United States Patent [19]

Terajima

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[54] **PAPER FEED TRAY FOR USE WITH COPYING MACHINE AND THE LIKE**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **271/11**; 271/18.1; 271/164; 271/DIG. 3

[51] **Int. Cl.²** **B65H 3/18**

[58] **Field of Search** ..... 271/11, 18.1, 18.2, 145, 271/146, 161–164, 105, DIG. 3, 193, 208

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[57] **ABSTRACT**

A paper feed device for use with a copying machine or the like, the device comprising a tray for containing a stack of copy paper, charging means for applying electric charge to at least the side of the stack to separate the sheets of copy paper from one another and thus lessen the probability of the sheets being double fed to the copying machine, and feeding means for feeding the sheets from the tray to the copying machine.

6 Claims, 4 Drawing Figures

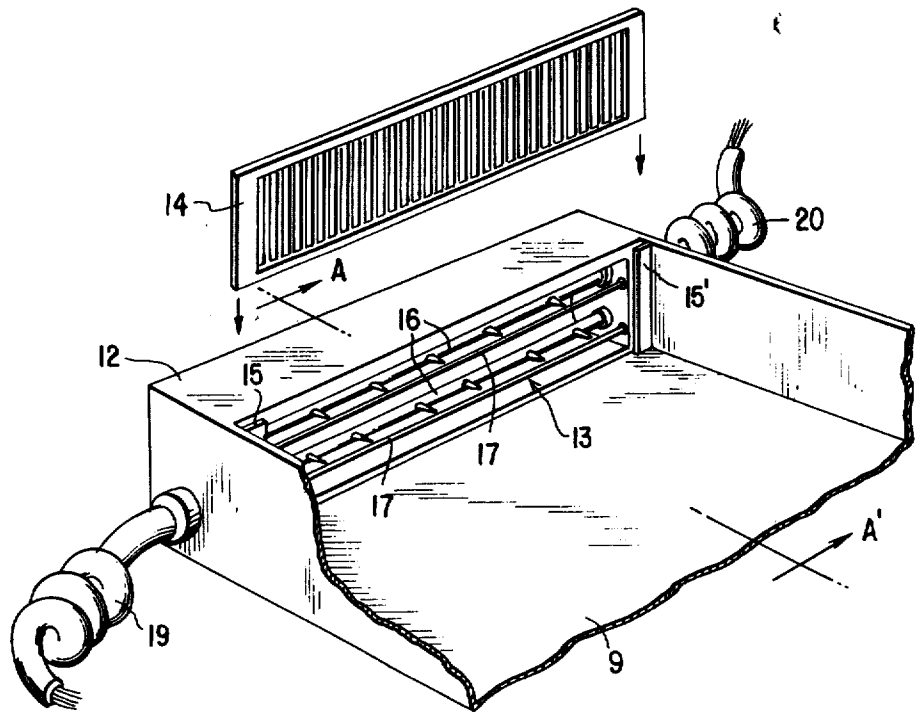
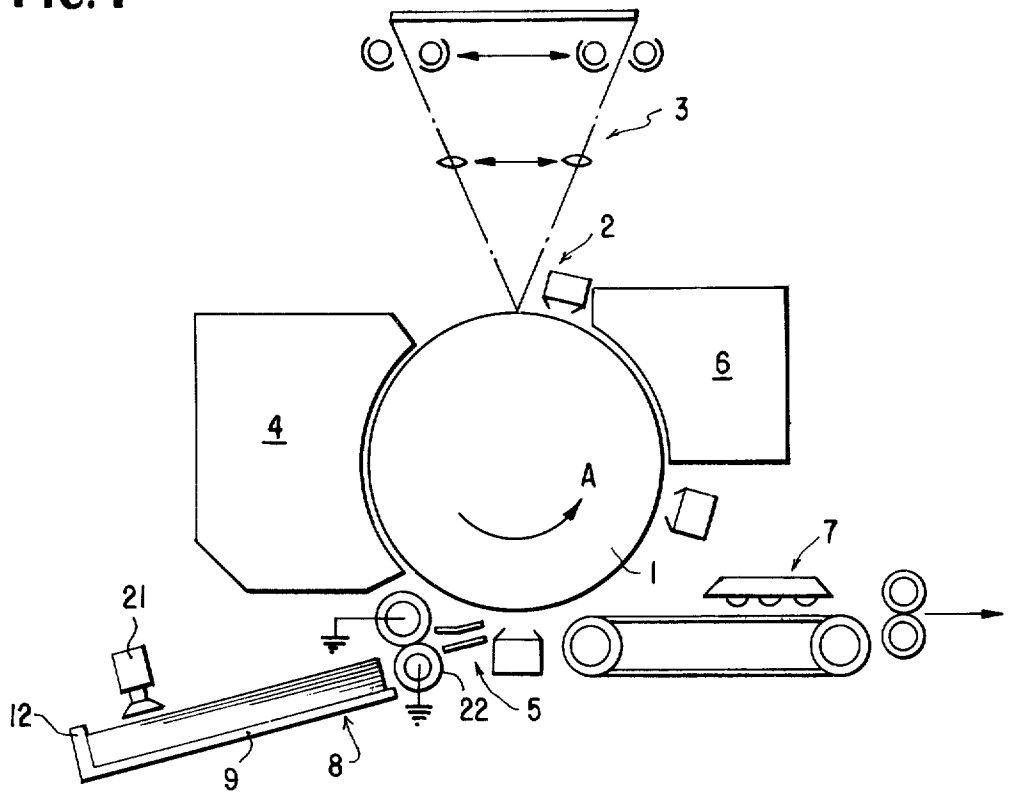


