

- [54] APPARATUS FOR PREVENTING
DISPLACEMENT OF MOLDS
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193/35 C
- [51] Int. Cl. B22d 33/00
- [58] Field of Search 164/137, 322, 323, 341,
164/364; 193/35 C, 35 R

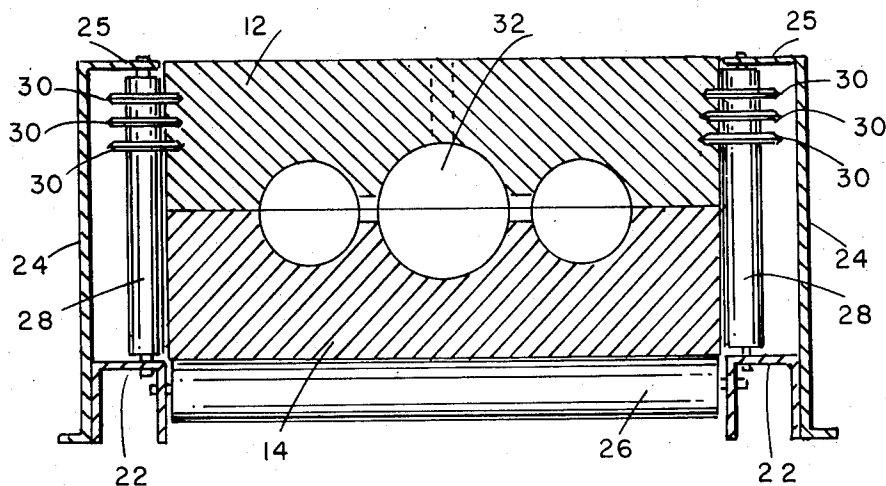
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[57] ABSTRACT

A method and apparatus for preventing displacement of molds during casting is described. The mold securing device has a plurality of spaced horizontally disposed rollers which define a horizontal path along which a mold may progress during the casting process. Spaced vertically disposed rollers are provided on each side of at least a portion of the path, the vertical and horizontal rollers together defining a space through which the mold passes as it moves along the path. A plurality of vertically spaced horizontally disposed cutting discs are mounted on the vertical rollers on at least the upper portions of the latter and have peripheral portions which project into this space into the path of movement of the cope halves of the molds. When the molds move along the path, the peripheral portions penetrate the cope halves and form grooves in the latter — the penetration of the discs into the cope halves preventing vertical displacement of the latter during the casting process.

9 Claims, 5 Drawing Figures



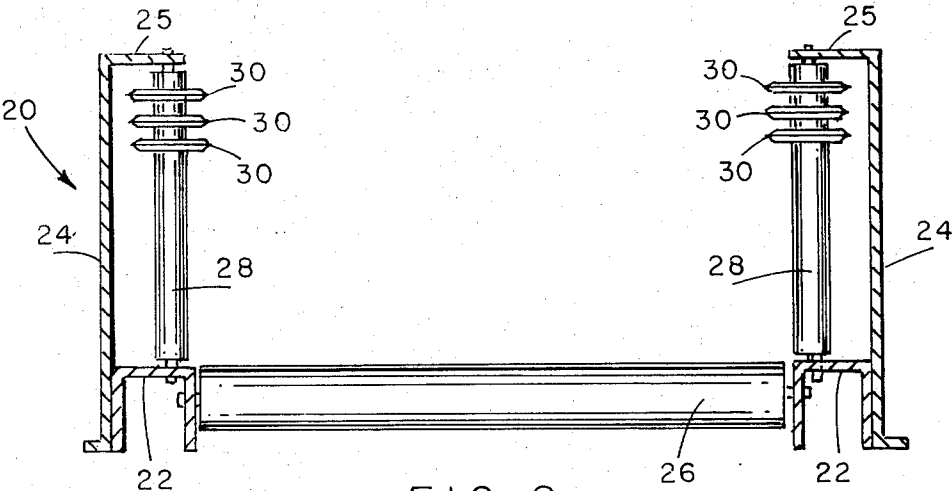
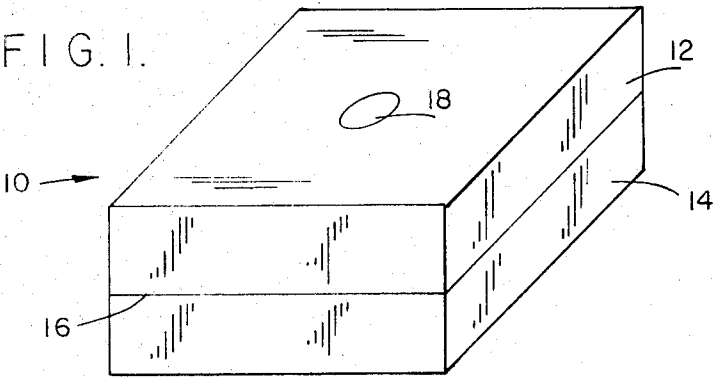


FIG. 2.

