

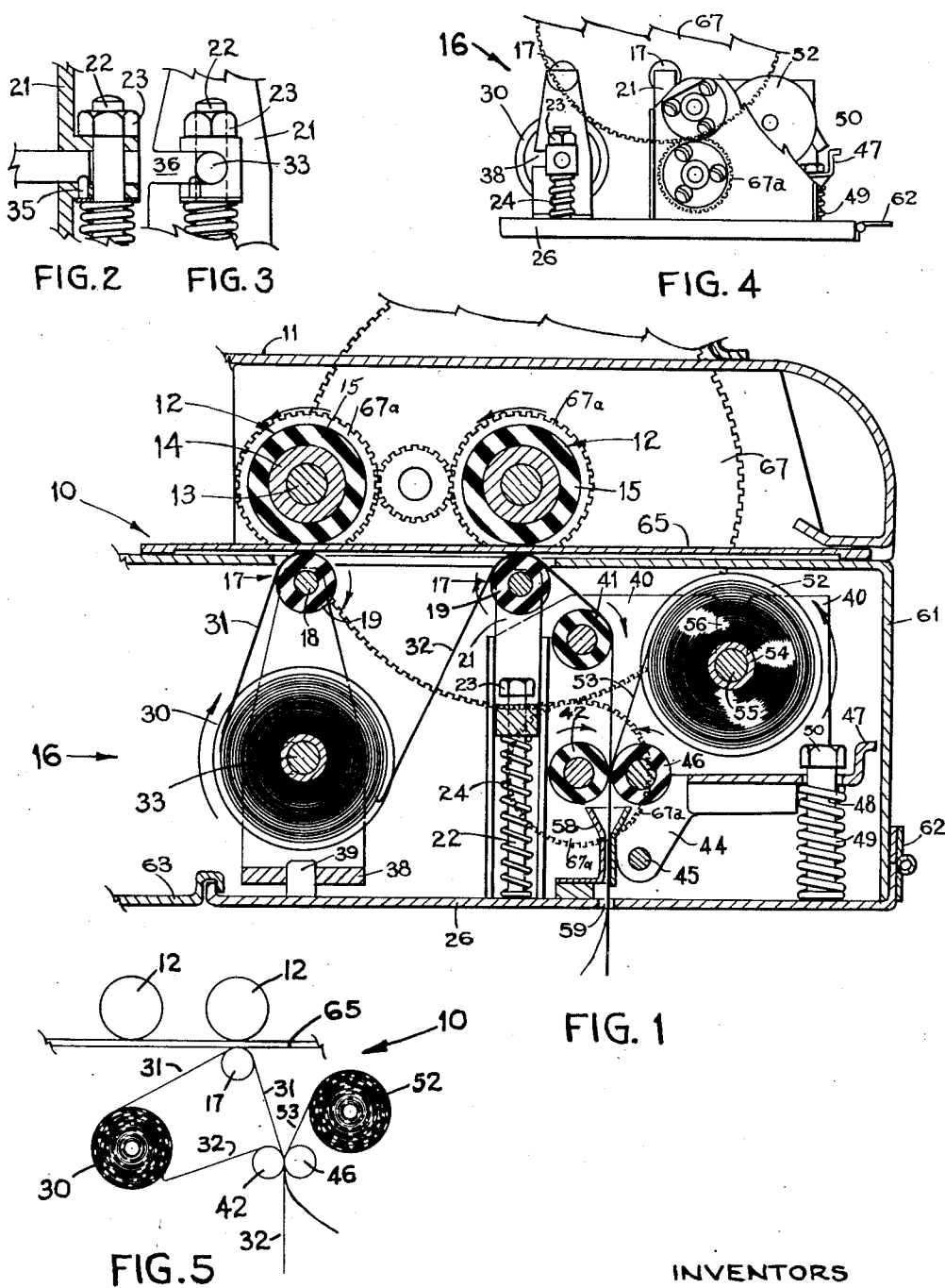
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ADHESIVE TRANSFER AND FIXING APPARATUS

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ADHESIVE TRANSFER AND FIXING
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This invention relates in general to electrophotographic transfer apparatus and in particular to adhesive transfer apparatus for electrophotography, and to adhesive transfer and fixing apparatus for said process.