FIG. 1



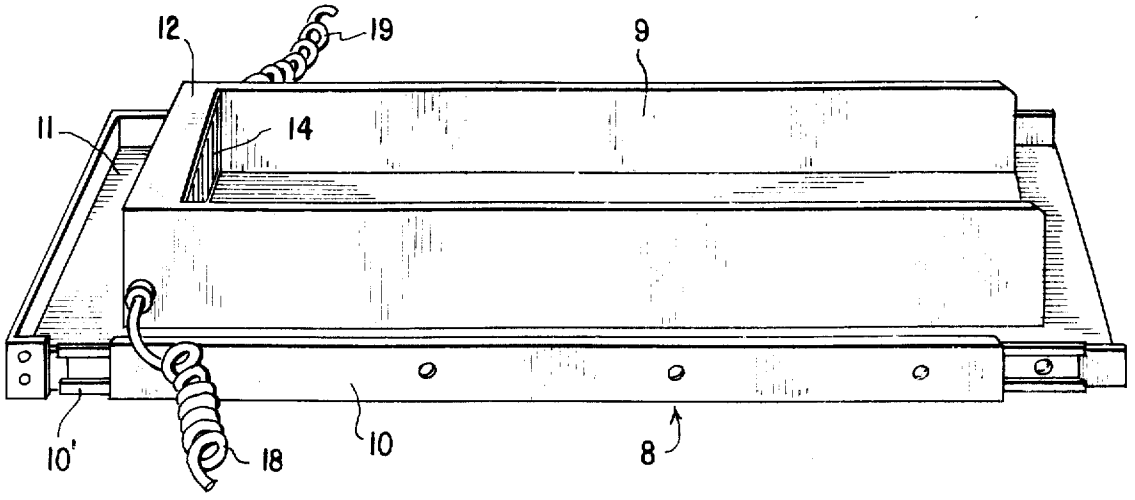
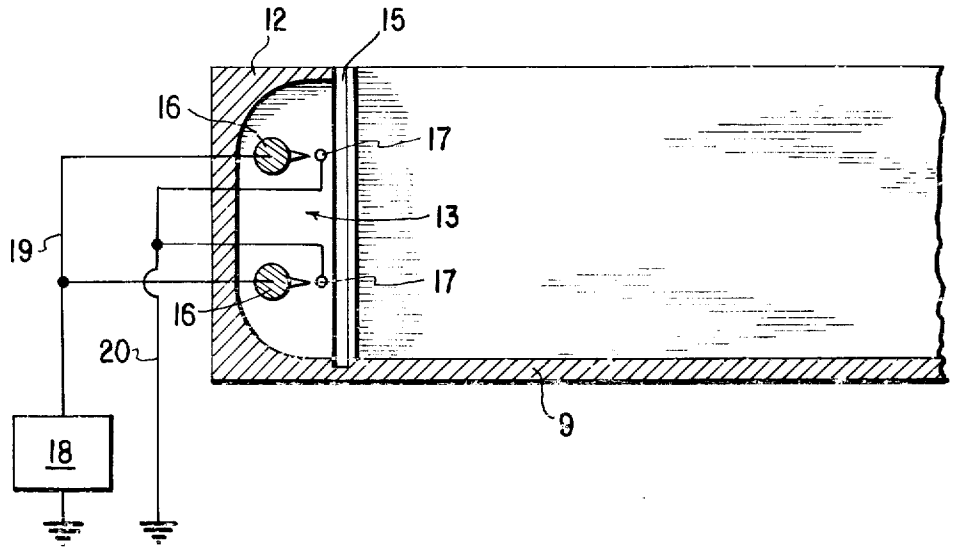


