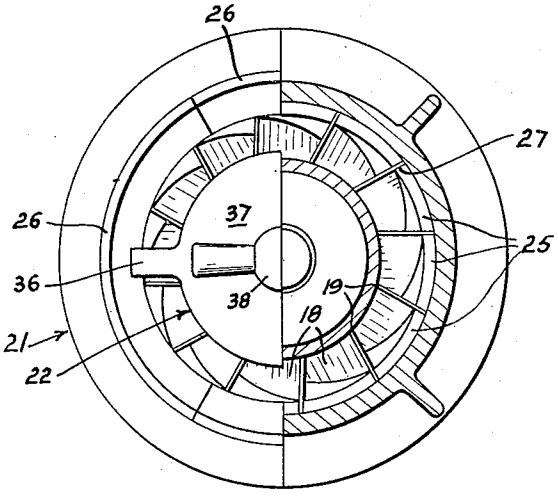


Fig. 5

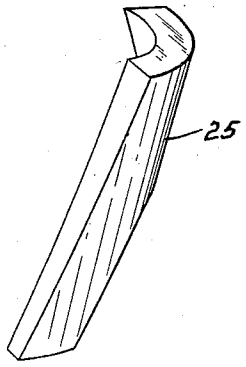


Fig. 6

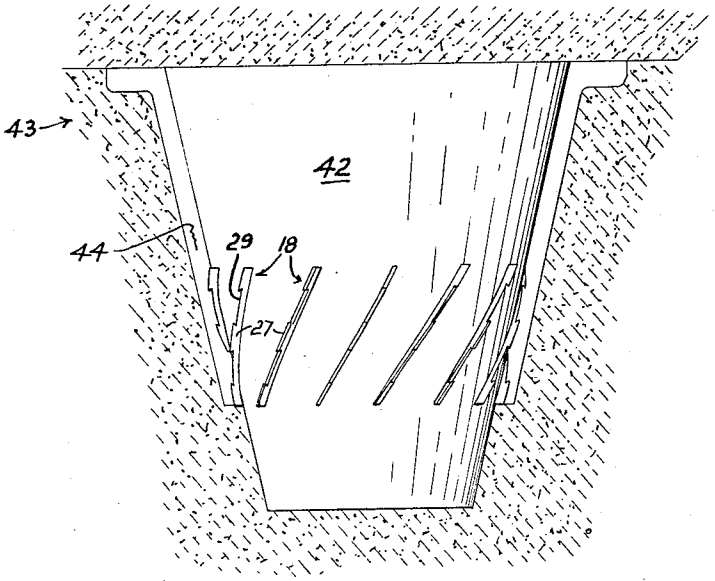


Fig. 8

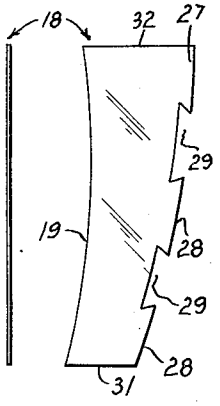


Fig. 7

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Patented May 19, 1931

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UNITED STATES PATENT OFFICE

WILLIAM B. SCOTT, OF OAKLAND, CALIFORNIA, ASSIGNOR TO MARCHANT'S FOUNDRY CO., OF OAKLAND, CALIFORNIA, A CORPORATION OF CALIFORNIA

MOLDING APPARATUS

Application filed March 4, 1930. Serial No. 433,042.

The invention relates to a method and apparatus for fixing a preformed fin or guide vane element or the like in required position in a cast metal article.

An object of the invention is to provide an improved and particularly effective method for fixing a fin or vane in its place in a casting during the casting process.

Another object of the invention is to provide a method and means for producing a core to carry said vane for cast-in engagement in the casting in required relation thereto.

A further object is to provide an improved core box for producing the core used in otherwise carrying out the invention.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth or be apparent in the following description of a preferred form of the invention which is illustrated in the accompanying drawings, in which:—

Figure 1 is an end perspective view of a burner element produced through the use of the present invention.

Figure 2 is an axial section through a burner assembly utilizing the element shown in Figure 1.

Figure 3 is a vertical mid-sectional view of a core box of the apparatus, the various core box parts being disposed in their operative relation to each other and to a plurality of vanes to be incorporated in the final casting, and an outer portion of the core sand around the vanes is shown rammed in place. Part of the section is taken along the surface of one of the vanes.

Figure 4 is a view generally similar to that of Figure 3 except that a vane-centering element of the apparatus is removed and the core box is shown as completely rammed with the sand.

