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VACUUM GRAVITY PRESS

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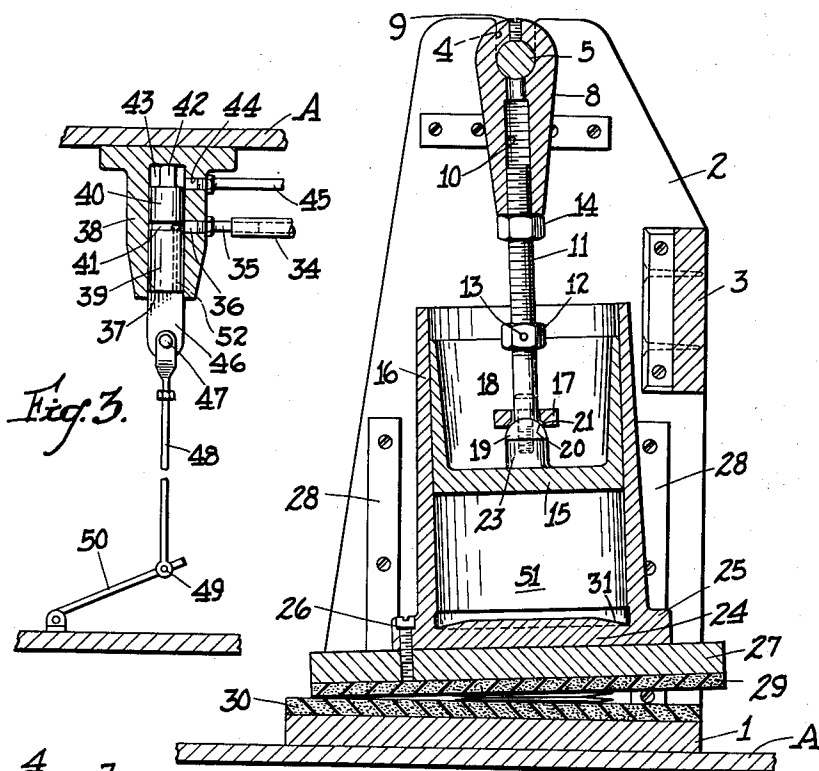


Fig. 2.

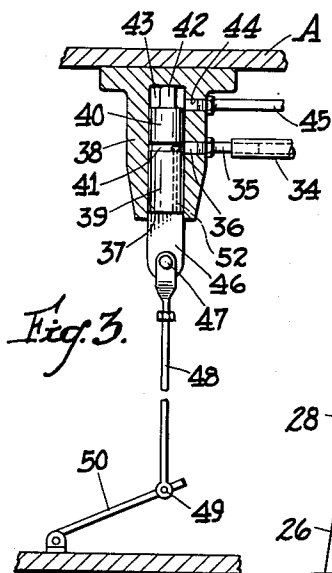


Fig. 3.

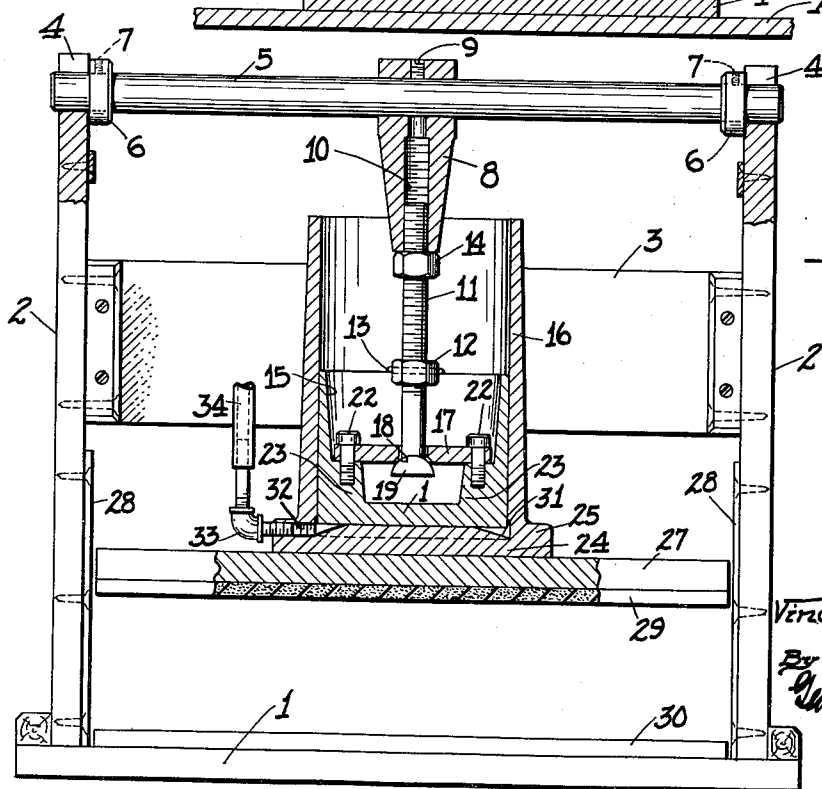


Fig. 1.

