June 8, 1926.

1,587,816

A. BROADMEYER

SHEET FEEDING APPARATUS

Filed Nov. 22, 1923

5 Sheets-Sheet 1

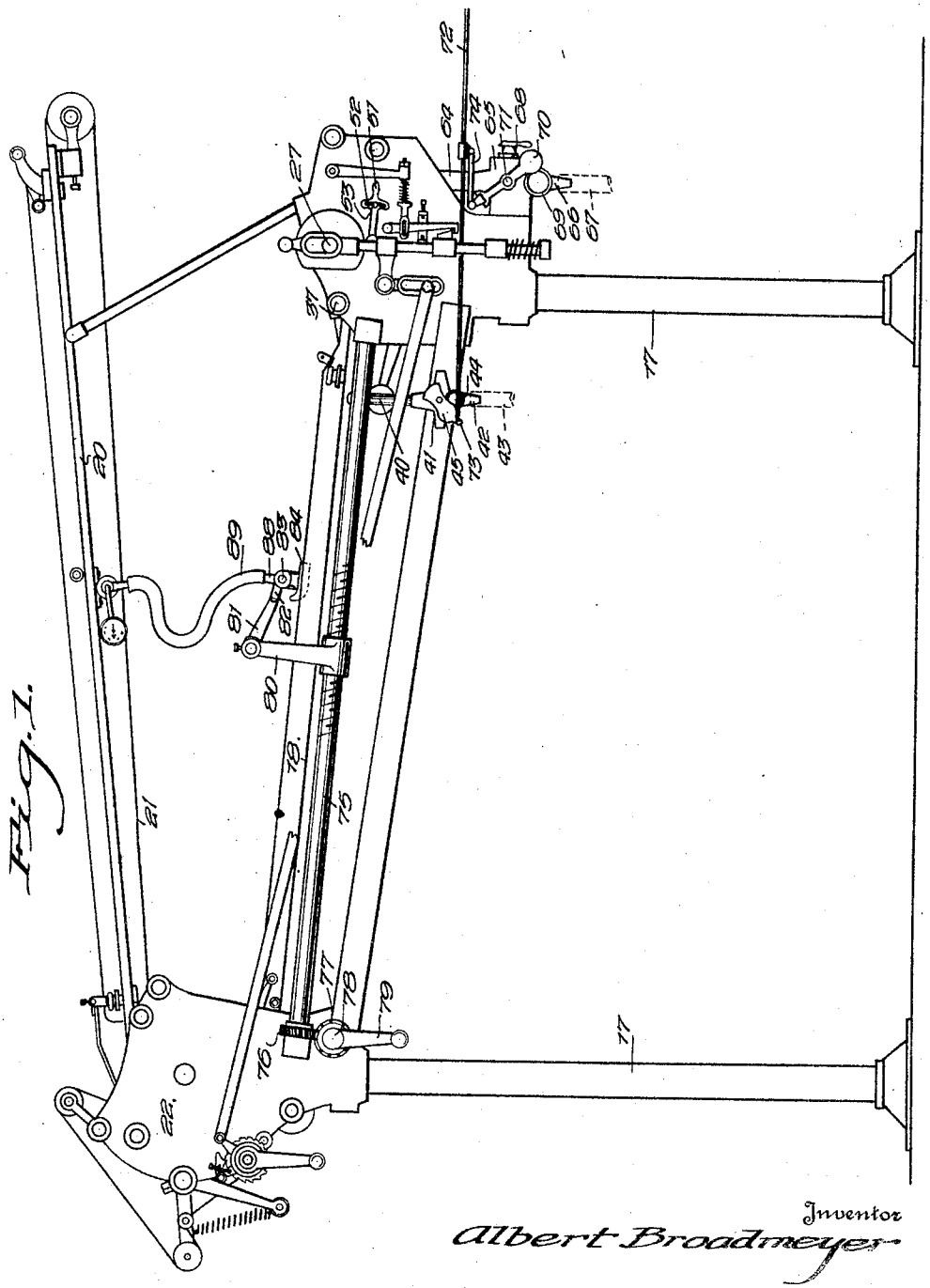


Fig. 1.

