

Jan. 25, 1966

M. SCHAIBLE ETAL
MODULAR PATTERN EQUIPMENT

3,230,590

Filed Dec. 18, 1963

2 Sheets-Sheet 1

Fig. 1

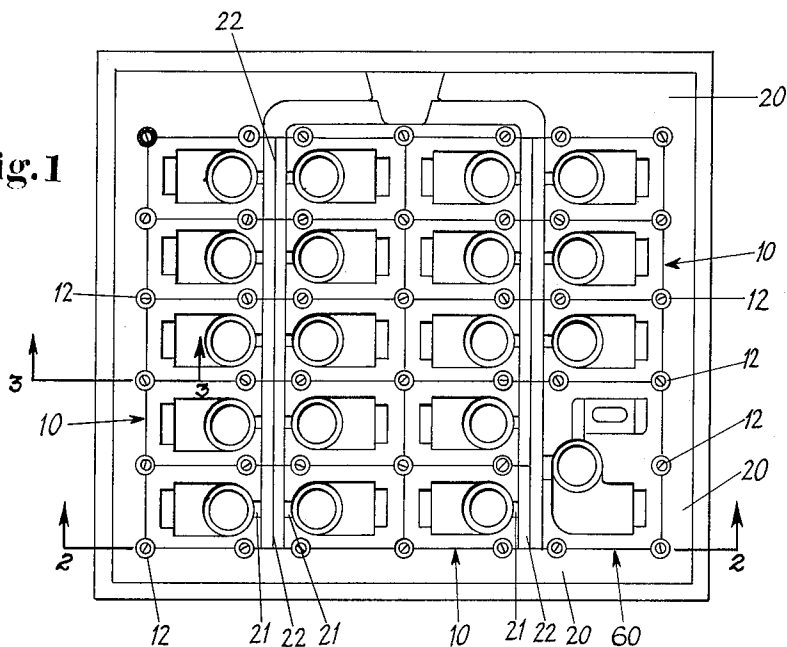


Fig. 2

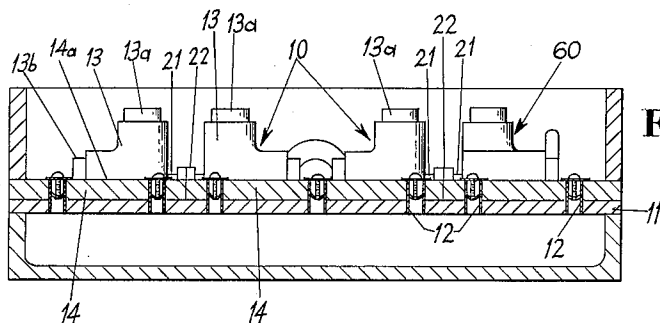


Fig. 4

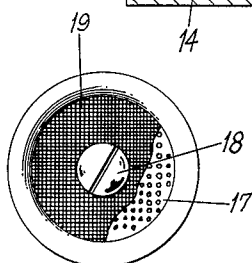


Fig. 5

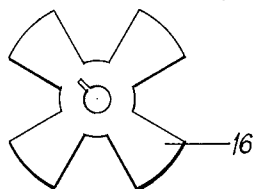
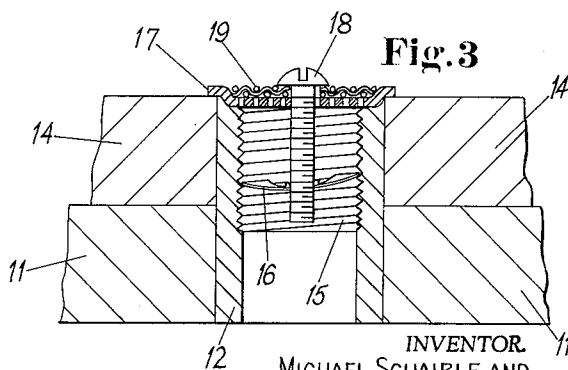


Fig. 3



INVENTOR.
MICHAEL SCHAIBLE AND
WAINWRIGHT TUTTLE,

BY

Yungblut, Melville, Phares & Foster
ATTORNEYS.

