

[54] **DEVELOPING DEVICE FOR
ELECTROSTATIC DUPLICATORS**

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[22] Filed: **May 6, 1970**

[21] Appl. No.: **34,994**

[30] **Foreign Application Priority Data**

May 16, 1969 Japan.....44/45131

[52] U.S. Cl.....118/637, 117/37 LE, 118/DIG. 23,
355/10

[51] Int. Cl.G03g 13/00

[58] Field of Search.....118/637, 637 LX; 117/17.5,
117/37 LX; 355/10, 16, 17

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[57] **ABSTRACT**

A developing device comprising a continuous belt for carrying exposed photosensitive paper, an electrically conductive belt supported to be driven at the same speed in parallel spaced relationship therewith through a developing solution. A number of string-like insulating members are supported on the surface of the conductive belt facing the surface of the carrying belt. The insulating members and the conductive belt are driven into contact with a cleaning member mounted adjacent thereto.

3 Claims, 3 Drawing Figures

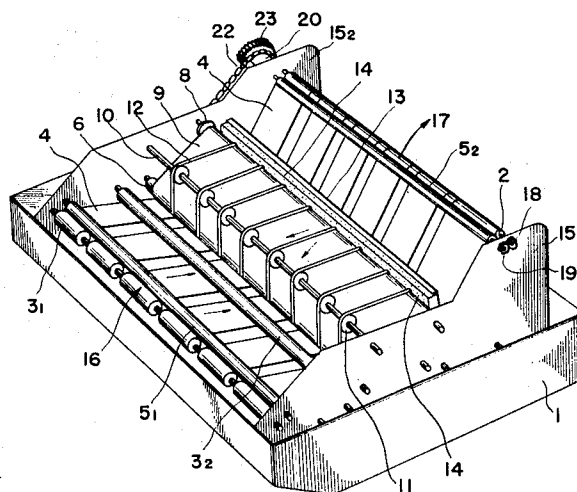


FIG. 1

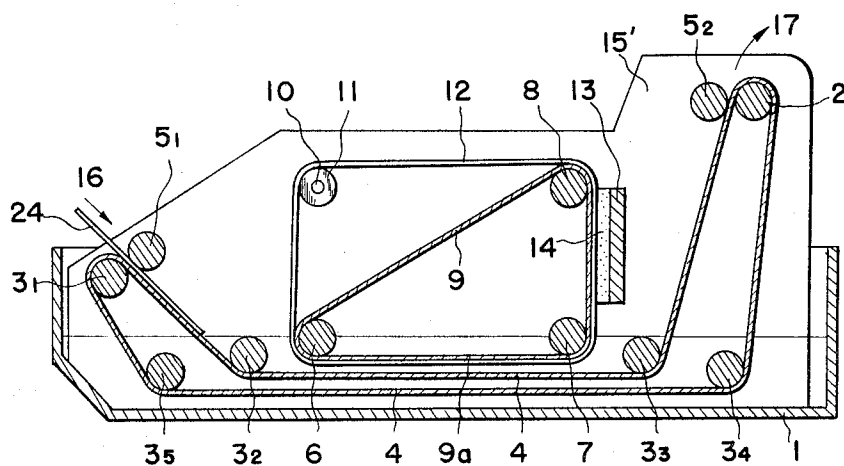
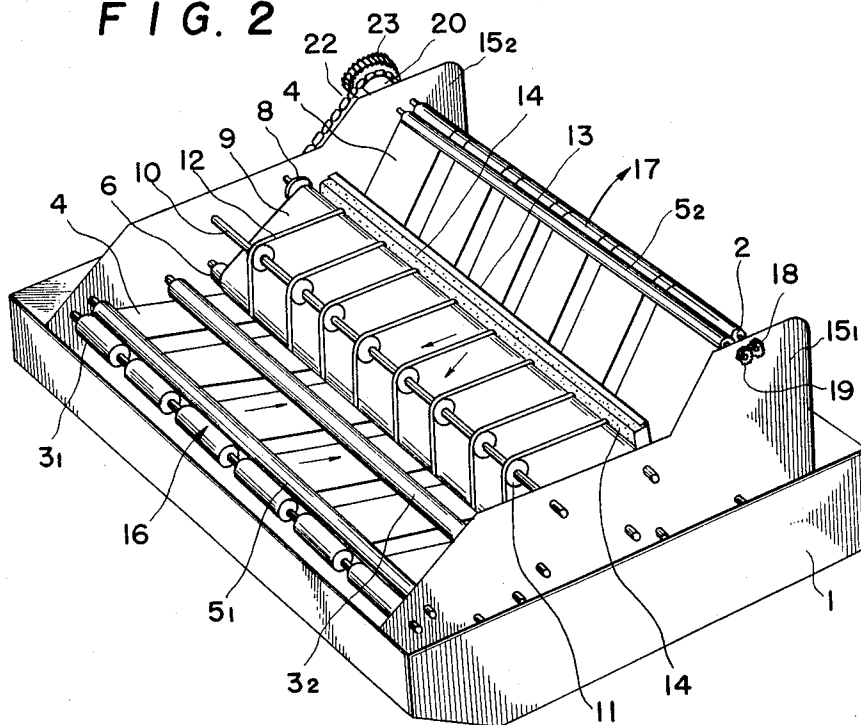


