B. D. STEVENS.

SUCTION SHEET FEEDER.

APPLICATION FILED MAR. 3, 1921.

1,433,423.

Patented Oct. 24, 1922.

2 SHEETS—SHEET 1.

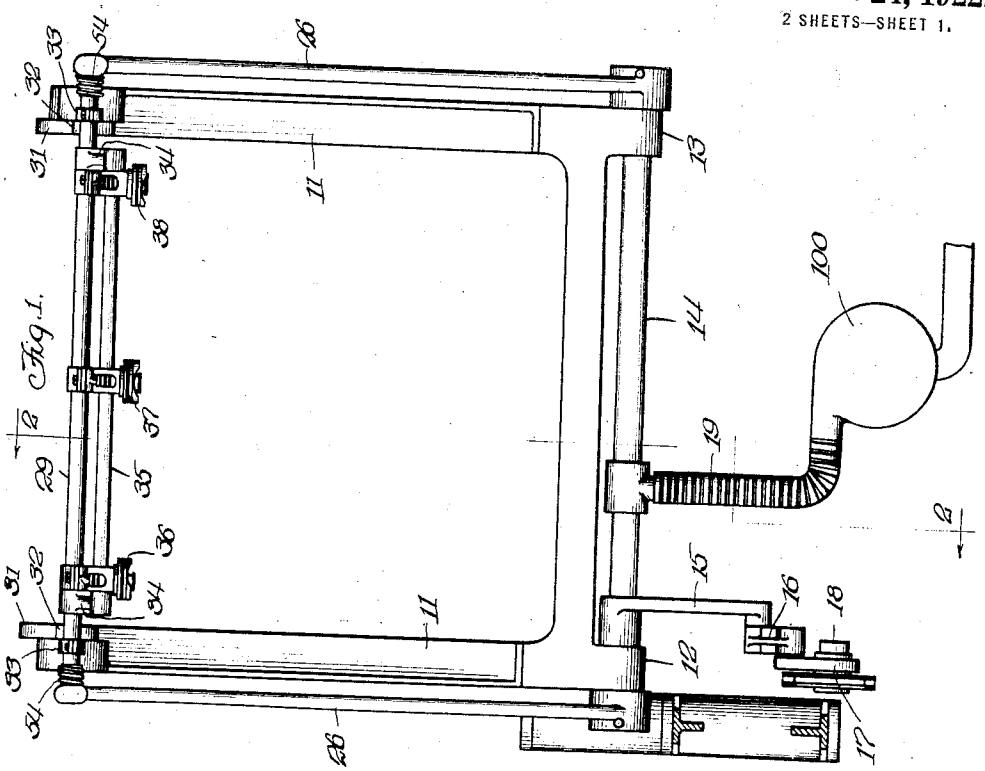


Fig. 1.

