

United States Patent

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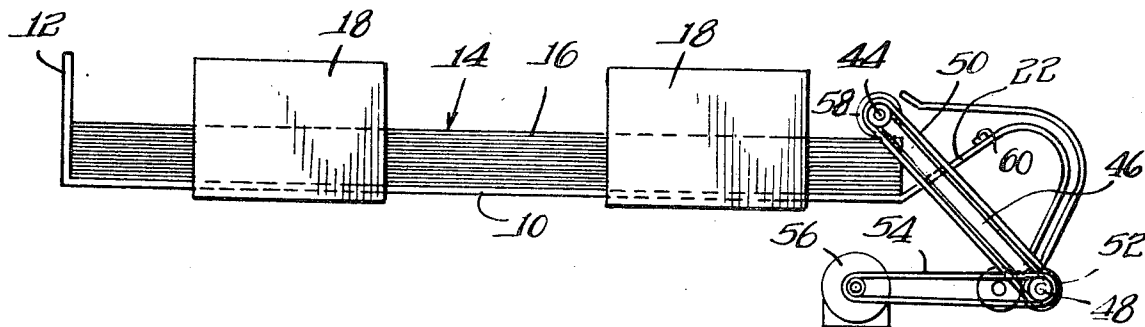
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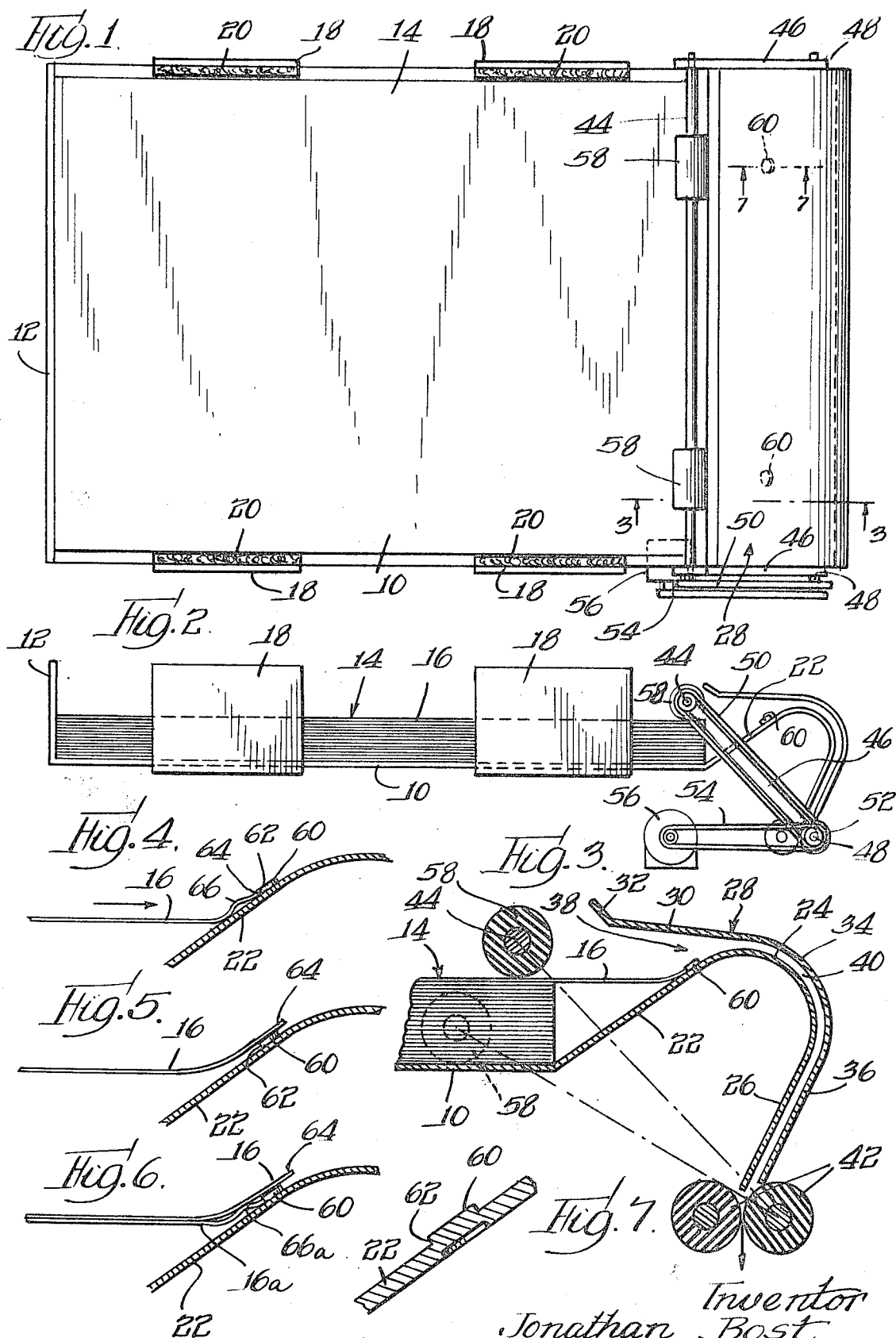
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[54] PAPER SEPARATOR 9 Claims, 7 Drawing Figs.

