Feb. 27, 1951 A. H. PETERSON 2,543,598

CORE MOLDING MACHINE

Filed June 21, 1946 2 Sheets-Sheet 1

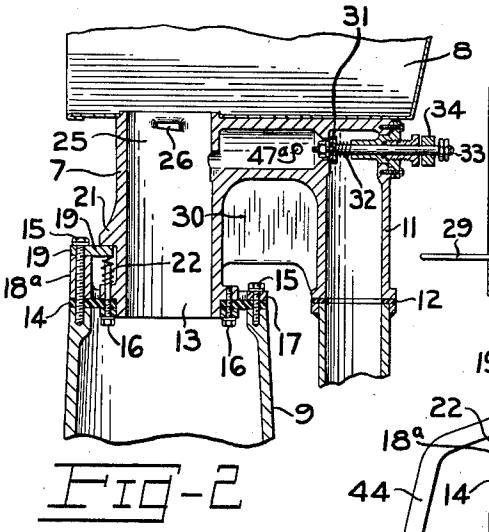


FIG-2

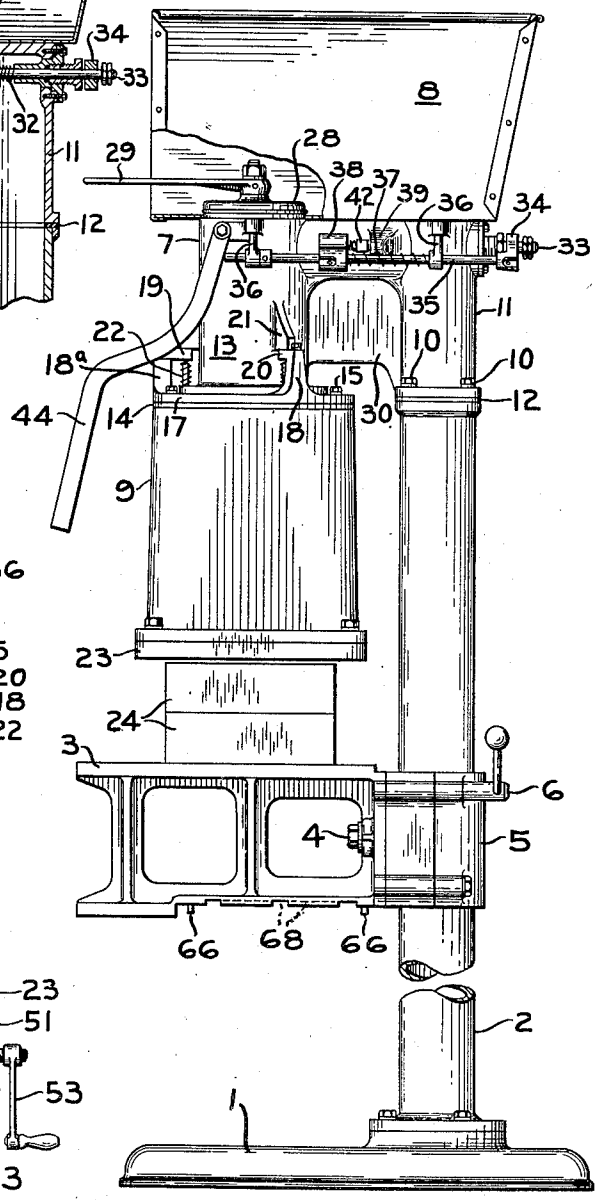


FIG-1

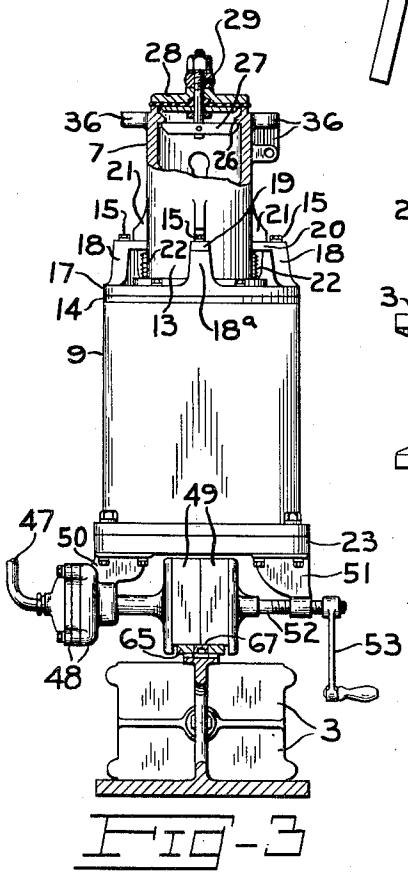


FIG-3

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CORE MOLDING MACHINE

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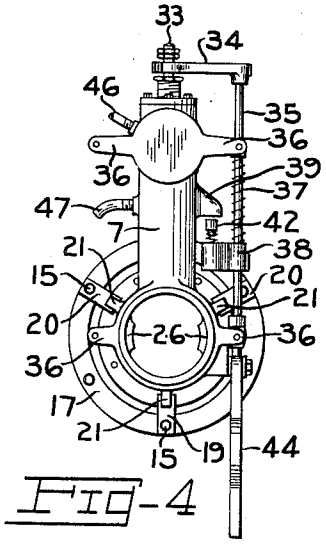


Fig-4

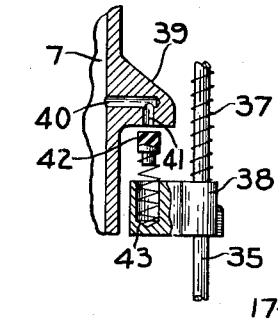


Fig-5

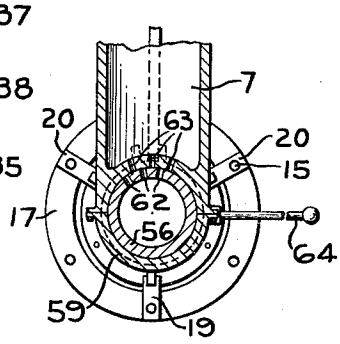


Fig-6

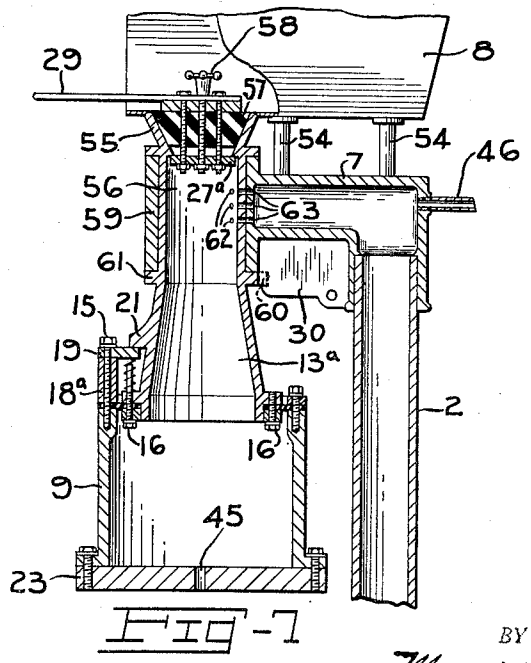


Fig-7

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CORE MOLDING MACHINE

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9 Claims. (Cl. 22—10)

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My present invention relates to molding apparatus and more particularly to apparatus for molding sand cores. Among the objects of this invention are the provision of an improved apparatus for the purpose stated; the provision of an improved apparatus for holding the core sand box tightly against the core box during the core molding operation; the provision of an improved apparatus in which the sand box will be withdrawn from engagement with the core box when the pressure of the compressed air is released from the sand box; the provision of improved means for feeding compressed air into the sand box during the core-molding operation; the provision of improved means for relieving compressed air from the sand box whereby to minimize the amount of time necessary to complete the operation after the molding operation has been completed; and such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the construction disclosed herein. My invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying drawings and, while I have shown therein what is now regarded as the preferred embodiment of this invention, together with modifications thereof, I desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 is a side elevation of a structure embodying my present invention;

Fig. 2 represents a vertical longitudinal section of a fragmentary portion of the upper end of the structure shown in Fig. 1;

Fig. 3 shows a part of the structure illustrated in Fig. 1, parts being broken away to more clearly show internal construction, this structure having a modified apparatus for placing lateral pressure upon a core box which is split vertically;

Fig. 4 is a plan view of the structure shown in Fig. 1 with the sand hopper removed and the lower portion not shown;

Fig. 5 is an enlarged fragmentary section of a part shown in plan in Fig. 4;

Fig. 6 is a fragmentary sectional plan of the structure shown in Fig. 7; and

Fig. 7 shows a central vertical section of the modified form of construction illustrated in Fig. 6.

