

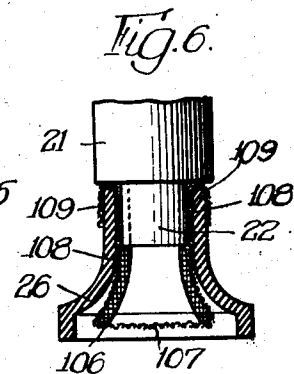
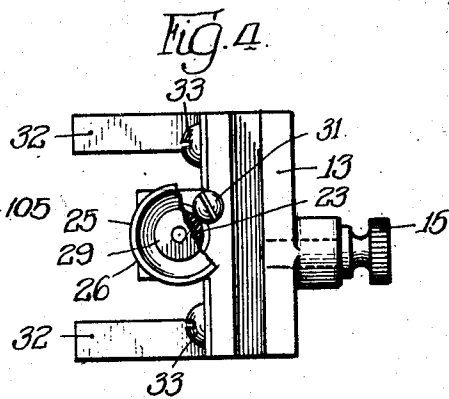
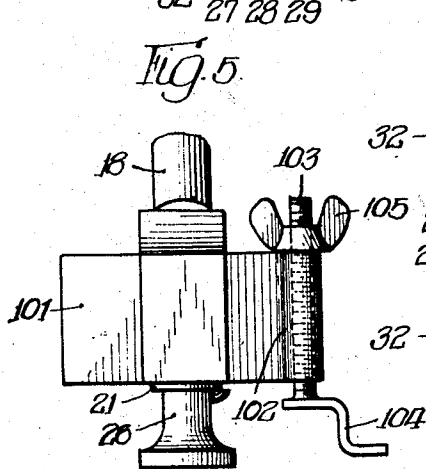
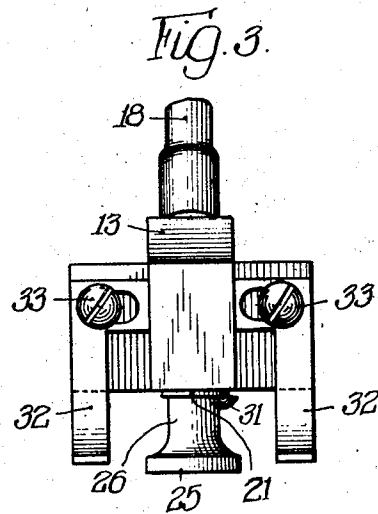
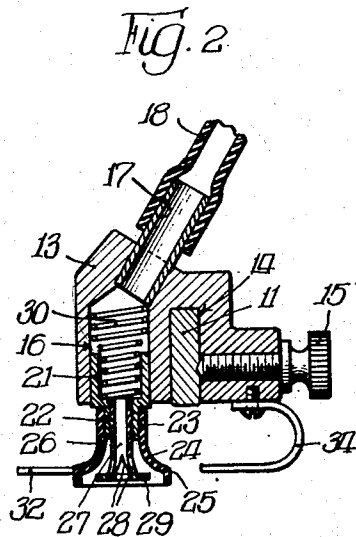
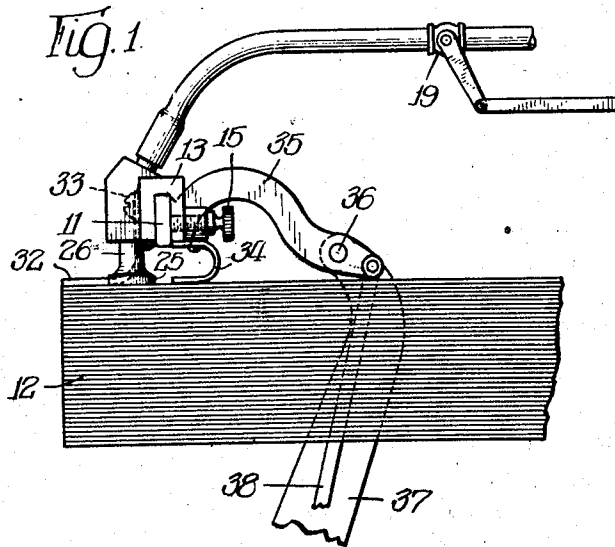
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SHEET SEPARATOR AND FEEDER