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18, 61

ABSTRACT: A paper separator for separating sheets of paper from a stack thereof. Rubber rollers advance the top sheet from the stack against a pair of protuberances of shallow height. The sheet of paper snaps over the protuberances. If two sheets are inadvertently moved edgewise from the stack, the top sheet snaps over the protuberances, but holds the lower sheet down against the protuberances which prevent advance of the second sheet.





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PAPER SEPARATOR

It is common practice in many types of copiers—such as xerographic or electrostatic copiers—to provide a stack of paper which is fed edgewise one sheet at a time from the top of the stack into position for electrostatic charging and subsequent processing to produce electrostatic prints. It is common practice to utilize one or more rollers resting on top of the paper near the forward end thereof to feed the top sheet of paper from the stack. However, occasionally two or more sheets at the top will tend to stick together, either as a result of static electricity, molecular adhesion, etc., whereby there is a tendency to feed two or more sheet at the same time. Obviously this is undesirable from many standpoints, including paper wastage, possible jamming of the feed mechanism, and improper charging.

In accordance with the present invention, the supporting surface over which the paper sheets are fed is provided with two protuberances (of slightly greater height than the paper thickness) which are engaged by the top paper sheet near the forward corners upon edgewise feeding of the paper sheet. These protuberances tend to stop the paper sheet, but since the paper sheet is driven by rollers or the like, it buckles slightly and then snaps over the protuberances for continued feeding. If two or more sheets are fed simultaneously, the top one either slides or snaps over the protuberances, while the underlying sheet or sheets, being held down by the top sheet, cannot snap over the protuberances. Thus, the top sheet is peeled off of the underlying sheets and fed to its ultimate destination, while the remaining sheet or sheets are arrested.

Accordingly, it is an object of the present invention to provide a simple and effective structure for positively separating sheets of paper which are fed edgewise from a stack of such sheets.

More specifically, it is an object of this invention to provide protuberance means in the path of paper fed edgewise from the stack thereof for separating the top sheet from underlying sheets which might tend to be fed with the top sheet.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in connection with the accompanying drawings wherein:

FIG. 1 is a top view of a paper separator constructed in accordance with the present invention;

FIG. 2 is a side view thereof;

FIG. 3 is a longitudinal sectional view taken substantially along the line 3-3 in FIG. 1;

FIG. 4 is a view similar to a part of FIG. 3 on an enlarged scale;

FIG. 5 is a view similar to FIG. 4, taken at a subsequent period of time;

FIG. 6 is a view similar to FIGS. 4 and 5 showing the separation of paper when two sheets are fed together; and

FIG. 7 is an enlarged sectional view taken along the lines 7-7 in FIG. 1.

Although the present invention has utility in almost any situation in which it is desired to feed the top sheet of a stack of paper from the stack, it has particular utility in a table top electrostatic copying machine such as that shown in application for United States Letters Pat. Ser. No. 710,266, filed Mar. 4, 1968, by Messrs. Jarzembki and Jaeger, and entitled "Table Top Unit for Electrostatic Copying Machine." In accordance with the present invention, a supporting surface or floor 10 (conveniently a steel plate) is provided, and has an upstanding rear wall or flange 12. A stack 14 of sheets of paper 16 is supported on the plate or floor 10, and is butted against the end wall or flange 12 for positioning. In addition, and in accordance with known techniques, there are provided lateral flange means 18 upstanding along the edge of the floor, and carrying pads 20 of foam plastic material which engage the edges of the paper sheets 16 in the stack 14 and tend to hold the sheets in place.

At the outfeed end of the floor 10—the right end as viewed in the drawings—the supporting surface angles upward as indicated at 22 at an acute angle with the horizontal, and then turns down at 24 substantially on a semicircle to a straight sec-

tion 26. An outer shield 28 encircles the foregoing part, comprising an infeed section 30 lying slightly above the horizontal, and having an upturned inlet end 32. The infeed section 30 merges with an arcuate, nearly semicircular, portion 34 which leads to a straight outfeed portion 36 parallel to the section 26, but spaced therefrom. The foregoing sections or portions define a paper feeding guide having a tapered inlet 38 and a substantially uniform height passage 40 leading to a pair of counterrotating guide rollers 42. These guide rollers are driven by any suitable means, not shown.

A cross-shaft 44 is supported above the stack 14 and relatively near the outfeed end thereof by means of a pair of arms 46 positioned at opposite sides of the plate or floor 10 and pivoted at their lower ends from a fixed support as indicated at 48. The cross-shaft 44 is driven by suitable means, such as a belt or chain 50 driven by an idler pulley or sprocket 52, the latter in turn being driven by a pulley or chain 54 from a motor 56 or other suitable power source.