In the art of electrostatic electrophotography, otherwise known as xerography, an image of transferrable electroscopic material is formed on a surface and transferred to a transfer sheet. In practice this transfer has been accomplished by an electrostatic transfer step, although it has been recognized that there might also be used contact transfer to moistened paper or to paper carrying a wax or like soft substance on its surface. These prior methods of transfer have generally been satisfactory where xerography is directed toward reproduction of line copy or in other fields where substantially 100% image transfer is not essential; however, it has been found that many of these methods accomplish transfer of considerably less than all the electroscopic material, with consequent inadequacy for the high requirements of continuous tone xerography. In addition a self-contained transfer mechanism is desirable to assist in making xerography a more useful and valuable art. It is apparent, therefore, that a simple, workable method and apparatus for substantially complete transfer is one of the key needs of xerography.

It is, therefore, an object of this invention to provide apparatus for transfer of xerographic images, the apparatus being simple and compact in use and structure and being efficient in operation.

It is another object of the invention to provide xerographic transfer apparatus for adhesive transfer of a xerographic image to an adhesive transfer material.

In transfer of continuous tone xerographic images it has been found desirable to transfer the image to a film or strip having a tacky smooth surface and optionally to fix the image by securing thereover a transparent sealing strip, and it is an additional object of this invention to provide methods and apparatus for such transfer and, optionally, such fixing method.

It is a further object of the invention to provide means and apparatus for bringing a transfer material having a smooth, tacky surface into uniform pressurized contact with a surface bearing a transferrable xerographic image and removing the transfer material from said image bearing surface.

It is a still further object of the invention to provide such means and apparatus including also

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means and apparatus for subsequently affixing a sealing strip over the surface of the transfer material.

Other objects of the invention will in part be obvious and will in part be apparent from the following description and from the drawings, in which:

Figure 1 is a side elevation in section according to one form of the invention;

Figure 2 is an enlarged fragmentary front view of a roller support according to Figure 1;

Figure 3 is an enlarged fragmentary side view of the member shown in Figure 2;

Figure 4 is a diagrammatic side elevation partially broken away of a drive and mounting assembly as shown in Figure 1;

Figure 5 is a diagrammatic view of apparatus according to a further embodiment of the invention.

In the embodiment of the invention illustrated in Figure 1, there is an adhesive transfer device generally designated 10 for transfer of a xerographic image which is adapted to be integrally mounted on an electrophotographic image forming machine. This device comprises an upper housing or frame 11 which preferably may be an integral part of a xerographic image forming machine or optionally may be separately mounted there-on. Rotatably positioned on the frame 11 are a plurality of pressure rollers 12 which preferably consists of axle 13, a core 14 around the axle and a resilient layer or sleeve 15 forming the outer surface. A pressure and mounting assembly 16 (separately shown in Figure 4) is mounted below this housing to carry the body of the mechanism in cooperation with roller 12 as shown hereinafter, this pressure and mounting assembly preferably being hinged to frame 11 for easy access to the mechanism for cleaning, changing parts and supplies, servicing and the like.

Directly below rollers 12, and mounted on pressure assembly 16, are a plurality of spring mounted pressure rollers 17. These rollers likewise comprise an axle 18 and a resilient pressure coating 19. The axles of pressure rollers 17 are rotatably mounted in a support yoke 21, which in turn is secured by a support post 22, a mounting spring 24, and stop 23 which is mounted on a base member or plate 26 and extends through a central opening in the mounting yoke. A pressure coil spring 24 is positioned around the pin and presses against base plate 26 and yoke 21 thereby forcing pressure roller 17 directly upwards toward the stop.

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Preferably on the support mechanism or yoke for the first pressure roller is mounted a roll 30 of an adhesive sheet material 31 optionally interspaced with a non-adhesive or protective material 32, this roll being mounted on an axle 33 which is rotatably mounted on the support yoke as illustrated in Figures 2 and 3. As shown in these figures a retarding pin 35 is mounted in a recess 36 in the yoke and serves the dual purpose of lightly securing the axle of the roll within 10 the recess and secondly providing a drag on it to prevent excessive unrolling of the sheet material.