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2 Sheets-Sheet 2

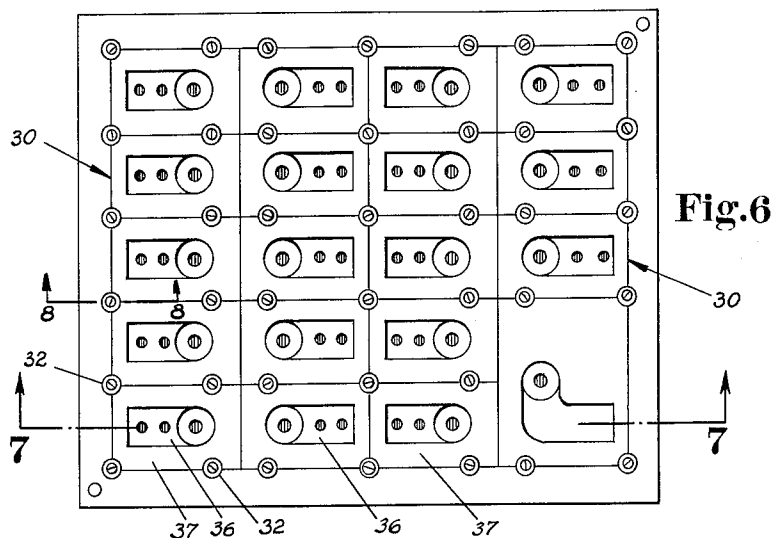


Fig. 6

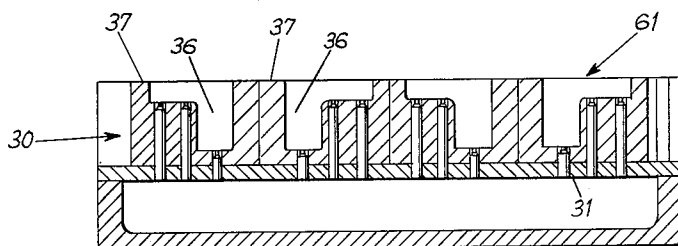


Fig. 7

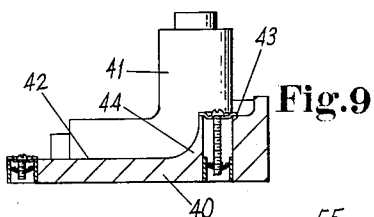


Fig. 9

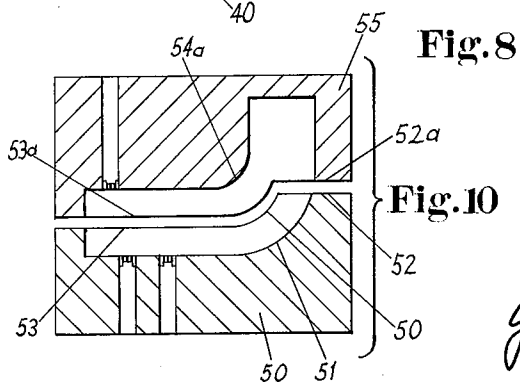
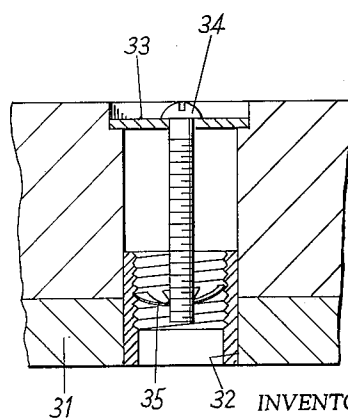


Fig. 8

Fig. 10



INVENTOR.
MICHAEL SCHAIBLE AND
WAINWRIGHT TUTTLE,
BY
Young Blum, McMillan, Hassen & Foster
ATTORNEYS.

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3,230,590

MODULAR PATTERN EQUIPMENT

Michael Schaible, Indianapolis, Ind., and Wainwright Tuttle, Cincinnati, Ohio, assignors, by mesne assignments, to Altamil Corporation, Indianapolis, Ind., a corporation of Delaware

Filed Dec. 18, 1963, Ser. No. 331,577

7 Claims. (Cl. 22-157)

This invention relates to patterns and coreboxes for foundry use in preparing molds for casting metal products, and more particularly to a modular system of mounting the pattern and corebox elements.

