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(54) **ROLLER TRANSFER APPARATUS HAVING AN EXTENDED NIP EXHIBITING LOW PRESSURE.**

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Description

This invention relates to a transfer apparatus for transferring a marking particle image from a dielectric web to a receiver member.

Description of the Prior Art

In typical electrographic reproduction apparatus, marking articles are attracted to a latent image charge pattern formed on a dielectric support to develop such image on the support. The dielectric support is then brought into contact with a receiver member and an electric field applied to transfer the marking particle developed image to the receiver member from the dielectric support. After transfer, the receiver member bearing the transferred image is transported away from the dielectric support and the image is fixed on the receiver by heat and/or pressure to form a permanent reproduction thereon.

Application of the electric field to effect marking particle transfer is generally accomplished by ion emission from a corona charger onto the receiver member, or by supporting the receiver member on an electrically biased roller holding the member against the dielectric support. While roller transfer apparatus are inherently more complex than corona charger transfer apparatus, roller transfer apparatus offer certain advantages. For example, roller transfer apparatus typically require a lower energy budget, and also maintain a more positive (physical) control over receiver members particularly where a member must be recirculated to have multiple images transferred thereto such as in making multi-color reproductions.

A well known alternate method for electrographic reproduction involves the use of a transfer intermediate. According to this method, a marking particle developed image on the dielectric support is transferred by an electric field to an intermediate member (roller or web) and thereafter transferred by an electric field to a receiver member at a location remote from the zone of transfer of the image to the intermediate member. This method is suitable for sequential transfer of a plurality of images, in register, to the intermediate member prior to transfer of any of the images from the intermediate member to the receiver member. Thus, the plurality of images can be transferred to the receiver member in one step to assure that their relative registration is maintained. Of course, for efficient operation, this method requires more effective cleaning of the intermediate member between transfer to the receiver member.

In the use of roller transfer apparatus, image defects, generally referred to as "halo", "hollow character", and "image disruption" have been found to occur particularly when using smooth paper as the receiver member. Studies have indicated that the strength of the transfer field, receiver member characteristics, and marking particle size all have an impact on the production of such defects. Additionally, the "hollow character" defect is due to the adhesion of the marking particles to each other and to the dielectric support when the receiver member is compressed with the dielectric support by the transfer roller. That is to say, the "hollow character" defect is related, at least in part, to the pressure in the transfer nip, and a substantial reduction in this defect is found to occur when the nip pressure is reduced. For example, US-A-3,942,888, in addressing the "hollow character" defect, discloses a transfer roller apparatus configured to function at a nip pressure below 6.9×10^3 Pa in order to reduce such defect. However, the roller disclosed in this patent has a complex construction including enlarged end portions which serve to provide a gap between the lesser diameter central portion and the dielectric member. As is apparent, a transfer roller of this construction must be capable of being selectively shimmed to successfully function to maintain desired pressure on a variety of receiver member thicknesses.

The Japanese Patent Application JP-A-56 167 165 discloses a transfer apparatus utilizing a heated transfer roller, wherein an auxiliary roller is used to achieve an extended contact nip zone.

It is an object of the present invention to provide for effecting efficient transfer of marking particle images from a dielectric support to a receiver member with a substantial reduction in image transfer defects by roller transfer apparatus of simplified construction which has an extended transfer nip exhibiting low pressure.

SUMMARY OF THE INVENTION

The above object is accomplished by a transfer roller including means for generating an electric field, and a dielectric web support means including first and second means offset relative to a transfer roller in an upstream and downstream direction for positioning the dielectric web relative to the transfer roller to establish an extended contact nip zone and a nip pressure in such zone less than 2×10^4 Pa.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiments of the invention presented below, reference is

made to the accompanying drawings, in which:

Fig. 1 is a side elevational view of the transfer apparatus according to this invention;

Fig. 1a is a side elevational view of the transfer apparatus according to this invention wherein the transfer apparatus is an intermediate member;

Fig. 2 is a side elevational view of an alternate embodiment of the transfer apparatus according to this invention;

Fig. 3 is a side elevational view of another alternate embodiment of the transfer apparatus according to this invention;

Fig. 4 is a side elevational view of another embodiment of the transfer apparatus according to this invention; and

Fig. 5 is a graphical representation showing the effective electrostatic field as a function of width of the transfer nip.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the accompanying drawings, Fig. 1 shows a transfer apparatus designated generally by the numeral 10. The transfer apparatus includes a rotatable transfer roller 12 comprising a cylindrical semi-insulating layer 14 mounted on a conductive core 16. An example of a semi-insulating layer 14 that will work with this invention is polyurethane with a bulk resistivity in the range of between 10^9 to 10^{10} ohm centimeters. The conductive core 16 can be formed of aluminum, for example. A potential source 18 is electrically coupled to the core 16.