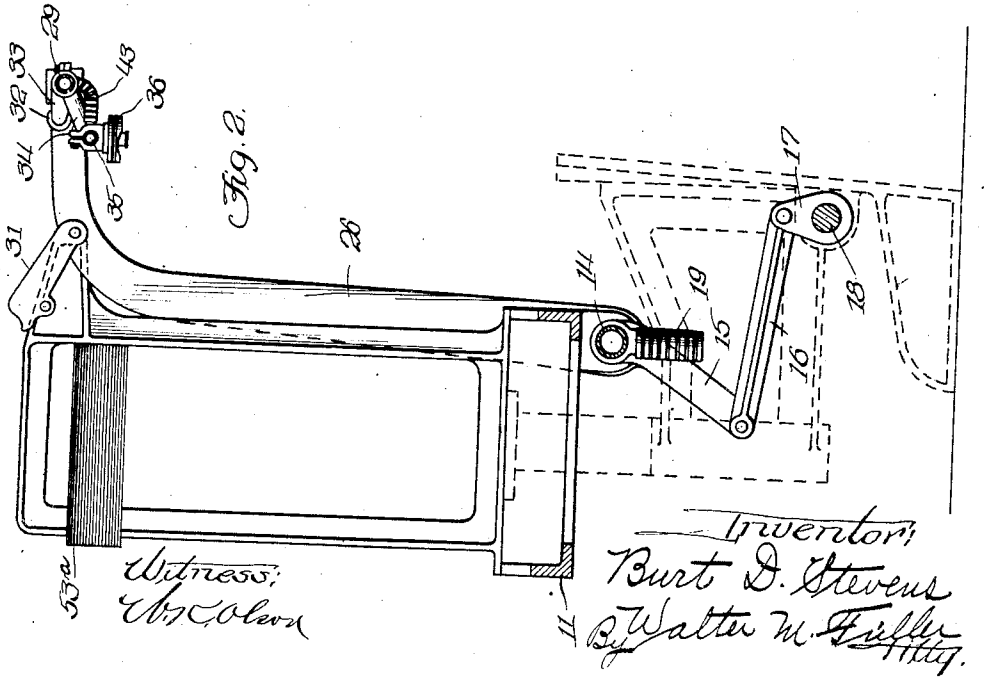


Fig. 2.

Witness:
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2 SHEETS—SHEET 2.

Fig. 3.

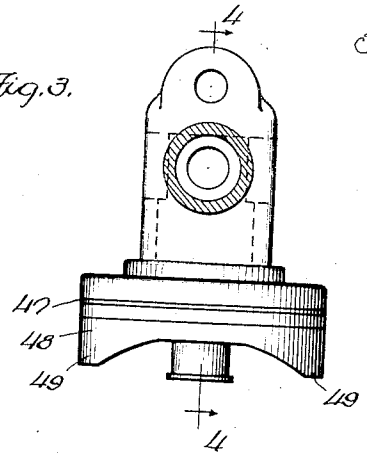


Fig. 4

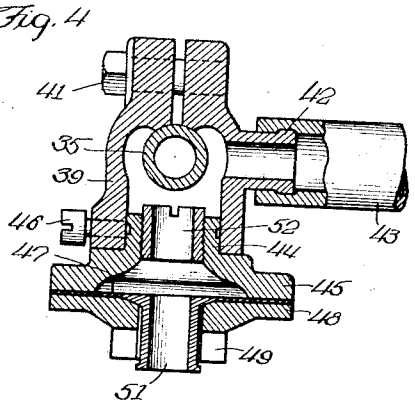


Fig. 5.

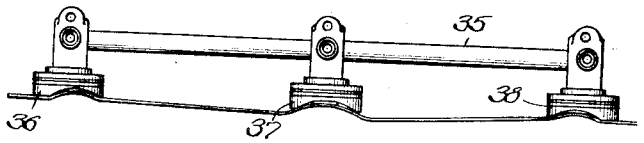


Fig. 6.

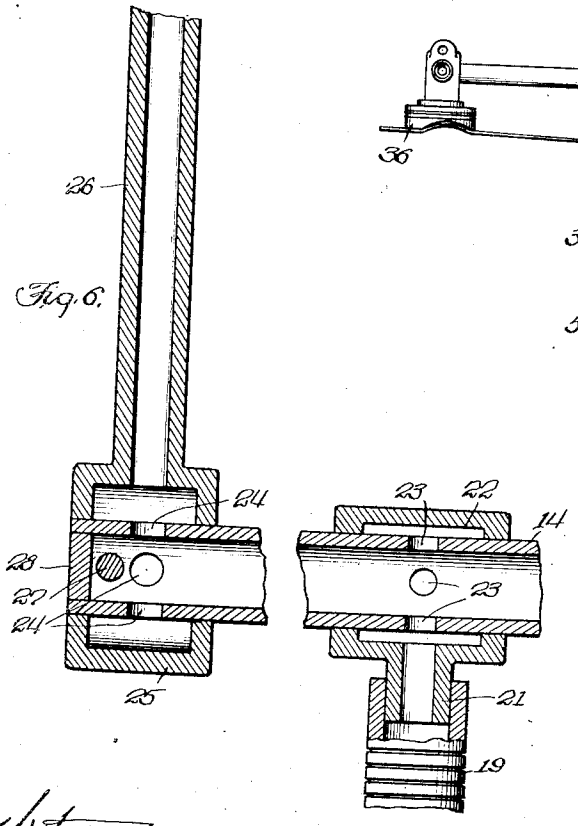


Fig. 7.