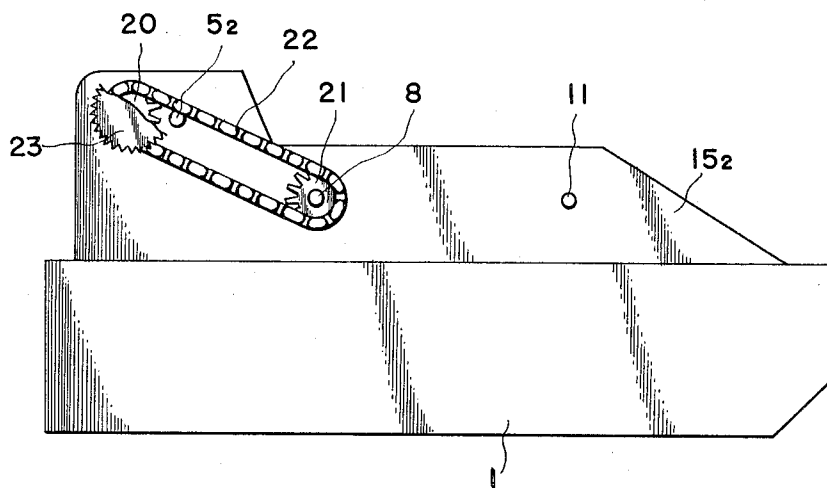
FIG. 2



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FIG. 3



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DEVELOPING DEVICE FOR ELECTROSTATIC DUPLICATORS

BACKGROUND OF THE INVENTION

In electrostatic duplicating apparatus, it is necessary for the exposed photosensitive paper and an electrode plate to be dipped in the developer wherein the photosensitive paper is carried close to the electrode plate by a belt or roller mechanism.

In the prior art, when a photosensitive paper is guided in proximity to said electrode plate, the photosensitive paper may protrude from the guide face or bend to come into contact with the electrode plate. The electrode plate and the photosensitive paper may rub against each other resulting in stain on the photosensitive paper or a blurring of the picture image and in a severe case the photosensitive paper might bend and break resulting in clogging.