A dielectric support, such as web 22, is movable in operative relation with the transfer roller 12. The web 22 includes, for example, a layer of photoconductive material and a grounded support layer such as shown in U.S.-A No. 3,615,414, issued October 26, 1971, in the name of Light. By any well known electrographic process, a marking particle image (or plurality of successive images) is formed on the web 22. The marking particle image, or successive images, is transferred by the apparatus 10 to a receiver member 20 supported on the peripheral surface of the transfer roller 12 by any suitable mechanism (not shown), such as vacuum or mechanical clamps. For transfer of a single image, the receiver member travels with the roller for at least a portion of its rotation; and for transfer of multiple successive images, the receiver member remains in supported relation on the roller surface and is recirculated by roller rotation into transfer relation with the web 22 a number of times corresponding to the number of successive images to be transferred to the receiver member. Of course, as discussed above, the transfer apparatus 10 can be an intermediate member which has marking particle image(s) transferred directly thereto with subsequent transfer to a receiver member (see Fig. 1a).

The transfer apparatus 10 includes back-up rollers 24, 26 which serve to support and direct the web into transfer relation with the transfer roller 12. The positional mounting of the rollers 24 and 26 are of particular importance in providing an extended transfer nip between the web 22 and the transfer roller 12, such nip exhibiting a sufficiently low pressure in order to prevent image transfer defects from being exhibited upon transfer of a marking particle image from the web to the receiver member. Additionally, such positioning of rollers 24 and 26 aids in certain aspects of receiver member handling. Of course other back-up mechanisms, such as plates or guides for example, are suitable for use with the present invention.

To accomplish the desired extended transfer nip of low pressure, the positional mounting of the rollers 24, 26 is as follows. The rollers 24, 26 are offset with respect to the transfer roller 12 (i.e., such rollers are spaced upstream/downstream of the transfer roller with their respective axes substantially parallel to the axis of the transfer roller). Further, such rollers are located so that a plane tangent to the rollers at the points (eg. 24a, 26a of Fig. 1) at which the web would be supported with the transfer roller 12 removed, passes through the roller 12 along a chord c thereof. The web 22 thus has a wrap angle α about the roller 12 to establish the extended transfer nip therebetween. The pressure in the extended nip is equal to the normal force of the roller 12 on the web 22, divided by the nip area according to the equation:

$$P = \frac{F_n}{(N_W)(R_L)}$$

where

P = pressure in Pa;

F_n = normal force in N;

N_W = nip width in m;

R_L = roller length in m.

When the roller 12 is otherwise unsupported, such normal force is equal to the vertical component of the weight of the roller 12. In the case where such roller is immovably supported at its ends, the nip pressure is directly

related to the tension in the web according to the equation:

$$P = \frac{T}{R}$$

where

P = pressure in Pa;

T = tension in N per linear m;

R = radius of curvature in m.

A resultant advantage accomplished by the present invention is that, by adjustment of the normal force (roller weight or tension on the web), nip width, or linear distance of roller/web contact, the transfer pressure can be set to a suitable level to avoid image transfer defects. Such pressure may be in the range of about 3.45 x 10^3 to 3.45 x 10^4 Pa , and is ideally maintained below 2 x 10^4 Pa. Several examples of geometric relationships for the transfer apparatus 10 according to the present invention which have successfully reduced image transfer defects are shown in the following Table No. 1.

TABLE NO. 1

Back-up Roller Offset (d_{24} or d_{26}) (m)	Transfer roller Weight (kgs)	Transfer Nip Width (m)	Nip Pressure (Pa/10^3)
.051	2.025	.016	5.04
.051	4.725	.028	6.76
.038	2.025	.021	4.35
.038	4.725	.033	5.73
.025	2.025	.021	3.73
.025	4.725	.022	8.56
.013	2.025	.010	7.59
.013	4.725	.011	17.9

The extended nip width over the wrap angle α and the low pressure in such nip provide a substantial advantage in reducing the "halo" and "hollow character" image transfer defects. This is believed to be due to the ability of obtaining a high electrostatic transfer field with a relatively low potential source with the extended nip, and the reduction of adhesion of the marking particles to each other and to the web 22 as a result of the low pressure in such nip. For example, Table No. 2 shows the relationship between the potential required for efficient transfer and nip width for a 0.015 m diameter roller having a bulk resistivity of 6 x 10^9 ohm centimeters in the low pressure arrangement according to the present invention.