Figure 5 is a plan and partly sectional view at 5—5 in Figure 3 without any sand in the core box.

Figure 6 is a perspective view of a vane spacer element of the core box structure.

Figure 7 discloses face and edge views of a vane for fixing in a casting such as that shown in Figures 1 and 2.

Figure 8 is a sectional view through a mold portion and discloses a core, formed by use of the core box, in its operative position in the mold and exposing portions of the vanes for embedment in a casting to be formed in the mold.

The present invention is particularly applied for the production of a cast outer nozzle member 11 of a burner 12 for the discharge of fuel oil in aerated and atomized form for the combustion thereof, said member and burner being shown in Figures 1 and 2. As disclosed, the burner 12 includes a forwardly opening atomizing cup 13 of cylindrical shape and mounted on a hollow shaft 14 for coaxial rotation within the forward end portion of the nozzle member 11. A relatively fixed drip nozzle 15 at the end of a pipe 16 through the bore of the shaft 14 discharges at the inner end of the cup cavity whereby the discharged fuel oil forms a film within said cup and is finally discharged tangentially at the outer cup edge 10, the cup cavity being more or less tapered whereby it is larger at said edge. As particularly shown, the shaft 14 is coaxial with the nozzle member 11, and said member is provided with a conically tapered bore through and from which air is arranged to be discharged against the atomized liquid as it leaves the cup 13. The outside of said cup and the bore of the member 11 are cooperative to define an annular discharge passage 17 for the air, said passage being of symmetrical section with respect to the nozzle axis whereby the air is distributed uniformly about the cup.

For effecting the best mixing of the discharged streams of air and atomized fuel, it is highly desirable that these streams impinge in mutual opposition, and guide vanes 18 are accordingly provided in the passage 17. Since the rotation of the cup 13 tends to carry the air in the passage 17 with it, the vanes 18 are fixed to the member 11 in unitary and integral association therewith to extend inwardly toward the cup and in such oblique relation to the axis of the assembly that the air emerging from the passage portions be-

tween the vanes 18 is directed obliquely against the flow of the generally flat and radial stream of liquid escaping from the cup 13. It is noted that the omission of the vanes 18 would permit an air discharge in the general direction of the flow of liquid and hence minimize both the mixing impact and the function of the air stream to direct the mixture forwardly of the nozzle as is required in this type of burner. The inner edges 19 of the vanes 18 must closely fit and uniformly clear the outer surface of the cup 13, and must be of a uniform and minimum possible thickness whereby to minimize the obstruction of the passage 17. The vanes 18 are usually of such thinness that they may not be cast as integral parts of the member and must be preferably of a different material; in practice, these vanes are desirably about one sixty-fourth of an inch.

The present type of nozzle is well-known in the oil burning art, and in manufacturing the same it has heretofore been the custom to preform the vanes of thin sheet metal of suitable qualities, such as nichrome steel, cast the outer nozzle member, provide slits in said member extending from the nozzle end, and secure the vanes to the member in its slits as by welding. The latter process is, however, both expensive and inaccurate and requires the truing up of the nozzle at the nichrome vanes, with a result that the nozzle elements have heretofore been unreasonably expensive to produce. In accordance with the present invention, however, a device is provided whereby the vanes are arranged to be incorporated in the outer nozzle member as it is cast and in such relation thereto as requires no finishing of the completed nozzle element at the vanes and assures an absolutely accurate and uniform fixed setting of the vanes.

Referring now to the apparatus disclosed in Figures 3 to 6 inclusive, said apparatus includes a core box 21 in which to form a core for shaping the bore of a member 11, and a centering element 22 for use in a manner to be hereinafter described. The cavity of the core box 21 is generally frusto-conical in shape with the angle of its core that of the bore of the member 11, and so of the core to be formed in the core box for producing the bore in the finished casting. The base 23 of the core box is at the smaller end of its bore, and at and above the point of the core box bore which corresponds to the position of the outer ends of the vanes 18 with respect to the core to be formed, the bore of the core box is expanded outwardly to provide an annular shoulder 24 which in the present instance defines a plane perpendicular to the core box axis. Sets of lining members 25 and 26 are provided for removable and superimposed disposal in the core box and against the wall thereof above said shoulder 24, each set of the said lining members completely encircling the wall and the inner faces of said members defining a continuation of the unexpanded bore portion of the core box whereby the outline for the core is completely and jointly defined by said members and said bore portion.