Inventor

Albert Broadmeyer

By

Attorney

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A. BROADMEYER

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5 Sheets-Sheet 2

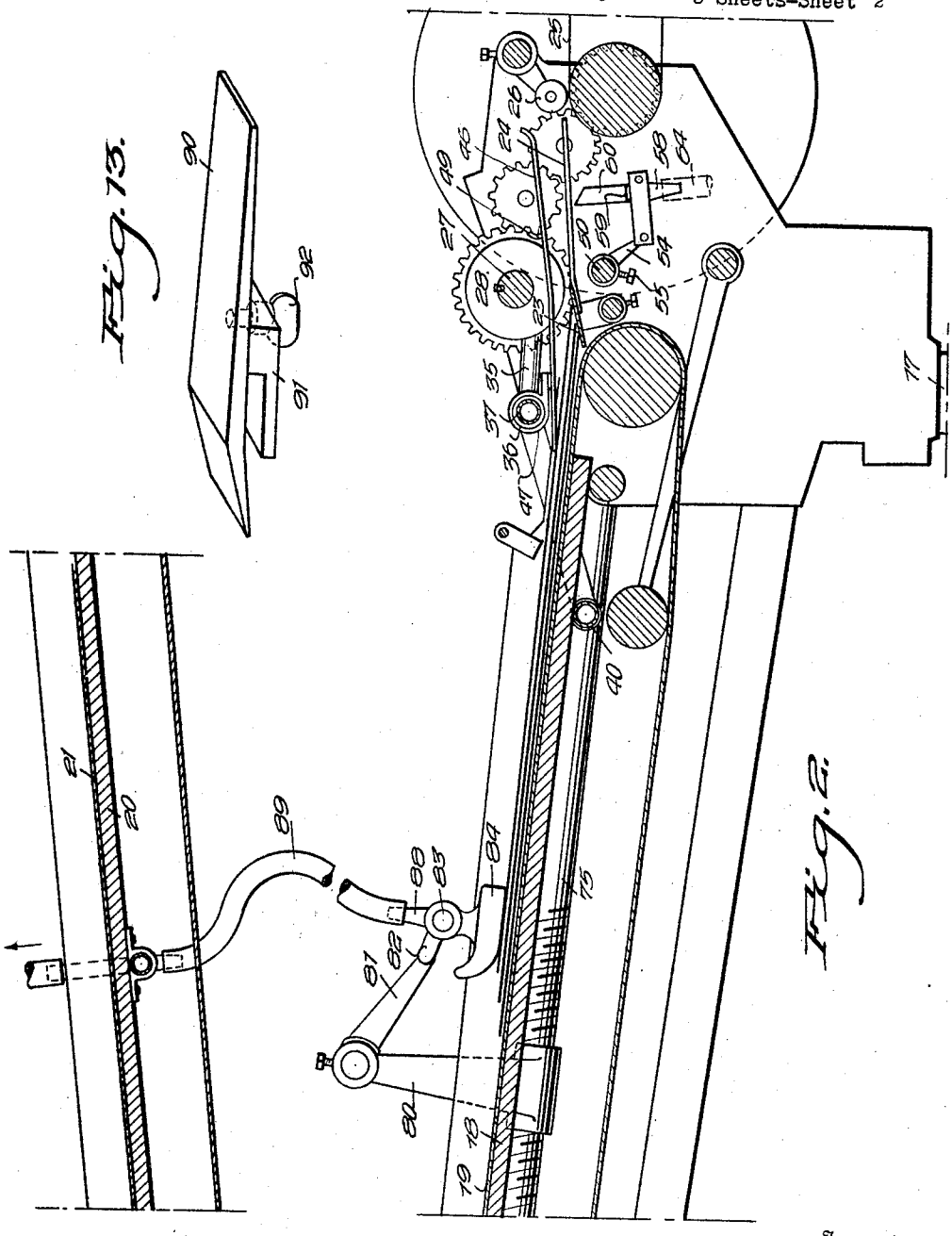


Fig. 2.

Fig. 13.

Inventor

Albert Broadmeyer

By

Attorney

June 8, 1926. 1,587,816

A. BROADMEYER

SHEET FEEDING APPARATUS

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Fig. 5.