SUMMARY OF THE INVENTION

In order to remove the drawbacks in the prior art described above, in the present invention the electrode plate is a belt shaped conductive band such as a flexible metal band, and is spread endlessly over a plurality of rollers so as to make one face thereof between the rollers and a parallel opposite face for the carrying path of the for developing the photosensitive paper in a developing tank, which face is opposed to an electrode in close proximity to the carrying path. And, on the periphery of belt shaped conductive band there are spread over at least the opposing portions of the parallel opposite face insulating yarns such as insulating guts. The belt shaped electrode plate and insulating yarns are driven in the same direction and at the same speed on the parallel opposite face. Additionally, the cleaner provided on the stationary part is equipped to come into contact elastically with the outside portions of the belt shaped conductive band and the insulating yarns.

The primary object of the present invention is to provide a developing device having an electrode plate in the form of an endless belt shaped conductive band spread over a plurality of rollers in parallel spaced relationship with the photosensitive paper carrying belt and driven in the same direction and at the same speed the photo-sensitive paper carrying belt.

The second object of the present invention is to provide a developing device so formed that insulating yarns spread over the periphery of the endless belt shaped conductive band prevent the photosensitive paper from coming into contact with the electrode.

The third object of the present invention is to provide a developing device equipped to clean the belt shaped conductive band and the insulating yarns driven by rollers so as not to stain the photosensitive paper even if the photosensitive paper comes into contact with the belt shaped conductive band and yarns.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view in section of the developing device in an electronic photograph duplicator of an embodiment in accordance with the present invention.

FIG. 2 is a perspective view of the embodiment shown in FIG. 1.

FIG. 3 is a side view of the embodiment shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the embodiment shown in the drawings in accordance with the present invention, to the upper portion in the part of said plates 15₁, 15₂ in developing tank 1, driving roller 2 is connected by a spindle. Driving gear 23 driven by a prime mover is fixed on the outside of side plate 15₂, and to the other end thereof driving gear 18 is fixed on the outside of side plate 15₁, and meshed with gear 19 provided on one end of driven roller 5₂ connected in contact with driving roller 2 and by a spindle between side plates 15₁, 15₂.

And thus, driving roller 2 and driven roller 5₂ a photosensitive paper carrying roller group for delivering the developed photosensitive paper to the next process, namely, a drying and fixing device as shown by arrow 17 in FIG. 2.

Photosensitive paper carrying belt 4 suspended on said driving roller 2 is spread over turning roller 3₁ connected by a spindle to the upper portion in the fore part of side plates 15₁, 15₂, and turning rollers 3₂, 3₃ are connected by a spindle to side plates 15₁, 15₂, and turning rollers 3₄, 3₅ connected by spindles to side plates 15₁, 15₂. And driven roller 5₁ is in contact with turning roller 3₁ and is connected by a pin to the upper portion in the fore part of side plates 15₁, 15₂. And thus, these rollers mentioned above form a photosensitive paper carrying roller group for delivering photosensitive paper 24 to developing tank 1 as shown by arrow 16 in FIG. 1.

Photosensitive paper 24 is carried into the developer so as to be developed between turning rollers 3₂ and 3₃ while riding on carrying belt 4, and further delivered by means of driving roller 2 and driven roller 5₂ as shown by arrow 17 in FIG. 1.

In parallel with turning roller 3₂, 3₃ and on the upper side thereof belt shaped conductive band rollers 6, 7 are connected rotatably by spindles to side plates 15₁, 15₂, and over rollers 6, 7 and driven roller 8 connected on the upper side of roller 7 by a spindle to side plates 15₁, 15₂, there is spread belt shape conductive band 9 of an endless flexible metal plate, and. Belt shaped conductive band 9 is provided in parallel with photosensitive paper carrying belt 4 so as to serve as electrode 9a between rollers 6, 7 and in addition the clearance between electrode 9a and photosensitive paper carrying belt 4 is determined by the spindle positions of rollers 6, 7 and turning rollers 3₂, 3₃ so as to be a little larger than the sum of the thickness of photosensitive paper 24 and the thickness of the insulating yarn described hereinafter.

