

[54] MASTER PAPER WINDING DRUM IN  
ELECTROPHOTOGRAPHIC COPYING  
MACHINE OF CONTACT PRINTING TYPE

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[58] Field of Search..... 355/3 R, 12, 17, 3;  
96/1 R; 117/17.5

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[57] **ABSTRACT**  
Apparatus for electrophotostatically placing the image of the indicia of an original onto a master sheet and transferring the image to a copy sheet. The apparatus includes a drum having a resilient layer and a flexible electrically conductive outer layer on which the master sheet is mounted.

**3 Claims, 4 Drawing Figures**

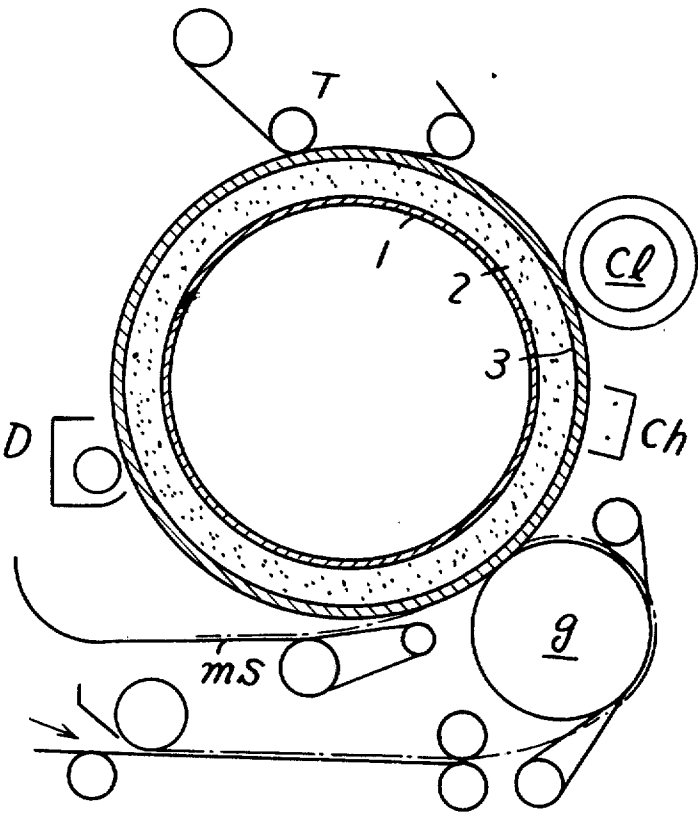


Fig. 1 PRIOR ART

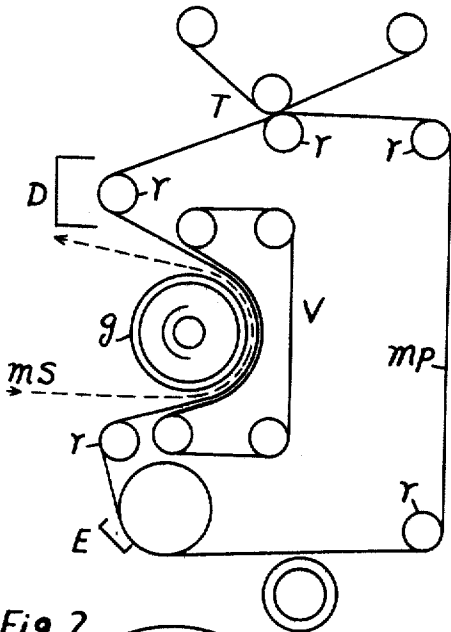


Fig. 2  
PRIOR ART

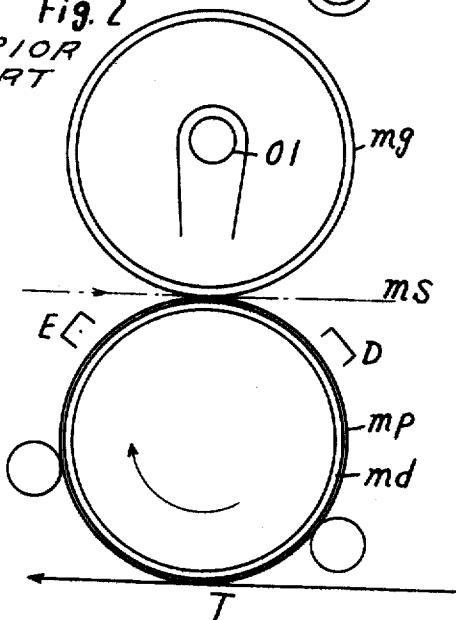


Fig. 3

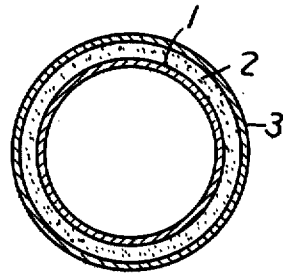
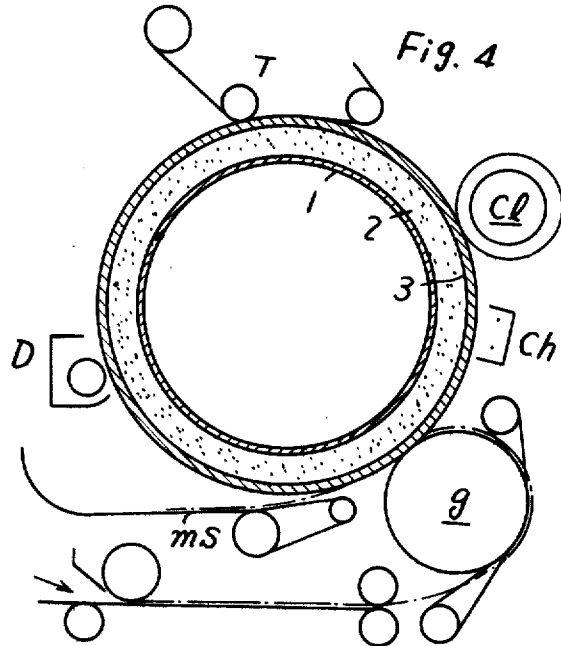


Fig. 4



# MASTER PAPER WINDING DRUM IN ELECTROPHOTOGRAPHIC COPYING MACHINE OF CONTACT PRINTING TYPE

## SUMMARY OF INVENTION

The preferred embodiment of the present invention overcomes the problem of difficulty to reproduce an image of sufficiently fine lines by providing an apparatus, that is, a rotating cylinder for printing in an electrophotographic machine, which comprise a central cylinder composed of a rigid material, an intermediate coating layer composed of an elastic material rich in softness and stretchability, and an outermost layer composed of a thin metal plate or metal net or a vacuum evaporation deposited metal.

## DETAILED DESCRIPTION OF INVENTION

This invention relates to an electrophotographic copying machine of the contact printing type in which a master paper wound on the peripheral surface of a rotary drum rotating in the state circumscribed with a light exposure drum is subjected to such operations as charging, light exposure, development, transfer and cleaning.

FIGS. 1 and 2 are views showing operation systems of known electrophotographic copying machines of the contact printing type. FIG. 3 is a view illustrating the section of the rotary drum of this invention. FIG. 4 is a view illustrating the operation system of the electrophotographic copying machine provided with the rotary drum of this invention.

