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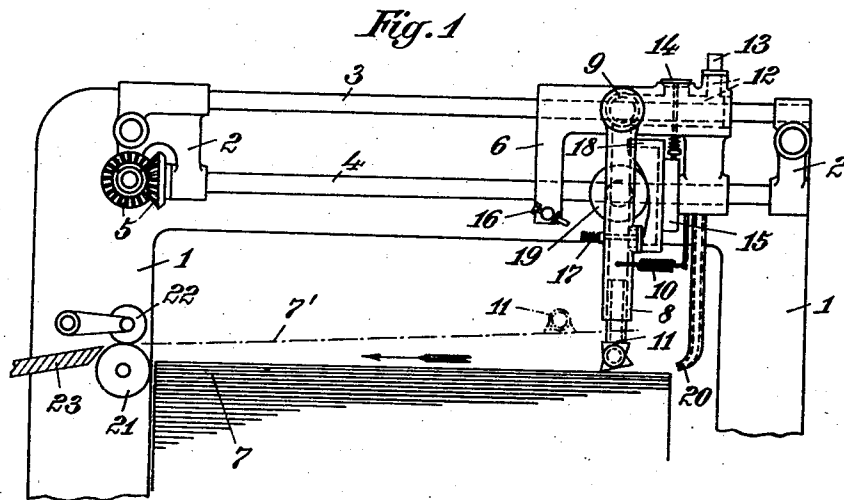
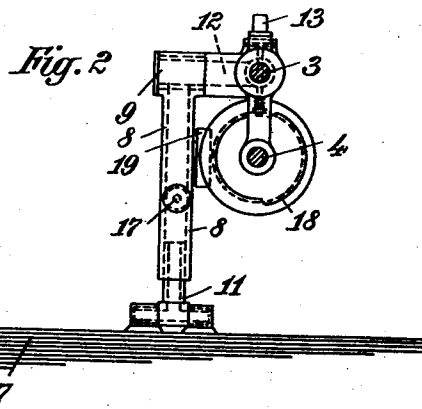
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2,224,802

DEVICE FOR LIFTING THE UPPERMOST SHEET FROM A PILE

Filed May 23, 1939

4 Sheets-Sheet 1



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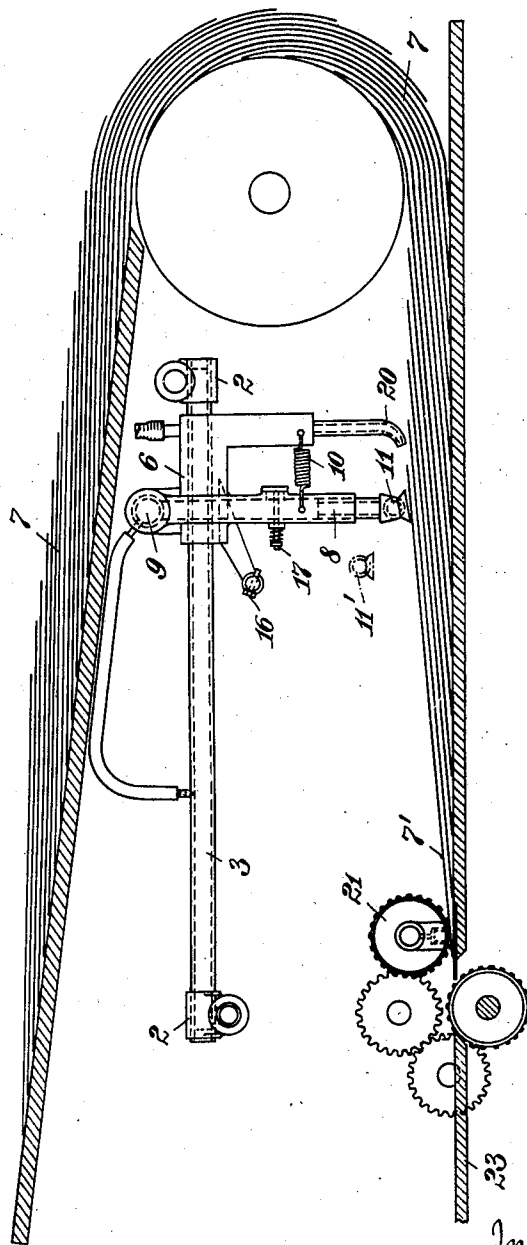
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DEVICE FOR LIFTING THE UPPERMOST SHEET FROM A PILE