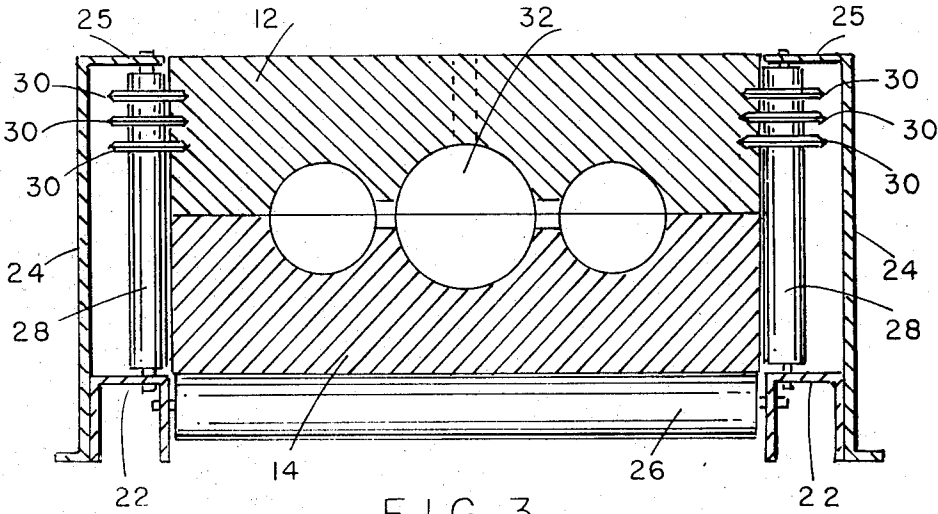


FIG. 3.