TABLE NO. 2

Nip Width (m)	Potential Volts
0.004	3250 ± 250
0.007	2250 ± 250
0.011	2500 ± 500

Further, Table No. 3 shows the effect of pressure in the extended transfer nip on the production of "hollow character" defect for certain types of receiver members (paper).

TABLE NO. 3

Paper Type	Pressure (Pa/10^3)					
	3.73	8.28	24.2	36.5	66.2	94.5
Husky Bond™	None	None	None	None	Little	Yes
Potlatch Vintage Velvet™	None	None	None	None	Yes	Yes
Potlatch Vintage Gloss™	Little	Little	Yes	Yes	Yes	Yes

With regard to the electric transfer field, for a semi-insulating transfer roller (10^9 - 10^{10} ohm centimeters), as shown in Fig. 5, the electric field F starts to build up at the point of initial contact of the web 22 with the transfer roller 12. The field continues to build to a maximum F_{max} which occurs when the web separates from the transfer roller, at which point the field rapidly decays. The field maximum F_{max} must be at a level which provides for effective, substantially complete, transfer of the marking particle image from the web 22 to the receiver member 20. As is apparent, for a given potential source and transfer roller geometry, the field maximum F_{max} is directly related to the width of the transfer nip. Therefore, for a given nip width, a particular F_{max} may be more efficiently produced (i.e. F_{max} reached with a lower output potential source). As a result efficient transfer of the marking particles is obtained with reduction in image defects such as "halo" and without a prenip ionization which might induce other types of image defects. Of course, the extended nip, low pressure arrangement of the transfer apparatus 10 according to the present invention is also suitable for use with conductive rollers (i.e. bulk resistivity of less than 10^9 ohm centimeters). The extended nip, with a dimension measured in the direction of rotation of the transfer roller 12, for a transfer roller having a semi-insulating layer in the above-noted resistivity range, is optimally in the range of about 0.0125 ± 0.0025 m. Of course for more insulative transfer rollers the nominal value of the nip width is higher, and for more conductive transfer rollers the nominal value is lower.

The transfer roller 12 may be positioned with respect to the rollers 24 and 26 in the direction of travel of the web 22 at alternate locations such as shown in the embodiments of Figs. 2-4. The elements of these figures which are similar to elements of Fig. 1 are designated by primednumerals. In Fig. 2, the transfer roller 12′ is shifted toward the roller 26′. Thus in measuring the distances between parallel planes through the respective axes of rotation of the rollers 24′ and 26′ and the transfer roller 12′, the distance $d_{26'}$ is substantially less than the distance $d_{24'}$. Moreover, the distance x′ measured between the axes of the transfer roller 12′ and the roller 26′ is substantially equal to the sum of the radii of the rollers plus the thicknesses of the web 22′ and the receiver member 20′. This results in a more sharply defined separation of the receiver member 20′ from the web 22′, over that found in Fig. 1, as the receiver member recirculates with the transfer roller 12′. This sharp separation aids in preventing the receiver member from prematurely detacking from the transfer roller and following the web.

In Fig. 3, the transfer roller 12″ is shifted toward the roller 24″. Thus in measuring the distances between parallel planes through the respective axes of rotation of the rollers 24″ and 26″ and the transfer roller 12″, the distance $d_{26''}$ is substantially greater than the distance $d_{24''}$. Moreover, the distance x″ is substantially greater than the sum of the radii of the transfer roller 12″ and roller 26″. With this arrangement, upon detack of the receiver member 20″ from the transfer roller 12″ at the completion of transfer, the receiver member more readily follows the web 22″ because the span of the web toward the roller 26″ does not define such a sharp separation therebetween. Moreover, with the receiver member following the web, the transferred (but unfused) image is trapped between the detacked receiver member and the web. Accordingly, this trapping action prevents potential image disruptions due to post nip ionization forces acting on the marking particleswhich would, if not trapped, be free to move relative to their image-wise configuration.

Of course, other alternate embodiments of the transfer apparatus 10 according to the present invention are possible by, for example, selectively combining the embodiments of Figs. 2 and 3. That is to say, at selected times (e.g. during recirculation of the receiver member or during detack), the relative location of the transfer roller to the web back-up rollers may be shifted to obtain the benefits of each arrangement. A still further embodiment based on the teachings of the embodiments of Figs. 2 and 3 is shown in Fig. 4. In Fig. 4, the distance $d_{26'''}$ is substantially less than the distance $d_{24'''}$ (similar to the arrangement shown in Fig. 2). However, the roller 26‴ is supported for relative movement in the direction of arrow A to effect a change in the distance between the axes of the transfer roller and the back-up roller (i.e., $x_{a'''}$ and $x_{b'''}$). Thus the sharpness of separation between

the web and the receiver member may be optimally set to selectively inhibit or enhance detack of the receiver member from the transfer roller as described above.

