

July 26, 1927.

1,637,019

A. BROADMEYER
SHEET FEEDING APPARATUS

Filed Jan. 24, 1924

4 Sheets-Sheet 1

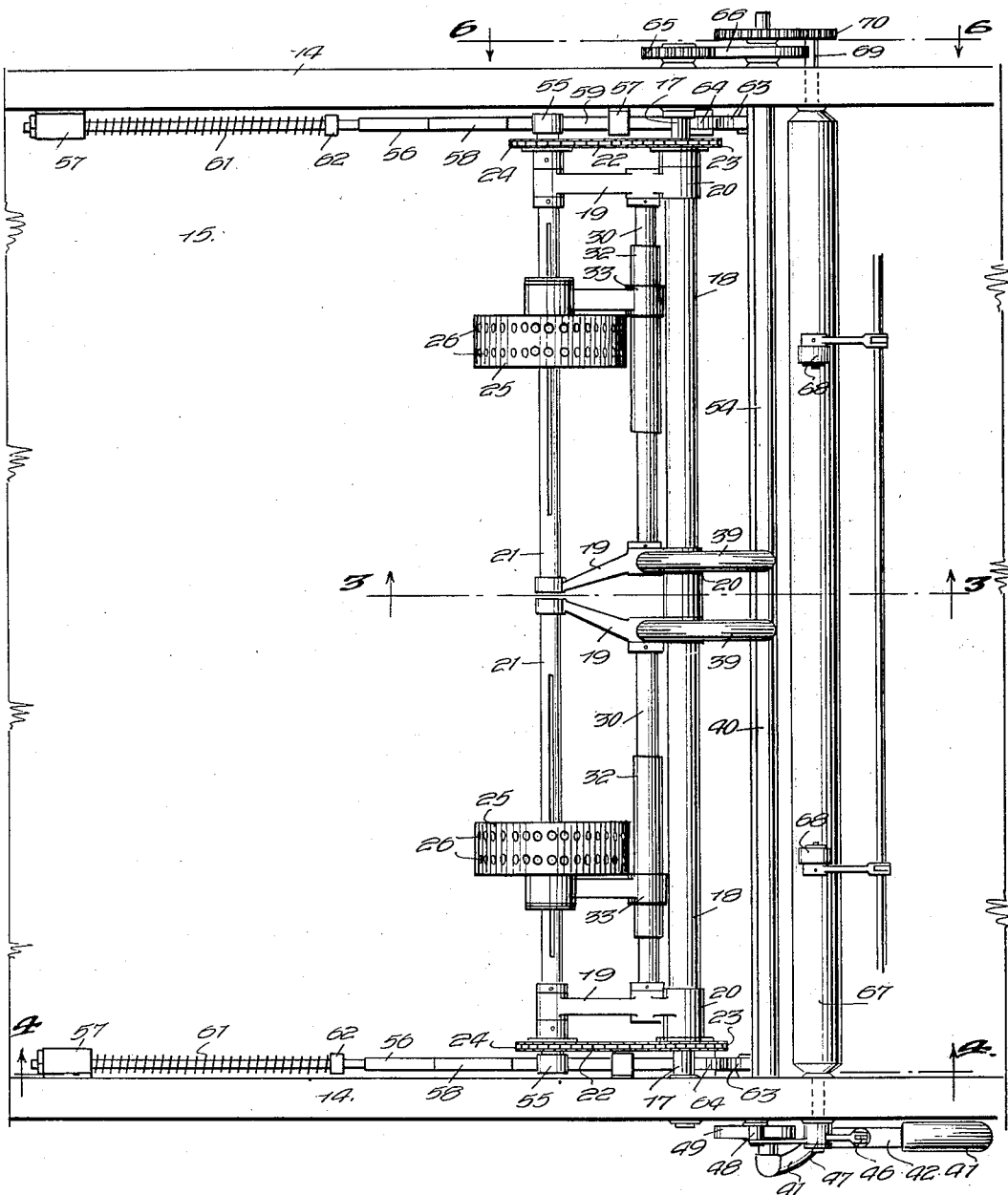


Fig. 1.

Inventor
Albert Broadmeyer

By

[Signature]

Attorney

July 26, 1927.