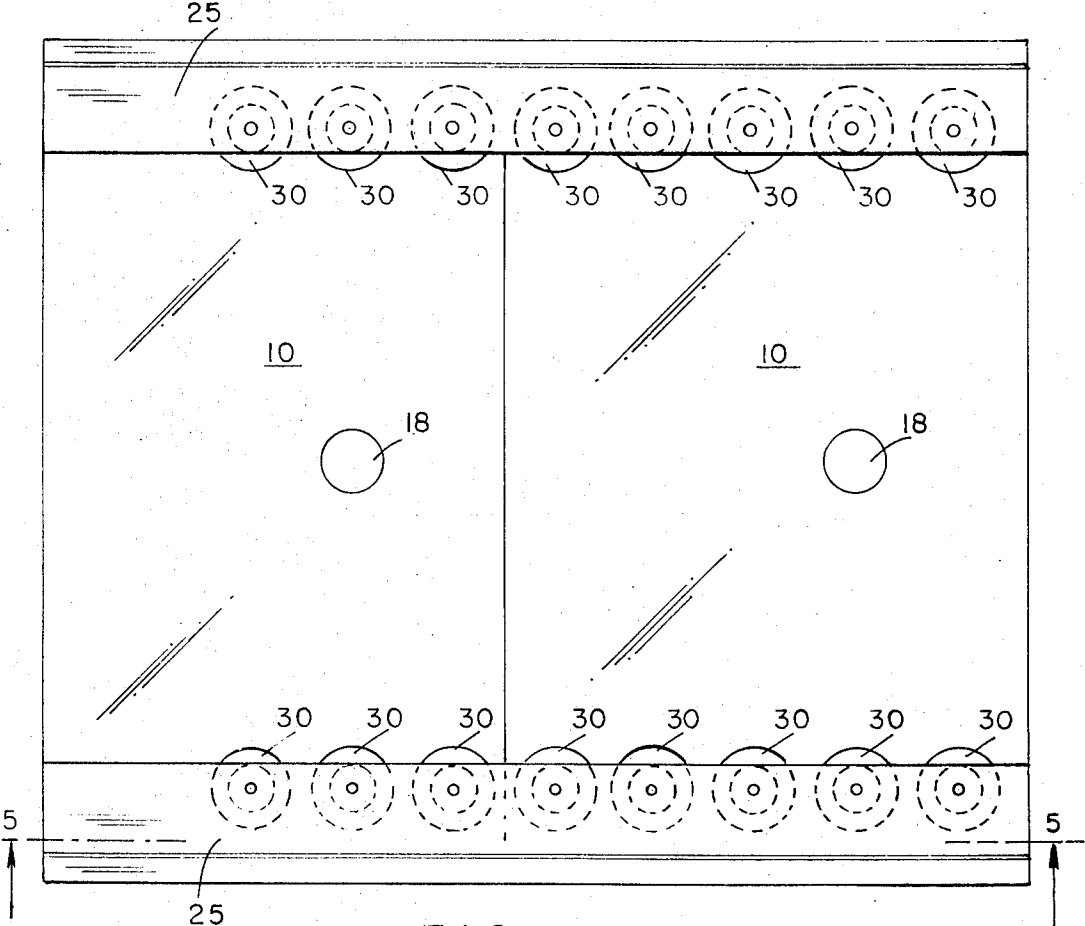


FIG. 4.

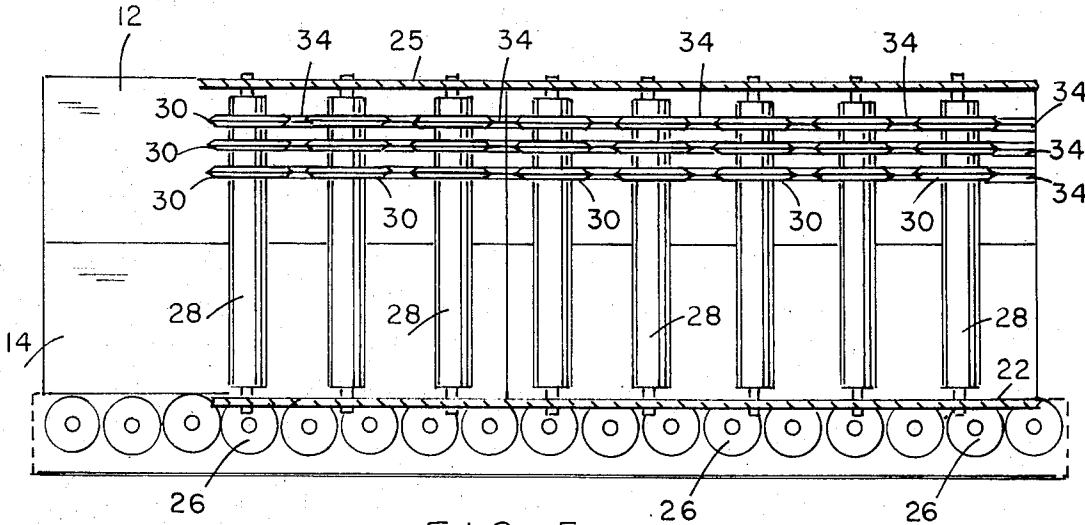


FIG. 5.

APPARATUS FOR PREVENTING DISPLACEMENT OF MOLDS

BACKGROUND OF THE INVENTION

The present invention generally relates to sand molds and apparatus utilized therewith for purposes of casting, and more particularly to a method and apparatus for preventing displacement of molds during casting.

Sand molds, frequently used for purpose of casting intricately shaped metal components, are often made in two halves — a cope or upper mold half and a drag or lower mold half. During the casting process, the cope and drag halves of the mold are aligned with each other and joined about their peripheral portions along a parting line to thereby form a mold having an internal mold cavity configured to the desired component shape. The mold cavity communicates with the exterior of the mold by means of runners or elongated channels which lead from the cavity to a sprue hole typically formed in the cope half of the mold through which the molten metal is poured.

A problem encountered in casting metal parts by the use of molds having cope and drag halves is the undesired separation of the two halves when the metal is poured into the cavity. This problem arises due to the gas bubbles which are formed in the molten liquid and which expand in the mold cavity. The pressure built up in the cavity tends to separate the cope and drag halves. In addition to the danger of molten liquid flowing from the mold cavity to the outside of the mold through the peripheral juncture portions along the parting line, the more frequent experience is the partial escape of the molten fluid into the space formed by the separated mold halves. When the metal in the space hardens, the cast part includes a rough peripheral ridge which extends about the part. The ridge is difficult to remove and sometimes limits the usefulness of the cast part.

