

Dec. 13, 1955

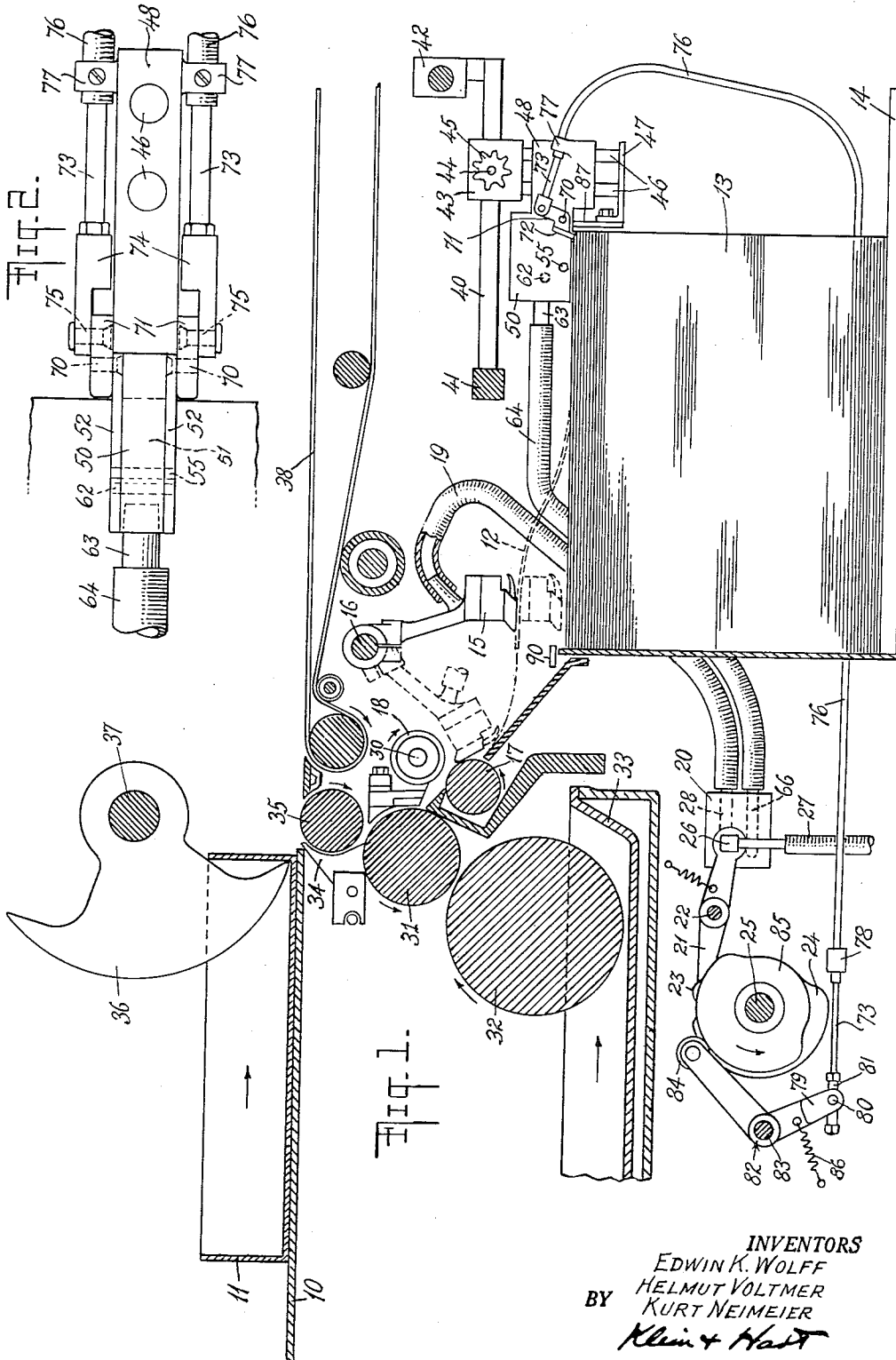
E. K. WOLFF ET AL

2,726,861

SHEET SEPARATING MECHANISM

Filed Aug. 28, 1951

2 Sheets-Sheet 1



INVENTORS
EDWIN K. WOLFF
HELMUT VOLTMER
KURT NEIMEIER
BY *Klein & Hart*
ATTORNEYS

Dec. 13, 1955

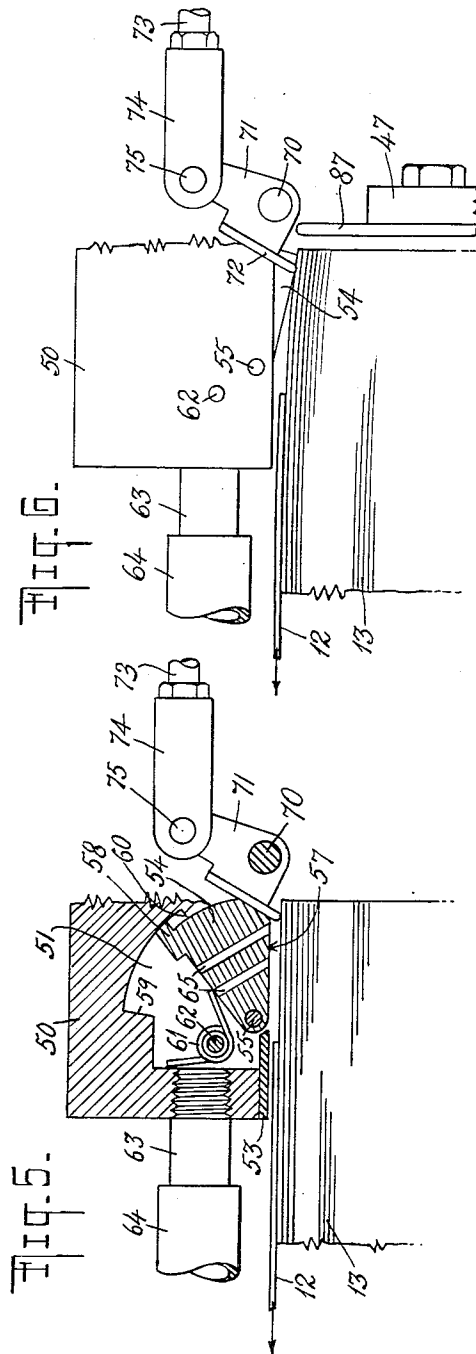
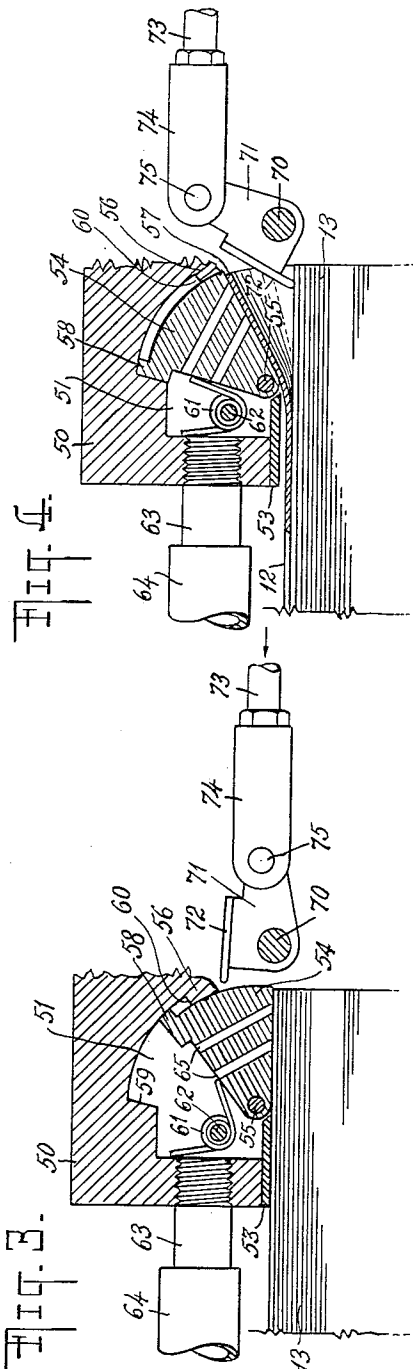
E. K. WOLFF ET AL

2,726,861

SHEET SEPARATING MECHANISM

Filed Aug. 28, 1951

2 Sheets-Sheet 2



INVENTORS
EDWIN K. WOLFF
HELMUT VOLTMER
KURT NEIMEIER
BY *Klein & Hart*
ATTORNEYS

1

2,726,861

SHEET SEPARATING MECHANISM

Edwin K. Wolff, Palisades Park, and Helmut Voltmer, Cliffside Park, N. J., and Kurt Neimeier, Chicago, Ill., assignors to New Jersey Machine Corporation, Hoboken, N. J., a corporation of New Jersey

Application August 28, 1951, Serial No. 244,058

21 Claims. (Cl. 271—26)

This invention relates to mechanism for separating and feeding paper sheets for use as box coverings, labels, box wraps and the like.

Sheets of the indicated type are usually removed from a stack of such sheets and fed in successive fashion to mechanism for performing some operation thereon, as for example, applying a coating of adhesive thereto, and then conveying the sheets to other means for further manipulation or treatment. Heretofore difficulty has been encountered in successively removing the top sheets of the stack without disturbing the underlying sheets in the stack. This has been found to be due to a number of reasons. For instance, when the top sheet in a stack is dragged over the stack in the usual manner of removal, the friction and static created by the sheet being removed tends to drag the underlying sheet with it. If the sheets are varnished and inked, as in the case of wrappings and labels, the varnished or inked surfaces thereof have a certain tackiness which increases the tendency of the underlying sheets to be moved from their proper position in the stack as the top sheet is removed therefrom. Further, the sheets in such stacks are often die cut in groups and as the fibers along the cut edges of the sheets in each group become interlocked by the die cutting action, the withdrawal of the uppermost sheet thereof will invariably disturb the position of the underlying sheets in the group. As a result of the foregoing and other factors, it is practically impossible to remove the top sheets from a stack without dragging along one or more of the underlying sheets and disturbing the proper arrangement of the stack. Some attempts have been made by the art to correct this condition. For example, it has been proposed to blow air in between the top and underlying sheets during the sheet removal operation, but this method proved unsuccessful because it was necessary to use such a great force of air to cause a satisfactory separation that the underlying sheets were forced out of position by the air stream. So far as applicants are aware, the art has not heretofore provided a satisfactory solution to this problem.