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4 Sheets-Sheet 2

Fig. 3



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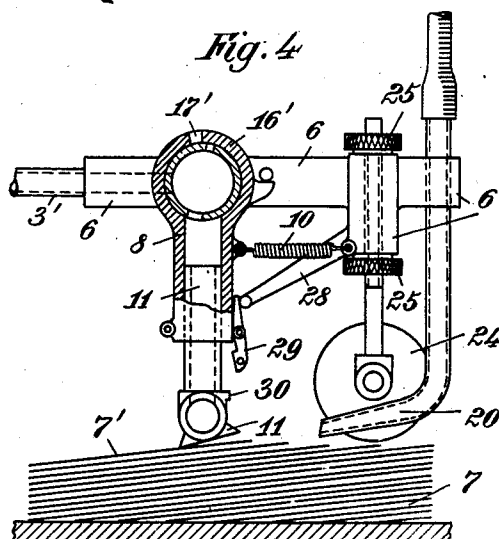
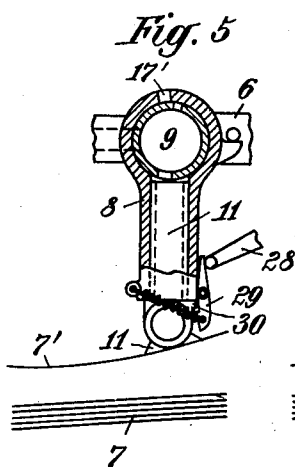
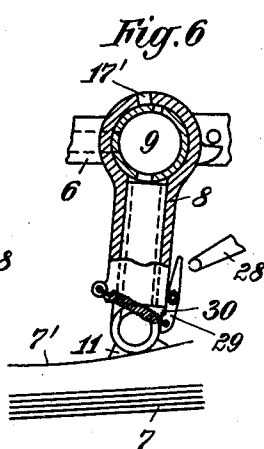
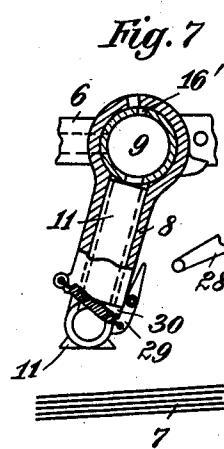
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DEVICE FOR LIFTING THE UPPERMOST SHEET FROM A PILE