In addition to the formation of the ridge as above described, the separation of the mold halves further represents a distortion in the caste components since the separation of the mold halves creates an enlargement of some of the dimensions of the internal cavity. Such distortion may, in certain instances, render the cast part useless.

In order to prevent mold separation as above described, it has been known heretofore to separately clamp the cope and drag halves to each other prior to the casting process. Such a procedure was generally inconvenient and required additional steps which were both time consuming and costly when large quantities of castings were formed.

Another prior art approach has been the placing of weights on the top or cope halves of the molds. In this manner, the weights offered increased resistance against the relative displacement of the cope relative to the drag half. The last described approach, however, possessed the disadvantage that the apparatus for placing the weights on the molds during casting was generally intricate or complex and costly to manufacture.

None of the prior art devices or methods for securing molds against relative displacement during casting are simple in construction and convenient to use. Further, some of the prior art devices are not suitable for successfully processing numerous molds.

SUMMARY OF THE INVENTION

Accordingly, it an object of the present invention to provide a mold securing device which is not possessed of the disadvantages associated with such prior art devices.

It is another object of the present invention to provide a mold securing device of the type under discussion which is simple in construction and economical to manufacture.

It is still another object of the present invention to provide a mold securing device as above described which prevents relative displacement of the cope and drag halves of a sand mold in a convenient and economical manner.

It is yet another object of the present invention to provide a mold securing device which is simple in construction and which is particularly suitable for processing a large number of successively formed molds.

It is a further object of the present invention to provide a method of preventing relative displacement of the cope and drag halves of a sand mold during casting the steps of which are easy and inexpensive to carry out.

In order to achieve the above objects, as well as other which will become apparent hereafter, a mold securing device for preventing relative displacement of the cope and drag halves of a sand mold during casting in accordance with the present invention comprises transport means defining a horizontal path along which a mold may progress during a casting process. Guide means are provided at least along a portion of said path, said transport and guide means together defining a space through which the mold passes as it moves along said path. Penetrating means are provided and disposed to each side of said path. Said penetrating means has portions which project into said space into the path of movement of the cope halves of the molds to thereby penetrate said cope halves and form elongated grooves in the latter as the mold moves along said path. The penetration of said discs into said cope halves thereby prevent vertical displacement of the latter during the casting process.

In accordance with the presently preferred embodiment, said transport and guide means respectively comprise spaced horizontally and vertically disposed rollers. Said vertically disposed rollers are positioned on each side of said horizontally disposed rollers and are generally spaced from each other distances greater than the spacing between the horizontally disposed rollers.

In accordance with an important feature of the present invention, said penetrating means comprises a plurality of vertically spaced horizontally disposed discs mounted on said vertically disposed rollers at least on the upper portions of the latter positioned adjacent the cope halves of the molds when the latter moves along said path. Advantageously, said discs are configured in the form of circular cutting blades.

The method of preventing relative displacement of the cope and drag halves of sand mold during casting in accordance with the present invention includes the step of transporting the mold along a substantially horizontal path and through a space disposed above said path. The method also involves projecting penetrating means into the space and into the path of movement of the molds. The cope halves of the molds are then pene-

trated with the projecting means to thereby form elongated grooves in the cope halves of the molds as the latter move along said path. Such penetration into the cope halves prevent vertical displacement of the cope halves during the casting process.

BRIEF DESCRIPTION OF THE DRAWINGS

With the above and additional objects and advantages in view, as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. 1 is a schematic representation, in perspective, of a sand mold of the type having a top or cope half and a lower or drag half whose relative displacement during casting is to be prevented;

FIG. 2 is a front elevational view, in cross-section, of the securing device in accordance with the present invention, showing the vertically and horizontally disposed rollers and the projecting discs which project into the space formed thereby;

FIG. 3 is similar to FIG. 2, but showing the cross section of a mold of FIG. 1 positioned in the mold securing device, as during casting;

FIG. 4 is a top plan view of the device of FIG. 2, showing sand molds passing through and being secured to prevent relative displacement of the sand mold; and

FIG. 5 is a cross-section of the device as shown in FIG. 4, taken along line 5-5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures, in which similar or identical parts have been designated by the same reference numerals, and first referring to FIG. 1, a sand mold 10 is shown to comprise a top or cope half 12 and a bottom or drag half 14. The cope and drag halves are joined to each other in abutting relationship about their peripheries generally designated by the parting line 16. A sprue hole 18 is provided in the cope half 12 which communicates with a mold cavity 32 (FIG. 3) interiorly of the sand mold 10. The cavity 32 is defined by the internal configurations of both the cope and drag halves, as well known to those skilled in the art.