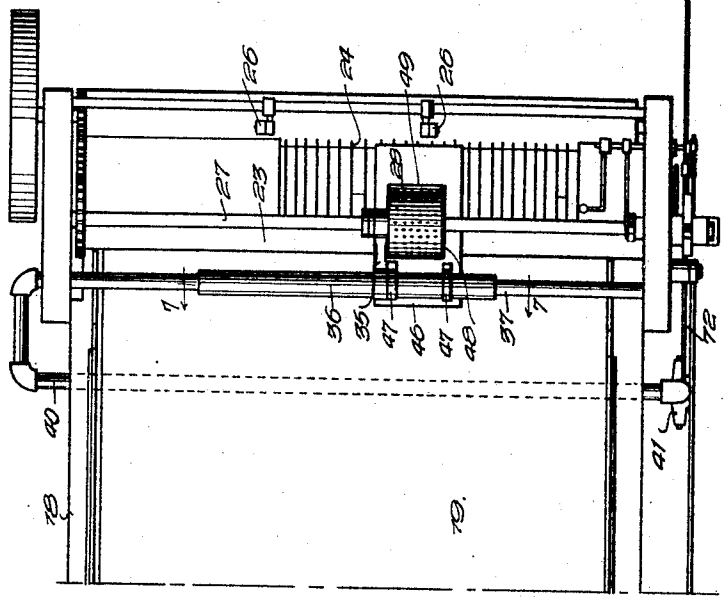


Fig. 5.

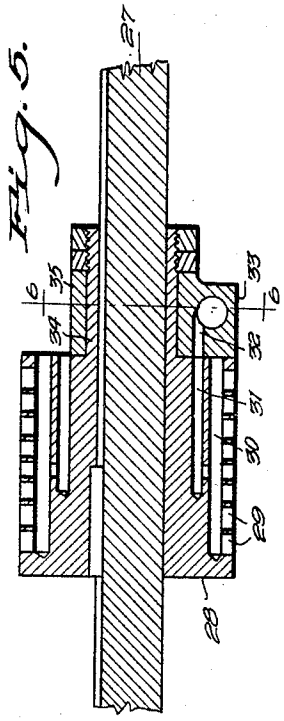


Fig. 6.

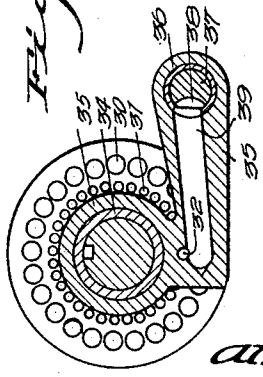
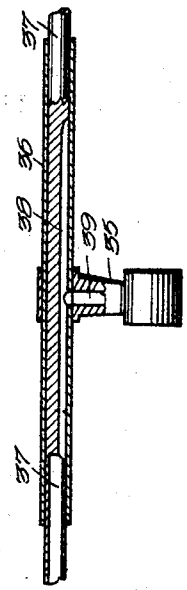


Fig. 7.



Inventor
Albert Broadmeyer

By

Attorney

June 8, 1926. 1,587,816

A. BROADMEYER

SHEET FEEDING APPARATUS

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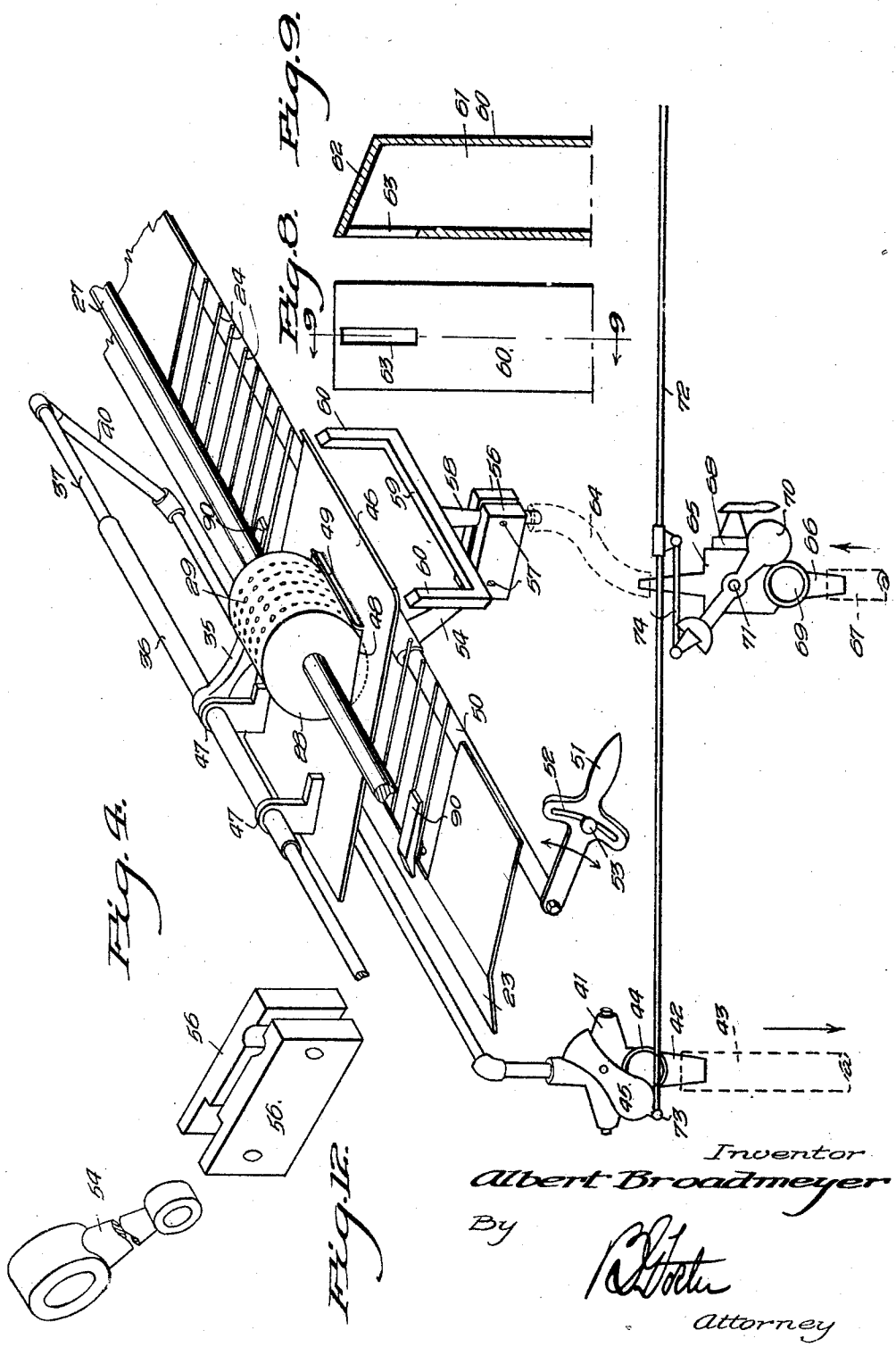