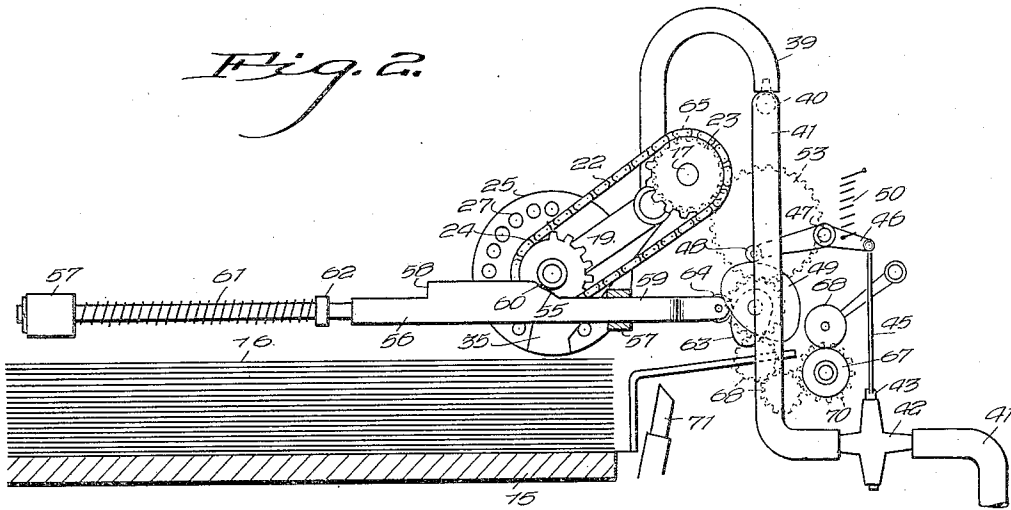
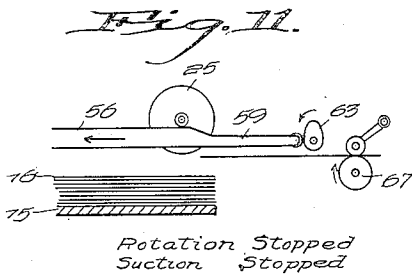
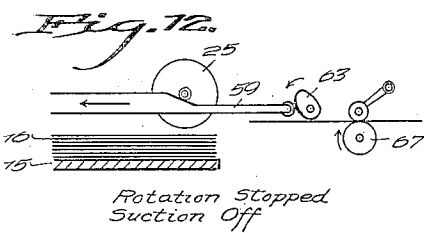
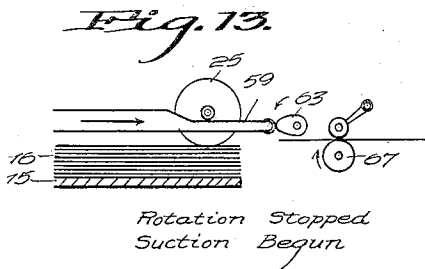
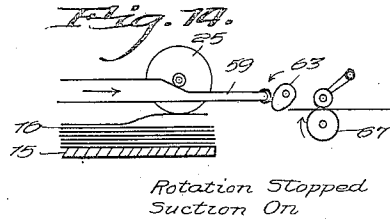
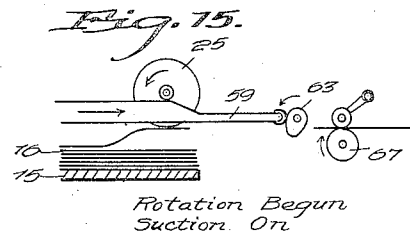
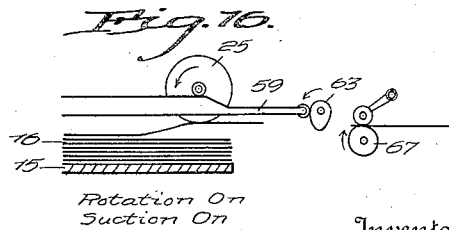
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1,637,019