As mentioned in the Background of the Invention, one of the objects in casting with sand molds is the prevention of relative displacement between the cope and drag halves. Stated differently, it is desired during such molding to maintain a good seal about the parting line 16 and prevent molten metal from flowing there-through.

A mold securing device in accordance with the present invention is shown in FIG. 2 and generally designated by the reference numeral 20. The mold securing device 20 comprises two spaced frame members 22 which are U-shaped in cross-section. Connected to the U-shape frame members 22 are protective covers 24 which extend upwardly from the frame members and include substantially horizontal overhanging portions 25 which are disposed above and generally extend along the length of the frame members 22.

Extending between the frame members 22 are a plurality of horizontally disposed rollers 26 which are rotatably mounted in the frame members 22 at opposite ends. As can best be seen in FIG. 5, the horizontal rollers 26 are spaced from each other in a substantially horizontal plane and together define a horizontal path suitable for transporting the sand molds, as to become apparent hereafter. The horizontal rollers 26 are advantageously spaced very closely to each other as shown in FIG. 5 but the spacing may be somewhat increased — the spacing between the adjacent rollers 26 being selected on the basis of the size of the molds which are to be transported thereon.

Disposed on each side of the path defined by the horizontal rollers 26, are a plurality of vertically disposed rollers 28 each of which extends between a U-shaped frame member 22 and an overhanging portion 25. The vertical rollers 28 are also rotatably mounted at opposite ends. As can best be seen in FIGS. 4 and 5, the vertically disposed rollers 28 are spaced from each other along the path defined by the horizontal rollers 26. The vertical rollers 28 serve as guide members which prevent the sand molds 10 from departing from the path above described. However, since the vertical rollers 28 do not directly support the sand molds 10, the spacing of the vertical rollers 28 may be greater than the spacing of the horizontal rollers 26. However, for reasons which will become apparent hereafter, it is presently preferred that the spacing between adjacent vertical rollers 28 be selected to provide the greatest number of rollers over the casting distance.

The apparatus thus far described, including the horizontal and vertical rollers 26, 28 respectively, defines transport means and guide means for the sand molds. As can best be seen in FIG. 2, the horizontal rollers 26 and the vertical rollers 28 together define a space above the horizontal path formed by the horizontal rollers. The spacing between the vertical rollers 28 is so selected so that it closely approximates the width of the sand molds 10 so that the sides of the sand molds are in close proximity to the vertical rollers 28 on each side of the mold securing device 20. This is shown in FIG. 3. Also, the length of the vertical rollers 28 are selected to substantially equal to the height of the sand molds 10. This is also shown in FIG. 3.

An important feature of the present invention is the provision of a plurality of discs 30, shown in FIGS. 2-5, which may be integral with the vertical rollers 28 or mounted on the latter. The discs 30 are mounted coaxially with the vertical rollers 28 and are advantageously selected to be configured in the form of circular cutting blades. The diameters of the discs 30 are so selected so that peripheral portions of the discs project into the space disposed above the horizontal path. By projecting into the space as just described, the peripheral projecting portions project into the path of movement of the cope halves of the molds to thereby penetrate said cope halves and form elongated grooves 34 in the latter as the molds move along the path. This is best shown in FIG. 5. The penetration of the discs 30 into the cope halves 12 prevent vertical displacement of the latter during the casting process. Three discs 30 are shown in the presently preferred embodiment. However, it should be clear that the specific number of discs which are provided is not critical for purposes of the present invention. Essentially, it is merely necessary that the one disc or the plurality of discs penetrate the sand mold sufficiently so as to fix the penetrated portion of the mold against movement. Since the vertical rollers 18 are prevented from moving in vertical direc-

tions, the discs 30 are likewise fixed against movement in the vertical direction. Consequently, the discs 30 grip the cope halves and prevent their upward movement.