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## UNITED STATES PATENT OFFICE

2,163,274

## SHEET SEPARATOR AND FEEDER

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9 Claims. (Cl. 271-26)

The present invention pertains or relates to novel and improved means for separating the top sheets individually in succession from a pile of sheets of paper, cardboard, or the like, and it is intended for employment on suction-fed automatic printing-presses and automatic feeders for printing-presses and the like.

One outstanding and prominent object or purpose of the invention is to provide simple and effective suction means for separating the sheets one at a time from the top of the pile and carrying or conveying them away without danger of the next underlying sheet adhering thereto or of becoming displaced or mal-positioned.

To enable those trained and skilled in this art to understand the valuable features of structure and beneficial mode of operation of devices incorporating the invention, present preferred embodiments of the invention have been illustrated in the accompanying drawing, in which like reference numerals have been employed to designate the same structural parts in the several views, this appliance being described in detail below.

In this drawing:

Figure 1 is a side elevation of one of the suction appliances of which two or more would ordinarily be employed;

Figure 2 is an enlarged vertical section through the device;

Figure 3 is a front elevation of the same;

Figure 4 is a bottom plan view;

Figure 5 is a front elevation of a modified structure; and

Figure 6 is a fragmentary, enlarged, vertical section through the suction-cup portion of the device.

Referring to this drawing, it will be observed that one only of two like structures has been illustrated, each being employed adjacent to one of the front corners of the pile of sheets.

Each such sheet separating and feeding device is mounted on a suitable horizontal bar 11 supported in any convenient manner adjacent to one edge of the sheets of a pile 12, each device comprising an appropriately-shaped block 13 having a groove 14 in its lower part adapted to fit over the bar, as indicated in Figures 1 and 2, and maintained in proper position thereon by a set-screw 15.

In its lower portion, in front of the bar member, such block or casting 13 has a downwardly-opening cylindrical cavity 16 the upper end of which is connected through a tube 17 to a flexible, rubber hose 18 joined to a suitable source

of suction, not shown, through an automatically-operated valve 19, which at the proper moments subjects such cylindrical recess to the action of suction and at the correct times terminates such sub-atmospheric action therein, all as will be readily understood.

A hollow piston or plunger 21, slidable in and fitting smoothly in the cylinder 16, has a hollow stem 22 of lesser diameter projecting downwardly therefrom and on which is mounted the upper tubular portion 23 of a resilient or elastic rubber suction cup or shoe having a flaring lower portion 24 terminating in a marginal downwardly-directed flange 25, such suction-shoe or suction-cup being characterized, as a whole, 26.

Extended through the plunger-stem 22 and mounted therein in any convenient manner, as by a screw-thread connection, to permit its demounting for replacement of the suction-shoe, is a metal-tube 27 split or slit longitudinally at its lower-end and expanded, thereby providing one or more openings or ports 28, a centrally-apertured metal disc 29 of somewhat larger size being brazed or soldered or otherwise secured on, and in axial alignment with, its lower end, such disc being located slightly above the bottom open mouth of the suction-shoe as is clearly illustrated.

From what precedes, it will be apparent that, when the valve 19 is open, the suction is exerted on the inside of the rubber-shoe or suction-cup, and, when the latter is applied to a sheet of paper and raised, the sheet or that portion of the sheet will be lifted with it.

Such suction-shoe and the piston or plunger on which it is mounted are normally pressed down by a coiled spring 30 but the piston is prevented from leaving the cylinder and the suction-shoe is precluded from descending too far, by the head of a stop or limiting screw 31 which overlaps the lower end of the plunger, and when such screw is removed it allows the plunger to be taken out of the cylinder, the spring normally bearing at its upper end against the end wall of the cylindrical cavity and at its lower end against the end face of the recess in the plunger or piston.