Claims

1. Transfer apparatus (10) for transferring a marking particle image from a dielectric web (22) to a receiver member (20), said apparatus comprising a moving dielectric web (22), dielectric web support means, and a transfer roller (12), **characterized** by said transfer roller (12) including means for generating an electric field (18), and said dielectric web support means including first and second means (24, 26) offset relative to said transfer roller (12) in an upstream and downstream direction respectively for positioning the dielectric web relative to the transfer roller to establish an extended contact nip zone and a nip pressure in such zone less than 2×10^4 Pa.

2. Transfer apparatus according to claim 1, characterized by the extended contact nip zone being of a dimension in the direction of web travel of at least 0.010 m.

3. Transfer apparatus according to claim 1, characterized in that said first and second position means include a pair of spaced rollers (24, 26) mounted on the opposite side of said dielectric web from said transfer roller (12) and with the axes thereof parallel to the axis of said transfer roller, one of said spaced rollers (24) being up-stream of said transfer roller and the other of said spaced rollers (26) being downstream of said transfer roller, and that a plane tangent to each of said spaced rollers passes through said transfer roller along a chord (c) thereof.

4. Transfer apparatus according to claim 3, characterized in that the distances (d_{24}, d_{26}) between vertical, parallel planes, passing through the respective axes of said pair of rollers (24, 26) and said transfer roller (12) perpendicular to said chord (c) or an extension thereof, are equal.

5. Transfer apparatus according to claim 3, characterized in that the distance between vertical, parallel planes, passing through the axis of the upstream roller (24′) of said pair of rollers and the axis of said transfer roller perpendicular to said chord (c) or an extension thereof, is greater than the distance between parallel planes, passing through the axis of the downstream roller (26′) of said pair of rollers and the axis of said transfer roller (12′) perpendicular to said chord (c) or an extension thereof.

6. Transfer apparatus according to claim 3, characterized in that the distances between vertical, parallel planes through the axis of the downstream roller (26″) of said pair of rollers and the axis of said transfer roller (12″) is greater than the distance between vertical, parallel planes through the axis of the upstream roller (24″) of said pair of rollers and the axis of said transfer roller (12″).

7. Transfer apparatus according to claims 1 to 3, characterized in that a receiver member (20‴) is supported on said transfer roller (12‴), and at least one of said spaced rollers is vertically movable in a plane (A) containing the axes thereof, whereby the angle of separation between said dielectric web (22‴) and the receiver member is optimally adjusted to inhibit or enhance detack of the receiver member from said transfer roller.

8. Transfer apparatus according to claim 1, characterized in that a receiver member (20) is supported on said transfer roller (12), and a plurality of marking particle images are successively transferred from a dielectric web (22) to a receiver member (20) under the influence of an electric field and wherein said first and second dielectric web support means include a pair of spaced rollers (24, 26) mounted on the opposite side of said dielectric web from said transfer roller and with the axes thereof parallel to the axis of said transfer roller, one of said spaced rollers being upstream of said transfer roller and the other of said spaced rollers being downstream of said transfer roller, and wherein a plane tangent to each of said spaced rollers passes through said transfer roller along a chord (c) thereof, at least one of said spaced rollers being movable in a vertical plane (A) containing the axes thereof whereby the angle of separation between said dielectric web and a receiver member on said transfer roller is increased to inhibit detack of the receiver member from said transfer roller during transfer of all but the last of such successive marking particle images, and the angle of separation between said dielectric web and receiver member is decreased during transfer of the last of such successive marking particle images to enhance separation of the receiver member from said transfer roller.

Patentansprüche

1. Übertragungsvorrichtung (10), mit der ein Tonerbild von einem dielektrischen Band (22) auf ein Empfangselement (20) übertragen wird und die ein sich bewegendes dielektrisches Band (22), dielektrische Trägermittel für das Band sowie eine Übertragungswalze (12) aufweist, dadurch **gekennzeichnet**, daß die Übertragungswalze (12) Mittel zum Erzeugen eines elektrischen Feldes (18) enthält und daß die Trägermittel

für das dielektrische Band erste und zweite Mittel (24, 26) aufweisen, die gegenüber der Übertragungswalze (12) versetzt und in der Bewegungsrichtung des Bandes vor und hinter dieser angeordnet sind und das dielektrische Band relativ zu der Übertragungswalze so positionieren, daß eine ausgedehnte Kontaktzone für den Übertragungsspalt entsteht, in der ein Spaltdruck von weniger als 2×10^4 Pa herrscht.

2. Übertragungsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die ausgedehnte Kontaktzone für den Übertragungsspalt in der Transportrichtung des Bandes mindestens 0,010 m mißt.

3. Übertragungsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die ersten und zweiten Positionierungsmittel zwei im Abstand voneinander angeordnete Rollen (24, 26) umfassen, die auf der von der Übertragungswalze (12) abgewandten Seite des dielektrischen Bandes gelagert sind und deren Achsen parallel zu der Achse der Übertragungswalze verlaufen, wobei die eine (24) der beiden im Abstand voneinander liegenden Rollen in der Bewegungsrichtung des Bandes vor der Übertragungswalze und die andere (26) hinter der Übertragungswalze angeordnet ist, und daß eine sich jeweils tangential zu den Rollen erstreckende Ebene längs eines Segments (c) der Übertragungswalze durch diese hindurch verläuft.

4. Übertragungsvorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Abstände (d_{24}, d_{26}) zwischen senkrecht und parallel zueinander verlaufenden Ebenen, die sich durch die Achsen der beiden Rollen (24, 26) und der Übertragungswalze (12) senkrecht zu der Sehne (c) oder deren Verlängerung erstrecken, gleich sind.

5. Übertragungsvorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß der Abstand zwischen senkrecht und parallel zueinander verlaufenden Ebenen, die sich durch die Achse der vorderen (24′) der beiden Rollen und die Achse der Übertragungswalze senkrecht zu der Sehne (c) oder deren Verlängerung erstrecken, größer ist als der Abstand zwischen parallelen Ebenen, die durch die Achse der hinteren (26′) der beiden Rollen und die Achse der Übertragungswalze (12′) senkrecht zu der Sehne (c) oder deren Verlängerung verlaufen.

6. Übertragungsvorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß der Abstand zwischen senkrecht und parallel zueinander verlaufenden Ebenen, die sich durch die Achse der hinteren (26″) der beiden Rollen und die Achse der Übertragungswalze (12″) erstrecken, großer ist als der Abstand zwischen senkrecht und parallel zueinander durch die Achse der vorderen (24″) der beiden Rollen und die Achse der Übertragungswalze (12″) verlaufenden Ebenen.

7. Übertragungsvorrichtung nach den Ansprüchen 1 bis 3, dadurch gekennzeichnet, daß auf der Übertragungswalze (12‴) ein Empfangselement (20‴) gelagert ist und mindestens eine der im Abstand voneinander liegenden Rollen senkrecht in einer die Rollenachsen enthaltenden Ebene (A) bewegbar ist, so daß der Trennungswinkel zwischen dem dielektrischen Band (22‴) und dem Empfangselement optimal eingestellt und ein Ablösen des Empfangselements von der Übertragungswalze erschwert oder erleichtert werden kann.

8. Übertragungsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß ein Empfangselement (20) auf der Übertragungswalze (12) gelagert ist und eine Vielzahl von Tonerbildern nacheinander unter dem Einfluß eines elektrischen Feldes von einem dielektrischen Band (22) auf das Empfangselement (20) übertragen wird, daß die ersten und zweiten Trägermittel für das dielektrische Band zwei im Abstand voneinander liegende Rollen (24, 26) aufweisen, die auf der von der Übertragungswalze abgewandten Seite des dielektrischen Bandes angeordnet sind und deren Achsen parallel zur Achse der Übertragungswalze verlaufen, wobei die eine der im Abstand voneinander liegenden Rollen in der Bewegungsrichtung des Bandes vor der Übertragungswalze und die andere hinter der Übertragungswalze angeordnet ist, daß eine jeweils tangential zu den im Abstand voneinander liegenden Rollen verlaufende Ebene sich längs einer Sehne (c) der Übertragungswalze durch diese hindurch erstreckt und daß mindestens eine der im Abstand voneinander befindlichen Rollen in einer die Achsen der Rollen enthaltenden senkrechten Ebene (A) bewegbar ist, so daß der Trennungswinkel zwischen dem dielektrischen Band und dem auf der Übertragungswalze befindlichen Empfangselement vergrößert und damit ein Ablösen des Empfangselements von der Übertragungswalze während der Übertragung aller außer dem letzten der aufeinanderfolgenden Tonerbilder verhindert wird, während der Trennungswinkel zwischen dem dielektrischen Band und dem Empfangselement bei der Übertragung des letzten der aufeinanderfolgenden Tonerbilder verkleinert wird, um das Ablösen des Empfangselements von der Übertragungswalze zu erleichtern.

