

March 15, 1966

F. X. GEBERT
AERATING MACHINE AND METHOD FOR DRYING STACKS
OF PRINTED PAPERBOARD SHEETS

3,239,944

Filed Jan. 8, 1963

3 Sheets-Sheet 1

FIG. 1

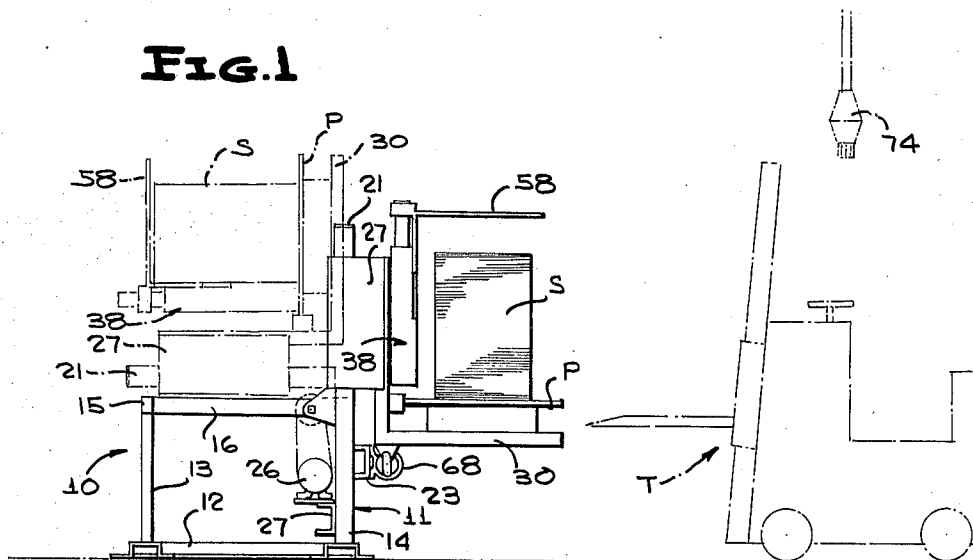


FIG. 2

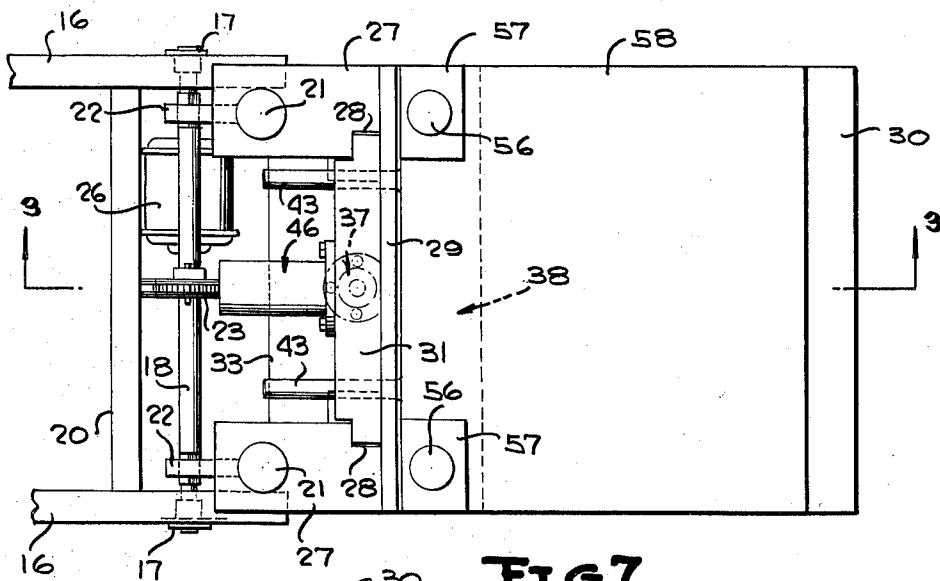
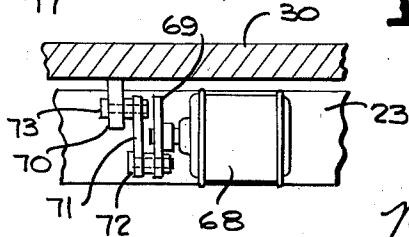