To the spindle of driven roller 8 gear 21 is fixed on the outside of side plate 15₂ as shown in FIG. 3, and over gear 21 and gear 20 provided in parallel with driving gears 23 driving chain 22 is spread. Therefore, driven roller 8 rotates counterclockwise in FIG. 1 at the same speed as driving roller 2, so that belt shaped electrode 9a between rollers 6 and 7 moves in the same direction and at the same speed as carrying belt 4 between turning rollers 3₂ and 3₃ and accordingly the photosensitive paper 24 is delivered at the same speed as belt shaped electrode 9a.

On the periphery of belt shaped conductive band 9 a plurality of insulating yarns 12 such as insulating guts are spread substantially at regular intervals and in the belt-like form. The insulating yarns are suspended respectively on a plurality of pulleys 11 connected by spindle 10 to side plates 15₁, 15₂ and disposed substantially at regular intervals on spindle 10. And thus, belt shaped insulating yarns 12 are rotated together with belt shaped conductive band 9 by means of driven roller 8 and prevented from deviating from belt shaped conductive band 9 in an axial direction while rotating by means of pulleys 11.

On the vertical face between said rollers 7 and 8 a cleaner 14 such as rubber, sponge, polyurethane, or mop is provided on holding plate 13 fixed to side plates 15₁, 15₂, and held in contact elastically with belt shaped conductive band 9 and insulating yarns 12 so as to clean them of toner adhered thereto from the developing process.

As the photosensitive paper 24 is carried in parallel with electrode 9a between turning rollers 3₂, 3₃ by means of carrying belt 4, when the photosensitive paper lifts out from carrying belt 4 or bends to come into contact with electrode 9a, insulating yarns 12 prevents the paper from coming into contact with the electrode, and also prevents the photosensitive paper from staining by contacting electrode 9a and spoiling the picture image. And in addition, even if photosensitive paper 24 comes into contact with electrode 9a between insulating yarns 12 the relative speed between photosensitive paper 24 and electrode 9a is zero, so that the stained portion is by no means enlarged and there is no clogging. Besides, belt shaped conductive band 9 and insulating yarns 12 are always cleaned by means of cleaner 14 between rollers 7 and 8, so that even if

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the photosensitive paper 24 comes into contact therewith it is hardly stained and it is possible to obtain flawless duplication.

I claim:

1. A developing device for an electrostatic duplicator having a liquid developing reservoir, comprising means for transporting photosensitized media through said developing reservoir;

first means for moving said means for transporting; electrically conductive means in parallel spaced relationship to said means for transporting and forming a gap therewith within said developing reservoir;

second means for moving said electrically conductive means at the same speed as said means for transporting along said gap;

electrically insulating means carried by said electrically conductive means on the surface thereof facing said means for transporting, and

said means for transporting and said electrically conductive means are each endless belts and said first and second means for moving are mechanically connected to each other to move at the same speed.

2. A developing device for an electrostatic duplicator having a liquid developing reservoir, comprising means for transporting photosensitized media through said developing reservoir;

first means for moving said means for transporting; electrically conductive means in parallel spaced relationship to said means for transporting and forming a gap therewith within said developing reservoir;

second means for moving said electrically conductive means at the same speed as said means for transporting along said gap;

electrically insulating means carried by said electrically conductive means on the surface thereof facing said means for transporting, and

means for suspending said electrically insulating means and including supporting members spaced across said insulating means, said insulating means comprises string-like members each extending over a respective supporting member.

3. A developing device for an electrostatic duplicator having a liquid developing reservoir, comprising means for transporting photosensitized media through said developing reservoir;

first means for moving said means for transporting; electrically conductive means in parallel spaced relationship to said means for transporting and forming a gap therewith within said developing reservoir;

second means for moving said electrically conductive means at the same speed as said means for transporting along said gap;

electrically insulating means carried by said electrically conductive means on the surface thereof facing said means for transporting, and

means for cleaning said electrically conductive means and said electrically insulating means.

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