SHEET FEEDING APPARATUS

Filed Jan. 24, 1924

4 Sheets-Sheet 2



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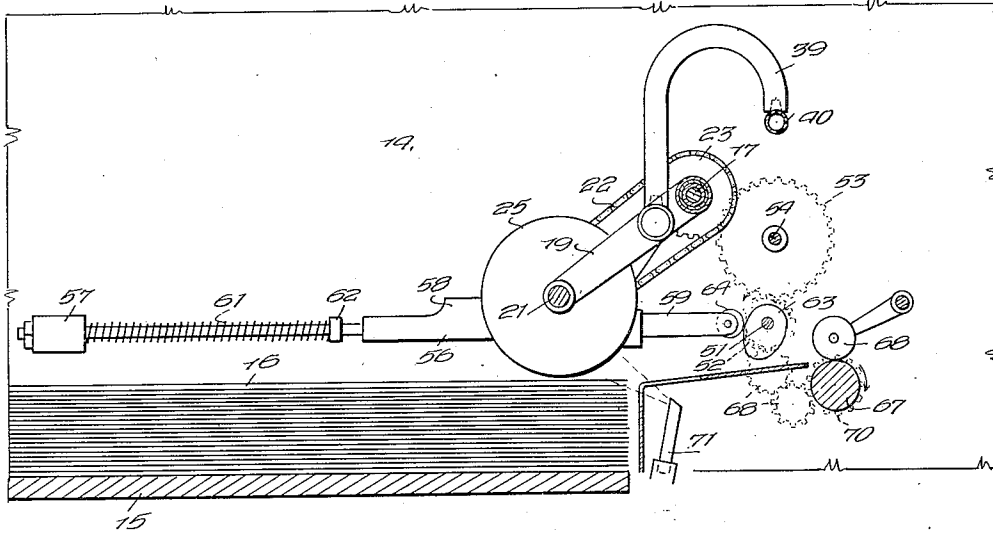
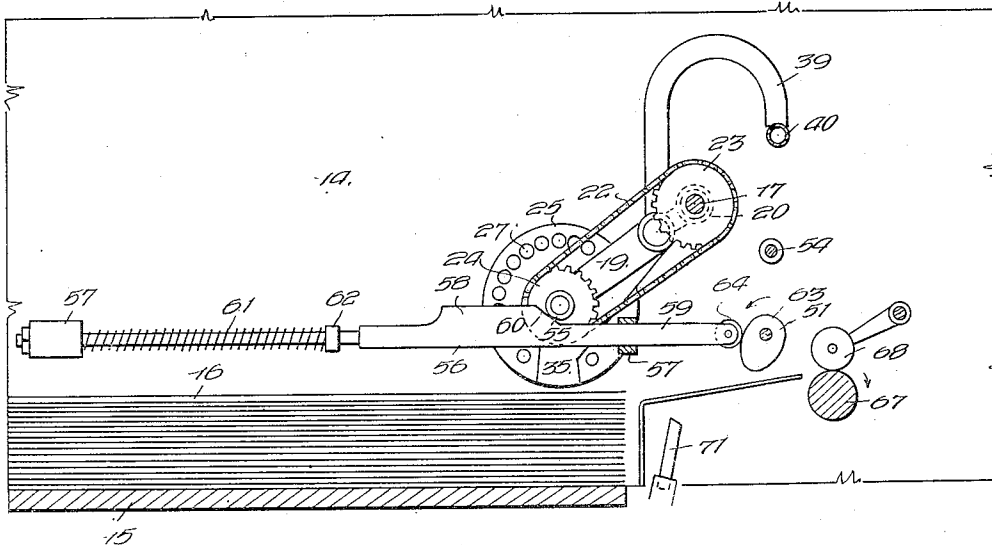
A. BROADMEYER

SHEET FEEDING APPARATUS

Filed Jan. 24. 1924

1,637,019

4 Sheets-Sheet 3



Albert Broadmeyer

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July 26, 1927.

1,637,019

A. BROADMEYER
SHEET FEEDING APPARATUS

Filed Jan. 24, 1924

4 Sheets-Sheet 4

Fig. 5.

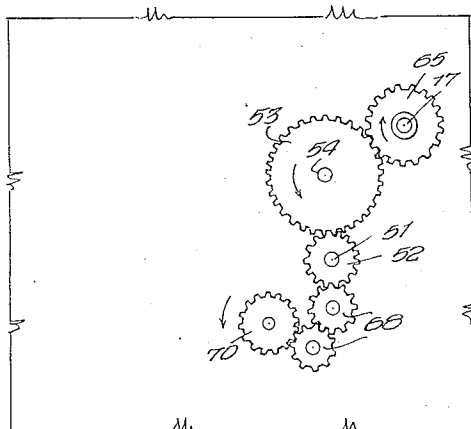
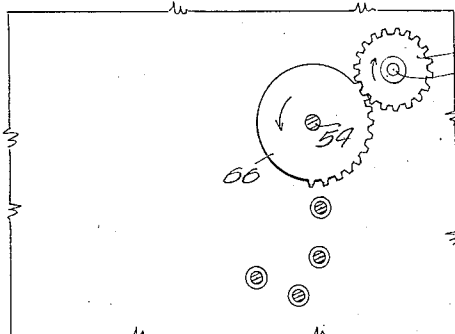


Fig. 6.