Fig. 9.

Fig. 8.

Fig. 4.

Fig. 12.

Inventor
Albert Broadmeyer
By
Attorney

June 8, 1926.

1,587,816

A. BROADMEYER

SHEET FEEDING APPARATUS

Filed Nov. 22, 1923

5 Sheets-Sheet 5

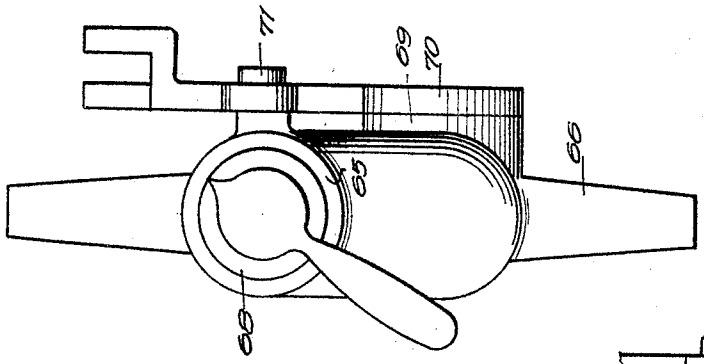


Fig. 10.

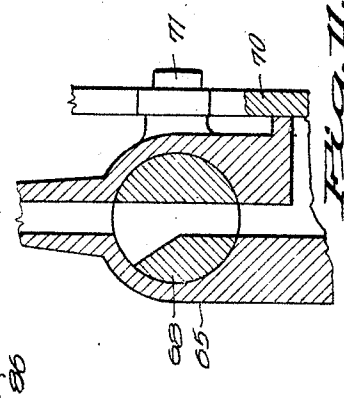


Fig. 11.

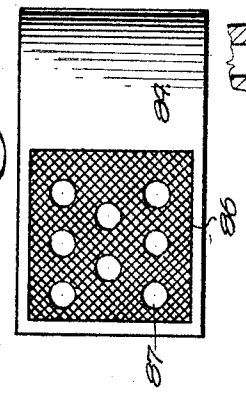


Fig. 16.