Reference will now be made in greater detail to the annexed drawings for a more complete description of this invention. In the drawings there is shown at 1 a supporting base from which rises

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a hollow standard 2 constituting a reservoir and having a considerable capacity for compressed air. A separate reservoir, connected to the head by a pipe or hose of suitable size, may be used in lieu of the reservoir in the standard. The lower end of the standard may be closed airtight in any suitable way, as, for example, by being fitted tightly to the base 1. Adjustably mounted on this standard is a reversible bracket 3 which serves as a table for supporting a core box for the making of sand cores. This table is pivotally connected by the bolt 4 to a collar 5 which may be rigidly, but, preferably, adjustably connected to the standard 2. A securing device 6 holds the table 3 in adjusted position when it has been adjusted to the desired height.

At its upper end, the standard 2 is provided with a laterally extending hollow head 7 upon which rests a sand hopper 8 from which sand may be fed into a sand box or container 9. Extending downwardly from the head 7 is a part 11 which is secured to the upper end of the standard 2 by bolts 10 and, in reality, constitutes an extension of said standard. A rubber gasket 12 is located between these two parts and renders this connection airtight. The head 7 has a downwardly extending tubular part 13 constituting an upward extension of the sand box 9. The upper end of the sand box 9 is spaced outwardly from the lower end of the tubular part 13 and the two are connected, where they overlap, by the multiple purpose gasket 14. This gasket is flexible and is preferably formed from rubber or a rubber-like composition which will yield and permit the sand box 9 to lower when compressed air is turned into the head 7. As is clear from Fig. 2, bolts 15 and 16 hold the rubber gasket 14 secured in place.

Gasket 14 has been referred to as a multiple purpose unit because it functions and operates in several capacities. Gasket 14 provides a dual sealing means since it is shaped as an annular ring with its outer periphery sandwiched between ring 17 and the upper end of sand box 9, and with its inner peripheral edge sandwiched between an annular flange on head 7 and a ring joined thereto by bolts 16. Thus the terminal ends of the head 7 and the sand box 9 are each sealed by the same gasket 14.

In addition, gasket 14 spans the gap between head 7 and sand box 9 providing a diaphragm to thus laterally join the telescoped adjacent ends of the head 7 and sand box 9. And said gasket 14 forms a flexible support to depend the sand box 9 from head 7 in sealed relation to prevent loss of air and/or sand from the interiors of the

connected head and sand box and at the same time such gasket permits relative movement between the head and sand box.

A ring 17 has posts 18 and 18a rising therefrom, and this ring is drawn against the gasket 14 by the bolts 15. The post 18a has an arm 19 secured to its upper end by one of the bolts 15. This arm 19 corresponds to the arms 20 which project inwardly from the upper ends of the posts 18. These arms 19 and 20 engage the under face of lugs 21 extending outwardly from the tubular member 13 and cooperate therewith to serve as stops for limiting upward movement of the sand box 9 under the influence of springs 22. Downward movement of the sand box 9 is limited by engagement of the arms 19 and 20 with the upper ends of some of the bolts 16, if and when air is admitted to the sand box without a core box in place on the table. It is therefore clear that the amount of movement of the sand box 9 is dependent upon the thickness of the arms 19 and 20 and the space between the bolts 16 and lugs 21. It is desirable to have but a small amount of motion of this sand box and to have just enough space between the top of the bracket 3 and the bottom 23 of the sand box 9 to permit the core box 24 to slide freely, laterally, between them. Then when the core box is moved into place and the compressed air admitted to the tubular member 13 or 13a, the sand box will be moved down into engagement with the top of the core box and the sections of the latter will be pressed and held together tightly. I have found that the sand box will move downwardly into contact with the core box before the sand starts to move out of the blowholes.