Sand casting is one of the oldest metal shaping processes, going back thousands of years. However, because of the inaccuracy of the working patterns, alignment errors between mating mold halves, corebox top and bottom elements, or between mold and corebox elements, and the variations in shrinkage in cooling metal, sand cast products are highly inaccurate and non-uniform, as compared with metal components formed by any other process.

Many efforts have been made to improve the accuracy of castings, but all such efforts have been of somewhat limited application, and increased the cost of the castings. These efforts include shell mold casting, permanent mold casting, die casting, investment casting, plaster mold casting, ceramic mold casting, and others, all of which have relatively limited application because of higher costs or special requirements for metal handled or shapes that can be made.

Inasmuch as sand casting's competitive survival has been due in large measure to its lower cost, it will be obvious that an invention which made possible improved accuracy in sand casting, without limiting the application of the sand casting process, or increasing its cost, would be a major advance in the art. The instant application is concerned with a modular pattern system employing individual pattern and corebox elements designed to permit accurate alignment of cope and drag pattern elements, and corebox top and bottom elements, and accurate alignment of corebox and mold pattern elements for mechanical gang core setting.

It is therefore a general object of this invention to provide a modular pattern construction which will increase the accuracy of sand cast products, without a corresponding increase in cost.

With conventional pattern and corebox equipment, the casting of small quantities of a given product is rather costly, because they must either be run in a small machine or costly large pattern equipment must be made for a larger machine. It is therefore a further object of our machine to provide modular pattern equipment which makes it possible to run a mix of products, and to change the mix conveniently and rapidly. This makes it possible to run low volume items at a cost which closely approaches the cost of high volume items, simply by putting one or a few pattern elements for the low volume item temporarily on the pattern plate with a large number of elements for a high volume product. The required mix will of course change with demand, but the modular pattern equipment can be changed accordingly, so that the overall cost is relatively low.

Still another object of the invention is to provide a superior mounting means for the various pattern and corebox elements, this mounting means providing adequate vents for mold blowing and the automatic handling of molds as taught in copending applications, now U.S. Letters Patent No. 3,181,213, dated May 4, 1965, Method for the Use of Dynamic Vacuum in Foundry Operations, and U.S. Letters Patent No. 3,181,207, dated May 4, 1965, Automatic Mold Preparing Apparatus.

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Still a further object of this invention is the provision of a mounting means which permits fastenings and vent parts subject to wear to be quickly and inexpensively replaced.

It is, of course, still another object to provide pattern equipment which permits individual modules which have become damaged or worn to be replaced easily and quickly.

The various features of this invention believed to be novel have been broadly set forth in the claims appended to this application. It is believed that a complete understanding of this invention, however, will be facilitated by the following description of an exemplary embodiment in some detail. Reference will be made to the accompanying drawings in which:

FIG. 1 is a top plan view of a modular drag mold pattern according to this invention.

FIG. 2 is a cross sectional view along the line 2-2 of FIG. 1.

FIG. 3 is a cross sectional view along the line 3-3 of FIG. 1 on a greatly enlarged scale.

FIG. 4 is a top plan view of one of the vents of FIG. 1 on a greatly enlarged scale.

FIG. 5 is a top plan view of one of the elements of FIG. 3.

FIG. 6 is a top plan view of a corebox top according to this invention.

FIG. 7 is a cross sectional view along the line 7-7 of FIGURE 6.

FIG. 8 is a cross sectional view along the line 8-8 of FIGURE 6 on a greatly enlarged scale.

FIG. 9 is a side elevational view showing a drag pattern element for a different product.

FIG. 10 is a side elevational view of corebox top and bottom pattern elements designed to mate with the drag pattern element of FIG. 9.

In a conventional foundry, the mold making and core making phases of a foundry operation are generally carried out entirely separately and independently. While it is of course possible to use the modular pattern and corebox equipment of this invention in such a manner, this invention has particular utility in conjunction with an automatic foundry operation such as taught in copending application Serial No. 179,960 Automatic Mold Preparing Apparatus. An automatic operation such as described therein requires that the elements in the mold halves be accurately aligned with respect to each other, that the individual elements in the corebox halves be accurately aligned with respect to each other, and that the corebox elements be accurately aligned with respect to the pattern elements, to facilitate mechanical gang core setting. Hence, it is to be understood, that while mold forming pattern elements and corebox elements differ in various respects, the term "pattern elements" will be used generically to describe them both.