Revendications

1. Appareil (10) de report d'une image de particules de marquage d'une feuille diélectrique continue (22) à un organe récepteur (20), l'appareil comprenant une feuille diélectrique (22) qui est introduite, un dispositif de support de la feuille diélectrique, et un rouleau de report (12), **caractérisé** en ce que le rouleau de report (12) comporte un dispositif générateur d'un champ électrique (18) et le dispositif de support de la feuille diélectrique comprend un premier et un second dispositif (24, 26) qui sont décalés par rapport au rouleau de report

(12) vers l'amont et vers l'aval respectivement afin qu'ils assurent le positionnement de la feuille diélectrique par rapport au rouleau de report et établissent une zone d'emprise à contact étendu et une pression d'emprise dans cette zone qui est inférieure à 2.10^4 Pa.

2. Appareil de report selon la revendication 1, caractérisé en ce que la zone d'emprise à contact étendu a une dimension, dans la direction de déplacement de la feuille continue, qui est au moins égale à 0,010 m.

3. Appareil de report selon la revendication 1, caractérisé en ce que le premier et le second dispositif de positionnement comportent une paire de rouleaux distants (24, 26) montés du côté de la feuille diélectrique opposé à celui du rouleau de report (12), leurs axes étant parallèles à l'axe du rouleau de report, l'un des rouleaux distants (24) étant placé en amont du rouleau de report et l'autre des rouleaux distants (26) étant placé en aval du rouleau de report, et en ce qu'un plan tangent à chacun des rouleaux distants passe par le rouleau de report suivant une corde (c) de celui-ci.

4. Appareil de report selon la revendication 3, caractérisé en ce que les distances (d_{24}, d_{26}) comprises entre les plans verticaux parallèles passant par les axes respectifs des rouleaux (24, 26) et du rouleau de report (12), perpendiculairement à la corde (c) ou à un prolongement de celle-ci, sont égales.

5. Appareil de report selon la revendication 3, caractérisé en ce que la distance comprise entre les plans parallèles verticaux passant par l'axe du rouleau amont (24′) de la paire de rouleaux et l'axe du rouleau de report perpendiculairement à la corde (c) ou à un prolongement de celle-ci, est supérieure à la distance comprise entre les plans parallèles passant par l'axe du rouleau aval (26′) de la paire de rouleaux et l'axe du rouleau de report (12′) perpendiculairement à la corde (c) ou à son prolongement.

6. Appareil de report selon la revendication 3, caractérisé en ce que la distance comprise entre les plans parallèles verticaux passant par l'axe du rouleau aval (26″) de la paire de rouleaux et l'axe du rouleau de report (12″) est supérieure à la distance comprise entre les plans parallèles verticaux passant par l'axe du rouleau amont (24″) de la paire de rouleaux et l'axe du rouleau de report (12″).

7. Appareil de report selon les revendications 1 à 3, caractérisé en ce qu'un organe récepteur (20‴) est supporté sur le rouleau de report (12‴), et l'un au moins des rouleaux distants est mobile verticalement dans un plan (A) contenant leurs axes, si bien que l'angle de séparation formé par la feuille diélectrique (22‴) et l'organe récepteur est ajusté de manière optimale afin que le décollage de l'organe récepteur du rouleau de report soit empêché ou accentué.

8. Appareil de report selon la revendication 1, caractérisé en ce qu'un organe récepteur (20) est supporté par le rouleau de report (12), et plusieurs images de particules de marquage sont reportées successivement d'une feuille diélectrique (22) à un organe récepteur (20) sous l'action d'un champ électrique, et dans lequel le dispositif de support de feuille diélectrique comporte deux rouleaux distants (24, 26) montés du côté de la feuille diélectrique opposé à celui du rouleau de report, leurs axes étant parallèles à l'axe du rouleau de report, l'un des rouleaux distants étant en amont du rouleau de report et l'autre des rouleaux distants étant en aval du rouleau de report, et dans lequel un plan tangent à chacun des rouleaux distants passe par le rouleau de report suivant une corde (c) de celui-ci, l'un au moins des rouleaux distants étant mobiles dans un plan vertical (A) qui contient leurs axes, si bien que l'angle de séparation de la feuille diélectrique et d'un organe récepteur placé sur le rouleau de report augmente et empêche le décollage de l'organe récepteur du rouleau de report pendant le report de la totalité des images successives de particules de marquage sauf la dernière, et l'angle de séparation formé par la feuille diélectrique et l'organe récepteur diminue lors du report de la dernière des images successives de particules de marquage afin que la séparation de l'organe récepteur du rouleau de report soit facilitée.