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4 Sheets-Sheet 3



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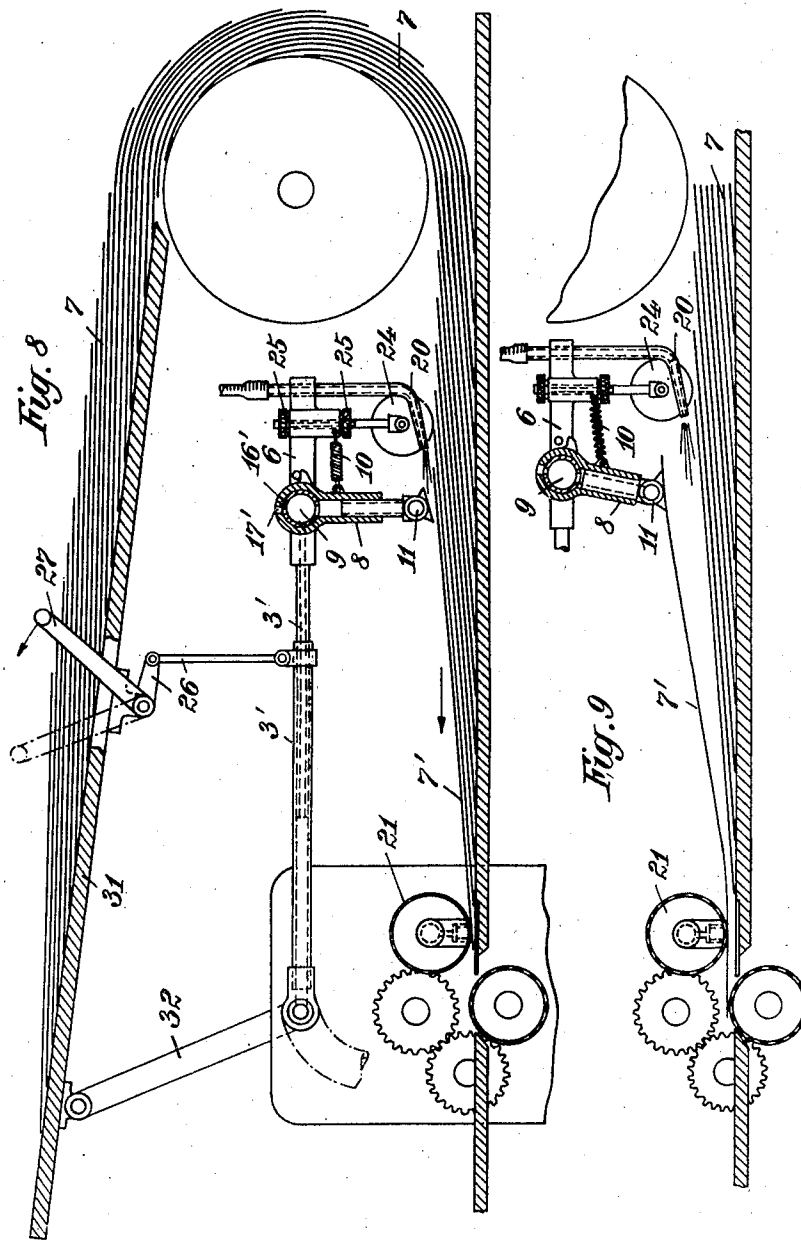
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DEVICE FOR LIFTING THE UPPERMOST SHEET FROM A PILE

Filed May 23, 1939

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,224,802

DEVICE FOR LIFTING THE UPPERMOST SHEET FROM A PILE

Georg Spiess, Leipzig, Germany

Application May 23, 1939, Serial No. 275,193
In Germany May 30, 1938

9 Claims. (Cl. 271—27)

This invention relates to improvements in sheet feeding devices and more particularly to a device for lifting or raising the uppermost sheet from a flat or fanned-out bank pile for rhythmically or non-rhythmically operating sheet working machines.

A device for lifting the uppermost sheet from a pile has already been proposed in which a suction nozzle rotatable around a pivot point lies, in its initial position, above the pile and sucks up the uppermost sheet thereof which is loosened by the blast air of a sheet separating device. Thereupon the suction nozzle describes a circular or rotary movement around its pivot point for forwarding the sucked-up sheet directly into a machine operating on it, for example a sizing or printing machine, the distance of the suction face of the suction nozzle from the pivot point being always the same and the sheet being consequently forwarded in a circular path. In another proposed device a plurality of suction nozzles movable in a vertical direction lift the uppermost sheet from the pile, which nozzles are moved, for carrying out the sheet forwarding operation, on a carrier guided in the horizontal forwarding direction of the sheet by means of a crank gear.

It has further been proposed to impart to a lifting suction member, besides the lifting or raising movement, also a swinging movement independent of the former by means of cams. For this purpose, however, a comparatively large number of moving means are necessary and the device does not operate with sufficient certainty or with sufficient rapidity for modern machines of high capacity.