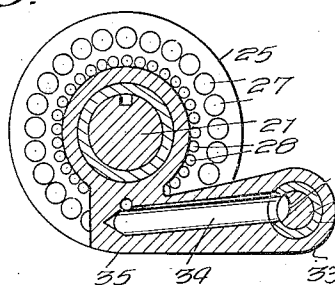
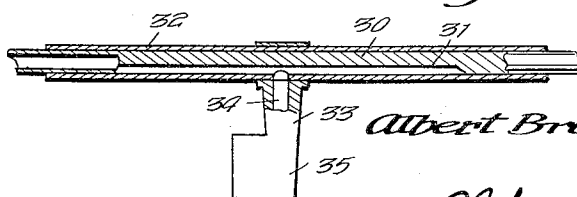


Fig. 9.



By

Fig. 1.

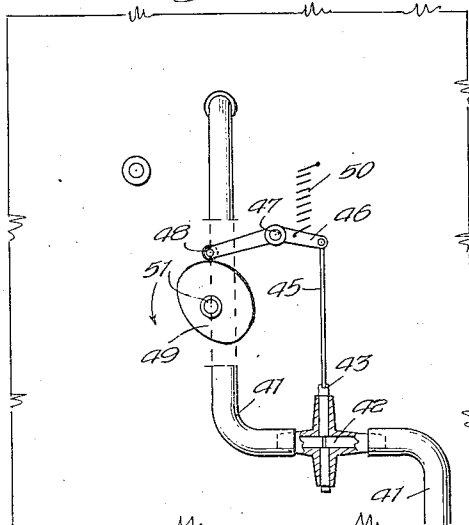
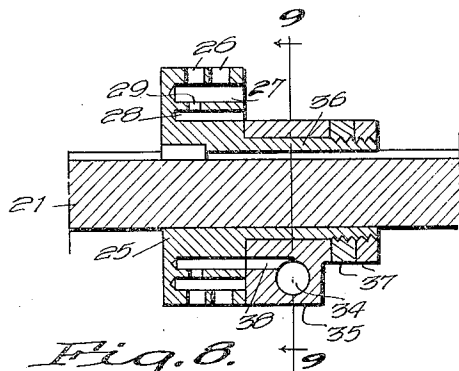


Fig. 8.

Fig. 10.

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UNITED STATES PATENT OFFICE.

ALBERT BROADMEYER, OF HARRISBURG, PENNSYLVANIA, ASSIGNOR TO THE W. O. HICKOK MANUFACTURING COMPANY, OF HARRISBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

SHEET-FEEDING APPARATUS.

Application filed January 24, 1924. Serial No. 693,275.

The present invention relates to that type of sheet feeding apparatus in which a suction roller or head is utilized.

One of the objects of the invention is to provide novel means whereby the suction member is dropped upon the sheet while inactive, and when contact is established suction is created through the head for the purpose of attaching the sheet thereto, the head is elevated to remove the topmost sheet from the pile and deliver it to carrying or feeding mechanism.

A further and important object is to provide means whereby large sheets can be properly handled without being distorted or their line of direction changed, the feeding means accommodating itself to the uneven level of the top of the pile. A still further object is to provide means whereby a plurality of sheets may be simultaneously fed, thereby materially increasing the capacity of the feeding apparatus and the machine that receives the sheets.

In the accompanying drawings:—

Figure 1 is a plan view of an embodiment of the invention, at present considered the preferable one.

Figure 2 is a side elevation somewhat diagrammatic in its character, in that the supporting frame is not illustrated, in order that the arrangement of the parts may be more clearly shown.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1,

Figure 4 is a sectional view taken on the line 4—4 of Figure 1,

Figure 5 is a side elevation of the gearing for driving the various instrumentalities,

Figure 6 is a sectional view illustrating the intermittent or mutilated gearing for rotating the suction heads,

Figure 7 is a detail view of the mechanism for periodically operating the suction controlling valve,

Figure 8 is a detail sectional view through one of the suction rollers or heads,

Figure 9 is a sectional view on the line 9—9 of Figure 8,

Figure 10 is a sectional view through a portion of one of the tubes, forming a suction conduit to one of the heads,

Figures 11 to 16 inclusive, are diagrammatic views illustrating different positions of one of the suction heads.