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VACUUM GRAVITY PRESS

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7 Claims. (Cl. 154—1)

1

This invention relates in general to presses, and more particularly to a type of small press that is adapted, among other things, for use in the manufacture of various paper and cardboard articles, to clamp and hold in firm contact the adhesive-coated layers or areas of such articles while the moist adhesive is setting or drying.

Heretofore, it has been the practice in factories specializing in the production of such articles, to use for this purpose a small press in which the movable or pressure-applying member is connected to the piston of a double-acting cylinder and piston unit, having suitable means for admitting compressed air, alternately, to opposite ends of the cylinder, in order to move the pressure-applying element into work-contacting position and then, after the glue has dried, into work-releasing position, to permit introduction to the press of other work to be acted upon. Such a device requires a stuffing box for the piston rod, and complicated valving for the motive fluid.

According to my invention, as hereinafter described, a single acting piston and cylinder unit is employed, thus eliminating the usual stuffing-box. In my improved press, gravity is utilized to obtain the operative or work-contacting stroke of the pressure-applying element, while the opposite or work-releasing stroke is obtained by suction or vacuum. This results in more economical operation of the press, as well as in a less complicated and less expensive construction. Furthermore, my invention, as hereinafter described, enables the impact of the pressure-applying element upon the work to be advantageously lightened, so as to avoid any damage to the work, or any disturbance or displacement of its adhesive-coated parts. In addition, said pressure-applying element has its weight augmented by the relatively heavy cylinder of said piston and cylinder unit, thereby to provide the optimum conditions for holding and clamping the work after said element has moved into contact therewith.

Other and further objects and advantages of my invention will be made apparent by the following detailed description thereof, taken in connection with the accompanying drawings in which

Fig. 1 is a front view, partly in section, showing the improved clamping press of my invention, with its pressure-applying element in raised or work-releasing position.

Fig. 2 is a sectional view of said press, at right angles to Fig. 1, showing the pressure-applying element in lowered or work-contacting position.

Fig. 3 is a fragmentary view, partly in section,

2

showing a treadle-operated valve by which the press operation is controlled.

Like reference characters refer to like parts in the different figures.

5 The stationary bed or platen of my improved clamping press is provided by a horizontal, preferably rectangular, member 1 of suitable material, adapted to rest flat on a bench or table A at which the operator works. Suitably secured to member 1, crosswise of each end thereof, are two spaced-apart standards or uprights 2, 2, which are preferably connected and made relatively rigid by a suitable brace 3. At their upper ends the uprights 2, 2 are formed with matching arcuate-bottomed slots 4, 4 to receive and confine the ends of a shaft 5, extending horizontally across the space between said uprights and prevented from becoming displaced endwise by any suitable means such as surrounding collars 6, 6 held by set-screws 7, 7 in abutting relation to the respective opposed faces of said uprights.

The shaft 5 thus rockably mounted in the standards 2, 2 carries at its central portion a depending arm 8 here shown as held in position by a set screw 9. The arm 8 is formed with a threaded bore 10, extending at right angles to the shaft 5 and receiving a threaded rod 11, which constitutes in effect an adjustable extension of the arm 8. That is to say, the rod 11 is arranged to be screwed in or out in the bore 10 by means of a nut 12, which is stationarily held on said rod by a pin 13, the turning of the rod serving to increase or decrease as the case may be the downward projection of the rod's lower end beyond the arm 8; when the desired adjustment has been made, the rod is locked in adjusted position by means of a nut 14 which is screwed upwardly on the rod into firm engagement with the lower end of arm 8.

40 The lower end of the rod 11 carries a relatively stationary piston 15, whose means of connection to the rod is preferably of swivel character, to permit said piston to be self-aligning relative to a movable cylinder 16 with which said piston is operatively associated, as hereinafter described. The piston 15 is of single-acting type, with its open end or skirt extending upwardly around the rod 11; for purposes of such self-aligning action, the piston's connection to the rod is by means of an interior plate 17 which has a central aperture 18 loosely surrounding the rod 11 above the latter's terminal enlargement 19. The enlargement 19 has an upper surface 20 of convex spherical contour, for cooperation with a surface 21 of concave spherical contour provided by the under-

3

side of plate 17 in concentric relation to the rod aperture 18 thereof. The ends of plate 17 are secured by bolts 22, 22 to diametrically opposite interior shoulder portions 23, 23 of the piston 15.