Preferably the base of this yoke comprises a horizontal base plate 38 secured to a guide pin 39 which in turn is mounted on the support plate 26 to hold the yoke in a substantially upright position. 15

Mounted on a supporting upright 40 beyond pressure rollers 17 is a guide roller 41 and a sealing drive pressure roller 42. A pivotally mounted support frame 44 is mounted on pivot pin 45 and carries a cooperating sealing pressure roller 46 which is positioned and adapted to press against roll 42. A pressure release member 47 is formed toward one end of frame 44 and is spring mounted on post 48 in much the same manner as the other spring rollers, having a spring 49 and a limit member 50 forcing the pressure release member upwardly and limiting its upward motion. The frame 44 is so mounted that roller 46 30 is forced into pressure contact with roller 42 by the upward action of spring 49 and can be released from such pressure contact by downward pressure manually applied to pressure release 47. Roll 52 of a transparent or at least translucent sealing material 53 is mounted on a core 54 on an axle 55 which rests in a slot 56 in supporting upright 40. 35

Adjacent to the sealing pressure rollers 42 and 46 is a guide channel 58 which is positioned to receive sheet material from between the pressure rollers and guide it through an exit slit 59 in the base plate 26 at which point the sheet material moves externally from the entire apparatus. 40

The entire pressure and drive assembly generally designated 16 is mounted on a support base plate 26 which is secured by means of a hinge 62, to a lower housing 61 mounted on upper frame 11, the base plate preferably being hinged from the lower edge of the housing 61, whereby the entire mechanism may be swung free from the upper housing. When in the closed position a light seal lip or member 63 engages the base plate, and firm light tight contact is achieved with a suitable catch member (not shown). 45

In use and operation a roll of adhesive material 30 is mounted in the first support yoke and its adhesive sheet material is fed around the first pressure roller 17 and between the pressure roller and its counter pressure roller 12 and thence between the succeeding pairs of pressure rollers, around guide roller 41 and finally between sealing pressure rollers and out through an exit slit 59. The non-adhesive or protective sheet, if any, in this roller, may pass around one or more of the pressure rollers 17 where it joins the adhesive sheet and is carried with it around guide roller 41 and out between sealing rollers 42 and 46 and exit slit 59. A roll 52 of sealing sheet material 50 53 is mounted to feed between sealing pressure rollers 42 and 46, there in a contact with the adhesive face of the adhesive sheet material 31 where it joins such material and is carried from the device therewith. 55

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An image bearing member such as an electrophotographic plate 65 is fed into the mechanism entering between the first pair of pressure rollers 12 and 17 and passing through the successive pairs of such rollers in contact with the adhesive surface of sheet material 31. In passing between these pressure rollers the surface of the electrophotographic plate meets the adhesive sheet material in pressure contact whereby this sheet material picks up and holds any powder image or the like on the surface of the electrophotographic plate. When the adhesive sheet material is stripped from this plate as it passes from the last of the pressure rollers it carries such image or powder material in its direct configuration to the sealing rollers where the sealing sheet material is pressed securely against the adhesive surface. As the sheet material leaves sealing rollers 42 and 46 it is in the form of a thin sandwich of the two sheet materials having the adhesive layer and its adhesively carried electrophotographic image material there-between. It thus emerges from exit slit 59 in the form of a finished electrophotographic print which may be suitably cut into individual pictures. 5

It is apparent that at least one of the first pressure rollers 12 and 17 and at least one of sealing pressure rollers 42 and 46 must be driven or otherwise rotated to carry the plate 65 and the various sheet materials through the mechanism and to expel the finished sheet. This may be accomplished by any suitable method, one of which is illustrated in Figures 1 and 4. Preferably, a master drive gear 67 is operated, for example manually, to drive and synchronize individual gears 67a on one or more of the pressure rollers, thus feeding and carrying the sheet materials through the mechanism. The power or drive means may be either mechanical or manual, as desired. 10

The mechanisms and details will, of course, be modified and varied in coordination with the nature of the transfer and sealing materials used in the apparatus. According to one process operating from the apparatus, the xerographic image is transferred by adhesion to a permanently tacky coating of the cellulose or Scotch tape type on a white opaque backing material, although it is to be realized that sheet material coated with any of numerous pressure sensitive adhesives will accomplish transfer. As supplied, this preferred transfer material is interwound on a roll with glassine paper between the layers of transfer material, the glassine paper serving to prevent adhesion between the layers and thus largely avoiding distortion upon unwinding the roll. The sealing film is a transparent film adhesive to the tacky surface of the transfer material and may, for example, be a cellulosic film, a film forming plastic such as transparent vinyl resins, acrylic polymers, and other like sheets or films. 15

In coordination with these materials, both the pressure and drive rollers of the apparatus are rubber covered rollers having structural cores such as steel cores. The pressure rollers were spring mounted to bear against the image plate or drive rollers with a force of at least about ½ pound per inch of roller and preferably between about 1 and about 10 pounds per inch of roller when utilized with a smooth-surfaced tacky material. The speed of passage through the mechanism is either manually or automatically controlled and may vary over a wide range, merely 20 25 being slow enough to obtain satisfactory and uni-

form contact with the particular adhesive sheet used. When operated under these conditions and with these materials, the mechanism yielded xerographic transfers of substantially 100% of the original image material, whereby the full, accurate reproduction qualities of the xerographic process were realized.