This action results since the head 7 and sand box 9 together form a closed hollow system except for the one or more blowholes 45 that may be formed in the bottom 23, and with the interiors of the head and sand box containing core sand, the latter builds up a resistance to the compressed air flow entering these hollow members 7 and 9 to thus cause downward movement of the sand box 9 permissible by the flexing gasket diaphragm 14. The air tends to expand the system but the head and sand box are metal, the head is fixed, and the sand box is suspended from the flexing member 14, so the sand box 9 is endowed with the capacity and ability to move limitedly relatively to the head 7. This movement of the sand box precedes sand and air discharge from the blowholes in the plate or bottom 23 of the sand box 9 because the air must first penetrate the entire mass of sand before it finds its way out of the sand box openings to carry sand therethrough.

At its upper end, the head 7 has an opening 25 through which sand may be supplied to the sand box 9 from the core sand hopper 8 at selected intervals as best determined by the number of sand blows and the capacities of the core boxes filled thereby. On opposite sides of the opening 25 are lugs 26 which cooperate with a crossbar 27 passing through a closure member 28 which is used to seal the upper end of the opening 25. A handle 29 is used in manipulating the cover 28 and in turning the bar 27 under the cam-faced lugs 26.

Hopper 8 is open upwardly and consists of a three sided core sand supply retainer having one open side through which the handle 29 of the closure member 28 extends for easy reach by the operator. Handle 29 need only be moved through a relatively small arc in order to seal the head opening 25 with the closure member 28 or to remove the latter therefrom. The width of hopper 8 between the walls adjacent handle 29 is such as to permit ample clearance for the proper manipulation of handle 29 and its attached closure means 28.

Core sand does not flow readily so hopper 8 can hold a considerable supply thereof banked against the three walls and preferably away from the region of the closure 28 although sand over closure 28 does not affect its operation. The core sand does not flow or move out of the open side of the hopper 8, and when more sand is needed in the sand box 9, closure 28 is removed as described and the hopper sand may then be raked into the opening 25 to replenish the operative supply of core sand in the sand box.

It will be seen that, by means of this structure, it will be possible to draw the cover plate 28 down tightly against the surface surrounding the opening 25. Therefore, when air is admitted to the hollow of the head 7, it cannot escape upwardly but must go downwardly in its effort to escape. In doing this, it forces the sand into the cavity of the core box below, filling the cavity or cavities in the core box and forming one or more cores, dependent upon the type of core box used.

A gusset 30 connects the parts 11 and 13, thus making the structure very rigid. In the structure shown in Figs. 1 to 5, inclusive, a valve 31 controls the opening from the standard to the hollow of the head and therefore prevents the escape of air in this direction otherwise than when the valve is open. As is clear from Fig. 2, the valve 31 is closed by a spring 32 surrounding the valve stem 33. An arm 34 is secured to the rear end of the valve actuator rod 35 which is slidable through the brackets 36 formed on one side of the head 7. These brackets have aligned holes therein for the reception of the actuator rod 35 which slides freely in these holes under the influence of the spring 37. This spring bears, at one end, against a bracket 36 and, at its opposite end, against an arm 38 clamped on the rod 35.

As is clear from Figs. 4 and 5, a lug 39 is formed on the side of the head 7 and this lug has an opening therethrough, terminating at one end at 40 and at its opposite end at 41. This opening serves to vent the air from the sand box 9 when the valve 42 is removed from the opening 41 by retraction of the arm 38 with the rod 35. In an opening in the arm 38 is a spring 43 which holds the valve member 42 in a position to close the opening 41 when the rod 35 is moved by actuation of the handle 44. When the handle 44 is pushed toward the machine, it forces the rod 35 forwardly causing the valve member 42 to close the opening 41, after which the arm 34 engages the nut on the end of the valve stem 33, resulting in the movement of the valve member 31 away from the opening in the head and permitting air from the hollow of the standard 2 to pass into the head and from this into the sand box 9. This causes compression of the springs 22, flexing of the gasket 14, and lowering of the sand box 9. When the sand box is lowered, it engages the top of the core box 24 and sand passes through openings 45 in the bottom of the box and in the top of the core box. When pressure is released from the lever or handle 44, the valve 31 closes and the valve 42 opens, releasing the air pressure in the sand box 9. While the air vent is desirable, it is not essential since the air may be vented between the sections of the core box or through vent plugs mounted in the core box.