In the embodiment disclosed, a suitable frame is employed, including side members 14, between which operates a vertically movable sheet support in the form of a table 15. This table is adapted to carry one or more piles of sheets, shown at 16. Extending across the frame, at the rear end of the pile is a driving shaft 17, on which is located a sleeve 18. Swinging supports, comprising sets of arms 19, have collars 20 journaled on the sleeve 18, and rotatably mounted in the free ends of said arms 19, is a pair of independent shafts 21 located end to end. These shafts are rotated from the driving shaft 17 through the medium of endless chains 22 operating around sprocket wheels 23 on the shaft 17 at the ends of the sleeve 18, and also operating around sprocket wheels 24 on the outer ends of the shafts 21.

Feathered to each of the shafts 21 is a suction head in the form of a roller 25, said rollers being thus adjustable on their respective shafts toward and from each other. Each head, as illustrated particularly in Figure 8, is provided with sets of air intake ports 26, the sets being disposed side by side and each opening into a chamber 27 formed by drilling a series of longitudinal bores into one end of the head, said bores terminating short of the other end. An exhaust passageway 28 is provided for each chamber 27, and has a port 29 affording communication therewith. These passageways 28 also open through the end of the head through which chambers 27 open. Mounted in each set of arms 19, in parallel relation to the shaft 21, is an exhaust tube 30 that has a portion provided with a longitudinal channel 31, as illustrated in Figure 10. Surrounding this tube and slidable thereon is a sleeve 32 that covers the channel 31. This sleeve is provided with a neck 33 having a passageway 34 therein that is in communication with the channel 31. The free end of the neck 33 terminates in a collar 35 surrounding a hub 36 integral with the rotatable head 25 and projecting from the end of said head through which the chambers 27 and passageways 28 open. The collar is maintained on the hub by any suitable means, as for example, nuts 37, and the passageway 34 terminates in an offset intake port 38 that successively registers with the outer ends of the passageways 28 as the head 25 ro-

tates. It will be evident by reference to Figure 8 that when one of the passageways 28 is in communication with the intake port 38, the outer end of the corresponding chambers 27 is closed by the adjacent face of the collar. This structure corresponds substantially to that disclosed in my co-pending application, Serial No. 499,331, filed September 8, 1921.

The two tubes 30 are connected by flexible hose 39 with a common exhaust conduit 40 extending across the frame and including a pipe 41 located at one side of said frame and having a valve casing 42 therein. In this casing operates a reciprocatory suction controlling plunger valve 43 having a reduced portion 44 that is movable to a position to afford a passageway through the conduit and to a position where such passageway is cut off. It will be understood that the conduit 41 is connected to any vacuum producing means, as for example, the intake side of a pump. The controlling valve 43 is connected by a link 45 with one arm of a lever 46 fulcrumed between its ends, as shown at 47. The other arm of this lever has a roller 48 that rides on a rotatable cam 49. A spring 50, connected to the lever 46, serves to maintain the roller 48 against the cam 49 and thus move the said lever and valve in one direction, while the cam obviously moves the lever and valve in the opposite direction and in opposition to the action of the spring. The cam 49 is fixed to a cam shaft 51 extending across the machine and carrying a gear 52 in mesh with a gear 53 on the main driving shaft 54. It will be understood that said driving shaft 54 may be coupled up to any suitable source of power.

The shafts 21 of each of the suction head supporting brackets or frames projects outwardly beyond the sprocket wheel 24, and on said projecting ends are journaled rollers 55. These rollers ride reciprocatory cam tracks 56 in the form of bars or rods slidably mounted in brackets 57 secured to the side members of the frame 4. The said tracks 56 have relatively elevated portions 58 and depressed portions 59 connected by inclined portions 60 that operate beneath the rollers 55. The rods are moved rearwardly by coiled springs 61 surrounding them, said springs bearing against abutments 62 on the rods and against the outer brackets 57. The rods are moved in opposition to the spring 61 by cams 63 mounted on the cam shaft 51, and operating against rollers 64 carried by the rear ends of said rods 56. It will thus be evident that as the shaft 51 is rotated the track rods 56 will be reciprocated synchronously, thereby intermittently raising and lowering the swinging supports and the rotatable suction heads or rollers.

The drive shaft 17, as shown more par-

ticularly in Figure 6, is provided at its rear end with a spur gear 65, and the main driving shaft 54 is provided alongside the gear 53 with a mutilated or intermittent gear 66. It will thus be evident that as the gear 66 rotates the teeth thereof will mesh with the gear 65 and cause its intermittent rotation, thereby effecting an intermittent rotation of the shaft 17 and through the gearing 22, 23, 24, the suction head shafts 21 and said suction heads. At the rear side of the above described mechanism is an intake roller 67, on which rests cooperating intake rollers 68. The roller 67 has a spindle 69 at its rear end, carrying a gear 70, through transmitting gears 68 in mesh therewith and the gear 52 is rotated from the main driving shaft 54.