What is claimed is:

1. Apparatus for adhesive transfer of an image electrostatically adhering to an insulating image surface, comprising a support housing, a pressure assembly mounted on said housing, at least one pair of opposing transfer pressure rollers mounted one on said housing and the other on said pressure assembly, at least one of said rollers being a drive roller, the rollers thus being adapted to receive an image bearing member and propel such member between said rollers, a support member on the pressure assembly to receive a tacky-surfaced web material feeding said web into pressure contact with the image bearing surface and between said surface and all pressure rollers bearing thereagainst, means to strip the web from the image bearing surface, said means comprising a pair of fixing pressure rollers, at least one of which is a drive roller operating at equal speed with the transfer drive rollers, a support for a protective web material and means for feeding the stripped adhesive web and said protective web material together between the fixing pressure rollers with the protective web contacting the adhesive surface of the adhesive web, whereby the adhesive web and protective web emerge together from said rollers bearing a transferred image therebetween.

2. Apparatus for adhesive transfer of an image electrostatically adhering to an insulating image surface, comprising a support housing, a pressure assembly mounted on said housing, at least one pair of opposing transfer pressure rollers mounted one on said housing and the other on said pressure assembly, at least one of said rollers being a drive roller, the rollers thus being adapted to receive a flat image bearing member and propel such member between said rollers, a support member on the pressure assembly to receive an opaque backed tacky-surfaced adhesive web source feeding said web into pressure contact with the image bearing surface and between said surface and all pressure rollers bearing thereagainst, means to strip the web from the image bearing surface, said means comprising a pair of fixing pressure rollers, at least one of which is a drive roller operating at equal speed with the transfer drive rollers, a support for a transparent protective web material and means for feeding the stripped adhesive web and said protective web material together between the fixing pressure rollers with the protective web contacting the adhesive surface of the adhesive web, whereby the adhesive web and protective web emerge together from said roller bearing a transferred image therebetween.

3. Apparatus for adhesive transfer of an image electrostatically adhering to an insulating image surface, comprising a support housing, a pressure assembly mounted on said housing, at least one pair of opposing transfer pressure rollers mounted one on said housing and the other on said pressure assembly, at least one of said rollers being a drive roller, the rollers thus being adapted to receive a flat image bearing member and pro-

pel such member between said rollers, a support member on the pressure assembly to receive a tacky-surfaced adhesive web material feeding said web into pressure contact with the image bearing surface and between said surface and all pressure rollers bearing thereagainst, means to strip the web from the image bearing surface, said means comprising a pair of fixing pressure rollers, at least one of which is a drive roller operating at equal speed with the transfer drive rollers, a support for a protective web material and means for feeding the stripped adhesive web and said protective web material together between the fixing pressure rollers with the protective web contacting the adhesive surface of the adhesive web, whereby the adhesive web and protective web emerge together from said rollers and are carried outside the housing bearing a transferred image therebetween, and a cutting member mounted at the point of emerging from the housing and adapted to cut the webs into individual image members.

4. Apparatus for complete transfer of a xerographic image electrostatically adhering to a xerographic plate, comprising a support housing, a pressure assembly mounted on said housing, at least one pair of opposing transfer pressure rollers mounted one on said housing and the other on said pressure assembly, said rollers bearing against each other with a force between about 1 and about 10 pounds per inch of roller, at least one of said rollers being a drive roller, the rollers thus being adapted to receive a flat image bearing member and propel such member between said rollers, a support member on the pressure assembly to receive a tacky-surfaced adhesive web material feeding said web into pressure contact with the image bearing surface and between said surface and all pressure rollers bearing thereagainst, means to strip the web from the image bearing surface, said means comprising a pair of fixing pressure rollers, at least one of which is a drive roller operating at equal speed with the transfer drive rollers, a support for a protective web material and means for feeding the stripped adhesive web and said protective web material together between the fixing pressure rollers with the protective web contacting the adhesive surface of the adhesive web, whereby the adhesive web and protective web emerge together from said rollers and are carried outside the housing bearing a transferred image therebetween, and a cutting member mounted at the point of emerging from the housing and adapted to cut the webs into individual image members.

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