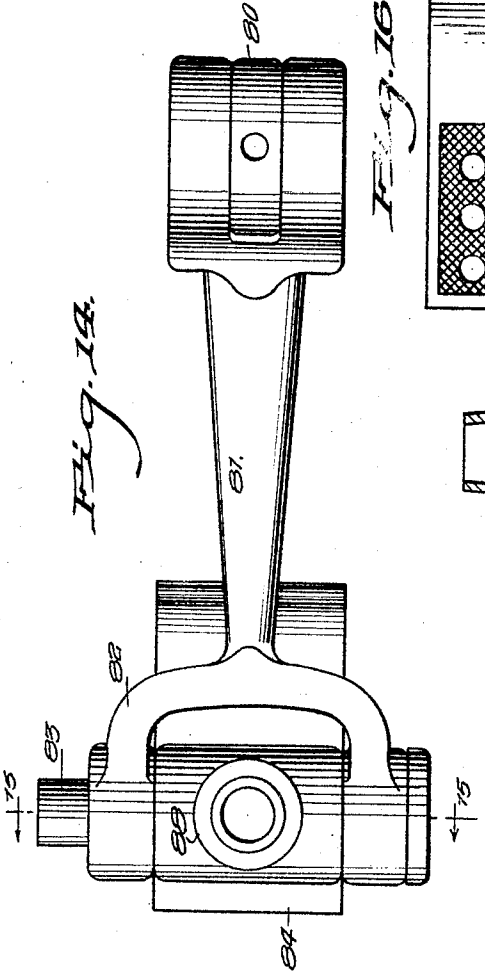


Fig. 14.

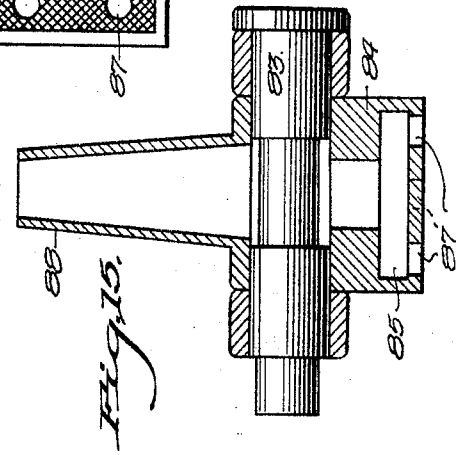


Fig. 15.

Inventor

Albert Broadmeyer

By

Attorney

Patented June 8, 1926. 1,587,816

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 November 22, 1923. Serial No. 676,283.

The present invention relates to sheet feeding apparatus, and one of the principal objects is to provide means of a novel character that will effect the separation of the sheets and insure their being individually delivered while being maintained in a smooth unwrinkled condition.

In the accompanying drawings is disclosed the preferred embodiment of the invention as applied to a double deck feeding machine, in which a supply table and a feed table are employed. The invention, however, can be employed on the well-known type of apparatus, in which a pile of sheets is elevated to the delivering apparatus.

In the drawings:—

Figure 1 is a side elevation of the machine,

Figure 2 is a detail longitudinal sectional view through a portion of the same on an enlarged scale,

Figure 3 is a top plan view,

Figure 4 is a detail perspective view,

Figure 5 is a longitudinal sectional view through the suction roller,

Figure 6 is a cross sectional view on the line 6—6 of Figure 5,

Figure 7 is a detail sectional view on the line 7—7 of Figure 3,

Figure 8 is a front elevation of one of the air blast delivery nozzles,

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

Figure 10 is a view in elevation of the vent-controlling means for the supply conduit to the blast head,

Figure 11 is a vertical sectional view therethrough,

Figure 12 is a detail perspective view of the supporting clamp and carrying arm for the blast head,

Figure 13 is a detail perspective view of one of the elevating blocks for card-board,

Figure 14 is a plan view on an enlarged scale of the sheet-retarding shoe,

Figure 15 is a sectional view on the line 15—15 of Figure 14,

Figure 16 is a bottom plan view of the sheet-retarding shoe.

Carried on supporting legs 17 is a feed table 18, over which passes an endless sheet-carrying belt 19, the table being inclined downwardly to its delivery end. Supported above the feed table is a supply table 20 that is inclined oppositely to the table 18, and is traversed by the upper stretch of an endless belt 21 that moves downwardly. Means, designated generally by the reference numeral 22 are provided at the adjacent ends of the table for transferring sheets from one to the other. As the mechanism disclosed is substantially that constituting the subject-matter of co-pending application, Serial No. 674,334, filed Nov. 12, 1923, and as this mechanism can be modified in various ways it is believed to be unnecessary to more fully describe the same.

The subject-matter of the present invention comprises means for delivering the sheets from the lower end of the feed table 18, to insure that only one will be removed at a time.

Located at the delivery end of the belt 19 is an abutment plate 23 that inclines upwardly and rearwardly with respect to the belt and has extending from its rear edge an open grid. This grid consists of spaced longitudinally disposed wire fingers 24, the rear ends of which are located adjacent to suitable offtake mechanism, as for example, belts or tapes 25. Cooperating with these belts or tapes are rollers 26. The said plate 23 and fingers 24 thus constitute a support that bridges the space between the belt 19 and the belt 25.