It is the primary purpose of this invention to provide an improved means whereby the paper sheets may be separated and fed from a stack of the same without disturbing the proper relation of the underlying sheets in the stack.

Other objects and advantages of the invention, as well as the novel features of construction thereof, will appear from a perusal of the following description when read in connection with the accompanying drawings in which Fig. 1 is a fragmentary sectional elevation of a machine embodying the invention; Fig. 2 is a top plan view of a part of the sheet removing and separating means; and Figs. 3 to 6 are side elevational views, partly in section, and illustrating the manner in which the apparatus removes a sheet from the stack without disturbing the underlying sheets.

For the purposes of illustration and explanation, the invention is shown in the drawings as incorporated in a well known form of machine for applying sheets of paper to hollow containers, it being understood that the inven-

2

tion is not in any sense limited to such application, but may be used to equal advantage in other machines for other purposes.

In a machine of the type illustrated there is provided a runway 10 leading to the point at which application of the sheets, labels or the like, takes place. Suitable means are associated with the runway 10 for properly advancing the articles, such as hollow containers 11 to such point of application. The sheets 12 which are to be adhered to the containers 11 are fed in successive fashion from the top of a stack 13 of such sheets carried by a support 14 which is mounted in any suitable manner in the machine so as to be vertically adjusted to maintain the top of the stack at a proper level for cooperation with the sheet removing means.

The means for transferring the sheets 12 in individual succession from the stack 13 comprises a suction head 15 pivotally connected at 16 with a member vertically movable in any well known way relatively to the stack 13 to pick up the uppermost sheet thereof as is shown in dotted outline in Fig. 1 of the drawings. Mechanism of any conventional type is provided for swinging the suction head 15 on the pivot 16 in a manner to transfer or deliver the sheet carried by such head to a pair of feeding rollers 17 and 18, as is shown in dotted outline in Fig. 1. Suction is developed in the suction head 15 through a tube 19 which is connected at its other end to a three way valve 20. Suction is provided by valve 20 in predetermined relationship to the cycle of movements of the suction head 15 by means of a rocking lever 21 pivoted at 22 and carrying at one end a roller 23 in rolling contact with a cam 24 mounted on the cam shaft 25. The other end of lever 21 carries a valve member 26 connected by means of a tube 27 to a source of suction, such as a suction pump. In the movements of lever 21 the valve member 26 periodically seats on one end of a passageway 28 in valve 20 to connect tube 19 and head 15 to the source of suction. The cam 24 is so designed that suction is provided in the suction head 15 just prior to the time it engages the topmost sheet 12 in the stack 13 and during the transfer of the leading edge of such sheet to the feeding rollers 17 and 18.

The feed roller 17 is journaled in the machine for rotational movement about a fixed axis and is intermittently driven in any suitable manner. The cooperating roller 18 is an idler roller carried by a shaft 30 which is carried by suitable means constructed and arranged to periodically move such shaft toward and away from roller 17, the arrangement being such that during the transfer of a sheet 12 by the suction head 15 the roller 18 is spaced from the roller 17, as shown in Fig. 1 of the drawings, so that the suction head can insert the leading edge of such sheet between rolls 17 and 18 which are stationary at that time. As soon as the leading edge of sheet 12 has been properly inserted between the spaced rollers 17 and 18, the latter is shifted towards the roller 17 so that the leading edge of the sheet becomes gripped between both rollers. At this stage, roller 17 is given its periodic rotation to cause the sheet 12 to be fed into engagement with the surface of an adhesive applying roll 31 which is adjacent to a transfer roll 32 journaled to rotate in a supply of suitable adhesive material provided in a container 33. The space between rollers 31 and 32 may be adjusted in any suitable manner to deliver the proper thickness of the adhesive to roller 31. The sheet engaging the adhesive coated surface of roller 31 is carried along thereby until it reaches a suitable pick-off device 34 which detaches such sheet from roll 31 and deflects the same into engagement with the surface of a deflecting roll 35. The latter continues the travel of the sheet 12 and brings its advancing or leading edge into surface engagement with the advancing end of the container 11 which projects at this time slightly

3

beyond the delivery end of the runway 10. At the proper time a device 36 in the form of a segmented cylinder and carried by shaft 37, is rotated by the latter so as to cause such device 36 to cooperate with roll 35 to apply a rolling pressure to the bottom of the container 11 and the sheet 12 and thereby securely adhere the two together. During this application of the sheet to the container they are moved onto a conveyor 38 which advances them to a place of discharge or to additional means for further manipulation of the sheet 12. At this time also, the roller 18 will have moved away from the feed roller 17 so that the sheet 12 will be drawn from the rollers 31 and 35 by the container 7 which is being shifted over the roller 35 by the device 36. After the attachment of a sheet 12 to a container 11 the above described cycle of operations will be repeated using a new sheet 12 and a new container 11.