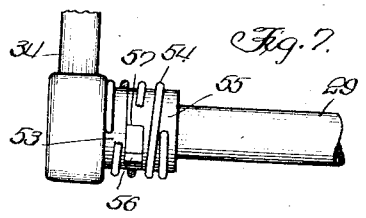
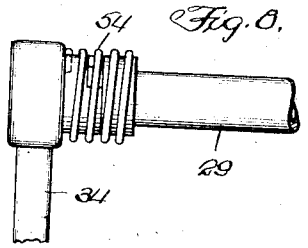


Fig. 8.



Witness:
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Inventor:
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By Walter M. Fuller Atty.

Patented Oct. 24, 1922. 1,433,423

UNITED STATES PATENT OFFICE.

BURT D. STEVENS, OF EVANSTON, ILLINOIS, ASSIGNOR TO MIEHLE PRINTING PRESS AND MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SUCTION SHEET FEEDER.

Application filed March 3, 1921 Serial No. 449,528.

To all whom it may concern:

Be it known that I, BURT D. STEVENS, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Suction Sheet Feeders, of which the following is a specification.

Suction-feeders for sheets of paper, such as are adapted for use on printing-presses and similar machines, have been known and used for some time, and improvements and betterments in the structures and modes of functioning of such appliances constitute the subject-matter of the present invention.

One of the prime aims of the invention is to produce a construction of this general character which will readily and effectively pick up the top one of a pile or stack of paper or similar sheets and carry or transport it to a desired new position, as for instance on a registration feed-board, ready for gripping to the impression-cylinder of a printing-press.

In order that such suction appliance may with efficiency and certainty lift and remove only one sheet at a time from the pile or stack, it is so constructed that it will first buckle the sheet to secure its ready separation from the underlying stack and then raise and carry it away.

A further purpose of the invention is to provide a feeder or sheet carrier of this general type and style which is simple in design, which is effective and reliable in its work, which is unlikely to get out of order or require repairs, which is composed of few parts, which is relatively inexpensive to produce, and which is readily adjustable for the performance of different kinds of work.

In the accompanying drawings, forming a part of this specification, a convenient and desirable incorporation of the invention in physical form has been illustrated, and throughout the several views of these drawings like reference characters refer to the same parts.

In these drawings:

Figure 1 is a side elevation of the suction-feeder;

Figure 2 presents a vertical section on line 2—2 of the same showing a pile of sheets;

Figure 3 illustrates one of the suction feeding means in elevation;

Figure 4 is a vertical section on line 4—4 of Figure 3;

Figure 5 depicts the manner in which the plurality of suction feet buckle the sheet of paper;

Figure 6 is an enlarged fragmentary section showing the suction connection through the hollow operating shaft and one of the supporting arms for the suction-shoes; and

Figures 7 and 8 show the spring mounting and abutment means for the suction-shoe supporting shaft or tube in bottom plan and elevation, respectively.

The appliance, as will be readily seen from these drawings, to which reference should be made, include a suitable frame-work 11 affording aligned bearings 12 and 13 in its lower portion for a horizontal, hollow, oscillatory shaft 14 rocked by an arm 15 fixed thereto and connected by a link 16 to a crank-arm 17 on a drive-shaft 18 rotated by any approved means, not shown.

Suction is exerted in the interior of such shaft by an exhaust-pump 100 acting through a flexible tube or pipe 19 having an end fitted over a perforated stem 21 (Figure 6) projecting from and communicating with the interior of a hollow collar or sleeve 22 secured around the shaft and connected to its interior through a plurality of holes or apertures 23, 23 in the latter.

Each protruding end of the shaft is perforated at 24, 24 to establish connection between its interior and the hollow hub 25 of a hollow, bent, supporting arm 26, secured to the end of the shaft by a fastening pin 27, each end of the shaft being closed by a stopper or plug 28.

At their upper ends these two arms rockingly support a hollow shaft 29 in such manner that the passages in the arms are in communication with the chamber of the shaft, as, for instance, in a way similar to that shown in Figure 6.

Thus the suction or exhausting action present in the tube or pipe 19 is transmitted through the shaft 14 and arms 26 to both ends of the upper shaft, thus in some degree equalizing such action throughout the length of the upper shaft.

As the shaft 29 travels bodily back and forth due to the rocking of its supporting arms 26, 26, it is oscillated by reason of two,

stationary cams 31, 31 mounted on opposite sides of the frame with the upper inclined surfaces of which rollers 32, 32 on arms 33, 33 fixed to the hollow shaft 29 coact.