FIG. 1

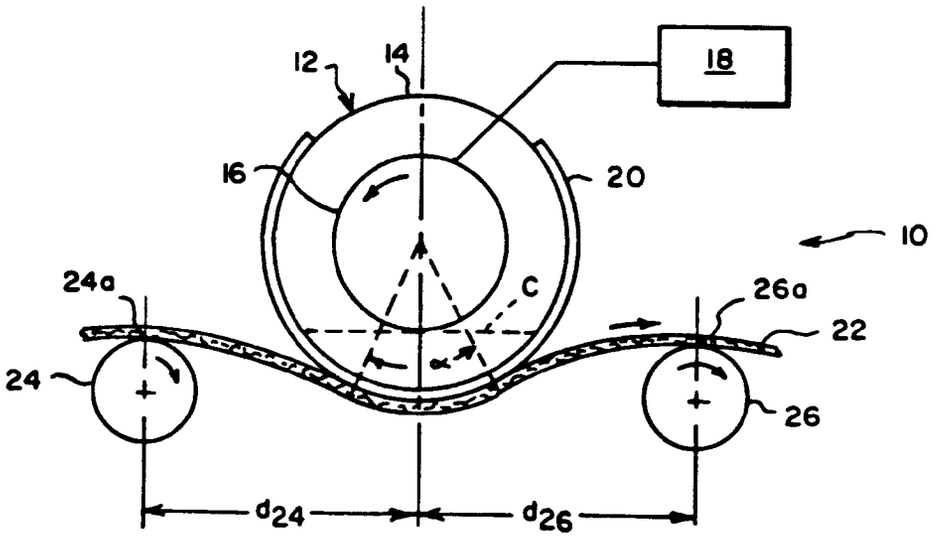


FIG. 1a

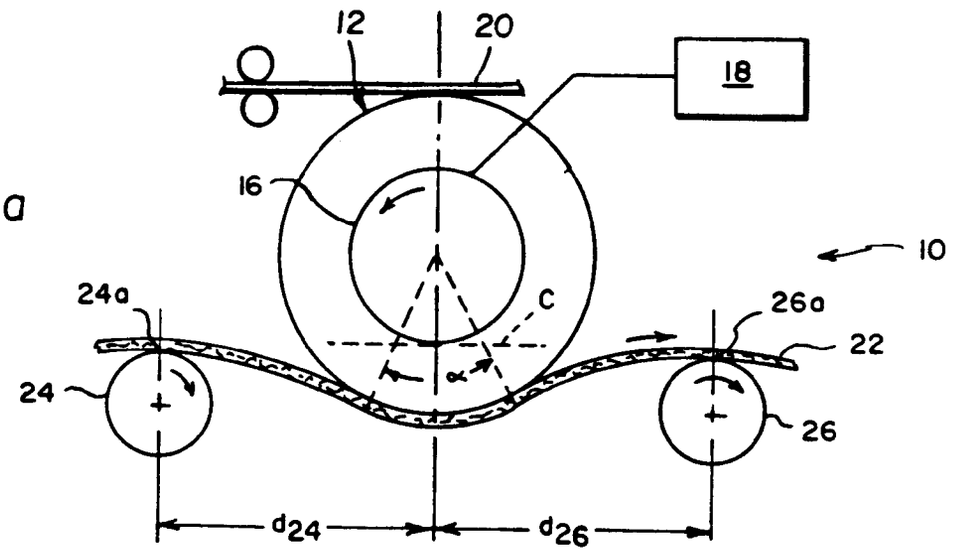


FIG. 2

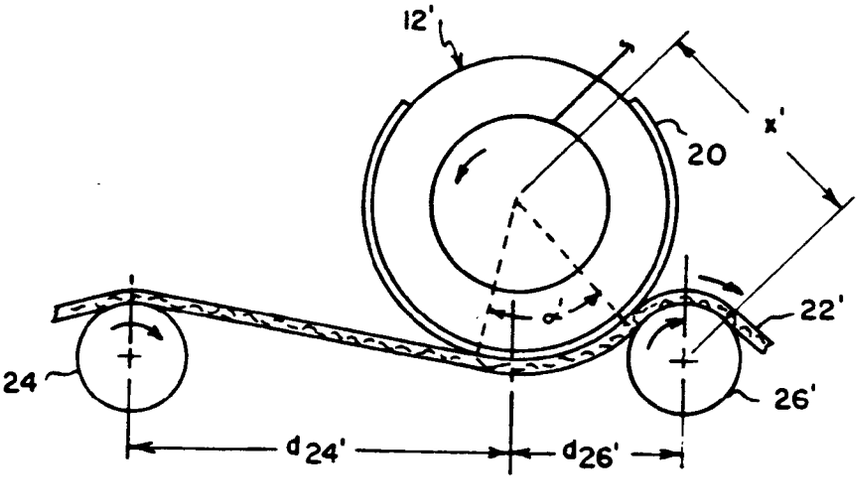