When the suction head 15 is moved into position to pick up a new sheet 12 from the stack 13, mechanism comes into operation to lift the following end of such sheet and to prevent the underlying sheets in the stack 13 from moving while the sheet 12 is picked up by the suction head 15. As is shown more clearly in Fig. 1 of the drawings this mechanism includes a rail 40 which is carried at its ends by supports 41, 42 fixedly secured to the machine in any suitable manner. Slidably mounted on the rail 40 is a slide block 43 which may be moved along the rail to adjust the position of the devices carried thereby with relation to the stack 13. The slide block 43 may be secured in an adjusted position on the rail 40 by means of a set screw 44 provided with a knob or hand wheel 45. Depending from the block 43 are two spaced guide bars 46, 46 which are connected together at their lower ends by a bar or bracket member 47. The bars 46, 46 extend through spaced passageways in one end of a slide block or bracket 48, the cross-sectional area of such passages being slightly greater than the cross-sectional area of the bars 46, 46 so that such block 48 is freely movable in a vertical direction with relation to such bars. Bracket 48 may thus be considered to be a free floating bracket on bars 46, 46 within the range defined by the slide block 43 and the bracket or bottom stop member 47.

Supported by the floating bracket 48 is a block 50 which extends over the stack 13 and is adapted to rest on the latter in the manner shown in Figs. 1 and 3 of the drawings. As the stack is depleted or raised the floating bracket 48 permits block 50 to correspondingly change its vertical position to maintain its engagement with the top sheet in the stack. The block 50 is provided with a recess 51 whose open end is on the underside of such block and whose sides are closed by plates 52, 52 secured by an air tight connection to the side edges of the block 50. The forward end of the opening of recess 51 is closed by a plate 53 secured in air tight connection to the bottom surface of block 50 and the bottom edges of plates 52, 52. The remainder of the opening of recess 51 is closed by a movable member 54 which is substantially triangularly-shaped in cross-section and which is pivotally mounted at its apex on a shaft member 55 fixedly supported at its ends by the side plates 52, 52. It will be noted from Figs. 4 to 5 of the drawings, that the shaft 55 is so positioned relative to plate 53, the rounded apex of the movable member 54 which in section is defined by an arc of a circle concentric to the axis of rotation of such member 54, in the rotative movements of such member 54, moves closely adjacent to the beveled edge of plate 53 throughout the range of movement of the movable member 54. The outer or base end of the movable member 54 is also arc-shaped in section and slides past the convexly curved outer surface of a transverse abutment or rib 56 in the movements of the member 54. It will thus be seen that the recess in block 50, by reason of the side plates 52, 52, plate 53, member 54 and rib 56 is formed into a closed chamber having a wall 57 which may be

4

moved outwardly from the position shown in Fig. 4 to the position shown in Figs. 3 and 5 without changing the closed condition of such chamber. The range of movement of wall 57 is controlled by a stop member 58 provided on the movable member 54 and by the transverse shoulder 59 formed in the recess and by the inner side wall 60 of abutment 56.

The movable member 54 is normally urged to an outer position, with the wall 57 thereof substantially flush with the under surface of plate 53 and in engagement with the top sheet in the stack 12 by means of a spring 61 which is wound around a bar 62 supported at its ends by the side plates 52, 52, and which has one end bearing against the inner wall of the recess 51 and its other end bearing against the inner wall of movable member 54. The member 54 is moved inwardly against the pressure of spring 61 by suction applied to the closed chamber 51 through a nipple 63 and tube 64. The suction within chamber 51 is applied at wall 57 by a plurality of passageways 65 which extend through the movable member 54 and connect the suction chamber 51 with the atmosphere. The spring 61 is relatively weak so that when suction is present in the chamber 51 and the outer ends of passageways 65 are closed by the topmost sheet in the stack, it will permit the inward movement of member 54 by such suction. Suction is supplied to tube 64 through a passageway 66 in valve 20 to which it is connected and the valve member 26 when the latter is seated on one end of such passageway 66. The cam 24 controlling valve member 26 is so designed that the latter connects passageway 66 and tube 64 to the source of suction after the suction head 15 has delivered a sheet 12 to the feeding rollers 17 and 18 and until just prior to the time that such suction head 15 engages the next topmost sheet in the stack 13.