Such shaft 29 has two arms 34, 34, rigidly mounted thereon and hence adapted to rock or oscillate therewith, carrying a rod 35 in their free ends parallel to the shaft.

The rod is provided for the purpose of adjustably supporting one or more spaced suction-shoes, three being shown in the present instance and characterized 36, 37 and 38.

Each of such shoes comprises, as shown in Figures 3 and 4, a main, hollow, split member 39 designed to be fastened on the rod 35 by a tightening or clamping screw 41, such shell member having a lateral, perforated lug or tubular extension 42 communicating with its interior chamber and connected to a flexible hose or tube 43, the other end of which by a hollow collar or sleeve connection, like or similar to that shown in Figure 6, is connected to the interior of the hollow shaft 29.

Element 39 has a round hole or bearing in its bottom accommodating an annularly-grooved, angularly-adjustable shank 44 of a hollow diaphragm-holder 45, the latter being retained in element 39 and maintained in proper adjusted position with relation thereto by a set-screw 46 extended through the wall of the part 39 and projecting into the groove of the shank 44.

Obviously by the construction shown and described any angular adjustment of the part 45 relative to its supporting member 39 may be readily effected and each suction-shoe as a whole may be fastened to its supporting rod in any one of a number of positions along the rod. Thus the several shoes may be so arranged with reference to one another to secure the best results in handling the sheets in the manner hereinafter described.

The circular border portion of a round rubber or other suitable flexible diaphragm 47 is clamped or fastened between the flat bottom ring-shaped face of the holder 45 and the top face of a centrally-apertured clamp-plate 48 equipped on its under surface with oppositely-disposed marginal projections 49, 49.

As is clearly shown in Figure 4, the flexible or elastic diaphragm is centrally apertured and provided with a downwardly-projecting, tubular extension or suction foot 51 in register with such hole and adapted at its lower end to engage the surface of a sheet of paper and through which the suction is exerted on the latter.

It should be noted that, whereas the external diameters of the two companion elements 45 and 48 are the same, the former bears on a much less area of the top face of the diaphragm than the latter does on its bottom surface, whereby the diaphragm may buckle, bow, or bend up into the chamber of the holder 45 when the lower end of tube or foot 51 is closed by the paper sheet and suction is imposed on the appliance.

To limit the extent or degree of such upward bowing or arching of the diaphragm, a hollow, adjustable screw 52 (Figure 4) is threaded into the passage through the shank 44, the lower end of such screw limiting the amount of upward deflection or distortion of the diaphragm.

As the arms 26, 26 swing toward the appropriately-supported pile of paper sheets 53^a, the rollers 32, 32 travel up the inclines of the cams 31, 31, thus rocking the shaft 29 and swinging the suction-shoes upwardly to escape the pile until they are over it, whereupon the rollers in passing down on to the lower portions of the cams permit the descent of the shoes on to the top sheet of paper, the lugs or projections 49 and the suction tubes or feet 51 resting on the latter.

Assuming that the tube or pipe 19 is subjected to a pressure less than atmospheric and that such suction is present in all of the plurality of the sheet-transporting shoes 36, 37 and 38 by reason of the connections 22, 23, 14, 24, 25, 26, 29, 43 and 42, as soon as the shoes have descended on to the pile the top paper sheet closes the ends of the several tubes 51 and the suction arches or bows upwardly the diaphragms 47 until they strike their abutment or stop screws 52.

During such ascent of the diaphragms, their tubes still clinging to the top sheet, buckle the latter because adjacent portions of it are held down by the feet 49, 49, and such warping or slight bending of the paper facilitates its ready separation from the underlying sheets assuring the removal of one sheet only at a time.

The sheet having thus been warped or buckled for the purpose indicated, the arms 26 begin their reverse travel, causing an initial ascent of the shoes by reason of the coaction of rollers 32 with their cams, thus rendering easy the lifting of the sheet, whereupon it is conveyed away by the shoes and deposited on a support provided for that purpose, the suction being released or discontinued at the proper moment by any suitable, automatically-actuated, controlling valve, not shown.

