Oct. 7, 1941. W. E. NAYLOR 2,258,466

CORE BOX CLAMP FOR CORE MAKING MACHINES

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Fig. 1

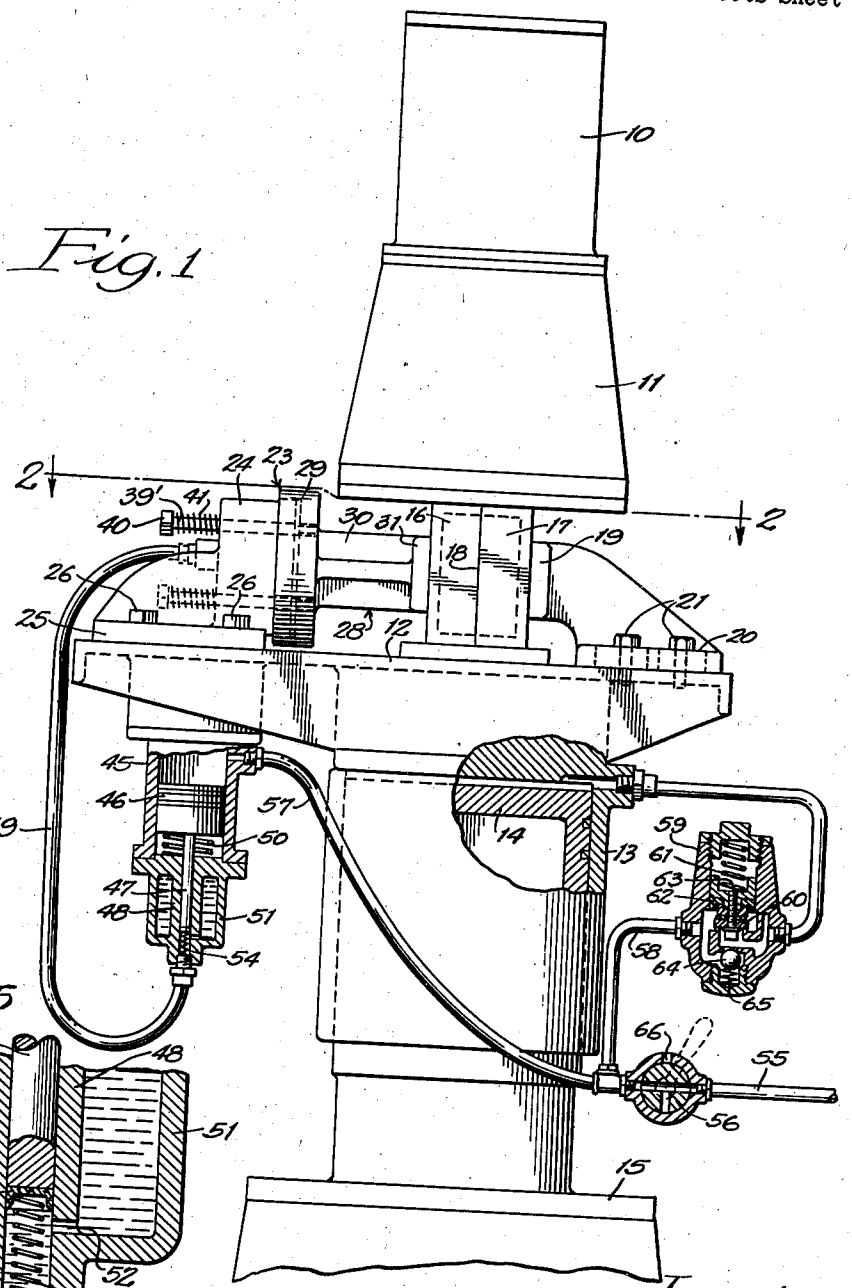
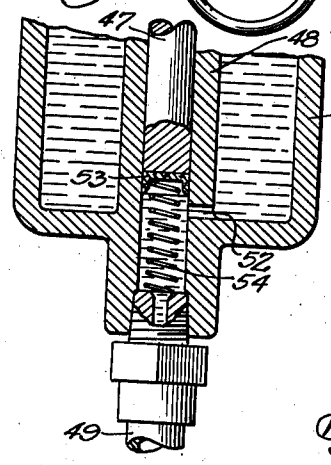