Extending transversely over this support is a driving shaft 27 carrying a rotary suction roller 28 that constitutes the subject-matter of a Patent No. 1,494,303. The said roller 28 is provided with sets of intake or suction ports 29 opening into internal chambers 30, and each of these chambers is connected by a bore 31 with an exhaust port 32 formed in one side of a head 33 that surrounds the projecting hub 34 of the roller. The port 32 is so related to the passageways 31 that as the roller rotates the said passageways successively move into and out of register with the port 32 when the exhaust ports 29 are in their lowermost positions. The head 33 is connected by a neck 35 with a sleeve 36 that is slidable longitudinally on an exhaust conduit 37 located in rear of the shaft 27 and parallel thereto. The bore 37 of this conduit terminates in a longitudinal slot 38 that is covered by the sleeve 36 and the neck 35 has a passageway 39 that affords communica-

tion between the slot 38 and the port 32. The conduit 37 is connected by a pipe 40 to a vent head 41, terminating in a nipple 42 that can be attached by a hose, indicated at 43, to the intake of an air pump, not shown. The head 41 has a vent 44 adapted to be controlled by a swinging closure plate 45 pivoted on said head 41.

Cooperating with the suction roller 28 is a stripper plate 46, preferably made of sheet metal, and hung from the sleeve 36 by suitable brackets 47. This stripper plate has an opening 48 through which the lower portion of the suction roller 28 passes, and at the rear side of said opening is an upturned curved flange 49 that lies close to said roller 28.

Journaled in the frame below the grid is a rock shaft 50 that can be turned by a handle lever 51 secured to its outer end. This handle lever has an arcuate slot 52, through which is passed a set screw 53, by which the lever and consequently the rock shaft, can be fixed in different positions. The lever carries a crank arm 54 located beneath the grid, this crank arm being adjustable along and around the shaft and being held in adjusted position by a set screw 55. Embracing the free end of the crank arm 54 is a pair of clamping jaws 56 that can be drawn together by tension screws 57. Clamped between these jaws is the depending tubular stem 58 of a blast head 59 terminating in upstanding nozzles 60 located below and adjacent to the side margins of the stripper plate 46 and beneath the open grid. These nozzles have internal chambers 61 and their upper ends preferably have inclined top walls 62. The rear walls of the nozzles have vertical slots 63 of less width than the chambers and forming outlet ports. The depending stem 58 constitutes a nipple for the reception of a flexible conduit 64 connected to a valve casing 65 that terminates in a depending nipple 66. This nipple 66 receives the end of a supply hose 67 coupled to the discharge or pressure side of the air pump. The valve casing 65 includes a rotary controlling valve 68 and furthermore has a vent 69 below said valve. The vent is controlled by a swinging closure plate 70 pivoted between its ends, as shown at 71 above the vent 69. The two vent closure controlling plates 45 and 70 are connected to a common operating rod 72, said rod being preferably pivoted, as shown at 73, to the lower end of the plate 45 and a link 74 connecting the rod 72 with the upper end of the closure plate 70. With this construction, by moving the rod 72 in one direction, it will be evident that the two vents will be opened, as shown in Figure 4, and by moving the rod in the opposite direction, said vents may be closed.

For the purpose of preventing two sheets being fed simultaneously from the machine, retarding devices may be employed. On each side of the table 18 are located threaded rods or shafts 75 having gears 76 meshing with the gears 77 of a transverse actuating shaft 78, this shaft being provided with an actuating handle crank 79. Carried by the rods 75 are standards 80, to which are pivoted freely-swinging arms 81. The free ends of the arms are bifurcated, as shown at 82, and are provided with transverse pivots 83. On said pivots are mounted freely swinging retarding shoes 84 having internal chambers 85, and roughened lower surfaces 86, through which are formed ports 87 that communicate with the chambers 85. The chambers are also in communication with upstanding nipples 88, to which are connected air exhaust hose 89.