The operation of this mechanism is as follows: Assuming the main driving shaft 54 is rotating and the suction heads are in their raised position, as indicated in Figure 11, said heads will be idle and the valve 43 in a position to cut off suction therefrom. As the cams 63 rotate they simultaneously force rearwardly the track bars 56, thereby permitting the suction heads or rollers to descend and rest upon the topmost sheet of the pile. As is well known to those skilled in the art, a thick pile of paper is apt to have an uneven top surface. Consequently the two rollers are permitted to drop sufficiently so as to accommodate themselves to any ordinary unevenness. When the rollers are thus in contact the cam 49 will move sufficiently to permit the valve 43 to open, and thereby create suction through both rollers. As a consequence the topmost sheet is attached to the rollers. The cams 63, as they continue to rotate, then permit the springs 61 to act, forcing back the track bars 56 and elevating the rollers. The usual air blast, supplied through nozzles indicated at 71, operating beneath the raised end of the sheet, loosens the same. The intermittent or mutilated gear 56 now comes into play by having its teeth engage the gear 65, thereby starting the rotation of the drive shaft 17 and consequently of the suction head carrying shafts 21. As a result the sheet is fed forward until it is caught by the intake rollers 67-68, whereupon the suction through the head is again cut off by the closing of the valve 43, and the teeth of the mutilated gear 66, passing the gear 65, the drive shaft 17 and consequently the suction heads or rollers become again idle. The above described operation is thereupon repeated.

There are many advantages for this structure. In the first place, it permits the practical feeding of large sheets and sheets of heavy material, in that the suction rollers are brought directly into contact with the sheets at separated points and they are raised after suction is created. Moreover

by utilizing a plurality of heads and allowing them to relatively drop a maximum distance, proper contact with the sheets is secured, irrespective of the difference in level of the surface of the pile. The heads moreover being relatively adjustable toward and from each other can be properly associated for different sizes of sheets. A further and important advantage resides in the fact that two sheets may be simultaneously fed side by side. In other words two piles of paper may be placed on the table and each head employed for feeding from a pile. As there are many machines, as for example, printing presses which can handle sheets in duplicate, obviously this provides practical means for feeding sheets thereto, and these sheets will obviously be delivered synchronously.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:—

1. In mechanism of the character set forth, the combination with a sheet supporting table, of swinging supporting means thereover, a plurality of suction rollers carried by the supporting means, a suction conduit having branches connected to the rollers, a valve in the conduit controlling the suction on both rollers, means for automatically elevating the supporting means and rollers and allowing them to move downwardly, means for automatically opening the valve when the rollers rest on the pile of sheets, and means for automatically rotating the rollers when elevated and while suction is thereon.

2. In mechanism of the character described, the combination with a support for a body of sheets, of a rotatable sheet-moving member movable toward and from the body of sheets, means for causing the member to move towards the body of sheets while not rotating, and means for starting and continuing the rotation of the sheet-moving member after it has been so moved.

3. In mechanism of the character described, the combination with a support for a body of sheets, of a rotatable sheet-moving member movable toward and from the body of sheets, means for thus moving the member, and means for effecting an intermittent rotation of the member in one direction only and causing its rotation when it has been moved from the body of sheets and stopping said rotation when it is moved toward the body of sheets.

4. In mechanism of the character set

forth, the combination with a support for a body of sheets, of a rotatable sheet-moving member movable toward and from the body of sheets, means for causing the member to move toward the body of sheets while not rotating, and means for starting the rotation of the member when it is in engagement with the topmost sheet and releasing it from the rotating means after it has again been moved away from the body of sheets.

5. In mechanism of the character set forth, the combination with a support for a body of sheets, of a support movable toward and from the sheet support, a suction tube carried by the movable support, a shaft journaled on the movable support, a suction roller mounted on and adjustable along the shaft and having adjustable connection with the suction tube, and means for periodically moving said support.

6. In mechanism of the character set forth, the combination with a support for a body of sheets, of a swinging support comprising pivotally mounted arms, a shaft journaled in the free ends of the arms, a suction tube mounted on said arms, a suction roller mounted on and adjustable along the shaft and having adjustable connection with the suction tube, and means for periodically moving said support.

7. In mechanism of the character set forth, the combination with a support for a body of sheets, of a swinging support comprising pivotally mounted arms, a shaft journaled in the free ends of the arms, a suction tube mounted on said arms, a suction roller mounted on and adjustable along the shaft and having adjustable connection with the suction tube, a reciprocatory track having elevated and depressed portions on which the support rides, and means for reciprocating the track.