Block or member 13 at each side of the suction-shoe is fitted with an angular foot or buckle gauge 32 adjustable on the element 13, toward and from the suction-shoe by reason of a slot and screw mounting 33 securing the gauge in position.

As will be readily appreciated, the lower bent ends or feet of such gauges are ordinarily positioned slightly above the mouth of the suction-shoe and are adapted to bear directly on the

sheet of paper or the like on which the suction-shoe acts.

Either one or both of such buckle-gauges may be used and it or they, as the case may be, is or are adjustable laterally of the suction-shoe to engage the sheet of paper at the proper point or points.

Also, if desired, although its use is not essential in all cases, another gauge or foot 34 may be mounted on the casting 13 and bear on the sheet of paper directly to the rear of the suction-shoe or cup.

Thus, the present appliance comprises a suitable, rubber vacuum-cup mounted on a hollow or cup-shaped piston or plunger freely slidably fitting in a cylinder of about twice the length of the piston, whereby the latter is capable of a substantial stroke in the cylinder with a like movement of the suction-shoe, so that, whenever the vacuum-shoe seals itself on a sheet of paper, the accumulated vacuum or suction in the cylinder automatically lifts or raises the piston and the associated suction-shoe, elevating that part of the paper sheet, the complementary spring assuring return of the suction-shoe to original position, as soon as the suction expires.

Bar 11 has a lateral arm 35 hinged or pivoted at 36 on a rock-arm 37 and arm 35 is actuated by a link 38, whereby, while the member 37 is stationary, bar 11 is first rocked upwardly by arm 35 in an arcuate path and then carried away by the rocking of arm 37 around its pivot, not shown.

Assuming that the device has been operated by the mechanism shown, or in any other approved manner, to bring the several gauges and the suction-shoe down on to the upper surface, near the corner, of the top sheet of the pile, when the suction is applied, either before or after such contact of the shoe or cup with the sheet, the sheet seals the mouth of the rubber suction member and is held thereto by the subatmospheric pressure in the shoe.

As soon as such sealing or closure occurs, the suction in the cylinder raises the plunger and shoe lifting that part of the sheet, the neighboring portions of the sheet being held down by the several gauges, thus buckling the sheet and securing effective separation of it from the next underlying sheet of the pile.

The flat disc 29 in the suction-shoe prevents buckling of the sheet into the suction-cup unduly or excessively, as otherwise it would be likely to take a permanent set, crease or wrinkle.

When the paper sheet engages such disc, it adheres thereto by reason of the suction existing in its aperture and closes the aperture, but this does not terminate the suction in the rubber-cup because of the openings 28.

Thus the suction is applied to the center of that portion of the sheet adhering to the suction-cup and also applied thereto in the form of a ring spaced outwardly from such center, the ring referred to being defined or bordered by the edge of the disc on the one hand and by the marginal flange on the suction-cup on the other hand.

The suction-cup having grasped the sheet in the manner stated, lever 35 is rocked by its link 38 to lift the bar 11 and several elements mounted thereon and afterwards arm 37 is rocked to convey the sheet away, the timing of these operations being anything desirable.

It is to be understood that any one, two or the three of the gauges may be used as occasion requires, and, as is well understood, the thinner

the paper the nearer gauges 32 should be to the suction-cup or shoe.

Obviously, when the conveyed sheet is to be deposited, the suction is terminated by the valve 19 and then instituted in the suction-cup later when it is to engage, separate and lift the next sheet.

A second and in some cases preferred construction is depicted in Figures 5 and 6 and, in this instance, the grooved block 101, corresponding to the member 13 in the other embodiment, has an upright boss 102 with a screw-threaded opening extended completely through it and adapted to receive the threaded shank or stem 103 carrying at its lower end a bent buckle-gauge 104, the portion of the stem above the member 101 being fitted with a thumb or set-nut 105.

By loosening the nut 105, the gauge, by turning it, may be adjusted as to both position and height and after the adjustment has been effected, it may be maintained by again tightening the nut.