FIG. 7



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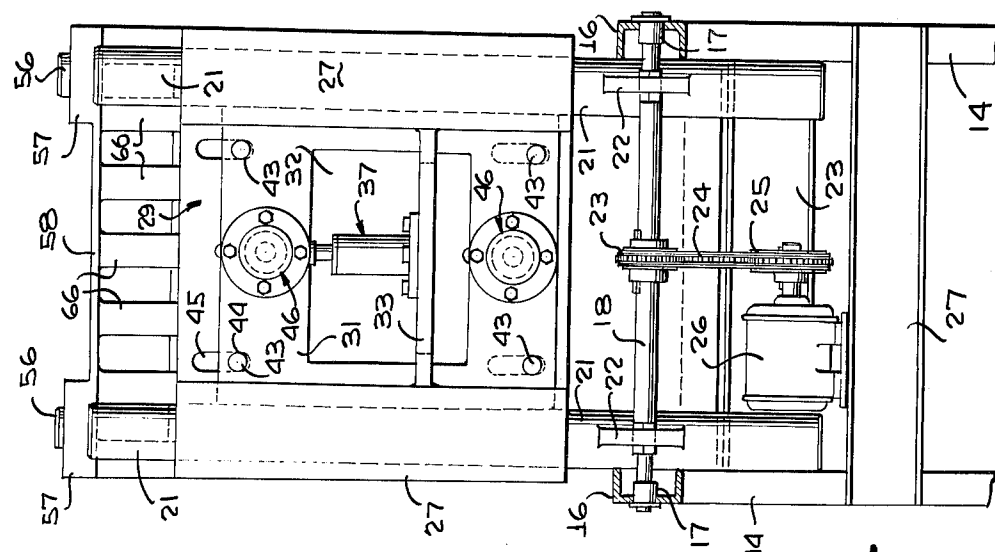