In another device as heretofore proposed a gripper suction nozzle reciprocable only vertically is held in its raised position by an air controlled locking member with a displaceable air piston. As soon as the sheet, sucked up by the nozzle, is separated by its forwarding means from the suction opening thereof and thereby communication is established with the atmosphere, the pneumatic locking member is released and the suction lifting nozzle returns to its position on the uppermost sheet of the pile.

Devices have furthermore been proposed in which a pile feeler is connected to the suction nozzles lifting the sheets, in such a manner that it takes part in the lifting movement of the nozzle. It has also been proposed to swing the suction nozzle from its otherwise constantly vertical position positively around a pin, such that the nozzle, drawn by a linkage controlled by a cam, strikes against a stationary stop. This

swinging movement takes place, however, in a direction oppositely to the feeding direction of the sheet and thus constitutes a loss of time.

The object of this invention is to provide a device for lifting the uppermost sheet from a flat or fanned-out bank pile for rhythmically or non-rhythmically operating sheet working machines of any kind by means of one or more gripper nozzles. The construction of this novel device is very simple and allows the device to act in the feeding direction of the sheet either at the front or the rear end of the pile, or in any intermediate position according as to the size of the sheets to be acted upon and other conditions necessitate.

The invention consists in that the gripper nozzle constructed in any suitable manner carries out from its initial position, in which it lies on or approximately on the particular sheet to be raised at the time from the pile, both an automatic movement, effected by the suction air action of the gripper nozzle, for lifting the sheet and also a swinging movement around a pivot point which is effected in the sheet forwarding direction by other suitable means.

The movement of the gripper nozzle in the forwarding direction of the sheet can be either a positive movement controlled, for example, by a cam and carried out rhythmically or a non-rhythmic movement in which the gripper nozzle swingable around a pivot point is taken or carried along in the forwarding direction of the sheet by the forward pull thereof.

In accordance with the invention the suction action of the gripper nozzle is adjustable as regards time by a controllable stop, such as an adjusting screw influencing the device for providing a flow of atmospheric air into the suction conduit.

A further feature of the invention consists in that, in complete or approximate agreement with the duration of movement of the gripper nozzle or the action of the suction air in the latter, blast air is forced from a known pneumatic sheet separating device underneath the raised sheet. Both kinds of air are made dependent on one another so that the best possible saving of suction and blast air is obtained.

In accordance with the invention, the gripper nozzle, which may be of any suitable kind and swingable around a pivot point, is held, during its outward swinging movement in the direction of the sheet feeding, in its raised sucking position by a suitable locking means, which is released automatically, for example by contact against a stop, only towards the end, or on, or after, the

return swinging movement of the gripper nozzle into its initial position, whereupon the gripper nozzle can again take up its position on or approximately on the particular sheet to be raised from the pile.

Moreover, in accordance with the invention, a mutual displacement of the sheets is entirely avoided even if they are strongly adhering to one another owing to electric or other influences, because the air pocket under the sheet, produced in known manner by the blast air of the sheet separating device acting on the under side of the sheet, is maintained in its intensity in a manner not hitherto attained.

The gripper nozzle is, according to the invention, arranged on a swinging frame with a feeler constantly resting upon the sheet pile, which feeler in the known manner automatically regulates the suction position of the gripper nozzle corresponding to the height of the pile. On the swinging frame, moreover, is arranged the blast nozzle for the sheet separation, the position of which, relatively to the pile height, is likewise automatically regulated so that its blast action for the purpose of loosening and separating the uppermost sheet from the pile always commences at the correct position. The swinging frame, moreover, consists of two or more relatively displaceable individual parts, which can be formed as a telescopic-like suction conduit for the gripper nozzle. According to the relative displacement of the individual parts of the swinging frame, the parts arranged on it, such as the gripper nozzle, the pile feeler and, if necessary, the blast nozzle can be made to conform to any particular size of sheet. The swinging frame is, moreover, in accordance with the invention swingable out of its working position for the purpose of rendering the whole device inoperative.