Fig. 5



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Fig. 2

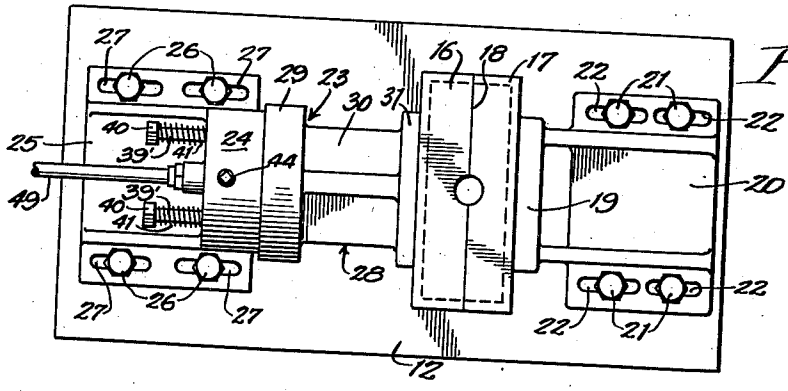


Fig. 3

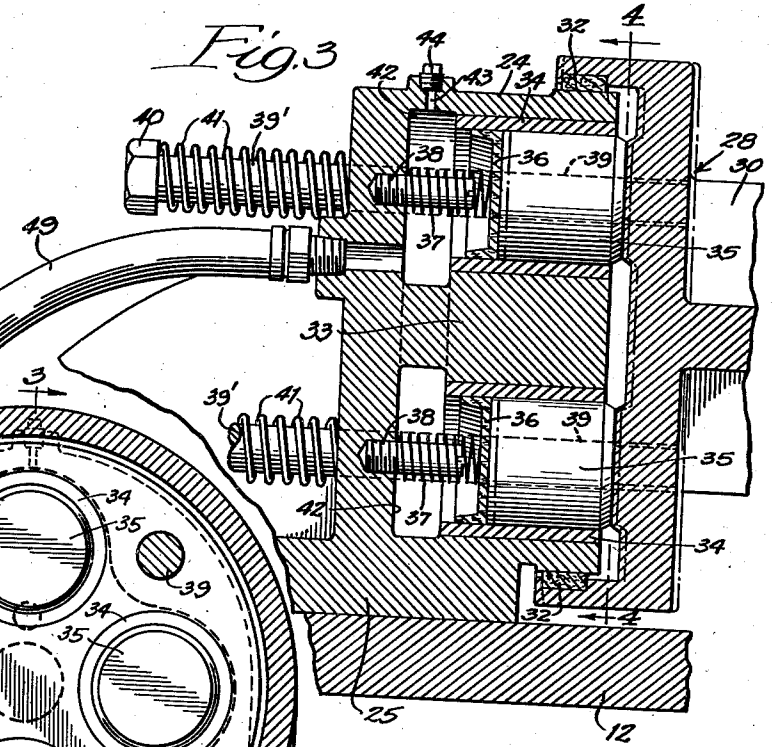
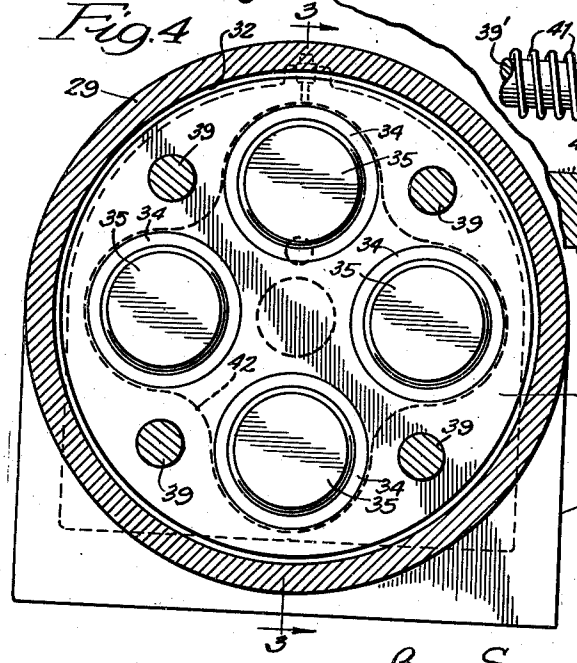


Fig. 4



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UNITED STATES PATENT OFFICE

2,258,466

CORE BOX CLAMP FOR CORE MAKING MACHINES

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Application July 27, 1940, Serial No. 347,829

3 Claims. (Cl. 22—10)

This invention relates to machines for making sand cores, and more particularly to machines of that type in which the sand that forms the core is blown into the core-box or mold by air under pressure. These machines are usually provided with an air chamber and a movable sand transfer member which carries a charge of sand at least sufficient to make the core from a supply hopper to a position in alinement with and between the air chamber and the core-box or mold. The core-box or mold is usually supported on a table or platform that is raised by a pneumatic lift to carry the core-box into tight engagement with the lower end of the sand transfer member and force the upper end of the latter into tight engagement with the air discharge port of the air chamber. From the sand transfer member the sand is blown by the air into the core-box and packed therein by the air and sand under high pressure. The lift is then lowered, and the core-box and core removed.