In Fig. 4, there is shown at 46 the inlet for

compressed air which may be supplied from any air pump or other compressor. Also, in Fig. 4 is shown a pipe 47 which is connected at one end to the opening 47*a* in the head 7 and at its opposite end to a pneumatic unit 48 which serves to exert pressure laterally on a core box 49 of the vertically split type. The unit 48 is supported on the bottom or blow plate 23 by a bracket 50 and, at the opposite side of the bottom, is a bracket 51 which has screw-threaded connection with the shaft 52 to which is connected the crank 53 by means of which the shaft is rotated to adjust the position of the core box 49 with relation to the head of the pneumatic unit 48 and the hole or holes in the bottom plate 23.

With the selection of a suitable relatively small size of pipe or hose 47 for clamp 48, or by restricting the opening 47*a* in Fig. 2, the sand box 9 is rendered capable of first moving downwardly against the core box 49 due to the much greater effective area of the sand box subjected to the pressure of the admitted air. After core box contact is established by the sand box 9, the air pressure in the pneumatic unit 48 finally builds up to a given maximum pressure to tightly clamp the two halves of the core box 49 together. These described functions of the parts considered are actually split second cyclic operations, including the sand discharge from the sand box, and may be considered substantially simultaneous for all practical considerations.

A plate 65 of suitable size may, when the bracket 3 is reversed, as shown in Fig. 3, be placed on the bracket, being provided with a pair of holes to cooperate with the pins 66. Vent plugs 67 are suitably placed in the plate 65 and communicate with the groove 68 to allow the escape of air from the core box. When a horizontally split core box is used instead of a vertically split box, as shown in Fig. 3, the pipe 47 is not needed and a plug is screwed into the opening 47*a*.

In the modified structure shown in Figs. 6 and 7, a pair of posts 54 rising from the top of the head 7 supports the sand hopper 8 at one end, its second end being supported on the upper end of the funnel-shaped extension 55 at the upper end of the sand conveyor 56 by which sand is conveyed from the hopper 8 to the sand box 9. A locking bar 27*a*, corresponding to the bar 27 of Fig. 3, serves to hold the plug 57 in the funnel-shaped member 55 to prevent leakage of air from the sand box. The plug may be tightened in the opening by turning the hand wheel 58, as is clear from Fig. 7.

The parts 59 and 56 are circular in cross-section and fit together closely but not so closely but what they may turn, one within the other. A pair of lugs 60 project outwardly from the flange 61 and are located upon opposite sides of the gusset 30 but spaced far enough apart so that the openings 62 and 63 may be brought into or out of registry whereby to serve as a valve for controlling the flow of air from the head 7 to the sand box 9. The box 56 is rotated in the part 59 by means of the handle 64, shown in Fig. 6.

It will be apparent that the structure shown as attached to the upper end of the standard 2 by the bolts 10 may be attached by such bolts to any other suitable support, such, for example, as a table. In such an arrangement it would probably be desirable to have a short post interposed between the table and the head.

It is of course understood that the specific description of structure set forth above may be departed from without departing from the spirit of this invention as disclosed in this specification and as defined in the appended claims.

Having now described my invention, I claim:

1. A sand core molding machine comprising a hollow standard, a core box supporting bracket mounted for vertical adjustment thereon and projecting laterally therefrom, a hollow head connected to the upper end of the standard and extending over said bracket, a sand box, expandible supporting means connected with said head and with said sand box for suspending said sand box from said head for vertical movement relatively to the head, a pneumatic press suspended from the bottom of the sand box and adapted to function in a direction substantially parallel to the bottom of the box, said sand box being vertically movable to engage the upper surface of a core box resting on said bracket, said standard being adapted to contain air under pressure and having a valve-controlled aperture for allowing air to flow from the standard to the sand box whereby to move the box downwardly into contact with a core box on the bracket, and means for operating the valve controlling the aperture.

2. A sand core molding machine having a hollow standard serving as an air reservoir, a hollow head in communication with said standard having a pipe-shaped extension operatively connected therewith and depending from said head, both ends of said extension being open, the interior of the head being connected to the interior of the standard, movable closure means detachably connected to the upper end of said extension in airtight relation, a sand box, a flexible air seal connected with said sand box and connected to the lower end of said extension to support said box in airtight relation therefrom, said head being provided with an air-venting valve, and the bottom of said sand box having at least one opening for delivering sand to a core box.