As is well known, in the form of apparatus disclosed, the sheets are delivered to the discharge end of the feed table 18, with their margins projecting in stepped relation, the uppermost sheet being farthest advanced, as indicated in Figure 2. Assuming that the pump connected to the hose lines 43 and 67 is in operation and the vents 44 and 69 are closed, air blasts will be delivered from the nozzles 60 upwardly through the grid and against the projecting ends of the paper sheets. These sheets therefore will be separated. At this point, it may be explained that it has been found that the narrow slotted outlet ports 63 of the nozzles distribute or spray the air blast outwardly, so that the action of the air will extend over a relatively wide area. As the sheets are advanced the uppermost will come into contact with the underside of the suction roller 8, and as said suction roller is revolving, the sheet will be caused to be moved by said roller over the grid until it is caught by the tapes 25 and rollers 26. In this operation the shoes 84 will rest upon the top of the pile of sheets passing beneath them and will be free to move up and down, according to the surface condition of the sheets. As the uppermost sheet is drawn from beneath the shoe 84, said shoe will drop upon the rear end of the sheet below it, and will hold or retard the movement of said sheet with the topmost sheet and thereby prevent two of said sheets being fed out of the machine simultaneously.

Where heavy sheets, such as cardboard, are employed which will not always be raised by the air blast beneath so as to come into contact with the suction roller 28, elevating blocks may be employed, as shown in Figures 4 and 13. These blocks preferably consist of strips 90 that are tapered and have angularly disposed portions adapted to rest upon the inclined abutment plate 23 and

extend above the grid fingers 24. They may be clamped in position by clips 91 that underlie the abutment plate 23 and are held by tie screws 92. As the heavier sheets ride over these blocks, their front ends will be elevated sufficiently to come into contact with the peripheral surface of the suction roller 28. They may be detached when not needed for ordinary sheets, such as relatively light paper.

From the foregoing, it is thought that the construction, and 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 sheet feeding apparatus, the combination with an upwardly and rearwardly inclined wall against which a plurality of sheets rest, of an open grid in rear of said inclined wall, means for delivering a blast of air through the grid in rear of the inclined wall and against the rear ends of said sheets as they successively pass thereover from the wall, and means for removing the top sheets and passing them over the grid.

2. In sheet feeding apparatus, the combination with an upwardly and rearwardly inclined wall against which a plurality of sheets rest, of an open grid in rear of said inclined wall, means for delivering a blast of air through the grid in rear of the wall and against the rear ends of said sheets as they pass over the grid, and a rotary suction roller operating over the grid for removing and delivering the topmost sheets.

3. In sheet feeding apparatus, the combination with a shaft, of a rotary suction roller adjustable longitudinally of the shaft, a rod parallel to the shaft, and a stripper plate slidable on said rod and having an opening through which the suction roller passes.

4. In sheet feeding apparatus, the combination with a shaft, of a rotary suction roller adjustable longitudinally of the shaft, a rod parallel to the shaft and constituting an exhaust conduit for the suction roller, a sleeve slidable on the rod and connected to the suction roller, and a stripper plate carried by the sleeve and having an opening through which the lower portion of the suction roller passes.

5. In sheet feeding apparatus, the combination with a grid, of a suction roller for moving sheets thereover, and means for directing a blast of air upwardly through the grid at both ends of the roller.

6. In sheet feeding apparatus, the combination with a grid, of a suction roller for moving sheets thereover, means for directing a blast of air upwardly through the grid at both ends of the roller, and a stripper coacting with the roller and located above the grid.

7. In sheet feeding apparatus, the combination with a grid, of a suction roller above the same, a stripper plate above the grid, said roller depending through the plate, and means for directing blasts of air through the grid and on opposite sides of the stripper plate at both ends of the roller.

8. In sheet feeding apparatus, the combination with an upwardly inclined abutment plate, and spaced fingers extending rearwardly therefrom and forming a grid, of a suction roller above the grid, a stripper plate of less width than the grid and having an opening through which the lower portion of the suction roller extends, and a blast head having spaced delivery nozzles for projecting air upwardly through the grid on opposite sides of the stripper plate.

9. In sheet feeding apparatus, the combination with an upwardly inclined abutment plate, and spaced fingers extending rearwardly therefrom and forming a grid, of a suction roller above the grid, a stripper plate of less width than the grid and having an opening through which the lower portion of the suction roller extends, and a blast head having spaced delivery nozzles for projecting air upwardly through the grid on opposite sides of the stripper plate, said roller, stripper plate and blast head being adjustable to different positions with respect to the grid.

10. In sheet feeding apparatus, the combination with sheet delivery means, of sheet separating means comprising a blast head having a stem, and spaced air blast delivery nozzles, a supporting clamp embracing the stem, and an air supply conduit connecting the stem.

11. In sheet feeding apparatus, the combination with sheet delivery means, of sheet separating means comprising a blast head having a depending stem and spaced upstanding air blast delivery nozzles, a supporting clamp embracing the stem, and an air supply conduit connecting the stem below the clamp.