In order that the invention may be fully understood I shall now describe some embodiments thereof by way of example by reference to the accompanying diagrammatic drawings, in which:

Figs. 1 and 2 are a side view, and a front view of the main portion, of one form of device for the rhythmic feeding of sheets from a flat pile.

Fig. 3 is an elevation of a modified arrangement for the non-rhythmic feeding of sheets from a fanned-out bank pile.

Figs. 4-7 are part sectional side elevations of a further modified device and showing the gripper nozzle in various different working portions, and

Figs. 8 and 9 are side views of the swinging frame showing the gripper nozzle, pile feeler and blast nozzle in different working positions.

Referring first to the embodiment shown in Figs. 1 and 2, a rod 3 is secured in bearings 2 on a side frame wall 1, and beneath the rod 3 is carried a constantly rotating shaft 4 having a bevel wheel gearing 5 arranged at one end thereof. On the rod 3 and the shaft 4 is arranged a carrier member 6 which is displaceable and fixable in the forwarding direction, indicated by the arrow in Fig. 1, of the uppermost sheet 7' raised from the pile 7. The adjustment is effected according to requirements and corresponding to the size of the sheets. On the carrier member 6 is swingably carried at 8 a hollow member 8, which a spring 10 constantly tends to bring into the position shown. In the lower part of the hollow member 8 is displaceably carried, after the manner of a piston, a gripper nozzle 11, which is supplied with suction air by means of air channels 12 and a pipe 13,

for connection to a suction pump, arranged in the carrier member 6. A spring-loaded valve 14 opening towards the outer air is arranged in the air channel in the carrier member 6, which valve is controlled by a cam 15 arranged on the shaft 4, and in the hollow member 8 is arranged a similar valve 17 controlled by an adjusting screw 16 on the carrier member 6. A cam disc 18, against which is pressed a roller 19 on the hollow member 8 under the action of the spring 10, is secured on the shaft 4 for the purpose of effecting the swinging movement of the gripper nozzle 11. The conduit 20 serves for effecting in the known manner the sheet separation by means of blast air. In the two frame walls 1 is, moreover, arranged adjacent the feed table 23 a forwarding roller 21 with a rhythmic roller 22 co-operating with it. The sheets can be withdrawn and forwarded from the pile 7 either individually or overlapped.

The above described device operates in the following manner:

In the position of the individual parts indicated in the drawings, on the further rotation of the shaft 4, the blast air in the conduit 20 for separating the sheet from the pile 7 and the suction air in the hollow member 8 and the gripper nozzle 11 is simultaneously positively started. The uppermost sheet of the pile is sucked on to the nozzle 11, whereby the latter, owing to the fact that its suction opening is closed by the sucked up sheet, is drawn, after the manner of a piston, into the hollow member 8 to an advantageously adjustable height and the uppermost sheet 7' is raised from the pile. Then or directly thereon the gripper nozzle 11 swings, owing to the rotation of the cam 18, in a clockwise direction. In order to prevent the sheet from being released from the suction nozzle 11 only in a rest position thereof, the adjusting screw 16 is so adjusted that by the striking of the valve 17 on the adjusting screw, air is introduced into the gripper nozzle 11 shortly before the end of the complete swinging-out movement thereof, and in this way the relieved suction nozzle 11 in the position 11' frees the sheet 7', which, in the meantime or now, is seized at the other end by the suction roller 21 or the forwarding rollers 21, 22 and brought to the feed table 23. The gripper nozzle 11 arrives in the position 11' in that it is drawn, after the manner of a piston, into the hollow member 8 and swung around the pivot point 9. As the sheet 7' is released during the swinging movement of the gripper nozzle 11 and is not withdrawn from a stationary suction nozzle, the sheet is very favourably treated and, in the case of a printed sheet, its printing is not smeared. Simultaneously with the entrance of air into the gripper nozzle 11, which takes place through the valve 14 opened by the cam 15, the blast air in the conduit 20 is positively stopped. The roller 19, then runs during the continued rotation of the shaft 4, on to the lowest part of the cam 18 and the gripper nozzle 11 is returned by the spring 10 into its initial position shown in the drawings, in which it again lies on the next uppermost sheet of the pile 7 or approximately on it, whereupon the cycle is repeated.