Fig. 4

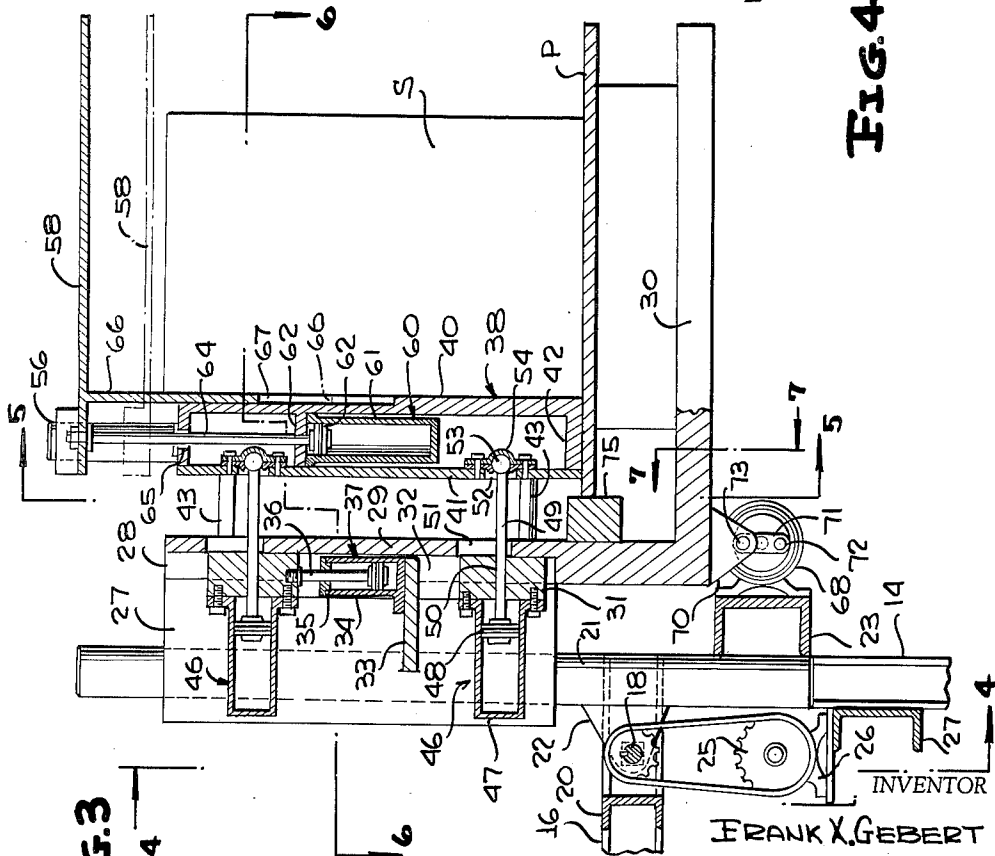


Fig. 3

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FIG. 5

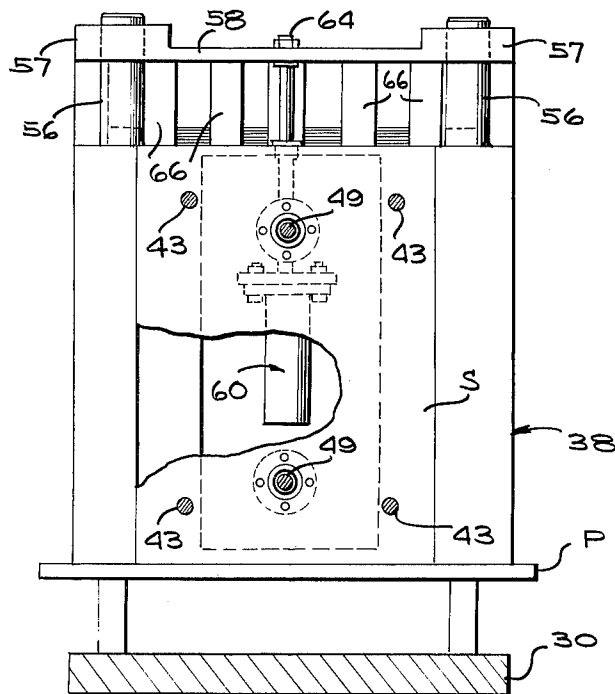
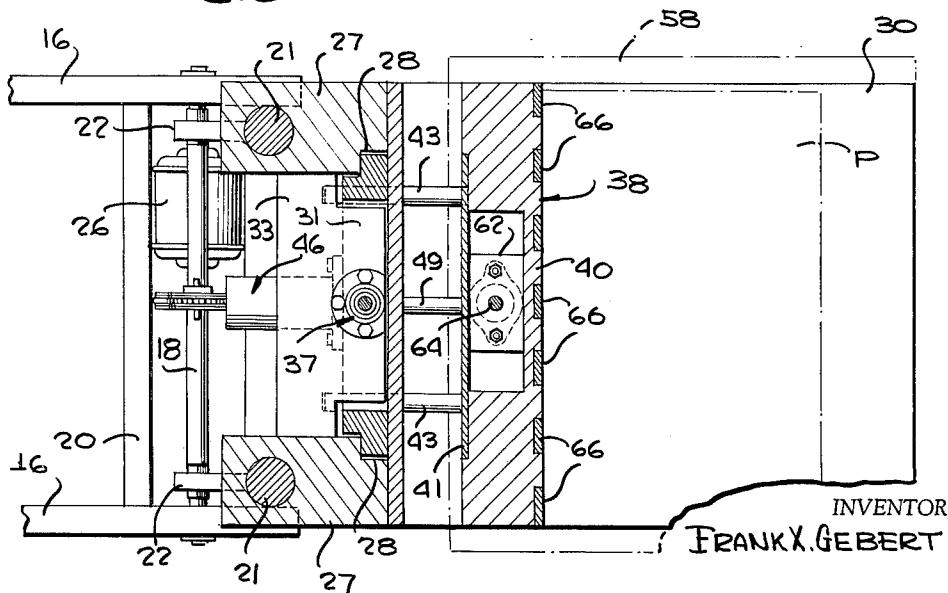