FIG. 2

FIG. 4



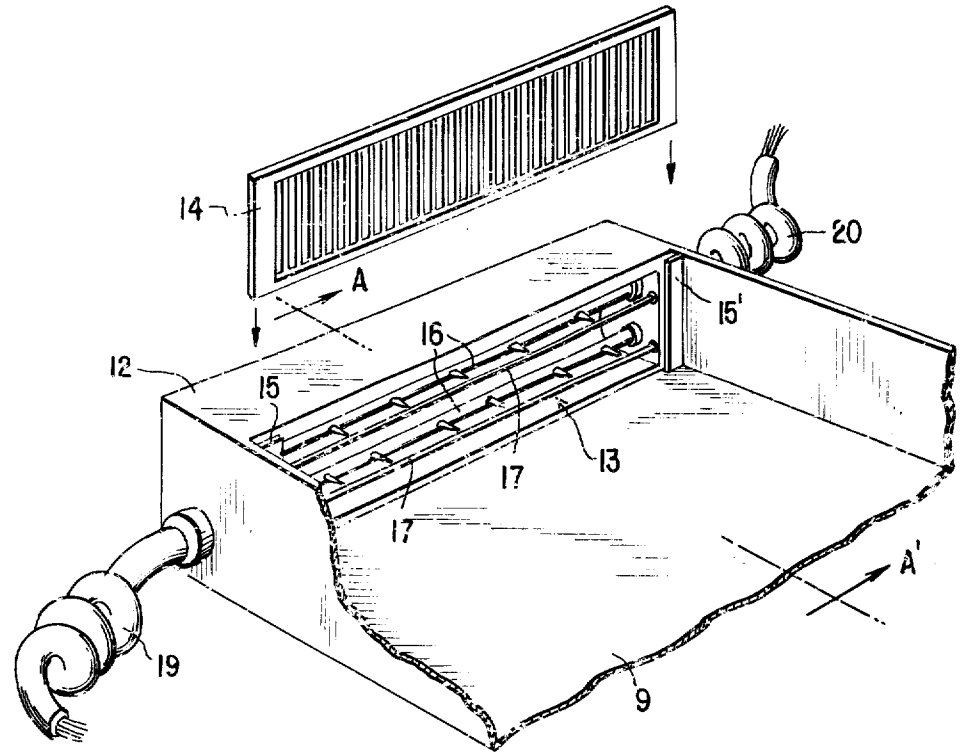


FIG. 3

PAPER FEED TRAY FOR USE WITH COPYING MACHINE AND THE LIKE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a paper feed device for use with a duplicator, a printing machine, or the like, and, in particular, to a paper feed tray for a stack of copy paper.

2. Discussion of the Prior Art

A conventional paper feed device of a duplicator, a printing machine, or the like is provided with a paper feed roll for feeding sheets of copy paper in tight contact therewith. The paper is fed forward by the paper feed roll for every cycle of duplication. However, the paper feed operation by the paper feed roll is often disturbed by the attraction between adjoining sheets of copy paper which may be caused by humidity or by static friction. Such double feeding constitutes a cause of trouble in the interior of the duplicator after the copy paper has been fed.

To minimize such defects, the stack of copy paper may be manipulated by the operator of the duplicator, prior to placing the stack of paper on a paper feed tray so that the ends of the paper are manually separated. Of course, all operators are not appropriately trained to effect this manipulation. Further, such manual manipulation tends to be unreliable.

A rubber roll inside the duplicator called a manipulating roll has been used to manipulate by revolving the rubber roll, and in addition, the manipulating roll has been supplemented by a blast pipe. However, such manipulation by a rubber roll or a blast pipe needs a driving gear to effectuate proper handling. Thus the duplicator tends to be bulky and complicated and hence, unsuitable for a small-sized duplicator or printing machine.

SUMMARY OF THE INVENTION

The present invention overcomes the aforementioned problems of the prior art and a primary purpose thereof lies in providing a paper feed tray capable of properly handling a stack of paper, in spite of the simple construction and the small size thereof.