The vane members 18, it will now be noted, are arranged to be preformed as elements from sheet metal of minimum thickness; as stated, a nichrome steel has been found to be particularly desirable material for the purposes of the nozzle. Since these vanes are arranged to be obliquely related to the axis of the member 11, and their inner edges 19 must lie along or in close proximity to the outer surface of the cup 13, said edges are concavedly curved longitudinally thereof as is particularly brought out in Figures 3, 4 and 7. The marginal portion 27 adjacent the outer vane edge 28 is arranged for embedment in the member 11, and in the present instance in which the outline of said member is frusto-conical, said edge is convexedly curved longitudinally thereof. To insure a fixing of the vane in the casting, the marginal portion 27 is notched or otherwise perforated to provide for its keying in the cast material of the member 11; as shown, dovetail notches 29 are provided along the vane edge 28. The forward and rear edges 31 and 32 of the vanes are straight and substantially parallel to each other.

The lining members 25, are alike and arranged to receive the outer marginal portions 27 of the vanes between them and to position said vanes as required in the finished product. With the vanes positioned as required, the outer vane edges 28 are arranged to engage along the core box wall above the shoulder 24 while the forward vane edges 31 rest against said shoulder. In the present instance the edges 31 are arranged to lie along the face of said shoulder, while the rear vane edges 32 define a plane parallel to that of said shoulder; it is noted however, that the shoulder need not be planar. Preferably, and as shown, the members 25 terminate at the vane edges 32 when the vanes are in place, and the adjacent members 25 of the set thereof are arranged to firmly grip the vanes between them whereby said vanes are arranged to be held fixed in similar set positions and in evenly spaced relation around the core box wall, the members 25 thus functioning as spacer members for the vanes.

Since the vanes 18 are alike, the described mounting thereof in the core box so disposes them that the inner vane edges 19 jointly define a cylindrical space corresponding to and slightly larger than the outline of the cup 13 which is to revolve between them. To insure the definition of the said cylindrical space, the centering element 22 (Figure 3) is provided; as shown, said element has an intermediate cylindrical portion 33 of the same

outline as the cup 13 and of slightly larger diameter for defining the aforesaid space between the edges 19 of the vanes. A lower portion 34 of said element is axially perforated to receive a centering boss 35 extending upwardly from the base 23 of the core box, while arms 36 extend radially from an upper portion 37 of said element for simultaneous engagement with the lining sections 26, it being noted that the lining portions provided by said latter sections are arranged for removal when desired or required and rests upon and above the positioned vanes and the set of vane-positioning sections 25. A handle 38 is provided on the member 22 for placing and removing the same in its operative position.

Having the vanes and core box elements disposed as described and as particularly shown in Figure 3, core sand 41, preferably containing a bonding material, is tamped into place between the element 22 and the core box bore and about the exposed portions of the vanes 18. When said sand has been firmed into place, the element 22 is removed and the space previously occupied thereby is filled and packed with more of the sand 41 to produce a core 42 as shown in Figures 4 and 8. The core 42 is, as usual, baked before it is used for molding; for baking the core 42, the core box and core therein may be placed in an oven (not shown) for the purpose whereby to prevent any drying distortion of the core.

When the core 42 is baked or otherwise set, the core box may be inverted for the removal of the same from the core in a usual manner. When the core box is removed from the core, the core lining section 25 and 26 remain in position about the core. The lining sections 25 may now be removed from between the vane marginal portions 27 and the removal of the lining sections 26 is the last step in preparing the core for use, it being noted that the core 42 carries the vanes 18 with only their marginal portions 27 projecting. The core 42 may now be invested in a sand mold 43, as is indicated in Figure 8, whereby to define in part a matrix 44 for filling with molten metal to provide the member 11; said molten metal flowing to and about the vane margins 27 to fix the vanes 18 in proper relation in the cast product. In this manner, successive members 11 are arranged to be produced with a minimum of labor and a particularly high degree of uniformity as to the essential relations of the parts thereof. It is noted that variation in the obliquity and shapes of the vanes may be readily afforded by providing substitute sets of the removable lining members 25 and 26 for the core box.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the construction and method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative, and that such changes may be made, when desired, as fall within the scope of the appended claim.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States, the following:

In molding apparatus for forming a tubular cast member having preformed vanes embedded therein to extend radially within the bore thereof, a core box, lining members in said core box cooperative to engage portions of said vanes to fixedly dispose the said vanes to extend into the core space of said box in circumferentially spaced alignment, a centering element adapted to be inserted into the core box and engageable with the vanes to maintain them in radial alignment, said centering element being tapered at its lower end and substantially cylindrical at the portion engageable with the vanes.

In testimony whereof, I affix my signature.

WILLIAM B. SCOTT.