FIG. 1 illustrates an electrophotographic copying machine of the known contact printing type, in which a master paper mp rotated in an endless manner by means of a plurality of rollers r is charged in a charging zone E, then the master paper is travelled in the state contacted with an original ms on the periphery of a glass cylinder g for light exposure by means of a belt V forwarded by a belt-driving device, to thereby effect printing, and then the master paper is subjected to a series of operations such as development and transfer in zones D and T. FIG. 2 illustrates another known type of an electrophotographic copying machine, in which, as in the case of this invention, a master paper mp is wound on a metal drum md, this metal drum is rotated in the state contacted with a light exposure cylinder, and a series of operations such as charging, light exposure, development, transfer and image erasing are performed during one rotation of the metal drum.

In the electrophotographic copying machine shown in FIG. 1, since the running passage of the master paper is curved and long, meandering and slip are readily caused to occur, and it is therefore difficult to place an original on the running master paper in such a manner that the image of the original is not placed on a joint of the starting and terminal ends of the master paper. This is one of the defects involved in the electrophotographic copying machine of the type shown in FIG. 1. The electrophotographic copying machine shown in FIG. 2 involves none of such defect, but since the metal drum md is circumscribed with the light exposure cylinder with a linear contact, if the light exposure cylinder is composed of glass, non-uniformity of the size accuracy inevitable in ceramic articles is brought about in the cylinder and this non uniformity has bad influences on the resulting image. With a view to overcoming this disadvantage, a cylinder of a plastic material is some-

times employed, but this plastic cylinder is readily scarred on the surface because of an insufficient hardness and it is deriorated by ultraviolet rays during long time use, resulting in reduction of light transmission.

Further, since the contact between the light exposure cylinder and the metal drum is a very precise line contact, the contact area is very small and it is difficult to reproduce an image of fine lines sufficiently. These are defects of the electrophotographic copying machine shown in FIG. 2.

