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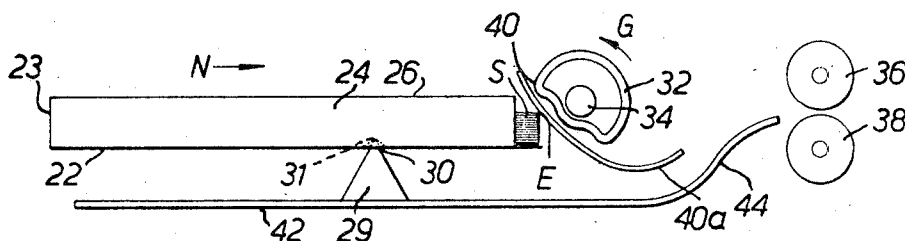
[54] SHEET-FEEDING ARRANGEMENTS
9 Claims, 3 Drawing Figs.

[52]	U.S. Cl.....	271/39
[51]	Int. Cl.....	B65h 3/06
[50]	Field of Search.....	271/36, 39,
		9

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ABSTRACT: The invention relates to apparatus and a method for feeding copy sheets from a magazine to the charging means of an electrostatic copier. The magazine contains a stack of sheets and the apparatus comprises feed means for feeding each succeeding top sheet downwardly from the stack at an acute angle to a leading face of the stack across an edge of the stack so that the top sheet bows upwardly away from the next sheet in the stack to minimize the risk of adhesion between the top sheet and the next sheet as the top sheet leaves the magazine.



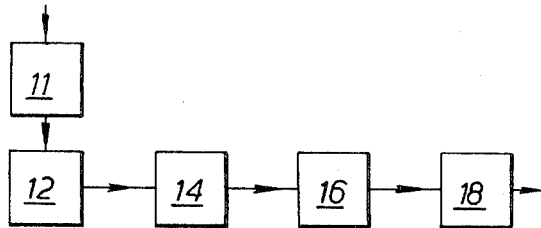


FIG. 1.

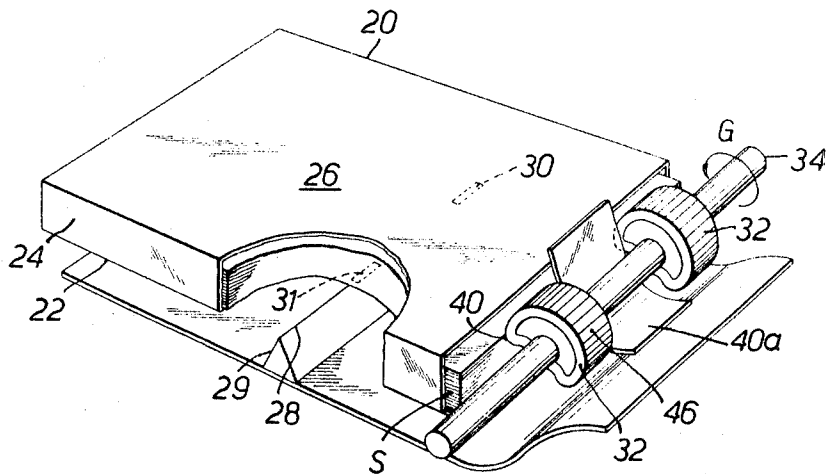


FIG. 2.

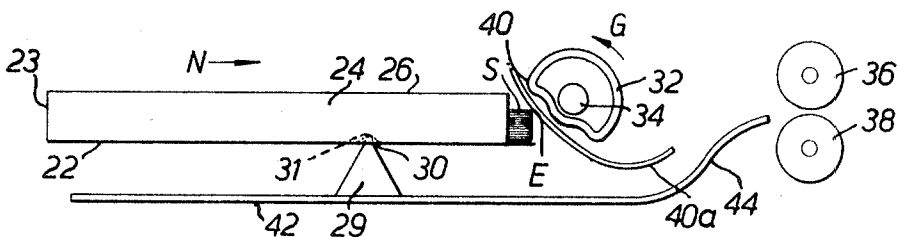


FIG. 3.

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SHEET-FEEDING ARRANGEMENTS

This invention comprises improvements in sheet-feeding arrangements for feeding sheets from a stack thereof and concerns particularly but not exclusively such sheet-feeding arrangements for use in electrostatic copying machines.