3. A core molding machine comprising an elongated reservoir serving as a supporting standard, a hollow cylindrical head connected thereto and having communication with the interior of the reservoir, tubular means for delivering air under pressure to said reservoir, a cylindrical sand box for molding sand positioned concentrically about said cylindrical head and in depending relation thereto, a flat annular air impervious diaphragm disposed transvserly between said head and said box and secured to each to permit limited relative axial deflection between said connected units and limited vertical movement therebetween, and valve means between the reservoir and head for controlling the flow of air from said reservoir through said head and into the sand box.

4. A sand core molding machine comprising, in combination, a supporting standard which serves as an air reservoir, said reservoir having a horizontally extending head opening upwardly and downwardly, a sand box connected to said head for movement in a vertical direction, flexible means providing a sealing joint between the box and the head and secured to each, said flexible means furnishing an air-impervious connection between the box and the head, means for delivering air under pressure to the interior of said machine, valve means for controlling the delivery of air to the sand box, and pneumatic clamping means arranged to function in a horizonal direction and having an air supply hose connecting the pneumatic clamping means with the interior of the head.

5. A unit cooperatively related to a core box support for blowing sand into a core box; said

unit comprising a chamber having interconnected upper and lower portions, a flexible joint interposed between said portions but connected with each and being air-impervious but allowing movement of the lower portion in relation to the upper portion, one of said portions having an opening for admission of a gas under pressure into said one portion, controlling means for opening and closing said opening, the lower portion receiving sand from the upper portion, said upper portion having a sand-admitting opening and means for closing the sand admitting opening.

6. A sand core making machine comprising a sand-receiving chamber, a core box table, said chamber having a sand discharge vent position to face the core box table, said chamber having means for admitting sand thereto, a compressed air source connected to the chamber so that compressed air may be admitted thereto to discharge sand through said vent, valve means governing the admission of air from said source to the chamber, a pneumatic press carried adjacent said core box table and having at least one jaw movable horizontally between the vent portion of said chamber and the table, said chamber having an air-exit opening, and hollow means directly connecting said exit-opening with said press to allow air to pass from the chamber to the press when the valve means is open.

7. In a sand core molding machine, a two piece core sand container, a mounting to suspend one of said pieces in fixed relation to a core box holding unit, the other of sand pieces having a core sand injection aperture, a support extending between and connected with each of said two pieces of said core sand container to bodily suspend the apertured injection piece from said fixed piece, said support comprising a flexible fluid seal joint interposed between said pieces whereby the apertured injection piece is disposed for operable movement relative to said fixedly supported piece and for movement in the direction of said core box holding unit, and fluid supply means to introduce fluid under pressure into said two piece container to deflect said flexible support to move said sand injection piece toward a core box and to force core sand from the injection aperture of said flexibly supported piece into said core box.

8. In a sand core molding machine, a two piece core sand container, a mounting to suspend one of said pieces in fixed relation to a core box holding unit, the other of said pieces having a core sand injection aperture, a support extending between and connected with each of said two pieces of said core sand container to bodily suspend the apertured injection piece from said fixed piece, said support comprising a flexible fluid seal joint interposed between said pieces whereby the apertured injection piece is disposed for operable movement relative to said fixedly supported piece and for movement in the direction of said core box holding unit, fluid supply means to introduce pressure into said two piece container to deflect said flexible support to move said sand injection piece toward a core box and to force core sand from the injection aperture of said flexibly supported piece into said core box, and cooperative spring and stop mechanisms carried by said two pieces of said core sand container to position said flexibly supported piece in a predetermined fixed relation with respect to said fixed piece and to said core box holding unit during normal atmospheric pressure conditions in said core sand container.

9. In a sand core molding machine, a two part fluid and core sand container having a fluid pressure source, one of said parts having a flat core box contacting end with a core sand injection aperture therein, table means to dispose the sand receiving side of a core box in fixed operative relation to said flat end of said sand container part, and a joining wall connected with each of said two container parts to normally carry one of said parts in a predetermined relation with respect to the other of said parts, said wall comprising a flexible fluid and sand sealing means between the two parts of said container to suspend the flat end of said one part of the container for operative movement in the direction of said core box when fluid pressure is introduced into said container, and said flexible wall also being arranged to provide means for relative tiltable movement of said container parts whereby said part having the core box engaging end is alined in operative sealing contact with the surface of the sand receiving side of the core box.

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