Broadly considered, this invention includes a mounting plate to which are secured a plurality of modular pattern elements. Alignment with the individual pattern elements is maintained by accurately positioned locating sleeves, these sleeves also serving as vents for mold shooting and hardening and assist in mold extraction as taught in applicants' copending application Serial No. 263,156 entitled Method for the Use of Dynamic Vacuum in Foundry Operations. Further, in the preferred embodiment of this invention, these locating sleeves also receive the hold-down means which secure the individual pattern elements to the mounting plate.

It also should be pointed out at this time that the mounting plate does not at any time contact the mold forming material. That is, this plate serves only as a mounting plate, the parting surface around the individual

patterns being formed integrally with the pattern shape itself.

Referring to FIGS. 1 to 3, a mold pattern for a plurality of cast brass sweat fittings (for use with copper tubing) in the form of T's will now be described. A plurality of modular pattern elements indicated generally at 10 are secured to a mounting plate 11.

Accurate positioning of the pattern elements with respect to the plate is maintained by the locating sleeves 12 which are secured to and extend upwardly from the mounting plate 11. In the preferred form of the invention, four identical mounting plates (one for the drag mold pattern, one for the cope mold pattern, one for the corebox top and one for the corebox bottom) are all jig bored at once, and the locating sleeves 12 are suitably secured in the resulting holes. By jig boring the holes in all four mounting plates at once, accurate alignment between the corresponding cope and drag cavities, between the corebox top and corebox bottom cavities, and between the cores projecting from the core cavities and the mold cavities is insured, so that a fully automatic mold preparing operation may be carried out.

While adjacent pattern elements 10 appear in FIG. 1 to actually contact each other, a clearance on the order of .007 inch is preferably provided. This insures that the individual elements are positioned by the locating sleeves 12 and not by contact with adjacent elements, thereby preventing an accumulation of error. Similarly a filler strip 20 will be provided around the edges of the mounting plate 11; this filler strip serves merely to provide a wider mold edge to contain the molten metal which is to be poured into the mold, and in no way serves to locate the pattern elements.

The locating sleeves 12 also serve as vents during the mold shooting and hardening operation, and provide a passage through which air under pressure may be introduced to the interface between the mold and pattern to assist in mold extraction, as taught in the copending application referred to above.

Each of the pattern elements indicated generally at 10 includes a pattern shape 13, and a base 14, the top surface of which forms the parting surface surrounding the shape between the mold or corebox parts respectively. As seen in FIG. 2, the pattern portion 13 is configured to form the outside surface of a solder T fitting. It will be noted that the straight run or cross-piece of the T is oriented generally perpendicular to the parting surface 14a; this manner of orientation has been explained in greater detail in applicants' copending application Serial No. 331,558 entitled Vertical Parting. It will also be noted that the pattern shape 13 includes the coreprint portions 13a and 13b. A core formed in the corebox pattern elements described hereinafter will be set in these coreprints to form a hollow casting.

It will also be seen in the preferred embodiment shown in FIGS. 1 and 2 that the gates 21 and runners 22 are integrally formed with the pattern shape 13. This feature of course greatly enhances the modular characteristic of the pattern equipment of this invention.

As shown in FIG. 3, the locating sleeves 12 may also be utilized in securing the pattern elements 10 to the base 11. That is, at least a portion of the inner surface of the sleeve 12 is provided with the serrations 15. These serrations serve as gripping points for the Tinnermann-type nut 16, shown in detail in FIG. 5. At the top of each sleeve 12 is a perforate, flanged hold-down washer 17. The flanges of the washer 17 extend over the edge of the base 14 of at least two adjacent pattern elements 10, and when held down by the bolt 18, serve to hold the pattern elements to the plate 11. It will be understood, of course, that there is not a great deal of force tending to lift the pattern elements 10 from the mounting plate 11, and hence numerous other hold-down means are

possible. For example, it may in some cases be desirable to secure the pattern elements 10 to the plate by means of magnets which are cast in the bottom of each pattern element.

In the embodiment shown, the washer 17 is provided with relatively large openings. To prevent clogging of the system by the sand or other molding material, the washer 17 will preferably be covered by the very fine mesh vent screen 19. By way of example, a 150 mesh screen has proven entirely satisfactory.