For example, a sheet of copy paper is fed from a stack through a charger in an electrostatic copying machine, the charger imparting an electrostatic charge to the sheet.

A problem arises, particularly with coated papers used in electrostatic copying processes, due to the electrostatic charge being conducted back through the sheet, or the coating on the sheet, to the stack of copy paper. This tends to make the sheets in the stack stick together and to cause the sheet next to that being fed to attach itself to the tail end of the sheet being fed so as to be dragged off the stack by that sheet. Due to this effect, a whole succession of sheets may become coupled and fed from the stack as a continuous web or chain, the electrostatic charge being conducted back through the chain, continuously to charge and attach succeeding sheets to the tail of the chain.

One means of overcoming this problem is to ensure that the sheet being fed to the charger from the stack, leaves the stack before its leading edge enters the charger. This tends to enlarge the machine, however, which is a disadvantage.

The present invention provides apparatus adapted for use in feeding sheets from a stack thereof comprising a support adapted to support a stack of sheets and feed means for feeding each succeeding top sheet downwardly from the stack at an acute angle to a leading face of the stack, across that edge of said face defined by the next sheet in the stack so that said top sheet bows upwardly away from the next sheet in the stack.

The invention also provides a method of feeding sheets from a stack thereof wherein each succeeding top sheet is fed from the stack downwardly at an acute angle to a leading face of the stack, across that edge of said face defined by the next sheet in the stack so that said top sheet bows upwardly away from the next sheet in the stack.

By feeding the sheets in this way in which each top sheet is caused to bow away from the next sheet in the stack, risk of adhesion of the sheets due to any electrostatic charge on the sheets, is very much reduced.

In an embodiment of the invention, for example guide means is provided adapted to guide the top sheet in a concave curved path as it is fed from the stack, the guide means acting to bow the sheet in the opposite direction to that in which it is bowed by the sheet feed means.

The guide means assists in bowing the sheet away from the next sheet in the stack by initially leading the sheet at the acute angle to said one side face of the stack at which it is fed from the stack by the sheet feed means. It may also have the effect of trapping a lower one of say two sheets fed forward simultaneously, in error, towards the charger. Thus, for example the leading edge of the lower sheet tends to drop away from that, of the top sheet, into abutment with a lower guide of said guide means, so as to arrest the movement of the lower sheet, while the top sheet continues to be fed forward by the sheet feed means. The separation of the sheets in this manner also prevents them adhering together by means of any electrostatic charge conducted back along the top sheet when the top sheet reaches the charging means.

There now follows a description, to be read with reference to the accompanying drawings, of a wet-type electrostatic copier embodying the invention. This description, which is also illustrative of method aspects of the invention, is given by way of example of the invention only and not by way of limitation thereof.

In the accompanying drawings:

FIG. 1 shows a schematic diagram of the electrostatic copier embodying the invention;

FIG. 2 shows a perspective view of sheet-feeding apparatus of the copier; and

FIG. 3 shows a side view corresponding to FIG. 2.

The electrostatic copier embodying the invention comprises (FIG. 1) sheet-feeding apparatus 11, a charging device 12 adapted to charge a copy sheet fed thereto by the apparatus 11, with a negative electrostatic charge, a projector 14 arranged to project an image to be copied onto the charged copy sheet to provide a latent image on one side thereof, apparatus 16 adapted for use in treating the sheet bearing the latent image with a developer liquid to develop the image, and a fan 18 arranged to dry the sheet leaving the apparatus 16; the copy sheet passing the fan 18 bears a developed image and is in a finished form. The path of the copy sheet through the copier is indicated by arrows in FIG. 1. The charging device 12, the projector 14 and the fan 18 are of conventional construction, and details thereof form no part of the present invention per se. The apparatus 16 is as described in our copending U.S. Pat. application Ser. No. 729,077, filed May 14, 1968 and now abandoned, and again details thereof form no part of the present invention per se.