Pivotaly mounted on the side plates 55, 55 by axially aligned pins 70, 70 are a pair of levers 71, 71, each of which are provided on one arm with a finger 72. The levers 71, 71 are actuated in a counter clockwise direction as viewed in Figs. 3 to 5 of the drawings, from the position shown in Fig. 3 to the positions shown in Figs. 4 to 6 by flexible shafts 73, 73 which are each attached at one end to a lever 71 by a connection 74 pivotally connected as by a pin 75 to the other arm of such lever. Each shaft 73 extends through a housing 76 secured at one end to a lug 77 on bracket 48 and secured at its other end by a lug 78 provided on the frame of the machine, the other ends of the shafts 73 being pivotally connected to a yoke 79 as by means of a pin 80 and connections 81. The yoke 79 forms part of a lever 82 which is pivotally mounted on a fixed shaft 83 and the other arm of which is provided with a cam roller 84 which is maintained in engagement with a cam 85 by means of a spring 86. The cam 85 is designed to rock lever 82 to advance shafts 73, 73 and consequently rotate levers 71, 71 in a counter-clockwise direction just after the movable member 54 has been retracted under suction and to maintain such levers 71, 71 in rotated position until after the suction head has delivered the topmost sheet 12 in the stack 13 to the feeding rollers 17 and 18 and the latter have fully withdrawn such sheet from the stack. The bracket member 47 supports a vertically disposed stop member 87 against the upper end of which the levers 71, 71 bear at the end of their counterclockwise movement to limit the downward movement of the fingers 72, 72 on such levers and to raise the unit composed of block 50 and bracket 48 for purposes which will hereinafter become more clear.

It will be understood from the foregoing that during the operation of the machine the block 50 is in a floating position on or over the stack 13. As the suction head 15 moves from the feeding rollers 17 and 18 towards the stack 13 to pick up a new sheet 12, the block 50 will be in the position shown in Fig. 4 of the drawings, that is, slightly raised above the top of the stack 13 and with the movable member 54 retracted under suction. The movable member 54 has lifted a portion of the following end of

5

the topmost sheet 12 in the stack and the levers 71, 71 have been advanced in a counter clockwise direction by the flexible shafts 73 so that the fingers 72, 72 are in engagement with the portion of the following end of the sheet underlying the lifted portion of the topmost sheet in the stack. It is due to this engagement of the fingers 72, 72 with the stack that the block 50 and the floating bracket 48 are in a slightly raised position with relation to the stack. This facilitates the removal of the topmost sheet in the stack as it entirely eliminates any possible frictional resistance which might otherwise be created by the block 50 in the removal of such sheet.

When the suction head 15 in its travel to the stack moves into position to engage the leading edge of the topmost sheet 12, suction is developed in such head to enable it to grip the leading edge of the topmost sheet and the suction in device 50 is cut off, thereby releasing the latter's grip on the following edge of the topmost sheet 12 and enabling the spring 61 to advance the suction wall 57. During the advancement of wall 57, the suction device 15 will have started its movement towards the feeding rollers 17 and 18 drawing the topmost sheet from the stack 13 (note Fig. 5 of the drawings). During this drawing action, the engagement of the fingers 72, 72 on the underlying sheets will effectively lock them in position in the stack and prevent their disarrangement by the sheet 12 being removed by the suction head 15. During this drawing action a nozzle 90 (note Fig. 1) connected to a suitable source of air pressure delivers a minimum amount of air between the sheet being removed and the top of the stack to minimize the friction of such sheet on the top of the stack. As shown in Fig. 6 of the drawings, the movable member 54 will advance under the pressure of spring 61 until the outer wall 57 thereof is below and inclined with respect to the under surface of plate 53, at which position the stop 58 on such movable member will be engaged with the inner side 60 of the transverse rib 56 (note Fig. 3).

It will be understood that if the sheets in the stack 13 are made of soft spongy paper so that the stack as a whole is soft or are embossed or printed so that the edges of the stack droop, the fingers 72, 72 when resting on the stack will not be able to properly lift the block 50 sufficiently to prevent an undue friction on the top sheet 12 as it is being withdrawn by the suction device 15 as hereinabove explained. To take care of this situation, a stop 87 (note Figs. 1 and 6) is provided on the bracket member 47 so that as levers 71, 71 are advanced by the flexible shafts 73, 73, the arms thereof carrying the fingers 72, 72 will come into engagement with the upper edge of such stop, thereby limiting the pressure of the fingers 72, 72 on the stack and lifting the suction device slightly. The stop 87 is adjustable by means of a screw on bracket member 47 and is so adjusted for either the soft or printed paper being fed from the stack, that when the fingers 72, 72 are fully advanced, the block 50 will be positively lifted from the stack to permit the removal of the top sheet 12 with a minimum of friction, and at the same time the fingers 72, 72 will be clamping the second sheet sufficiently to keep it in position during the withdrawal of the top sheet 12.

After the topmost sheet 12 has been driven by the suction head past the device 50 in the feed of such sheet to the feed rollers 17 and 18, the levers 71, 71 are retracted by the flexible shafts 73, 73 to the position shown in Fig. 3 of the drawings, thereby enabling the floating suction device 50 to come to rest on the top of the second uppermost sheet in the stack. As the unit 50 moves into position upon the stack the member 54 thereof will be slightly retracted from its fully advanced position against the tension of spring 61 to a position which conforms to the underlying edge of the stack and with the wall 57 of such member 54 snugly seated on such edge of the stack. After the suction head 15 has delivered the removed sheet 12 to the feed rollers 17 and 18,

6

suction is applied to the chamber 51 thereby causing the movable member 54 to be retracted against the tension of spring 61. As member 54 retracts the suction created at the wall 57 thereof through the passageways 65 will cause the following edge of the topmost sheet in the stack to be bent upwardly about the apex of such movable member. Due to the bending of the sheet about such a sharp angle and to the inherent stiffness of the underlying sheet, the corresponding edge of the latter will be prevented from following that of the topmost sheet and only the topmost sheet will be so gripped by the suction unit 50.