The cylinder 16 is of single-acting type, its upper end being open for passage of the rod 11 and its lower end being closed by a preferably integral head 24. The head 24 is extended laterally to provide an annular flange 25 which serves for the passage of a series of bolts 26, 26 (only one being shown) by which a flat pressure-applying member 27 is attached to said cylinder head 24. Said member 27 is here shown as rectangular in shape, to correspond with the bed or platen 1; its end portions as shown in Fig. 2 have a slight spacing or clearance relative to wear plates 28, 28 secured to the inside surfaces of the uprights 2, 2. The member 27 carries on its under surface a pad 29 of rubber, felt or the like, in opposed relation to a similar pad 30, secured to the upper surface of the stationary bed or platen 1. The cylinder head 24 is interiorly recessed, as shown at 31, and communicating with this recess is a threaded passage 32 into which is screwed a fitting 33 that is connected by flexible tubing 34 to a fitting 35, Fig. 3, that is screwed into a port or passage 36 communicating with the bore 37 of a valve body 38.

Said valve body 38 is here shown as secured in any suitable way to the underside of the bench or table A, and its bore 37 contains a slidable valve member, that includes as shown in Fig. 3, a lower piston portion 39, an upper piston portion 40 and a short intermediate reduced diameter portion 41. Projecting from upper piston portion 40 is a lug 42, adapted by contact with the upper or closed end of bore 37 to maintain in said bore a space 43 with which communicates a port or passage 44 that has a pipe connection 45 to any suitable source of suction or vacuum, not shown. Such suction or vacuum is thus always effective in the space 43, and tends normally to hold the valve member at the upper limit of its travel, in the position shown by Fig. 3, corresponding to the press position shown by Fig. 2.

The valve's lower piston portion 39 has a downward projection 46, to which is pivotally connected at 47 a link or rod 48 whose lower end is pivotally connected at 49 to a treadle 50, located conveniently for foot operation by the operator of the press. Depression of treadle 50 pulls the valve downwardly, and carries piston portion 40 below the port or passage 36; this makes the suction effective through passage 36, tubing 34 and fitting 33 in the cylinder space 51 (Fig. 2) with the result that the cylinder 16 and its attached member 27 are drawn upwardly to the position shown by Fig. 1, the parts being held by the suction in this position so long as the treadle 50 is held down by the operator's foot. This gives opportunity for the removal of work that has been in the press and for the disposal of one or more pieces of unpressed work on the platen pad 30. Then upon removal of foot pressure from treadle 50, the valve is immediately drawn up by the suction to the position shown in Fig. 3, cutting off the suction to the press, and registering with passage 36 the annular space that surrounds the reduced diameter valve portion 41.

The said annular space around valve portion 41 is in communication with the atmosphere by way of a restricted bleed passage 52 through the lower piston portion 39 of the valve. Thus, as soon as the valve arrives at the position shown in Fig. 3, air begins to flow in a limited quantity through bleed passage 52 and tubing 34 to the

4

cylinder space 51, gradually relieving the vacuum that previously had held up the cylinder 16 and plate 27 in the position shown by Fig. 1, and permitting said last-named parts to descend, by their own weight, toward the work on platen pad 30. This descent of the pressure-applying parts is at a substantially uniform rate, which can be made as slow and gradual as desired (by properly proportioning the bleed passage 52) so as to avoid all possibility of damage to the work, or disturbance of the registry of its adhesive-coated parts, by undue impact from the descending parts. The latter's pressure on the work is always substantially uniform, being the pressure produced by the combined weights of the cylinder 16 and attached plate 27.

These pressure-applying parts are guided in their downward and upward movements by the contact of the cylinder's interior wall with the relatively-stationary piston 15. While the piston 15 thus serves to guide the pressure elements in a vertical path, the mounting of said piston is so arranged as to permit the parts to assume in their operative position (Fig. 2) an out-of-level relation on account of the interposed thickness of the work, this compensation of position being permitted not only by the trunnion mounting of the shaft 5, but also by the capacity for limited swiveling movement in any direction afforded by the surfaces 20 and 21 of the connection between said piston and the rod 11. After the work has sustained the weight of cylinder 16 and pressure plate 27 for an adequate time, to permit the adhesive to set and dry, the operator, by depression of treadle 50, again makes the vacuum effective in the cylinder space 51 to raise the cylinder and pressure plate to the position shown in Fig. 1, so that the finished work can be replaced by other work that needs to be subjected to pressure. For adapting the press to work of various different thicknesses, the turning of rod 11 in the arm 8, to change the position of piston 15, provides an adjustment of the height to which the pressure plate 27 will rise, at each operation of the press.