For convenience in removing the finished core, most core boxes are made in mating halves, divided either vertically or horizontally; and, where the box is designed to mold a tapered core, it is usually made in a single piece having a tapered cavity, it being practical to remove the finished tapered core from the box by merely lifting the latter off the core. During the blowing operation the interior of the core-box is under a high pressure, often as high as 130 pounds per square inch. If the core box is divided horizontally, the two sections of the box are maintained closed on each other by the upward thrust of the lift on the lower section and the opposed downward thrust of the sand transfer member on the upper section, and no lateral supports are required to prevent the box from spreading sidewise. Where, however, the core-box is divided vertically, either the two sections of the box must be securely clamped together, or lateral supports for the two sections are necessary to prevent spreading of the sections during the blowing operation. The application and removal of clamps involves considerable time on the part of the operator; and, consequently, to speed up the operation of core making, heretofore the core box has been flanked on one side by a fixed vertical wall on the platform, and during the blowing of the core the other side of the box has been subjected to a thrust sufficient to prevent spreading of the box under its internal pressure. So far as I am aware, the means hereto-fore used for laterally clamping the core-box during the blowing operation has consisted of a plunger directly actuated by compressed air usually from the same source that supplies pressure to actuate the vertical lift or jack. Unless such plunger has a very large area subjected to the air pressure, which makes it clumsy and cumbersome, it is inadequate to resist the internal spreading pressure to which the core-box is subjected, and this sometimes imposes an undesirable limitation on the air pressure which can be used in the blowing operation, in order to avoid accidents in the making of the cores through spreading of the two core box sections.

The main object of the present invention has been to provide an improvement on the means heretofore used for laterally compressing or clamping a vertically divided core box; and, as will hereinafter fully appear, this improvement is based on the principle of the hydraulic press, through the use of which the pressure afforded by a body of compressed air, which may be at the same pressure as that used in the pneumatic jack or lift, operating in an air cylinder of relatively small diameter, is greatly multiplied through a body of liquid such as oil or water of much larger area acting directly upon one or more plungers that exert a direct thrust on the side of the core box; the area of such plunger or plungers being greatly in excess of the area of the pneumatically operated plunger of an hydraulic pump which transmits pressure to the confined body of liquid in the hydraulic press.

In order that the invention, its novel structural features and its mode of operation, may be clearly understood, I have, in the accompanying drawings, illustrated one practical embodiment thereof which, in practice has been found to satisfactorily effectuate the stated object of the invention. Referring to the drawings—

Fig. 1 is a front elevation of such parts of a known core making machine as cooperate with my improved core-box clamp, certain parts of the latter being shown in vertical section.

Fig. 2 is a top plan view, on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section, mainly through the oil chamber and rams of the hydraulic press, taken on the line 3—3 of Fig. 4.

Fig. 4 is a vertical transverse section, taken on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged vertical section through the lower portion of the hydraulic pump which applies pressure to the oil in the main oil chamber of the hydraulic press.

In the drawings, 10 indicates diagrammatically a casting containing a valve controlled air cham-

ber, communicating with a source of compressed air, and into which the air blast for blowing the sand into the core-box is admitted. The lower end of this air chamber is adapted to register with the upper end of a sand carrier designated by 11 which, in common practice, is laterally shiftable between the discharge end of a sand hopper and its position in register with the air chamber 10. Underlying the sand carrier 11 is a platform 12, that is mounted on the upper end of a cylinder 13 that slidably telescopes over a fixed plunger 14 supported on a base 15. The platform 12 forms a support for a core-box, that, just prior to the blowing operation, is raised by the platform 12 into tight engagement with the sand discharge grid in the bottom of the sand carrier 11; the platform and core-box being raised by compressed air admitted between the movable platform and the upper end of the fixed plunger 14.

The parts thus far described are well known parts in the core making machine art.