Other objects and advantages of this invention will become apparent upon reading the appended claims in conjunction with the following detailed description and the attached drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic drawing of a copying apparatus incorporating the present invention.

FIG. 2 is a perspective of the paper feed device 8 of FIG. 1.

FIG. 3 is a perspective of the important section of the paper feed tray 9 of FIGS. 1 and 2.

FIG. 4 is a section along A—A' in FIG. 3.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

In FIG. 1 there is diagrammatically illustrated a photosensitive drum 1 which revolves in the direction of the arrow A. The surface of the drum is repetitively processed at the following conventional stations which include an electrification or charging station 2, an exposure station 3, a developing station 4, a transfer station 5, and a cleaning station 6. A fixing station 7 and a paper feed device 8 are also employed.

As shown in FIGS. 2, 3 and 4, the paper feed device 8 comprises a paper feed tray 9 made of an electrically insulating material, and a paper feed platform 11 having rails 10, 10' for sliding paper feed tray 9 so that copy paper can be readily placed in the tray. The rear wall 12 of paper feed tray 9 has an electrifier 13 provided therein. A screen 14 is provided on the side of rear wall 12 and confronts the copy paper to separate electrifier 13 and the copy paper. The screen 14 may be placed in or taken out of position freely by inserting it into, or pulling it out of grooves 15, 15' formed in paper feed tray 9.

The electrifier 13 comprises a needle-shaped electrode 16 and an opposed electrode 17 disposed in parallel to each other. The needle-shaped electrode 16 is connected with a direct-current high-voltage generator 18 and the opposed electrode 17 is preferably grounded. The direct-current high-voltage generator 18 has an interrupt switch (not shown in the drawing) disposed on the input side thereof. The interrupt switch may be placed on a door which is opened when the operator of the duplicator is about to place copy paper into tray 9. This switch would be switched off when the door is opened. The cord 19 on the high-voltage side of the electrifier 13 and the cord 20 on the ground side thereof are sufficiently long to allow the paper feed tray 9 complete freedom to slide.

When a stack of copy paper is placed on paper feed tray 9 and a power switch (not shown in the drawing) of the duplicator is switched on, electrifier 13 is placed in operation and the rear portion of the stack of copy paper is given an electric charge by electrifier 13. As a result, the copy paper stack has the adjoining sheets thereof made repulsive to each other, thus placing them in an electrostatically separated state. While in the separated state, the top copy paper is attracted by a vacuum device 21 as shown in FIG. 1 and then further fed to a paper feed roller 22 placed at the front end of the copy paper so that it is pinched and fed to transfer station 5. The paper feed roller 22 is electroconductive and discharges the electrostatic charge applied by the electrifier 13 to the copy paper.

The paper feed tray of the present invention is such that the copy paper need not be processed prior to the placing thereof in the tray. Further, the construction thereof is quite simple and thus, it is quite advantageous in terms of space savings, lower price, and better performance when compared with the conventional more complicated paper feed trays.

Numerous modifications of the invention will become apparent to one of ordinary skill in the art upon reading the foregoing disclosure. During such a reading it will be evident that this invention provides a unique paper feed tray for accomplishing the objects and advantages hereinstated.

What is claimed is:

1. A paper feed device for use with a copying machine or the like, said device comprising:

a tray for containing a stack of copy paper;

charging means for applying electric charge to at least the side of said stack to separate the sheets of copy paper from one another and thus lessen the probability of the sheets being double fed to the copying machine;

a potential source for said charging means;

feeding means for feeding said sheets from said tray to said copying machine; and

said tray being slideably disposed in said copying machine and the said potential source for said charging means being fixedly disposed in the copying machine, the potential source being connected to the charging means by wires of sufficient length to permit free sliding movement of said tray.

2. A device as in claim 1 including discharging means for discharging the charge on said sheets after they are transferred from said tray by said feeding means.

3. A device as in claim 2 where said feeding means includes at least one feed out roller for feeding said copy papers from said stack, said feed out roller being

connected to a reference potential to discharge the charge on said copy paper.

4. A device as in claim 3 where said feeding means includes vacuum means for applying a vacuum to the topmost sheet of said stack of copy paper after it has been separated by said charging means to initiate the feeding of the topmost sheet from said stack.

5. A device as in claim 1 where said charging means is disposed at one end of said tray.

6. A tray as in claim 1 including screen means disposed in said tray for separating said charging means from said stack of copy paper.

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