The gripper nozzle 11, secured against falling out of the hollow member 8, can, by suitable displacement of the carrier member 6 on the rod 3 and the shaft 4, contrary to the arrangement shown in Fig. 1, be caused to act at the other forward end of the sheet pile directly in front

of the forwarding rollers 21, 22 or the suction roller 21, or in any intermediate position.

In the embodiment shown in Fig. 3 for the use of the invention with a fanned-out bank pile 7 and a non-rhythmically working machine, the uppermost sheet 7', of the sheets superimposed in scale-like manner on one another, is engaged at its front end by a suction roller 21 and at its rear end by the gripper nozzle 11 arranged in its initial position shown in Fig. 3. On starting the blast air in the sheet separating conduit 20 and simultaneously the suction air for the gripper nozzle 11, the latter is drawn by the suction air after the manner of a piston into the hollow member 8 and the rear part of the uppermost sheet 7' is drawn up with it, whereupon the gripper nozzle 11, without the use of any other mechanical moving means, swings solely under the action of the pull of the suction roller 21 on the sheet seized by it, or, by the pull of the sheet, into the position 11'. If, by the striking of the valve 17 on the adjusting screw 16, the suction air conduit of the gripper nozzle 11 is then connected with the atmosphere, the nozzle 11 frees the sheet adhering to it. The gripper nozzle 11 then swings back, under the action of the spring 10, automatically into the initial position indicated in the drawings and lies automatically on the next uppermost of the scale-like arranged sheets of the fanned-out bank pile 7 or approximately thereon, whereupon the whole operation is repeated.

In the embodiment shown in Figs. 4-9 the valve 17 and the adjusting screw 16 are replaced by air channels 16' and 17'. Moreover, a roller 24 serving as a pile feeler is carried in the carrier member 6 by means of a forked rod displaceable therein and fixable by means of two nuts 25.

In the embodiment according to Figs. 4-7, the gripper nozzle 11 is shown in Fig. 4 in its initial position. It sucks the uppermost sheet 7' of the fanned-out bank pile 7 under the influence of the blast air coming from the separating nozzle 20. When this has taken place, see Fig. 5, the gripper nozzle 11 is drawn up into the hollow member 8 and then swings in the above-described manner around the hollow axis 9, Fig. 6. A locking pawl 29 arranged on the hollow member 8, moreover, is released from the stop 28 on the hollow member 8 and is displaced under the action of a spring automatically beneath a projection 30 on the gripper nozzle 11. The latter is thus now locked in its raised position within the hollow member 8. If, now, according to Fig. 7, the two air channels 16', 17' come into register with one another for the purpose of allowing the inflow of air into the hollow member 8 and the gripper nozzle 11, the gripper nozzle 11 releases the sheet 7' and returns automatically under the action of the spring 10 into its initial position shown in Fig. 4. Shortly before, or on, or after the finish of this return swinging movement the locking pawl 29 engages the preferably adjustable stop 28 and thus unlocks the projection 30 of the gripper nozzle 11, which can then return to its position on or approximately on the now uppermost sheet of the fanned-out bank pile 7.

In the embodiment according to Figs. 8 and 9, on the supporting table 31 for the fanned-out bank pile 7 is arranged a lever 32 and, moreover, a bell crank lever 26 carried in a frame and provided with a hand lever 27. To these two levers 26 and 32 is pivoted a swinging frame 3' consist-

ing of two telescope-like displaceable tubes, which frame carries at its other end the carrier member 6 with the hollow member 8 and gripper nozzle 11, the pile feeler 24 and the sheet separating nozzle 20. Owing to the suspension of the swinging frame 3' on the levers 26 and 32 the whole device can, by means of the hand lever 27, be swung upwardly out of its operative position according to Figs. 8 and 9 into an inoperative position.