I have herein illustrated the above described parts as cooperating with a vertically divided core-box, comprising two mating sections 16 and 17, the line of division being indicated at 18. Flanking the section 17 is a heavy abutment member 19 formed with a base 20 secured to the platform 12 as by cap screws 21. As shown in Fig. 2, the screws 21 may pass through longitudinal slots 22 in the base 20, to adjust the apparatus to core-boxes of varying widths.

Flanking the outer side of the other section 16 of the core-box is an hydraulic press designated as an entirety by 23. The preferred structural features of this press are best illustrated in Figs. 3 and 4. It includes a fixed member 24 preferably of circular cross-section and having an integral base 25 that is adjustably secured to the top of the platform 12 by screws 26 and slots 27, as in the case of the abutment 19. It also includes a movable member designated as an entirety by 28, and comprising a circular head 29 that telescopes over the adjacent end of the fixed member 24, a ribbed shank 30, and a foot 31 which bears directly on the outer side of the core-box section 16. Between the overlapping parts 29 and 24 there is inserted a packing ring 32 for excluding sand from the interior of the press. The fixed member 24 is cast with an internal transverse skeleton web designated by 33, and through this web are formed a group (herein shown as four) of holes in which are fitted circular linings 34 for a corresponding number of slidable rams 35, symmetrically grouped around the axis of the fixed member 24. These rams 35 at their outer ends contact the head 29 of the movable member 28 of the press, as clearly shown in Fig. 3; and lying in contact with the inner ends of the rams are cup-shaped washers 36, that are pressed against the rams by thrust springs 37 encircling studs 38 mounted in the end wall of the fixed member 24.

The movable member 28 of the press is constantly urged toward its cooperating fixed member 24 by the following means. 39 designates each of a group of rods that are mounted in the head 29 of the movable member and extend through holes in the web 33 and the end wall of the fixed member 24, and project beyond the latter as shown at 39'. On the outer ends of the projections 39' are heads 40, and encircling the projections 39' and confined endwise under tension between the heads 40 and the end wall of the fixed member 24 are thrust springs 41. Manifestly, these springs act to automatically retract the movable press member 28 from the core-box, to release the latter, after the blowing operation has been completed, so that the core-box may be readily removed and opened.

Within the fixed member 24, between its end wall and web 33 is a chamber 42 that is completely filled by a body of liquid, preferably oil. In the circumferential wall of chamber 42 is a port 43 (Fig. 3) closed by a removable plug 44, through which oil can be introduced to charge the chamber 42 or to replace losses through leakage.

Describing next the power means for operating the hydraulic press, 45 (Fig. 1) designates the cylinder of a pneumatic motor that may be hung from one end of the platform 12, and in this cylinder a piston 46, to the underside of which is secured the narrow plunger 47 of an hydraulic pump, that works in a cylinder 48 depending from the lower head of the pneumatic cylinder 45. The lower discharge end of the pump cylinder 48 communicates by a hose 49 with the liquid chamber 42 of the hydraulic press, as clearly shown in Fig. 3. The piston 46 of the pneumatic motor is forced downwardly by compressed air admitted above the same, and is returned by a spring 50. To provide for the back flow of the necessary small quantity of oil when the hydraulic press is collapsed, the cylinder 48 of the hydraulic pump is encircled by a small oil well 51 that is ported at its lower end as shown at 52 (Fig. 5) to the discharge end of the hydraulic pump cylinder 48. On the lower end of the plunger 47 of the hydraulic pump is a cup-washer 53, best shown in Fig. 5, that is held in place against the plunger by a spring 54.

Compressed air for operating both the core-box lift and the core-box clamp may be supplied from a suitable source through a hose 55 (Fig. 1), in which is included a two-way cock 56 for admitting and exhausting the motive fluid. To this air line 55 are connected, beyond the cock 56, a branch hose 57 leading to the pneumatic motor 45 which operates the pump of the hydraulic press, and another branch hose 58 leading to the pneumatic motor 13 which raises the core-box into engagement with the sand carrier. In machines where the raising of the core-box into register with the sand carrier automatically opens the sand blow valve (which is usually the case), it is essential to operate the hydraulic press to clamp the core-box laterally, before raising the core-box to receive the sand blast. For this purpose I have provided in the air supply line means by which the hydraulic pump that supplies pressure to the hydraulic press is actuated in advance of the pneumatic lift which raises the core-box. This means preferably consists of what is known as a sequence valve indicated as an entirety by 59 that is introduced in the branch line 58. This sequence valve partly throttles and slows down the air flowing to the air lift through line 58 relatively to that flowing through line 57 to the air motor of the hydraulic pump, so that the latter is first actuated to effect the clamping of the core-box, and the core-box lift is actuated immediately thereafter. This sequence valve 59 is a known commercial valve, and no claim thereto per se is made herein. It includes an upper valve 60 pressed to its seat by a spring 61, which is opened by differential pressure on a piston 62 connected to the valve stem 63, when the air is turned on, the valve 60 partially throttling the air flow. It also includes a