FIG. 6



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AERATING MACHINE AND METHOD FOR DRYING STACKS OF PRINTED PAPERBOARD SHEETS

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15 Claims. (Cl. 34—28)

This invention relates in general to new and useful improvements in drying apparatus, and more particularly to a novel apparatus for the speedier drying of stacked, freshly printed paperboard sheets.

It is readily apparent that when sheets of paperboard are stacked, due to the weight of the sheets in the stack, an air layer between the individual sheets is almost entirely eliminated. Thus stacked, freshly printed sheets of paperboard which have been stacked by the stacker of a printing machine need very long cure periods. When the freshly printed sheets are tightly stacked together, the sheets have a tendency to be glued together by the wet ink. Such a gluing together of the wet sheets not only results in mackled sheets, but also results in considerable stoppages in the printing processes when the sheets are again sent through the printing press for a second or succeeding print colors. In addition, the long curing period required with stacked sheets results in a large accumulation of sheets for which storage space has to be provided. This causes quite a problem for printing plants having a high production.

At the present time, in order to overcome the foregoing difficulties, the stacks are alternately stacked, sheet by sheet, and inspected for sticking and blemishes. In spite of this effort at a high labor cost, the result is not of average quality. Another method practiced to prevent sticking and to increase the rate of drying is to blow powder between the sheets while they are being stacked. Although this method prevents sticking fairly well, it has little influence on the drying or curing process. The disadvantages of this method are obvious.

In view of the foregoing, it is the primary object of this invention to provide a novel apparatus which will receive a stack of freshly printed paperboard sheets and effect the fanning of the sheets of the stack so as to provide for the effective aeration of the printed surfaces of the sheets and the quick drying thereof.

Another object of this invention is to provide a novel apparatus for effecting the aeration of freshly printed paperboard sheets, the apparatus including means for receiving a stack of the paperboard sheets, and rotating the stack of sheets approximately 90° whereby the sheets stand on edge and are free to move slightly apart to provide for the necessary aeration of the individual sheets.

Still another object of this invention is to provide a novel apparatus for effecting the fanning of sheets of paperboard arranged in a stack, the apparatus being provided with means for receiving a stack of sheets and rotating the same so that the sheets stand on edge with the sheets being free to move apart a slight amount whereby air may pass in between all of the sheets.

A further object of this invention is to provide a novel apparatus for supporting a stack of freshly printed paperboard sheets in a manner wherein the sheets are free to fan apart, the apparatus including a platform adapted to have the stack of sheets rested thereon, a backing member for engaging one side of the stack of sheets and to function as a support for the sheets when the stack is rotated 90°, and a retainer initially overlying the stack of sheets and spaced therefrom, the retainer cooperating with the platform when the stack is in a rotated position

to restrict the movement apart of the sheets, that is, the expansions of the sheets, whereby a limited separation of the sheets and the aeration of the printed surfaces thereof is facilitated.

5 Still another object of this invention is to provide a novel apparatus for rotating a stack of freshly printed paperboard sheets so that the sheets of the stack stand on edges, wherein the sheets are free to move apart to provide for the necessary aeration thereof, and there being provided vibratory means for vibrating the stack of sheets to effect the fanning thereof.