Following the lifting of the following edge of the topmost sheet in the stack 13 by the member 54 of unit 50, the flexible shafts 73, 73 are actuated to advance the levers 71, 71. As the levers 71, 71 advance in a counter-clockwise direction the fingers 72, 72 carried thereby move in under the raised edge of the topmost sheet and bear on the end of the stack under such edge. The pressure of fingers 72, 72 on the stack causes the floating suction device 50 to be raised to a position slightly above the top of the stack and the remainder of the topmost sheet not gripped by its movable member 54. As previously mentioned this raising of the device 50 eliminates friction on the topmost sheet and facilitates its withdrawal. The cycle of operations of the parts are then repeated in the manner above described.

It will thus be seen from the foregoing that the apparatus of this invention provides a device which initially raises the following end of the topmost sheet in the stack and then locks in position the sheets underlying such topmost sheet at the edge of the stack underlying the raised portion of the topmost sheet, such locking action being maintained on the underlying sheets of the stack until the topmost sheet has been withdrawn therefrom by the suction head 15. The device satisfactorily and effectively performs its operations whether the stack of sheets are horizontal throughout their entire areas in the stack or whether the sheets are of such construction that the edges of a stack of such sheets will droop off. In this latter connection and also with respect to sheets of a soft spongy nature, the pressure of the sheet locking fingers 72, 72 on the stack is controlled to prevent undue drooping action of the edges of the stack under pressure. The range of movement of the movable member 54 can of course be predetermined to take care of the usual amount of drooping which occurs in stacks of sheets of the type on which the device is to operate.

While we have illustrated and described a preferred embodiment of our invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

We claim:

1. Mechanism for separating sheets from the top of a stack of sheets, comprising a floating device arranged to overlie the stack and to engage the top thereof, and means for floatingly supporting said device, to permit free movement of the latter toward and away from the top of the stack, said floating device including suction means for lifting a portion of the topmost sheet in the stack, and means for engaging the exposed portion of the next underlying sheet in the stack after the topmost sheet has been so lifted and for applying a holding pressure on such underlying sheet, said last mentioned means being connected to said floating device so as to raise the latter from the top of the stack as such means applies a holding pressure on such underlying sheet.

2. Mechanism for separating sheets from the top of a stack of sheets, comprising means for periodically removing successive topmost sheets in the stack, means for lifting the topmost sheet in the stack to expose the next underlying sheet prior to the removal of a topmost sheet by said removing means, a stack engaging device, means

for moving said device into engagement with the stack after the topmost sheet has been lifted to apply a holding pressure on an exposed portion of the next underlying sheet in the stack as the topmost sheet is being removed therefrom, and means separate from said device and from said device moving means and engageable with said device during the application of such holding pressure thereby to control the amount of pressure exerted on such underlying sheet by said device as the topmost sheet is being removed from the stack, said last mentioned means being stationary relative to said device during the movements of said device into engagement with and away from the stack.

3. Mechanism for separating sheets from the top of a stack of sheets, comprising a device arranged to overlie the stack and to engage the top thereof, said device including a movable suction member constructed and arranged on said device to lift a portion of the topmost sheet in the stack while said device is in engagement with the stack, means for floatingly supporting said device to enable the latter to rest by gravity on the stack, and means for engaging an exposed portion of the next underlying sheet in the stack after such topmost sheet portion has been so lifted, said last-mentioned means being constructed and arranged to lift said device from the stack during its engagement with the underlying sheet.

4. Mechanism for separating sheets from the top of a stack of sheets, comprising a floating device arranged to overlie the stack and to engage the top thereof under gravity, said device including a movable suction member constructed and arranged on said device to lift a portion of the topmost sheet in the stack while said device is resting by gravity on the stack, and means mounted on said floating device and constructed and arranged to engage an exposed portion of the next underlying sheet in the stack after such topmost sheet portion has been so lifted and to lift said device from the stack during its engagement with the underlying sheet.

5. Mechanism for separating sheets from the top of a stack of sheets, comprising means for periodically separating successive topmost sheets in the stack, and means for holding the next underlying sheet in the stack during the separation of a topmost sheet thereof, said second-mentioned means including a pivoted member carried by said first-mentioned means and having a sheet engaging finger, means supporting said member for pivotal movement about an axis movable relative to the stack of sheets, and means for periodically advancing said member to cause said finger to engage the upper end of the stack, said periodic means being constructed and arranged to maintain said finger in engagement with the stack for a predetermined period and to withdraw said member and finger at the end of such period, and said supporting means being so constructed and arranged that said axis is raised during the advancing engagement of said finger with the stack and is lowered during the retraction of said finger from the stack.