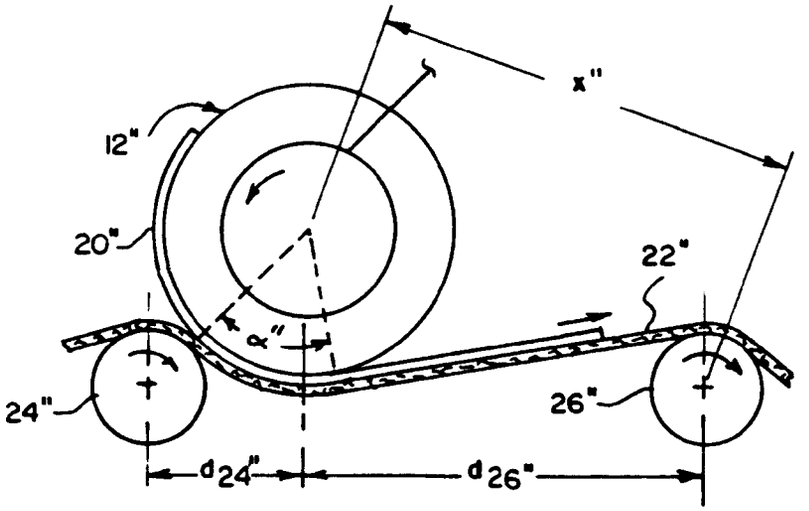


FIG. 3



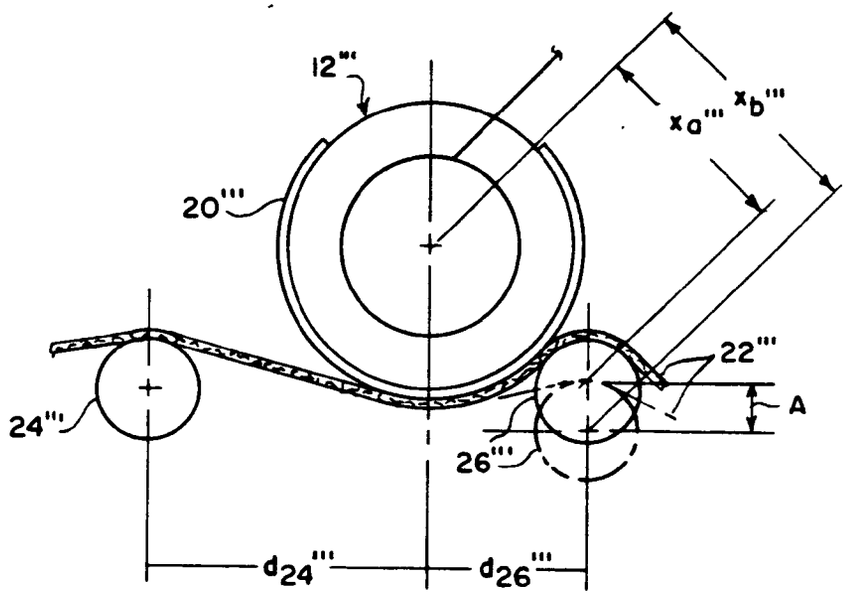


FIG. 4

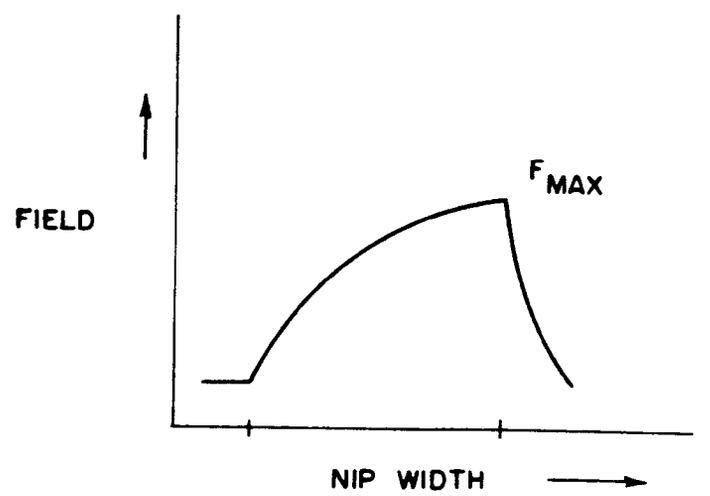


FIG. 5