10 A still further object of this invention is to provide a novel method of aerating freshly printed paperboard sheets, the method including the rotation of a stack of sheets until the sheets of the stack stand on edge, and then permitting the sheets to fan apart so that air may pass in between the sheets to effect the necessary drying operation.

15 With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings:

In the drawings:

20 FIGURE 1 is a side elevational view of the apparatus of this invention and shows a stack of paperboard sheets initially loaded therein, a fork lift truck for placing and removing the stack of sheets and a control unit for the apparatus being shown in phantom lines.

25 FIGURE 2 is a plan view on a large scale of the apparatus of FIGURE 1, and shows more specifically the details thereof.

30 FIGURE 3 is a longitudinal vertical sectional view taken along the line 3—3 of FIGURE 2, and shows specifically the details of the apparatus.

35 FIGURE 4 is a vertical transverse sectional view taken generally along the line 4—4 of FIGURE 3, and shows other details of the apparatus.

40 FIGURE 5 is a transverse vertical sectional view taken generally along the line 5—5 of FIGURE 3, and shows additional details of the apparatus.

45 FIGURE 6 is a horizontal sectional view taken along the line 6—6 of FIGURE 3, and shows the manner in which the backing member is mounted for movement relative to the platform.

50 FIGURE 7 is a fragmentary transverse vertical sectional view taken along the line 7—7 of FIGURE 3, and shows specifically the details of the vibrator of the apparatus.

55 Referring now to the drawings in detail, it will be seen that the apparatus, which is the subject of this invention, is shown generally in FIGURE 1 and is generally referred to by the numeral 10. The apparatus 10 includes a supporting frame which is generally referred to by the numeral 11. The supporting frame 11 includes a base 12 which has a set of rear columns 13 and a set of forward columns 14 extending upwardly therefrom. The rear columns 13 have the upper ends thereof connected together by a transverse frame member 15. Longitudinal frame members 16 extend forwardly from the upper ends of the rear columns 13 to the upper ends of the front columns 14.

60 It will be seen from FIGURE 4 in particular that the longitudinal frame members 16 carry bearings 17 in which there are journaled the ends of a shaft 18. The shaft 18, as is best illustrated in FIGURE 3, is disposed immediately forward of a transverse frame member 20 which extends between the longitudinal frame members 16.

70 A pair of normally upright supports 21 are normally disposed alongside the columns 14 and inwardly thereof. Each of the frame members 21 is provided with a rear-

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wardly extending ear 22 which is rigidly secured to the shaft 18 for rotation therewith. The lower ends of the upright supports 21 are rigidly connected together by a transverse frame member 23 which is best illustrated in FIGURE 3. The shaft 18 is provided with a centrally located sprocket 23 which is keyed thereonto and which is driven by a drive chain 24 from a drive pulley 25 carried by a power unit 26. The power unit 26 is supported on a transverse frame member 27 which connects together the columns 14.

Each of the upright supports 21 is provided with a block 27 which is provided at its forward inner corner with a notch 28. An upstanding arm 29 of a platform 30 is rigidly secured to the forward faces of the blocks 27 and cooperates therewith so that the notches 28 open in opposite position to one another. A generally rectangular frame 31 having a large central opening 32 formed therein is mounted between the blocks 27 with the edges thereof received in the notches 28 for guided vertical movement. A plate 33 extends between the blocks 27 within the general confines of the frame 29. A cylinder 34 of a fluid motor 37 is seated on the plate 33. The cylinder 34 is provided with a piston 35 which is rigidly secured to the frame 31 for moving the same.

It will be readily apparent that the fluid motor, which is generally referred to by the numeral 37, may be used for the purpose of raising and lowering the frame 31. The frame 31 is restricted against movement other than vertical movement by being seated within the notches 28 of the blocks 27.