12. In sheet feeding apparatus, the combination with sheet delivery means, of sheet separating means comprising a blast head having an air blast delivery nozzle, a rock shaft, means for moving the shaft and holding it in different positions, a crank arm carried by the rock shaft, and a mounting for the blast head adjustably mounted on the crank arm.

13. In sheet feeding apparatus, the combination with sheet delivery means, of sheet separating means comprising a blast head

having a depending stem and spaced upstanding air blast delivery nozzles, a rock shaft, means for turning the rock shaft and holding it in different positions, a crank arm carried by the rock shaft, and clamping jaws embracing the stem of the blast head and the crank arm.

14. In sheet feeding apparatus, the combination with a support, over which pass sheets, of a suction roller for successively moving the sheets over the support and located above the same in spaced relation thereto, and directing blocks detachably mounted on the support and adapted to raise the heavier sheets substantially into contact with the roller.

15. In sheet feeding apparatus, the combination with a support comprising an inclined abutment plate, and an open grid composed of spaced fingers, of a suction roller for successively moving the sheets over the support and located above the same in spaced relation thereto, and directing blocks clamped on the rear margins of the abutment plate and extending above the grid fingers to raise the heavier sheets substantially into contact with the roller.

16. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for delivering the sheets successively from the support, and means for separating the sheets comprising a nozzle having an internal chamber, and means for supplying air under pressure to the chamber, said nozzle having an outlet orifice comprising a slot opening from the chamber and narrower than said chamber.

17. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for delivering the sheets successively from the support, means for separating the sheets comprising a head having spaced nozzles, each having an internal chamber and an outlet orifice comprising a slot opening from the chamber and narrower than said chamber, and means coupled to the head for supplying air under pressure to the chambers of both nozzles.

18. In sheet feeding apparatus the combination with a suction roller, of a blast creating nozzle and means for directing sheets between them, of a conduit for withdrawing air from the suction roller, having a vent, a conduit for supplying air under pressure to the nozzle, having a vent, and common means for controlling said vents.

19. In sheet feeding apparatus, the combination with a suction roller, of a blast creating nozzle and means for directing sheets between them, of a conduit for withdrawing air from the suction roller, having a vent, a conduit for supplying air under pressure to the nozzle, having a vent, closures for said vents, and common actuating means for the closure.

20. In sheet feeding apparatus, the combination with a suction roller, of a blast creating nozzle and means for directing sheets between them, of a conduit for withdrawing air from the suction roller, having a vent, a conduit for supplying air under pressure to the nozzle, having a vent, pivotally mounted closures for each vent, and an operating rod having connections for both closures.

21. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for successively delivering the topmost sheets from the support, a suction drag shoe that operates on the sheets to prevent them being delivered simultaneously by the delivering means, and means for creating suction in said shoe.

22. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for successively delivering the topmost sheets from the support, a suction drag shoe that operates on the sheets to prevent them being delivered simultaneously by the delivery means and having a port in its underside across which the sheets pass, and means for creating suction through said port.

23. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for successively delivering the topmost sheets from the support, a suction drag shoe that operates on the sheets to prevent them being delivered simultaneously by the delivering means, means for creating suction in said shoe and means for supporting said shoe to permit it to freely rest upon the sheets.

24. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for delivering sheets from the support, a standard alongside the support, a holding arm pivoted to the standard, a shoe pivoted to the arm and having a chamber opening through the underside of the shoe, said underside resting on the sheets, and means for exhausting air from the shoe.

25. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for delivering sheets from the support, a holder adjustable longitudinally along the support, a shoe movably connected to the support and having a chamber opening through the underside of the shoe, said underside resting on the sheets, and means for exhausting air from the shoe.

26. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for delivering sheets from the support, a standard alongside the support, a holding arm pivoted to the standard, a shoe pivoted to the arm and having a chamber opening through the underside of the shoe, said underside resting on the sheets, means for exhausting air from the shoe, and

means for adjusting the holder and holding it in different positions with respect to the support.

27. In sheet feeding apparatus, the combination with a support for a plurality of sheets, of means for delivering sheets from the support, a standard alongside the support, a holding arm pivoted to the standard, a shoe pivoted to the arm and having a chamber opening through the underside of the shoe, said underside resting on the sheets, means for exhausting air from the shoe, and means for adjusting the standard, along the support longitudinally of the direction of movement of the sheets.

In testimony whereof, I affix my signature.

ALBERT BROADMEYER.