8. In mechanism of the character set forth, the combination with a support for a body of sheets, of sheet feeding mechanism including a rotatable suction head movable toward and from the support, means for creating suction through the head, operating mechanism for automatically moving the head toward and from the support and controlling the suction creating means to secure suction when the head is moved toward the support and stop said suction when it is away from the support, and means for rotating the head when suction is secured there-through.

9. In mechanism of the character set forth, the combination with a support for a body of sheets, of sheet feeding mechanism including a rotatable suction head, means for periodically rotating the head, a swinging support for the suction head that permits its movement toward and from the sheet support, a suction conduit connected to the head, a controlling valve for the conduit, and

mechanism for effecting the swinging of the support and the operation of the valve and the rotation of the head when the head is in a predetermined position and suction is secured therethrough.

10. In mechanism of the character set forth, the combination with a support for a body of sheets, of sheet feeding mechanism including a rotatable suction head, a swinging support for the suction head that permits its movement toward and from the sheet support, a suction conduit connected to the head, a controlling valve for the conduit, mechanism for effecting the swinging of the support and causing the valve to open when the head is in contact with the body of sheets and to close when the head has been moved away from the body of sheets, and means for effecting the rotation of the head when the same has been moved away from the body of sheets and the valve is open.

11. In mechanism of the character set forth, the combination with a support for a body of sheets, of sheet feeding mechanism including a suction head, a swinging support for the suction head that permits its movement toward and from the sheet support, a suction conduit connected to the head, a controlling valve for the conduit, cams for respectively operating the swinging support and valve, and common driving means for the cams.

12. In mechanism of the character set forth, the combination with a sheet supporting table, of a swinging support movable toward and from the same, a longitudinally movable track having elevated and depressed portions on which the support rides, a rotary cam for moving the track, a suction head movable with the support, a suction conduit connected to the head, a controlling valve for the conduit, a lever connected to the valve, a cam operating the lever, and means for rotating said cams.

13. In mechanism of the character set forth, the combination with a support for a body of sheets, of a rotatable suction head movable toward and from the sheets placed on said support, and means for rotating said head when it has been moved toward said sheets and stopping the rotation of said head when it has been moved away from the body of sheets.

14. In mechanism of the character set forth, the combination with a support for a body of sheets, of a rotatable suction head movable toward and from the sheets placed on said support, and mutilated gearing for rotating said head when it has been moved toward said sheets and stopping the rotation of said head when it has been moved away from the body of sheets.

15. In mechanism of the character set forth, the combination with a support for a body of sheets, of a rotatable suction head,

a swinging support for the head, cam mechanism for effecting the swinging of the support, mutilated gearing for periodically rotating the head, and means for operating the cam mechanism and gearing to cause the rotation of the head when it has been moved to a position to engage the topmost sheet of the body and stop it after the head has been elevated from the body.

16. In mechanism of the character set forth, the combination with a sheet supporting table, of a rotatable suction head, and mechanism for intermittently rotating the head and creating suction therethrough when it is rotated.

17. In mechanism of the character set forth, the combination with a sheet supporting table, of a rotatable suction head, and mechanism for intermittently rotating the head and creating suction therethrough when it is rotated and destroying the suction when it is not rotated.

18. In mechanism of the character set forth, the combination with a sheet supporting table, of a rotatable suction head movable toward and from the same, and mechanism for automatically creating suction through the head and rotating said head when it has been moved away from the support and stopping rotation and suction while it is away from the support.

19. In mechanism of the character set forth, the combination with a sheet supporting table, of a swinging support movable toward and from the table, a rotatable suction head carried by and swinging with the support, a suction conduit connected to the head, a controlling valve for the conduit, and mechanism for swinging the support imparting an intermittent rotation to the suction head and intermittently operating the valve.

20. In mechanism of the character set forth, the combination with a sheet supporting table, of a swinging support movable toward and from the table, a reciprocal track having elevated and depressed portions on which the support rides, a cam for moving the support, a rotatable suction head carried by and swinging with the support, mutilated gearing for intermittently rotating the suction head, a suction conduit connected to the head, a controlling valve for the conduit, a cam for periodically operating the valve, and driving means for the cams and gearing.