A backing member, generally referred to by the numeral 38, overlies the platform 30 and is disposed in generally parallel relation to the arm 29. The backing member 38 is of a hollow construction and includes a front plate 40, a rear plate 41 and a generally rectangular frame 42 extending between the plates 40 and 41. Four guide rods 43 extend rearwardly from the rear wall 41 in rectilinear arrangement and are slidably received in openings 44 in the frame 31 and serve to support the backing member 38 from the frame 31. The guide rods 43 pass through vertically elongated slots 45 formed in the arm 29.

The backing member 38 is mounted for movement towards and away from the arm 29. In order to effect this movement, there is secured to the rear surface of the frame 31 a pair of extensible fluid motors 46. The fluid motors 46 are disposed in vertical alignment and are disposed generally along the vertical center line of the frame 31. Each fluid motor 46 includes a cylinder 47 which is rigidly secured to the rear surface of the frame 31. A piston 48 is mounted in each of the cylinders 47 and has a piston rod 49 connected thereto. Each piston rod 49 passes through an opening 50 in the frame 31 and through a vertically elongated slot 51 in the arm 29. Each piston rod 49 also passes through a large opening 52 in the rear wall 41 of the backing member 38 and terminates in a ball head 53. A socket defining assembly 54 is secured to the forward or inner surface of the rear wall 41 and receives the ball 53 so that a pivotal connection between the backing member 38 and each of the piston rods 49 is provided.

It will be readily apparent that inasmuch as the fluid motors 46 are disposed along a vertical center line of the frame 29, a pivoting of the backing member 38 about a vertical axis is possible. Also, it will be readily apparent that a pivoting of the backing member 38 about a horizontal axis is possible. Thus, the backing member 38 can be effectively brought into engagement with a rear-most wall of the stack.

A pair of guides 56 extend upwardly from the backing member 38 and sleeve elements 57 of a retainer 58 are engaged over the guides 56. The retainer 58 is in the form of a relatively wide and elongated plate which overlies the support 30. The retainer 58 is vertically adjusted relative to the platform 30 by means of an extensible fluid

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motor, generally referred to by the numeral 60, which is mounted within the backing member 38. The extensible fluid motor 60 includes a cylinder 61 which is suitably secured to a transverse plate 62 disposed within the backing member 38 and rigidly secured to at least the front wall 40 thereof. A piston 63 is mounted within the cylinder 61 for movement and has connected thereto a piston rod 64 which passes through an opening 65 in the top part of the frame 42. The piston rod 64 is suitably secured to the retainer 58 for effecting the up and down movement of the retainer 58.

In order to assure continuity of the front wall 40 of the backing member 38, the retainer 58 is provided with a plurality of depending fingers 66 which are secured to the retainer 58 within the plane of the front wall 40 and which are seated in shallow recesses 67 formed in the forward surface of the front wall 40, as is clearly shown in FIGURES 3 and 6.

It is to be understood that the blocks 27 are mounted for limited sliding movement along the supports 21. This is to effect the reciprocation at a high speed of the platform 30, the backing member 38 and the retainer 58 as a unit. To this end, there is carried by the transverse frame member 23 a power unit 68 having an eccentric crank 69 which is connected to a plate 70 extending from the platform 30, as is clearly shown in FIGURES 3 and 7. It is to be noted that a link 71 is disposed intermediate the eccentric crank 69 and the plate 70. The link 71 is connected to the eccentric crank 69 by means of a pin 72 and to the plate 70 by means of a pin 73.

It will be readily apparent that the controls for the apparatus 10 are relatively simple. It is merely necessary that the power unit 26 be of the reversible type and that it be provided with a control which will provide for the running thereof in either of the two possible directions and the stopping thereof. The power unit 68 merely requires a stop-start control. It is preferred that the controls for the power units 26 and 68 be mounted in overhead housing 74 at a position spaced slightly in front of the apparatus 10. In accordance with this invention, a stack S of printed paperboard sheets will normally be mounted on a pallet P and the positioning thereof on the platform 30 and the removal thereof from the platform will normally be accomplished by means of a fork lift truck T of a conventional type. It is therefore desirable that the controls for the power units 26 and 68 be positioned where they may be readily manipulated by the operator of the fork lift truck T while seated in position thereon.