Several observations should be made at the present time. Firstly, although three discs 30 have been shown and described, it should be clear that any number of such discs may be utilized if suitable in a particular application. Secondly, although circular discs have been shown and described, any other peripheral configurations may be provided. For example, the discs 30 may be notched or may be in the form of a sprocket wheel. Blades may also be used instead of discs—all these variants having different degrees of advantage.

The diameters of the discs 30 have been exaggerated relative to the other dimensions of the mold securing device 20 for the sake of clarity. Typically, the vertical rollers 28 are spaced approximately 24 inches from each other and their diameters are approximately 1½ inches. The diameters of the discs 30 are typically 1¾ inches so that the peripheral portions which are available for projection into the space formed by the rollers is approximately one-eighth of an inch. These dimensions are given for illustrative purposes only and it should be clear that any other suitable dimensions may be utilized. The peripheral portions should project into the space above the path a distance sufficient to grip or securely engage the cope halves at the anticipated pressures inside the mold.

The rollers are mounted for free rotation and are not motivated by any mechanical means. Instead, the molds 10 progress along the path on the horizontal rollers 26 as a result of the forces exerted thereon by subsequently formed molds urged onto the conveyor of the horizontal rollers 26.

The vertical rollers 28 have been described above as being freely rotatable. The discs 30 may be integral with the vertical rollers 28 or may be mounted thereon in any conventional manner. Thus, the discs 30 similarly rotate about their axis as the molds progress along the path. This minimizes the friction which the discs encounter while positioned in the grooves 34.

Although only three vertical rollers 28 are illustrated in FIGS. 4 and 5, any number of such rollers may be disposed along the path. It is only necessary, however, to provide the discs 30 on those vertical rollers in the region defining the casting station, i.e., the region where molten metal is poured through the sprue hole 18 into the mold cavity 32. More particularly, the discs are advantageously provided on the vertical rollers extending along the horizontal path where expanding gases in the mold 10 tend to separate the cope half 12 from the drag half 14 or along the path where the metal remains molten. When these expanding gases are expelled and the tendency to so displace the mold is no longer present, the discs 30 need no longer be provided.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present dis-

closure relates to a preferred embodiment of the invention which is for purposes of illustration only and is not to be construed as a limitation of the invention.

What is claimed is:

1. A mold securing device for preventing relative displacement of the cope and drag halves of a sand mold during casting, comprising transport means defining a horizontal path along which a mold may progress during a casting process; guide means at least along a portion of said path, said transport and guide means together defining a space through which the mold passes as it moves along said path; and penetrating means disposed at each side of said path at a casting station and having portions which project into said space into the path of movement of the cope halves of the molds to thereby penetrate said cope halves and form elongated grooves in the latter as the molds move along said path for preventing vertical displacement of the latter during the casting process.
2. A mold securing device as defined in claim 1, wherein said transport means comprises a plurality of spaced horizontally disposed rollers.
3. A mold securing device as defined in claim 1, wherein said guide means comprises spaced vertically disposed rollers positioned on each side of said transport means.
4. A mold securing device as defined in claim 1, wherein said transport and guide means respectively comprise spaced horizontally and vertically disposed rollers, said vertically disposed rollers being positioned on each side of said vertically disposed rollers and being spaced from each other distances greater than the spacing between the horizontally disposed rollers.
5. A mold securing device as defined in claim 1, wherein said guide means comprises spaced vertically disposed rollers positioned on each side of said transport means and mounted to prevent vertical movement thereof, said penetrating means comprising at least one horizontally disposed disc mounted on a vertically disposed roller and having a peripheral portion which projects into the path of movement of the cope halves to thereby penetrate said cope halves.
6. A mold securing device as defined in claim 5, wherein said penetrating means comprises at least two discs each of which is mounted on another vertically disposed roller on another side of said path.
7. A mold securing device as defined in claim 5, wherein said penetrating means comprises a plurality of vertically spaced horizontally disposed discs mounted on said vertical rollers at least at the upper portions of the latter disposed adjacent to the cope halves of the molds when the latter move along said path.
8. A mold securing device as defined in claim 7, wherein three discs are provided on each vertically disposed roller.
9. A mold securing device as defined in claim 5, wherein said disc is configured in the form of a circular cutting blade.

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