The pile feeler 24 is so adjusted that the gripper nozzle 11 is always arranged at a suitable distance from the pile 7 or the uppermost sheet 7' thereof. From its initial position, Fig. 8, the gripper nozzle 11 swings out with the sucked-up sheet 7' as shown in Fig. 9, releases the sheet in the registering position of the air channels 16' and 17' and returns, under the action of the spring 10, into its initial position shown in Fig. 8 and again comes to rest automatically on or approximately on the next uppermost sheet. If a thinner or more yielding part of the sheet pile comes under the feeler 24, then the position of the gripper nozzle 11 and the sheet separating nozzle 20 is automatically correspondingly varied. In Fig. 9 the individual parts of the swinging frame 3' are drawn somewhat apart for a larger size of sheet.

I claim:

1. A device of the kind specified for use in the feeding of sheets from a pile to a sheet working machine, comprising the sub-combination of: a support; a suction gripper pivotally mounted on said support; pneumatic means associated with said gripper for moving the topmost sheet of the pile into engagement with said suction gripper; suction producing means for causing the sheet to adhere to said gripper and for causing the latter to be raised vertically upwardly away from the pile; means, independent of said suction means, for swinging said gripper and the sheet adhering thereto, around its pivot point in the direction of feed of the sheets so as to advance the raised sheet towards the sheet working machine; and adjustable means for putting said suction producing means out of operation for the purpose of releasing the sheet from said suction gripper as required.

2. A device of the kind specified for use in the feeding of sheets from a pile to a sheet working machine, comprising the sub-combination of: a support; a suction gripper pivotally mounted on said support; suction producing means associated with said gripper for drawing the topmost sheet of the pile into engagement with said suction gripper, said means also causing said gripper to be raised vertically upwardly to raise said sheet from the pile; means, independent of said suction producing means, for swinging said gripper and the sheet adhering thereto, around its pivot point in the direction of feed of the sheets so as to advance the raised sheet towards the sheet working machine; and adjustable means for putting said suction producing means out of operation for the purpose of releasing the sheet from said suction gripper as required, said means comprising a stop on said support and a valve on said suction gripper, said valve being adapted, on coming into contact with said stop, to open said gripper to the atmosphere.

3. A device of the kind specified for use in the feeding of sheets from a pile to a sheet working machine, comprising the sub-combination of: a support; a hollow tube, having an air outlet channel therein, carried by said support; said tube having a depending sleeve; a hollow tube slidably

mounted in said depending sleeve; a suction gripper carried at the lower end of said tube; a sleeve mounted in said first-mentioned hollow tube, said sleeve having a peripheral opening therein adapted to register with the air outlet channel in said first hollow tube on rotation of said sleeve; and a second peripheral opening adjacent said depending tube; means connected to said rotatable sleeve for producing suction in said suction gripper, for drawing the topmost sheet of the pile into engagement with said gripper, and for causing said gripper-carrying-tube to move upwardly after the manner of a piston, in said depending sleeve thereby raising said gripper and the sheet adhering thereto, vertically; and a sheet forwarding device associated with said sheet raising device, the arrangement being such that on the raising of the sheet by said gripper, said sheet is seized by said forwarding device and fed towards the sheet working machine, said suction gripper being taken along by said sheet with simultaneous swinging of said first-mentioned hollow tube around said inner sleeve until said outlet channel and peripheral opening register with one another, whereupon said suction gripper is opened to the air and the suction action thereof is cut off and said sheet is released; and means for returning said suction gripper to its initial vertical position.