The apparatus 11 (FIG. 2) comprises a cardboard magazine 20 containing a stack S of copy sheets and the apparatus is adapted for use in feeding sheets one at a time from the stack S. The magazine 20 provides a relatively rigid platform 22 supporting the stack S, a rear wall 23, sidewalls 24 and a top wall 26. The magazine 20 is open at the front and the platform 22 extends forwardly of the top wall 26. The top sheet of the stack S is spaced below the top wall 26. The platform 22 is pivoted on a fulcrum edge 28 provided by a fulcrum member 29 and extending transversely of the direction of feed, indicated by the arrow N; the platform 22 is located on the fulcrum edge 28 by two spaced slots 30 in the platform 22 which are received over corresponding formations 31 extending upwardly from the edge 28. It will be realized that the fulcrum member 29 provides a support for the stack S. The weight of the stack S is distributed so that an edge E of the stack is yieldably urged upwardly by said weight into frictional contact with a pair of spaced generally D-shaped feed rollers 32 mounted side-by-side for rotation on a shaft 34 extending transversely to the direction of feed.

The rollers 32 are shown in an angular position in which a sheet (not shown) has been fed forward to secondary sheet feed means constituted by rollers 36, 38 and the rollers 32 are reapproaching their initial position ready to feed the next sheet exposed on top of the stack S. In this initial position, in which the feed rollers 32 are intermittently halted, the uppermost rounded corners 40 (FIG. 3) of the rollers 32 engage the exposed surface of the top sheet of the stack S adjacent the edge E, the noncircular sides of the rollers 32 then extending forwardly beyond the edge E of the stack. The axis of the shaft 34 lies above the stack S beyond the edge E thereof in the direction of feed.

When it is required to feed the top sheet from the stack S the rollers 32 are rotated by conventional means (not shown) in the direction of the arrow G from their initial position as described, the top sheet is flicked from the stack S and fed downwardly across the edge E, which is now defined by the next sheet in the stack S, at an acute angle to the leading face of the stack, under a curved stationary guide 40a. The trailing portion of the top sheet now bows upwardly away from the next sheet in the stack S.

As the rollers 32 continue to rotate, the bowed sheet is fed forward across the edge E, which is maintained in contact with the rollers 32 by the weight of the stack S acting about the fulcrum edge 28, until the leading edge of the sheet reaches a position in the nip of the rollers 36, 38 which are subsequently operated to feed the sheet into the charging device 12. The change of radial distance between the edge E and the axis of the rollers 32, during rotation of the rollers 32 is accommodated by tilting of the magazine 26 on the fulcrum edge 28.

A stationary member 42 supports the fulcrum member 29 and provides a guide 44 confronting the guide 40a to define a curved guide passage for guiding the top sheet in a concave curved path towards the nip of the rollers 36, 38, as the sheet is fed from the stack S.

The guide passage is curved upwardly over an exit portion adjacent the 36, 38 36,38 whereby the guide 44 acts to arrest the lower of two sheets which may happen to be fed forward together, as previously described.

Each roller 32 has a serrated flexible covering 46 so as to present triangular-sectioned flexible teeth extending transversely on their peripheral surface.

The magazine 20 is as described in copending U.S. Pat. application Ser. No. 713,806, filed Mar. 18, 1968.

I claim:

1. Apparatus for feeding sheets from a stack thereof comprising:

a support means for supporting a stack of sheets to expose at least a portion of the top sheet adjacent the leading edge thereof; and feed means for engaging the exposed surface of the top sheet of the stack adjacent its leading edge and for feeding each successive top sheet downwardly from the stack at an acute angle relative to a leading face of the stack, across the edge of said leading face, the edge being defined by the next sheet in the stack, to bow the top sheet of the stack upwardly away from the next sheet in the stack.

2. Apparatus according to claim 1, wherein the support means is arranged so that the stack is yieldably urged into frictional contact with the feed means in the operation of the ap-

paratus.

3. Apparatus according to claim 2, wherein the feed means comprises a feed roller of generally D-shaped cross section, and means for rotating the feed roller through a complete revolution.

4. Apparatus according to claim 3, wherein the feed means comprises a plurality of said D-shaped rollers, said rollers being coaxial.

5. Apparatus according to claim 2, wherein the support means comprises a platform supporting the stack, and fulcrum means for pivoting the platform on an axis extending transversely to the direction of feed so that in the operation of the apparatus the weight of the stack yieldably urges the stack into said frictional contact.

6. Apparatus according to claim 5, comprising a magazine containing the stack and providing the platform.

7. Apparatus according to claim 6, wherein the magazine is of cardboard.

8. Apparatus according to claim 1, comprising guide means for guiding the top sheet in a concave curved path as it is fed from the stack.

9. Apparatus according to claim 1 wherein said feed means includes a guiding element.

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