The cross-shaft 44 is provided relatively near the opposite ends thereof with a pair of rubber rollers 58. These rollers are of a rather soft nature having high frictional qualities in engagement with a sheet of paper. Due to the support by the pivot arms 46, the rollers are free to move from the solid line position shown in FIG. 3 with a full stack of paper down toward the broken line position shown in FIG. 3 as the stack of paper is depleted.

As will be apparent in FIGS. 2 and 3, rotation of the rollers in a counterclockwise direction feeds the top sheet of paper 16 from the stack 14 to the guide 38,40, and thence down between the rollers 42 for continued feeding. As has been noted heretofore, there is sometimes a tendency for two or more sheets at the top of the stack to stick together, whereby more than one sheet is fed. To overcome this, and substantially in line with the rollers 58 and hence toward the edges of the paper, there is provided a pair of upstanding protuberances 60 spaced above the top sheet of the stack 14 on the inclined plate 22 relatively at the upper end thereof, and substantially at the junction with the arcuate plate section 24. The protuberances 60 are provided by partially punching circular sections from the sheet 22. In accordance with a preferred example of the invention, the protuberances 60 are struck up 0.015 inch above the surface of the inclined plate 22 for use with a sheet of paper approximately 0.003 inch thick. Each protuberance 60 is in the nature of a round semiperforation in the plate, and has square shoulders, particularly at the leading edge indicated at 62. The circular shape is especially efficient in effecting the snapping over of the paper without snagging.

Thus, as may be seen in FIG. 4, when the top sheet 16 is fed forward from the stack 14 by the rollers 58, the leading edge 64 of the sheet engages the shoulder 62 of each protuberance 60, temporarily to arrest the sheet 16. However, since the sheet is more or less positively driven by the rollers 58 on a line with the protuberances 60, the sheet first buckles locally, as indicated at 66 in FIG. 4, and then snaps over the protuberance as shown in FIG. 5 for continued feeding into the guide 38,40.

On the other hand, if two sheets are fed forward by the rollers 58 as shown in FIG. 6, it is the lower sheet, indicated at 16a, which buckles at 66a, thus raising the top sheet 16 so that it readily rides over the protuberances 60. There may be some localized buckling of the top sheet upon initial engagement with the protuberances 60, but this is readily overcome by the semipositive feeding by the rollers 58. On the other hand, since there is no great edgewise feeding force imparted to the second sheet 16a, and particularly since the second sheet is held down by the first sheet (noting that the sheets are deflected up by the guide surface 22 and exert a certain degree of downward resilience as well as a downward gravitational weight), the underlying sheet is firmly held against the protuberances 60, and thus the two sheets are separated from one another.

It will now be apparent that by the use of very simple structure adding substantially no significant cost to the overall cost

of a copying machine—particularly an electrostatic copying machine,—I have provided means for most effectively separating sheets of paper fed edgewise from a stack, whereby only the top sheet is fed, and any underlying sheets are restrained or arrested.

The specific example of the invention as herein shown and described is for illustrative purposes only, and various changes in structure as may occur to those skilled in the art will be understood as forming a part of the present invention insofar as they fall within the spirit and scope of the appended claims.

I claim:

1. Apparatus for feeding and separating paper or the like sheets comprising means for supporting a stack of paper or the like sheets in face-to-face relation, roller means engageable with the top sheet in said stack and rotatable to feed the top sheet edgewise from the stack, guide means against which the top sheet is fed, and protuberance means on said guide means and against which the lading edge of said top sheet impinges, said protuberance means being of a sufficient extent to arrest an underlying sheet of paper in the event of simultaneous feeding of more than one sheet from the stack but of insufficient extent to prevent snapping of said top sheet thereover.

2. Apparatus as set forth in claim 1, wherein the protuberance means comprises a plurality of laterally spaced protuberances.

3. Apparatus as set forth in claim 2, wherein the protube-

rances are relatively adjacent the opposite edges of the sheet.

4. Apparatus as set forth in claim 2, wherein the protuberances are partially struck from said guide means.

5. Apparatus as set forth in claim 4, wherein said protuberances are substantially round.

6. Apparatus as set forth in claim 2, wherein said roller means comprises a plurality of rollers of like number with said protuberances and substantially in line with said protuberances in the direction of feed.

7. Apparatus as set forth in claim 1, wherein said guide means is at an oblique angle relative to said stack supporting means in the direction of said paper stack from said supporting means and deflects said paper in the same direction as said protuberances.

8. Apparatus as set forth in claim 7, wherein the protuberance means comprises a plurality of laterally spaced round protuberances disposed relatively adjacent the opposite edges of the paper and partially struck from the surface of said guide means, and wherein the roller means comprises a like plurality of rollers substantially aligned with the protuberances in the direction of paper feed.

9. Apparatus according to claim 1 in which said protuberance means are spaced from said means for supporting the stack of paper in the direction of the path of movement of sheets as they are successively fed from the stack.

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