21. In mechanism of the character set forth, the combination with a sheet supporting table, of a drive shaft, swinging supporting arms journaled on the drive shaft, a shaft journaled in the arms and driven from the drive shaft, a rotatable suction head on the arm-carried shaft and adjustable along the same, a suction tube mounted on said frame and having communication with the

suction head, a conduit connected to the tube, a controlling valve in said conduit, a lever connected to the valve and a cam operating the lever, a longitudinally reciprocal track having elevated and depressed portions, a roller carried by the arms and riding the track, a spring for moving the track in one direction, a cam for moving the track in opposition to the spring, mutilated gearing for intermittently rotating the drive shaft, and means operating the gearing and the cams.

22. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of rotatable sheet feeding suction heads that operate on the sheets placed on the support, said suction heads being movable toward and from the support and being capable of assuming different relative positions, and means for causing suction simultaneously through the heads irrespective of their relatively different positions.

23. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of rotatable sheet feeding suction heads that operate on the sheets placed on the support and are movable toward and from the support, said suction heads being capable of assuming different relative positions, means for effecting their movements toward and from the sheets placed on the support and allowing them to engage portions of sheets that are at different levels, means for simultaneously rotating them, and means for causing suction therethrough irrespective of their relatively different positions.

24. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of rotatable sheet feeding suction heads that operate on the sheets placed on the support, separate supports for the feeding heads movable toward and from the sheet support, means for effecting said movements of the supports and heads, and means for simultaneously causing suction through the heads and effecting their simultaneous rotation.

25. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of rotatable sheet feeding suction heads that operate on the sheets placed on the support, separate supports for the feeding heads, said heads being relatively adjustable toward and from each other on the supports, and means for simultaneously rotating the feeding heads and effecting suction therethrough.

26. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of rotatable sheet feeding suction heads that operate on the sheets placed on the support, separate supports for the feeding heads movable toward and from the sheet support, said heads

being relatively adjustable toward and from each other on the support, and means for moving the supports and simultaneously rotating the feeding members and causing suction therethrough.

27. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of rotatable sheet feeding suction heads that operate on the sheets placed on the support, separate supports for the feeding heads, said heads being relatively adjustable toward and from each other on the supports, and means for simultaneously moving the supports and rotating feeding heads and simultaneously causing suction through the feeding heads.

28. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of swinging supports operating thereon, rotatable suction heads mounted on the supports, means for swinging the supports and heads, and means for simultaneously rotating the heads.

29. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of swinging supports operating thereon, rotatable suction heads mounted on the supports, means for swinging the supports and heads in unison and permitting the movements of the heads downwardly upon the sheets different distances, and means for simultaneously rotating the heads.

30. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of swinging supports operating thereon, rotatable suction heads mounted on the supports, means for swinging the supports and heads, and means for simultaneously creating suction through the heads.

31. In mechanism of the character set forth, the combination with a support for a plurality of sheets, of a plurality of swinging supports operating thereon, rotatable suction heads mounted on the supports, means for swinging the supports and heads, means for simultaneously creating suction through the heads, and means for simultaneously rotating the heads.

32. In mechanism of the character set forth, the combination with a sheet supporting table, of a plurality of supports operating thereover, means for causing the periodical raising and lowering of said supports, rotatable suction heads on the supports, and means for intermittently rotating the heads and causing suction therethrough.

33. In mechanism of the character set forth, the combination with a sheet supporting table, of a plurality of supports operating thereover, means for causing the periodical raising and lowering of said supports, rotatable suction heads on the supports, and

means for starting the rotation of said heads and causing suction therethrough when the heads are lowered and continuing the same until after the heads are raised.

5 34. In mechanism of the character set forth, the combination with a sheet support-
ing table, of a drive shaft, sets of swinging
arms journaled on the drive shaft as a cen-
ter, shafts journaled in the sets of arms and
10 driven from the drive shaft, suction rollers
mounted on the arm-carried shafts, and ad-
justable along the same, a suction conduit
having connection with the suction rollers,
and means for swinging the arms.

15 35. In mechanism of the character set forth, the combination with a sheet support-

ing table, of a drive shaft, sets of swinging
arms journaled on the drive shaft as a cen-
ter, shafts journaled in the sets of arms and
driven from the drive shaft, suction rollers 20
mounted on the arm-carried shafts and ad-
justable along the same, a suction conduit
having connection with the suction rollers,
a controlling valve in said conduit, cam op-
erated mechanism for periodically operating 25
the valve and swinging the sets of arms,
mutilated gearing intermittently operating
the drive shaft, and driving means for the
cam operated mechanism and the mutilated
gearing. 30

In testimony whereof, I affix my signature.
ALBERT BROADMEYER.