Referring now to FIGURE 3 in particular, it will be seen that the arm 29 is provided with a stop 75 spaced above the surface of the platform 30 and adapted to engage an edge of the pallet P. When it is desired to aerate a stack S of printed paperboard sheets, the pallet and the stack are positioned on the platform 30 while the platform 30 is in a horizontal position. The pallet P is advanced rearwardly over the platform 30 until it strikes the stop 75. The fork lift truck or other stack and pallet conveying means is then removed. The apparatus 10 is now ready to be positioned relative to the stack S to effect the necessary aeration of the individual sheets of the stack S.

At this time, it is also pointed out that it is preferred that all of the fluid motors 37, 46 and 60 be of the double acting type and be mounted within the housing 74. Thus these fluid motors can also be actuated by the operator of the fork lift truck T while seated thereon.

Once the stack S and the pallet P have been positioned on the platform 30, the backing member 38 is advanced until it comes into contact with the rear surface of the stack S by operating the fluid motors 46. The backing member 38 is also lowered, by operating the fluid motor 37, until it comes to rest on the pallet P. It is to be understood that the rear surface of the

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stack S is not necessarily vertical and due to the specific mounting of the backing plate 38, a slight twisting thereof to conform to the rear surface of the stack S is possible. Accordingly, the backing member 38 may be brought into firm engagement with the rear surface of the stack S.

After the backing member 58 has been properly positioned with respect to the stack S, the retainer 38 is lowered by operating the fluid motor 60. The retainer 58 is not brought into engagement with the uppermost sheet of the stack S, but is spaced therefrom a predetermined distance which will permit expansion of the stack S.

The power unit 26 is now operated and the supports 21 are tilted rearwardly from the position shown in FIGURE 3 to a horizontal position shown in dotted lines in FIGURE 1 overlying the base 11. As the stack S is rotated, the support thereof is shifted from the pallet P to the backing member 38 so that the individual sheets of the stack S are supported by the edges thereof. This relieves the load of one sheet on the next sheet and permits a slight fanning action of the individual sheets to permit air to pass therebetween and effect the desired drying operation. This fanning action in itself may be sufficient to accomplish the desired drying operation. However, the drying of the ink printed onto the paperboard sheets may be accelerated by vibrating the stack of sheets so that the sheets fan back and forth. It is to this end that the power unit 68 is provided.

It is to be understood that the operating cycle of apparatus 10 is of very short duration with normal inks. After the necessary aeration of the printed surfaces of the paperboard sheet has been accomplished, the power unit 26 is again actuated, but in a reverse direction, to effect the return of the platform 30 from its upright position shown in dotted lines in FIGURE 1 to the solid line horizontal position thereof. In view of the fact that the sheets S have at all times been supported by either the pallet P or by the backing member 38, it will be readily apparent that the sheets again assume their original stacked positions. The retainer 58 is elevated, and the backing member 38 is moved upwardly and rearwardly so as to free the stack S and the pallet P. The fork lift truck T is then engaged with the pallet P and the stack and pallet are removed.

It will be readily apparent that the advantages of the above described apparatus are numerous. The major ones of the advantages are (1) a great reduction in labor cost; (2) a considerable acceleration of the curing process and thereby a reduction of the necessary storage time and storage space; and (3) a reduction of the waste of the printed sheets due to sticking and a better quality of printing.

Although only a preferred embodiment of the invention has been specifically illustrated and described here, it is to be understood that minor modifications may be made in the apparatus within the spirit and scope of the invention, as defined in the appended claims.