6. Mechanism for separating sheets from the top of a stack of sheets, comprising means for removing sheets from the top of the stack including a suction device arranged to overlie the stack and to engage the top thereof, means for floatingly supporting said suction device to permit free movement of the latter toward and away from the top of the stack and to enable said device to rest on the stack by gravity, means for adjusting the position of said floating support to adjust the position of said suction device relative to the stack in directions transverse to the directions of free movement thereof, and means mounted on said suction device and constructed and arranged to hold the next underlying sheet in the stack during the removal of a topmost sheet thereof.

7. Mechanism for separating sheets from the top of a stack of sheets, comprising means for removing sheets

from the top of the stack including a suction device arranged to overlie the stack and to engage the top thereof, a bracket supporting said suction device, means floatingly supporting said bracket, means for adjusting the position of said bracket support to thereby adjust the position of said suction device relative to the stack, means carried by said floating bracket and constructed and arranged to hold the next underlying sheet in the stack during the removal of a topmost sheet thereof, and means carried by said bracket support for limiting the holding pressure exerted on the underlying sheet by said holding means.

8. Mechanism for separating sheets from the top of a stack of sheets, comprising a floating device arranged to overlie the stack and to rest on the top of the latter by gravity, said device including suction means for lifting a portion of the topmost sheet in the stack while said device is resting on the top of the stack, and means to engage the stack under such lifted portion of the topmost sheet and raise such floating device against gravity from the stack, thereby permitting the free removal of such topmost sheet from the stack while holding the underlying sheets thereof.

9. Mechanism for separating sheets from the top of a stack of sheets, comprising a device arranged to overlie the stack and to rest on the top of the latter, said device including suction means for lifting a portion of the topmost sheet in the stack while said device is resting on the top of the stack, and means to engage the stack under such lifted portion of the topmost sheet and raise such device from the stack, thereby permitting the free removal of such topmost sheet from the stack while holding the underlying sheets thereof.

10. Mechanism for separating sheets from the top of a stack of sheets, comprising a device arranged to overlie the stack and rest on the top of the latter, said device including suction means for lifting a portion of the topmost sheet in the stack while said device is resting on the top of the stack and means to engage the stack under such lifted portion of the topmost sheet and raise such device from the stack, and guiding means for restricting the movements of said device in vertical directions.

11. Mechanism for separating sheets from the top of a stack of sheets, comprising a device arranged to overlie the stack and rest on the top of the latter, said device including suction means for lifting a portion of the topmost sheet in the stack while said device is resting on the top of the stack and means to engage the stack under such lifted portion of the topmost sheet and raise such device from the stack, a vertically disposed stationary guide restricting the movements of said device in vertical directions, and stop means located in vertically disposed spaced relation and restricting the range of vertical movement of said device relative to said guide.

12. Mechanism such as defined in claim 11, in which said guide and stop means are adjustably mounted for movement in a horizontal direction to adjust the position of said device relative to the stack.

13. Mechanism for separating sheets from the top of a stack of sheets, comprising a support, a guide member depending from said support, and extending from a point above the top of the stack a substantial distance downwardly, a device slidably mounted on said guide member and arranged to overlie the stack to rest on the top of the latter, stop means on the lower end of said guide to limit the downward movement of said device as the stack is depleted, said device including suction means for lifting a portion of the topmost sheet in the stack when said device is resting on the top of the stack and means to engage the stack under such lifted portion of the topmost sheet and raise such device from the stack to permit the free removal of the topmost sheet from the stack while holding the underlying sheets thereof.

14. Mechanism such as defined in claim 13 including a

stationary horizontally disposed bar in which said support is slidably mounted on said bar for adjustment in a horizontal direction relative to the stack, and including means for fixing said support in an adjusted position on said bar.

15. Mechanism for separating sheets from the top of a stack of sheets, comprising a suction device having a suction chamber and a movable suction member constructed and arranged on said device to periodically lift the following end of successive topmost sheets in the stack, means for supporting said device to enable the latter to rest on the stack, means on said device for engaging the exposed following end of the next underlying sheet in the stack after each topmost sheet has been so lifted and for applying a pressure on such underlying sheet such as will raise said device from the stack to permit the removal of a topmost sheet, a second suction device for periodically engaging the leading edges of the topmost sheets in the stack and for removing successive such topmost sheets while said engaging means holds said first mentioned suction device raised from the stack, a source of suction, valve means between said source of suction and both of said suction devices, and periodically operated means controlling said valve means to alternately connect the source of suction to said first and second mentioned suction devices.

16. Mechanism for separating sheets from the top of a stack of sheets, comprising a suction device having a movable suction member constructed and arranged on said device to lift a portion of the topmost sheet in the stack when said device is resting on the top of the stack, means for supporting said device to enable the latter to rest on the stack, and means for engaging the stack under such lifted portion of the topmost sheet and for raising said device from the stack to permit the removal of the topmost sheet from the stack while holding the underlying sheets thereof, said last mentioned means including a pair of levers pivotally mounted on the sides of said device and having sheet engaging portions adapted to come into engagement with the stack when said levers are advanced, and means for periodically advancing said levers to cause the sheet engaging portions thereof to engage the stack and thereby raise said suction device, and for periodically withdrawing said levers to permit said device to come to rest on the stack.