I claim:

1. A press of the class described comprising a stationary bed or platen, an opposed movable pressure-applying element, a single-acting cylinder attached at its head end to said element, a relatively-stationary piston in said cylinder, and means for exerting suction in the cylinder space to procure movement of said element and said cylinder toward said piston and away from said platen, said piston being rockably mounted, thereby allowing said element to assume an out-of-level position relative to said platen.

2. A press of the class described comprising a stationary bed or platen, an opposed vertically movable pressure-applying element, a single-acting cylinder attached at its head end to said element, a relatively-stationary piston in said cylinder, means for exerting suction in the cylinder space to procure upward movement of said element and said cylinder toward said piston, and means for bleeding air to said cylinder space, to obtain slow gravitational movement of said element and said cylinder into contact with work positioned on said bed or platen.

3. A press of the class described comprising, a stationary bed or platen, an opposed vertically movable pressure-applying element, a single-acting cylinder attached at its head end to said element, a relatively stationary piston disposed within said cylinder, means above said cylinder

5

for pivotally supporting said piston about a substantially horizontal axis, means for exerting suction in the cylinder space to procure movement of said element and said cylinder toward said piston and away from said platen, and means including a constricted conduit for bleeding air slowly to said cylinder space thereby to obtain a slow downward movement of said element and said cylinder under the force of gravity.

4. A press of the class described comprising, a stationary horizontal bed or platen, an opposed vertically movable pressure-applying element, a single-acting open top cylinder having a closed lower portion substantially vertically disposed over said platen with its closed lower portion secured directly to said element, a piston rod supported by its upper end from above said cylinder and with its lower end extending into said cylinder, a piston disposed within said cylinder and pivotally secured to the lower end of said piston rod, means for exerting suction in the cylinder space to procure movement of said element and said cylinder toward said piston and away from said platen, and means including a constricted conduit for bleeding air slowly to said cylinder space thereby to obtain a slow downward movement of said element and said cylinder under the force of gravity.

5. A press of the class described comprising, a frame having a lower horizontally disposed bed or platen and an upper support or suspension means disposed above said platen, cooperating piston and cylinder members arranged between said platen and said suspension means, a pressure-applying element disposed between said platen and said cooperating cylinder and piston members and being rigidly carried by one of said latter two members, means for rockably mounting the other of said two members upon said suspension means thereby allowing said pressure-applying element to assume an out-of-level position relative to said platen, means for exerting suction in the cylinder space to procure movement of said pressure-applying element away from said platen, and means for slowly bleeding air to said cylinder space to obtain under the force of gravity a slow movement of said pressure-applying element toward said platen.

6. A press of the class described comprising, a frame having a lower horizontally disposed bed or platen and an upper support or suspension means disposed above said platen, cooper-

6

ating piston and cylinder members arranged between said platen and said suspension means, a pressure-applying element rigidly carried by said cylinder and disposed directly over said platen, a normally endwise immovable piston rod having its upper end secured to said suspension means, a universal joint connecting the lower end of said piston rod to said piston thereby allowing said pressure-applying element to assume an out-of-level position relative to said platen, means for exerting suction in the cylinder space to procure movement of said pressure-applying element away from said platen, and means for slowly bleeding air to said cylinder space to obtain under the force of gravity a slow movement of said pressure-applying element toward said platen.

7. A press of the class described comprising, a frame having a lower horizontally disposed bed or platen and an upper support or suspension means disposed above said platen, cooperating piston and cylinder members arranged between said platen and said suspension means, a pressure-applying element rigidly carried by said cylinder and disposed directly over said platen, a normally endwise immovable piston rod having its upper end rockably mounted about a horizontal axis and upon said suspension means, a universal joint connecting the lower end of said piston rod to said piston thereby allowing said pressure-applying element to assume an out-of-level position relative to said platen, means for exerting suction in the cylinder space to procure movement of said pressure-applying element away from said platen, and a valve device movable in response to said suction and having therein a constricted conduit for slowly bleeding air to said cylinder space to obtain under the force of gravity a slow movement of said pressure-applying element toward said platen.

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