It is an object of this invention to improve the rotary drum on which a master paper is wound in the known copying machine of the type shown in FIG. 2 and overcome the foregoing defects involved in the copying machine of this type while retaining merits of this copying machine.

In the known copying machine shown in FIG. 2, the rotary drum on which a master paper is wound is composed of a metal. One reason is that the metal is a material which can be processed according to the precision method. The other reason is that the metal has a conductivity necessary for the charging operation.

In view of the foregoing, the master paper winding drum of this invention has been achieved. More specifically, as is illustrated in FIG. 3, the central portion of the drum is composed of a cylinder 1 of a metal or a rigid material, an elastic material 2 having a rich stretchability such as sponge rubber or the like is coated on said cylinder 1, and a thin metal layer or metal net or a vacuum evaporated metal is disposed on the coating 2 as an outermost layer 3. In the master paper winding drum of this invention having the above structure, the conductivity necessary for charging the master paper is provided by the outermost thin metal layer, and by virtue of the presence of the intermediate layer of the elastic material rich in stretchability the contact between the drum and light exposure cylinder is not linear but a band-like face-to-face contact is attained.

When the rotary drum of this invention is employed, the master paper is forwarded on the fixed passage in the state wound and fixed on the drum, and therefore, there is no apprehension that meandering or slip of the master paper is caused to occur during transporation of the master paper as in the machine of FIG. 1. Further, a mechanism is mounted so that an original is not placed on the joint of the starting and terminal ends of the master paper. Therefore, transportation of the original and interchange of the master paper can be greatly facilitated. Moreover, since a layer of an elastic member rich in stretchability such as sponge rubber is formed as the intermediate layer, the contact between the light exposure cylinder and rotary drum can be converted to a face-to-face contact by contraction of the intermediate layer if the thickness of the intermediate layer is adjusted appropriately, and hence, it is possible to reproduce an image of fine lines completely. Still further, even when the light exposure cylinder is composed of glass inclusive of distortion brought about during the manufacturing step, a clear copied image can be obtained with no fading, and it is unnecessary to heighten the size accuracy as strictly as in the conventional machine and therefore, the manufacturing cost can be reduced. Still in addition, since a thin metal plate or net or a vacuum evaporated metal layer, which is composed of stainless steel or phosphor bronze, is formed as the outermost layer, the charging operation

can be performed without a trouble. Thus, all of the defects and disadvantages involved in the above-mentioned known conventional machines can be overcome in this invention.

FIG. 4 is a view illustrating the entire operation system of the copying machine in which the rotary drum of this invention is provided. In FIG. 4, symbols *g*, *D*, *T*, *cl* and *ch* indicate a light exposure glass cylinder, a development device, a transfer device, an image erasing device and a charging device, respectively.

What is claimed is:

1. In an electrophotostatic copying machine of the contact printing type in which images on an original paper are copied on a master paper wound around a master drum, and subsequently transferred to a copy paper, and in which the master drum respectively advances the master paper to a charging means, a light exposure means, a developing means, transfer means, and an image erasing means disposed in series around and adjacent the master drum, the improvement comprising the master drum having a rigid central cylinder, an intermediate resilient coating layer disposed around said central cylinder and a thin metallic outer layer disposed over said resilient layer whereby the outer surface of the master drum is both yieldable and conductive.

2. An electrophotostatic copying machine of the contact printing type comprising a drum having a rigid central cylinder, an intermediate resilient layer disposed about said central cylinder and a thin flexible electrically conductive outer layer carried by said resilient layer so that the outer surface of said drum is yieldable and electrically conductive, a master sheet mounted on said outer layer of said drum, electrical charging means located adjacent to said drum for imparting an electrical charge to said master sheet, light exposure means disposed adjacent to said drum for transferring an image of the indicia carried by an original onto said master sheet, said light exposure means being in intimate contact with said drum to cause a portion of said outer layer to be deflected and a portion of said intermediate layer to be compressed, means for moving said original between said drum and said light exposure means, means for selectively operating said original moving means so that the image of the original is placed in a predetermined position on the master sheet, an image developing means located adjacent to said drum for developing the image on said master sheet, transfer means located adjacent to said drum, means for moving a second sheet through said transfer means so that the image on said drum is transferred to said second sheet, and erasing means adjacent to said drum for removing the image from said master sheet after the image has been transferred to said second sheet, whereby an image of the indicia carried by an original is placed on a master sheet and transferred to a second sheet after which the image is erased from said master sheet.

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3. The structure of claim 2 in which said thin flexible outer layer is a metallic net.

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