17. Mechanism for separating sheets from a stack of sheets comprising a suction device, a member receivable in the suction chamber of said device and forming a closure for such suction chamber, said member having a sheet engaging portion and having a passageway for bringing such portion into communication with said chamber, means supporting said member on said device for pivotal movement about an axis fixed relative to said device, means normally tending to bias said member about said pivot to an advanced position relative to such suction chamber to enable such portion to engage the terminal sheet in the stack, said member, when suction is applied to said suction device, being withdrawable into such suction chamber about said fixed axis against the action of said biasing means to draw the portion of the terminal sheet in the stack with which such portion of the member is engaged, means on said suction device adjacent to said pivotal axis to hold an adjacent portion of the terminal sheet against the stack as said member is withdrawn so that the drawn portion of the sheet makes a sharp bend with relation to the held portion thereof, and means carried by said suction device for engaging the exposed portion of the next adjacent sheet in the stack after the drawn portion of the terminal sheet has been so bent by said member and for moving said holding means away from the terminal sheet to enable free removal of the latter while holding the remaining sheets in the stack.

18. Mechanism for separating sheets from a stack of sheets comprising a suction device having a suction cham-

ber and including a member fixed with relation to said device and having a flat sheet engaging surface, and including a member movable relative to said device and having a flat sheet engaging surface, means pivotally supporting said movable member for movement about an axis fixed relative to said device and parallel and adjacent to adjoining edges of said fixed and movable surfaces, biasing means normally tending to maintain said movable member at a position where such surface thereof forms with said fixed surface a combined substantially flat sheet engaging surface, said movable member having a passageway for bringing said movable surface into communication with said suction chamber, said movable member when suction is applied to said chamber being withdrawable about said axis from said position against the action of said biasing means to draw the portion of the terminal sheet in the stack with which the surface of such movable member is engaged, supporting means for said device enabling said fixed surface to remain in engagement with the terminal sheet during the drawing action of said movable member so that the drawn portion of the sheet makes a sharp bend with relation to the portion of the sheet engaged by said fixed surface, and means carried by said device for engaging the exposed portion of the next adjacent sheet in the stack after the drawn portion of the terminal label has been so bent by said movable member, and for moving said device relative to said supporting means to move said fixed surface away from the terminal sheet to enable free removal of the latter while holding the remaining sheets in the stack.

19. Mechanism for separating sheets from a stack of sheets, comprising a device arranged to engage the terminal sheet in the stack, said device including suction means for drawing a portion of the terminal sheet in the stack and a member adjacent to said suction means for holding an adjacent portion of the terminal sheet against the stack as said suction means is drawing said first mentioned portion of the terminal sheet, and means to engage the stack under such drawn portion of the terminal sheet and to move said holding member out of engagement with the terminal sheet to enable the free removal of the terminal sheet from the stack while holding the remaining sheets in the stack.

20. Mechanism for separating sheets from a stack of sheets, comprising a device arranged to engage the terminal sheet in the stack, said device including a suction member for drawing a portion of the terminal sheet in the stack and a member adjacent to said suction member for holding an adjacent portion of the terminal sheet against the stack as said suction member is drawing said first mentioned portion of the terminal sheet, and means for moving said holding member out of engagement with the terminal sheet to enable the free removal of such sheet from the stack while holding the remaining sheets in the stack, said means including a member for engaging the stack under such drawn portion of the terminal sheet and mechanism for advancing such member after said suction member has moved the drawn portion of the terminal sheet away from the stack, and while said holding member is still in engagement with the terminal sheet, said mechanism being constructed and arranged to enable said engaging member to apply sufficient positive force to the stack to move said holding member out of engagement with the terminal sheet and to hold the remaining sheets in the stack during the removal of such terminal sheet.

21. Mechanism for separating sheets from a stack of sheets, comprising a device arranged to engage the terminal sheet in the stack and including means for drawing a portion of the terminal sheet in the stack while said device is in engagement with the stack, means to engage the stack under such drawn portion of the termi-

nal sheet and to move said device out of engagement with the terminal sheet to enable the free removal of the terminal sheet from the stack while holding the remaining sheets in the stack, said drawing means and said engaging means being constructed and arranged to have predetermined paths of movement relative to each other, and means for adjusting the position of said drawing means and said engaging means relative to said stack without changing the relation of such paths of movement.

5

References Cited in the file of this patent

UNITED STATES PATENTS

1,635,626	Liljebladh	July 12, 1927
1,755,662	Petersen	Apr. 22, 1930
1,929,361	Liljedbladh	Oct. 3, 1933
2,086,577	Reinartz	July 13, 1937
2,406,765	Harrold	Sept. 3, 1946
2,476,577	Backhouse	July 19, 1949