lower ball valve 64 lightly held to its seat by a spring 65, which provides a return for the exhaust of the pneumatic lift 13 when the core box is lowered.

The description of the operation has been to a considerable extent indicated in connection with the description of the structure, but may be briefly summarized as follows:

When the empty core-box has been placed on the platform 12 in register with the discharge from the sand carrier 11, the valve 56 is turned to the position shown in Fig. 1, and compressed air flows first to the pneumatic cylinder 45 actuating the hydraulic pump and causing the hydraulic press to clamp the core-box. An instant later compressed air reaches the air lift and raises the closed core-box into sealed registration with the sand carrier 11, and this turns on the air blast, filling the core-box with densely packed sand, thus making the core. This position of the parts is illustrated in Fig. 1. The valve 56 is then given a quarter turn clockwise viewing Fig. 1, and this places both branch lines 57 and 58 in communication with an exhaust port 66 in the casing of the valve 56, providing for the exhaust of both pneumatic motors. The cylinder 13 of the pneumatic lift, the platform 12, and the hydraulic press and core-box descend, and at the same time the piston 46 is raised to its high position by the spring 50. The springs 41 at the same time act to retract the movable member 28 of the hydraulic press from the core-box, so that the latter may be readily removed and replaced by the next empty core-box to be filled by a repetition of the same cycle. It may here be stated that both the rising and lowering movements of the platform and core-box and the in-and-out movements of the core-box engaging member of the hydraulic press are but a small fraction of an inch, and this very small required compressive and release movement on the core-box is one reason that makes the use of an hydraulic press to clamp the core-box thoroughly practical in a machine of this character.

Variations and modifications in the details of structure and arrangement from those herein shown and described may be resorted to without departing from the substance of the invention as defined in the following claims.

I claim:

1. In a core-box clamp of the type described, the combination with a sand transfer member, a platform beneath said transfer member to support a divided core-box, and a pneumatic motor for raising said platform to force the core-box into snug contact with said transfer member, of an hydraulic press mounted on said platform engaged with one side of said core-box, a fixed abutment on said platform engaged with the opposite side of said core-box, an hydraulic pump communicating on its discharge side with the liquid chamber of said hydraulic press, a pneumatic motor for actuating said hydraulic pump, a compressed air supply line having branches respectively serving said pneumatic motors, and a cock in said air supply line for admitting and exhausting compressed air to and from said branches.

2. In a core-box clamp of the type described, the combination with a sand transfer member, a platform beneath said transfer member to support a divided core-box, and a pneumatic motor for raising said platform to force the core-box into snug contact with said transfer member, of an hydraulic press mounted on said platform engaged with one side of said core-box, a fixed abutment on said platform engaged with the opposite side of said core-box, an hydraulic pump communicating on its discharge side with the liquid chamber of said hydraulic press, a pneumatic motor for actuating said hydraulic pump, a compressed air supply line having branches respectively serving said pneumatic motors, means in one of said branches for effecting actuation of the hydraulic pump motor in advance of the actuation of the platform raising motor, and a cock in said air supply line for admitting and exhausting compressed air to and from said branches.

3. In a core-box clamp of the type described, the combination with a sand transfer member, a platform beneath said transfer member to support a divided core-box, and a pneumatic motor for raising said platform to force the core-box into snug contact with said transfer member, of an hydraulic press mounted on said platform engaged with one side of said core-box, a fixed abutment on said platform engaged with the opposite side of said core-box, an hydraulic pump communicating on its discharge side with the liquid chamber of said hydraulic press, a pneumatic motor for actuating said hydraulic pump, a compressed air supply line having branches respectively serving said pneumatic motors, a sequence valve in the branch serving the platform raising motor, and a cock in said air supply line for admitting and exhausting compressed air to and from said branches.

WALTER E. NAYLOR.