FIGS. 6, 7 and 8 correspond respectively to FIGS. 1, 2 and 3 and show a modular corebox bottom. In this case a plurality of individual pattern elements 30 are secured to the mounting plate in any suitable manner. Once again, accurate alignment of the elements 30 is achieved by virtue of the locating sleeves 32.

As seen in FIG. 8, the locating sleeves 32 are identical to the locating sleeves 12 of the mold pattern shown in FIG. 3. Inasmuch as the locating sleeves 32 are not located in a position where they may suitably serve as vents, the upper end of the sleeve 32 may be closed with the hold-down washer 33, secured by the long bolt 34 to the spring Tinnermann nut 35. It will be noted that the washer 33 is recessed sufficiently so that the head of the bolt 34 does not extend above the top surface of the corebox elements 30.

As will be appreciated by the skilled worker in the art, the mold pattern elements and the corebox pattern elements are essentially opposite in form. That is, the mold pattern elements may be considered as a base or parting surface surrounding a male pattern shape, while the corebox pattern elements are simply cavities or female pattern shapes surrounded by the area 37 which forms the parting surface. In any event, it will be seen by comparing FIGS. 1 and 6 that mold pattern elements 10 and corebox elements 30 have the same surface area, and by comparing FIGS. 2 and 7, that these elements respectively have corresponding parting surfaces.

Referring now to FIGS. 9 and 10, pattern elements for both the drag mold and corebox for forming a 90° elbow have been illustrated. Once again, it will be seen that each pattern element includes a base portion 40 and a pattern shape 41. It will be noted that the upper surface of the base portion 40, which as before, forms the parting surface surrounding the pattern shape between the mold halves, includes the parallel planar portions 42 and 43, joined by the curved surface 44. This particular parting surface is necessary to prevent an undercut cavity when using the teachings of applicants' copending application noted above. Similarly, the corebox bottom includes a cavity 51, and a parting surface including the parallel planar portions 52 and 53, joined by the curved portion 54. The corebox top 55 includes the mating parting surfaces 52a, 53a and 54a.

It will be understood that many elements such as the 90° elbow illustrated in FIGS. 8 and 9 will require a split parting line as described above. Inasmuch as the individual pattern elements described throughout this application include both a pattern shape and a base which forms the parting surface of the mold, it is believed obvious that it is not possible to interchange pattern elements having a planar parting surface with those requiring a split parting surface, at least with respect to a single runner in the mold.

Numerous modifications within the scope and spirit of this invention will readily occur to the skilled worker in the art. For example, as shown in FIGS. 1, 2, 6 and 7, an individual pattern element can be designed which is exactly twice the surface area of the individual element. See for example the element 60 in FIGS. 1 and 2 and the corresponding core element 61 in FIGS. 6 and 7. Accordingly, no limitation on this invention is intended, except insofar as set forth in the following claims.

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What is claimed as new and what is desired to be secured by Letters Patent is:

1. A modular pattern comprising:
 - (a) a mounting plate;
 - (b) a plurality of pattern elements, said pattern elements each having a plurality of locating indentations;
 - (c) a plurality of locating means permanently secured to said plate, said locating means being located intermediate adjacent pattern elements and arranged to mate with said locating indentations; and
 - (d) means securing said elements to said plate.
2. The pattern claimed in claim 1 wherein each of said pattern elements includes a pattern shape and means forming a parting surface of a mold surrounding said pattern shape.
3. The pattern claimed in claim 2 wherein said means securing said elements to said plate comprises a hold-down washer associated with each said locating means.
4. The pattern claimed in claim 1 wherein said locating means comprises a hollow sleeve secured to said plate and extending upwardly therefrom, and bolt receiving means secured inside said sleeve.
5. A modular pattern comprising:
 - (a) a mounting plate;
 - (b) a plurality of locating means secured to said plate,

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- said locating means including vent passage means extending therethrough;
- (c) a plurality of pattern elements, each of said elements having at least two locating means receiving notches arranged to mate with said locating means; and
 - (d) means for securing said pattern elements to said plate.
6. The pattern claimed in claim 5 wherein each of said pattern elements includes a pattern shape and means for forming a parting surface of a mold surrounding said pattern shape.
7. The pattern claimed in claim 5 wherein said means for securing said elements to said plate comprise a hold-down washer, said washer being secured to one of said locating means.

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MARCUS U. LYONS, *Primary Examiner*.