As in the previous instance, the block 101 is otherwise the same as the part 13 and is fitted with like accessories including the hollow piston or plunger 21 and its downwardly-extended, hollow stem 22, but the stop or gauge inside of the suction-cup is different and is mounted in a modified manner, facilitating its removal and replacement.

In this case, this stop, characterized as a whole 106, inside of the suction-cup comprises a suitably-shaped piece of fine-mesh metallic-screen formed to provide a round, bottom, flat part 107 with oppositely-arranged transversely-curved tongues or strips 108, 109 which partially or wholly surround and grasp the stem 22 between them, their upper ends 109, 109 being bent outwardly and downwardly outside of the rubber suction-cup 26.

The resilient and elastic suction-cup when in place, as shown in Figure 6, holds the ends of the tongues against the lower face of the plunger 21 and compresses the tongues themselves against the stem 22 sufficiently to keep both the stop and the suction-cup in position, but nevertheless in a manner rendering them capable of demounting by pulling downwardly thereon, after which the parts may be readily replaced using a new suction-cup to take the place of the worn-out one.

As will be readily understood, the open mesh of the stop member permits the proper application of the partial vacuum inside of the rubber cup whereby to allow the latter to function in the manner already indicated, the stop 107 performing the work of the stop-disc 29 in the other embodiment of the invention.

Those acquainted with this art will readily understand that the invention is not necessarily limited to the precise and exact features of construction and mode of operation herein outlined and that major or minor modifications may be resorted to without departure from the heart and essence of the invention as defined by the appended claims and without the loss or sacrifice of any of the material benefits or advantages accruing from the employment of the invention.

I claim:

1. In an apparatus for successively separating the top-most sheets of a pile individually and conveying the same away from the pile, the combination of a member having a downwardly-facing cylindrical cavity, a plunger reciprocatory in said cavity, a hollow resilient suction-cup mounted on and movable with said plunger, conduit

means connecting the interior of said suction-cup with said cavity, a stop in and near the mouth of said suction-cup limiting the degree of flexure of the sheet in said suction-cup without interfering with the continuance of the suction in the cup acting on the sheet, a spring tending to force said plunger and suction-cup down, means limiting the descent of said plunger and suction-cup, means to apply and to terminate the application of suction in said cavity and suction-cup, one or more buckle-gauges mounted on and movable with said member, and means to move said gauge or gauges and suction-cup to engage the top sheet of a pile, to separate such sheet from the pile, and to convey it away, the applied suction in said cavity overcoming the action of said spring and raising the plunger and the suction-cup.

2. The structure presented in claim 1 in which said conduit comprises a tube mounted on said plunger and on which said suction-cup is mounted, said tube connecting said cavity with the interior of said suction-cup, and in which said stop is mounted on said tube.

3. The structure presented in claim 1 in which said conduit comprises a tube mounted on said plunger and connecting said cavity with the interior of said suction-cup, said suction-cup being mounted on said tube, and in which said stop

comprises an apertured disc with this aperture in communication with said tube, said tube having one or more openings therethrough above said disc and connecting with the interior of said suction-shoe.

4. The structure presented in claim 1 in which said stop is made of wire-mesh fabric.

5. The structure presented in claim 1 in which said plunger has a hollow downwardly-extended stem and in which said stop and said suction-cup are both mounted on said stem.

6. The structure presented in claim 1 in which said stop is made of wire-mesh fabric, in which said plunger has a hollow downwardly-extended stem and in which said stop and said suction-cup are both mounted on said stem.

7. The structure presented in claim 1 in which said stop is made of wire-mesh fabric, in which said plunger has a hollow downwardly-extended stem, and in which said stop and said suction-cup are both mounted on said stem, said suction-cup holding said stop on said stem.

8. The structure presented in claim 1 in which each buckle-gauge is adjustable angularly and as to height on said member.

9. The structure presented in claim 1 in which each buckle-gauge has a screw-threaded shank in a screw-threaded hole in said member, in combination with a lock-nut on said shank.

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