4. A device of the kind specified for use in the feeding of sheets from a pile to a sheet working machine, comprising the sub-combination of: a support; a movable suction gripper for raising the topmost sheet from the pile carried by said support; means associated with said gripper for applying suction to said suction gripper to cause the topmost sheet of the pile to adhere thereto and for moving said gripper together with the sheet adhering thereto, vertically upwardly away from the pile; means, independent of said suction producing means, for moving said gripper, in the raised position thereof, in the direction of feed of the sheets; and releasable means for retaining said suction gripper in the vertically raised position.

5. A device of the kind specified for use in the feeding of sheets from a pile to a sheet working machine, comprising the sub-combination of: a support; a suction gripper pivotally mounted on said support; suction producing means associated with said gripper for causing the topmost sheet of the pile to be drawn into engagement with and to adhere to said suction gripper, said means also causing said gripper to be raised vertically upwardly to raise said sheet from the pile; means, independent of said suction producing means, for swinging said gripper and the sheet adhering thereto, around its pivot point in the direction of feed of the sheets so as to advance the raised sheet towards the sheet working machine; and a releasable locking pawl pivoted to said support operable to engage said suction gripper in the raised position of the latter for the purpose of retaining said gripper in the raised position during the swinging thereof in the sheet forwarding direction.

6. A device of the kind specified for use in the feeding of sheets from a pile to a sheet working machine, comprising the sub-combination of: a support; a suction gripper pivotally mounted on said support; suction producing means associated with said gripper for causing the topmost sheet of the pile to be drawn into engagement with, and to adhere to said suction gripper, said

means also causing said gripper to be raised vertically upwardly to raise said sheet from the pile; means, independent of said suction producing means, for swinging said gripper, and the sheet adhering thereto, around its pivot point in the direction of feed of the sheets so as to advance the raised sheet towards the sheet working machine; a releasable locking pawl pivoted to said support operable to engage said suction gripper in the raised position of the latter for the purpose of retaining said gripper in the raised position during the swinging thereof in the sheet forwarding direction; means for releasing the sheet from the said gripper; means for returning said gripper to its initial vertical position; and a stop carried by said support adapted, on return movement of said gripper, to release said locking pawl and allow said gripper to move downwardly substantially as described.

7. A device of the kind specified for use in the feeding of sheets from a pile to a working machine, comprising the sub-combination of: a support; a swinging frame pivotally suspended from said support; a horizontally movable carrier member mounted on said swinging frame; a pivoted suction gripper mounted on said carrier; means for moving said carrier horizontally on said frame to adjust the initial position of said gripper with respect to the pile; means, associated with said carrier member, for applying suction to said gripper to cause the topmost sheet of the pile to adhere thereto and for moving said gripper, together with said sheet, vertically upwardly away from the pile; and means, independent of said suction producing means, for swinging said gripper, in the raised position thereof, in the direction of feed of the sheets.

8. A device of the kind specified for use in the feeding of sheets from a pile to a working machine comprising the sub-combination of: a support; a swinging frame pivotally suspended from said support; a horizontally movable carrier member mounted on said swinging frame; a pivoted suction gripper; a pile feeler and a sheet loosening and separating device mounted on said carrier; means for moving said carrier horizontally on said frame to adjust the initial position of said gripper with respect to the pile; means, associated with said carrier member, for applying suction to said gripper to cause the topmost sheet of the pile to adhere thereto and for moving said gripper, together with said sheet, vertically upwardly away from the pile; and means, independent of said suction producing means, for swinging said gripper in the raised position thereof, in the direction of feed of the sheets.

9. A device of the kind specified for use in the feeding of sheets from a pile to a working machine, comprising the sub-combination of: a support; a swinging frame pivotally suspended from said support, said frame comprising at least two mutually displaceable parts, whereby the size of said frame may be adjusted in conformity with the size of sheet; a movable suction gripper pivoted to said swinging frame; means for applying suction to said gripper to cause the topmost sheet of the pile to adhere thereto and for moving said gripper, together with said sheet, vertically upwardly away from the pile; means, independent of said suction producing means for swinging said gripper in the direction of feed of the sheets; and means for moving said swinging frame into and out of operative position substantially as described.