I claim:

1. An apparatus for aerating paperboard sheets and the like disposed in stacks comprising a base, a normally upright support, means coupling said support to said base for pivoting between the normal upright position thereof and a horizontal position, a platform carried by said support for receiving a stack of sheets, a stack retaining member overlying said platform, and means adjustably supporting said retaining member for movement relative to said platform while retaining said retaining member parallel to said platform to control the amount a stack may expand when horizontally disposed.

2. The apparatus of claim 1 wherein said means coupling said support to said base includes a horizontal pivot shaft, and a support rotating mechanism for rotating said support about the axis of said pivot shaft.

3. An apparatus for aerating paperboard sheets and

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the like disposed in stacks comprising a base, a normally upright support, means coupling said support to said base for pivoting between the normal upright position thereof and a horizontal position, a platform carried by said support for receiving a stack of sheets, a stack retaining member overlying said platform, means adjustably supporting said retaining member for movement relative to said platform while retaining said retaining member parallel to said platform to control the amount a stack may expand when horizontally disposed, and a vibrator connected to said platform for vibrating the same when said support is in a horizontal position.

4. An apparatus for aerating paperboard sheets and the like disposed in stacks comprising a base, a normally upright support, means coupling said support to said base for pivoting between the normal upright position thereof and a horizontal position, a platform carried by said support for receiving a stack of sheets, a backing member disposed parallel to said support and overlying said platform for engagement by a stack in the vertical position of said support and for supporting a stack in a horizontal stack aerating position of said support, a stack retaining member overlying said platform, and means adjustably supporting said retaining member to control the amount a stack may expand when horizontally disposed.

5. The apparatus of claim 4 together with means carried by said support mounting said backing member for movement towards and away from said support to assure engagement of said backing member with a stack seated on said platform.

6. The apparatus of claim 4 together with means carried by said support mounting said backing member for vertical movement towards and away from said platform to compensate for variations in the heights of stack supports.

7. The apparatus of claim 4 together with means carried by said support mounting said backing member for movement towards and away from said support to assure engagement of said backing member with a stack seated on said platform, and for vertical movement towards and away from said platform to compensate for variations in the heights of stack supports.

8. The apparatus of claim 4 wherein said backing member is supported from said support by means including cooperating guides and at least one generally transversely centered adjustable positioning member whereby the spacing between said support and said backing member may be varied and said backing member may be tilted relative to said support to align with a stack surface.

9. The apparatus of claim 1 wherein said retainer is carried by said support.

10. An apparatus for aerating paperboard sheets and the like disposed in stacks comprising a base, a normally upright support, means coupling said support to said base for pivoting between the normal upright position thereof and a horizontal position, a platform carried by said support for receiving a stack of sheets, a vertically adjustable frame guided by said support, guides carried by said frame supporting a backing member in a position overlying said platform and generally parallel to said support, means extending between said support and said frame for adjusting the vertical position of said frame and said backing member, backing member positioning means connected between said frame and said backing member for adjusting the spacing of said backing member from said support, said backing member being adapted to support a stack in a tilted position of said platform, and a retainer overlying said platform in generally parallel relation to limit the amount a stack may expand when horizontally disposed.

11. The apparatus of claim 10 wherein said guides are pivotally connected to said backing member to permit a limited pivoting of said backing member relative to said platform.

12. The apparatus of claim 10 wherein said retainer

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is carried by said backing member for movement there-with.

13. The apparatus of claim 10 wherein said retainer is carried by said backing member for movement there-with, and means mounting said retainer for movement relative to said backing member towards and away from said platform. 5

14. The apparatus of claim 10 wherein said guides are pivotally connected to said backing member to permit a limited pivoting of said backing member relative to said platform, and said backing member positioning means being centrally located. 10

15. A method of aerating sheets arranged in a stack comprising the steps of mounting a stack of the sheets on a platform, confining the stack along one side and above the same in spaced relation, tilting the platform and the 15

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stack with the stack assuming a position resting on the one side, and vibrating the stack to effect the repeated separation of closing of adjacent sheets to provide for air flow therebetween.

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