In order to prevent the suction-shoes from jumping or jerking during the coaction of rollers 32, 32 with cams 31, 31, shaft 29 at both ends is fitted with coil torsion springs 54, 54 tending to rock the shaft in a direction to depress the shoes. Each of such springs encircles a notched hub 53 on the corresponding arm 34 and an interfitting notched collar 55 rigid with the shaft, the end walls or shoulders 56 and 57 of the two

notches acting as cooperating stops to limit the descent of the suction-shoes when the rollers 32 are free from their cams 31.

Within the scope of the appended claims specifying the invention fall many embodiments of the latter differing from one another in details of structure but all incorporating the underlying principles of construction and modes of operation characteristic of this invention. Obviously the latter is not limited and restricted to the single embodiment illustrated and described in detail.

I claim:

1. In a suction sheet-feeder of the character described, the combination of a shoe adapted to engage the top sheet of a pile, a suction-device comprising a flexible diaphragm and a suction-foot thereon movable relatively to the shoe and adapted by such movement to buckle said top sheet while engaged by the shoe to facilitate its separation from the pile and then to transport the sheet while held thereto by the suction, and means to operate said shoe and foot, substantially as described.

2. In a suction sheet-feeding appliance of the character described, the combination of a hollow suction-shoe, a flexible apertured diaphragm extended across the chamber of said shoe, a perforated suction-foot mounted on and movable relatively to the shoe by the flexing of said diaphragm, means on said shoe adapted to bear on the top sheet of a pile, means to operate said shoe, and means to apply suction to said shoe, whereby the suction flexes the diaphragm and moves the foot to which the sheet adheres while said bearing portion of the shoe engages the sheet, thereby first buckling the top sheet to facilitate its separation from the pile and then transporting it while adhered to said suction foot, substantially as described.

3. In a suction sheet-feeding appliance of the character described, the combination of a shoe adapted to engage the top sheet of a pile, a suction-foot movable relatively to said shoe to first buckle such top sheet while engaged by the shoe to facilitate its separation from the pile and then to transport the sheet while held thereto by the suction, adjustable means to limit the extent of movement of the foot relatively to the shoe, and means to operate said shoe and foot, substantially as described.

4. In a suction sheet-feeding appliance of the character described, the combination of a hollow suction-shoe, a flexible apertured diaphragm extended across the chamber of said shoe, a perforated suction-foot mounted on and movable relatively to the shoe by the flexing of said diaphragm, means on said shoe adapted to bear on the top sheet of the pile, means to operate said shoe, means to apply suction to said shoe, and adjustable means to limit the flexing of the diaphragm to determine the amount of buckling of the sheet, whereby the suction flexes the diaphragm and moves the foot to which the sheet adheres while said bearing means engages the topmost sheet of the pile thereby first buckling the top sheet to facilitate its separation from the pile and then transporting the sheet while adhered to said suction-foot, substantially as described.

5. In a suction sheet-feeding appliance of the character described, the combination of a hollow suction-shoe, a flexible apertured diaphragm extended across the chamber of and secured around its margin to said shoe, a perforated suction-foot mounted on and movable with said diaphragm and having its perforation in register with the aperture of said diaphragm, angularly adjustable means on said shoe adapted to bear on the top sheet of a pile, means to operate said shoe, and means to apply suction to said shoe, whereby the suction flexes the diaphragm and moves the foot to which the sheet adheres while said shoe engages the sheet thereby first buckling the top sheet to facilitate its separation from the pile and then transporting the sheet while adhered to said suction-foot, substantially as described.

6. In an appliance of the character described, the combination of a plurality of members constructed to first buckle the top sheet of a pile to facilitate its separation from the pile and then to transport the sheet, a support for said members, means to operate said support, means permitting angular adjustment of said members on said support, and means to operate said members, substantially as described.

7. In a suction sheet-feeder of the character described, the combination of a plurality of shoes adapted to engage the top sheet of a pile, a suction-foot for each shoe movable relatively to said shoe to first buckle said top sheet while engaged by the shoes to facilitate its separation from the pile and then to transport the sheet while thus held thereto by the suction, means to adjust said shoes relatively to one another, and means to operate said shoes and feet, substantially as described.

8. In a device of the character described, the combination of an abutment adapted to engage a sheet of paper, and means to buckle the sheet while thus engaged including a flexible diaphragm, a suction foot thereon designed to contact with the sheet, and suction means to flex said diaphragm and thereby lift said foot.

BURT D. STEVENS.