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[54] **VACUUM TRANSPORT**

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[52] **U.S. Cl.** ..... **271/174;** 271/197; 355/3 R

[51] **Int. Cl.** **B65h 29/56**

[58] **Field of Search** 271/DIG. 2, 174, 80, 197; 355/3, 73

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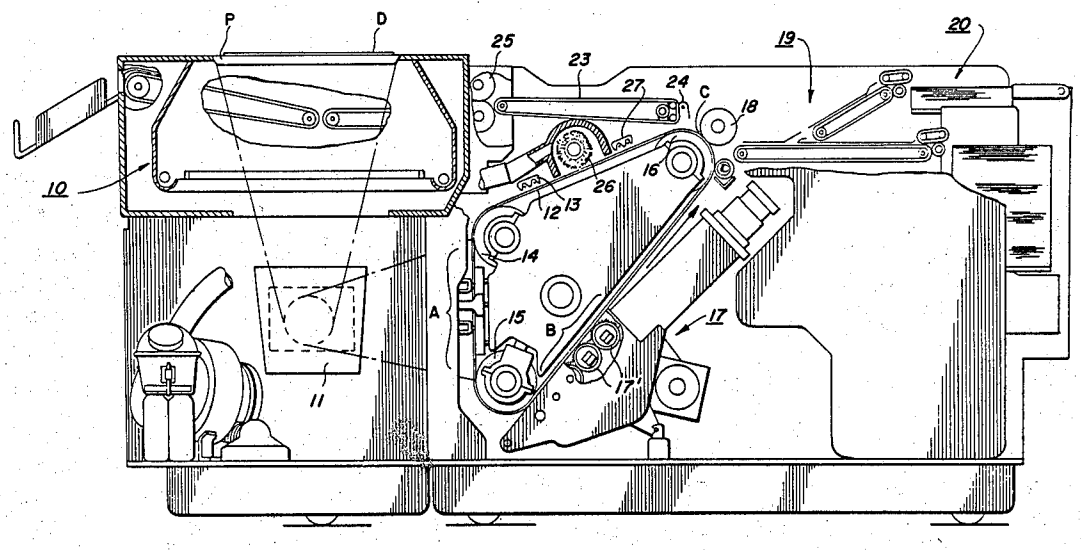
Primary Examiner—Evon C. Blunk

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[57] **ABSTRACT**

A transport mechanism for stripping a copy sheet from a photoconductive surface and transporting the copy sheet therefrom. The transport comprises a plurality of perforated belts mounted for movement relative to a vacuum plenum, a plurality of small diameter rolls being provided on the transport adjacent the photoconductive surface to support the belts at a minimal distance from the copy strip point, the detack corona emission device and the photoconductive surface.

3 Claims, 3 Drawing Figures



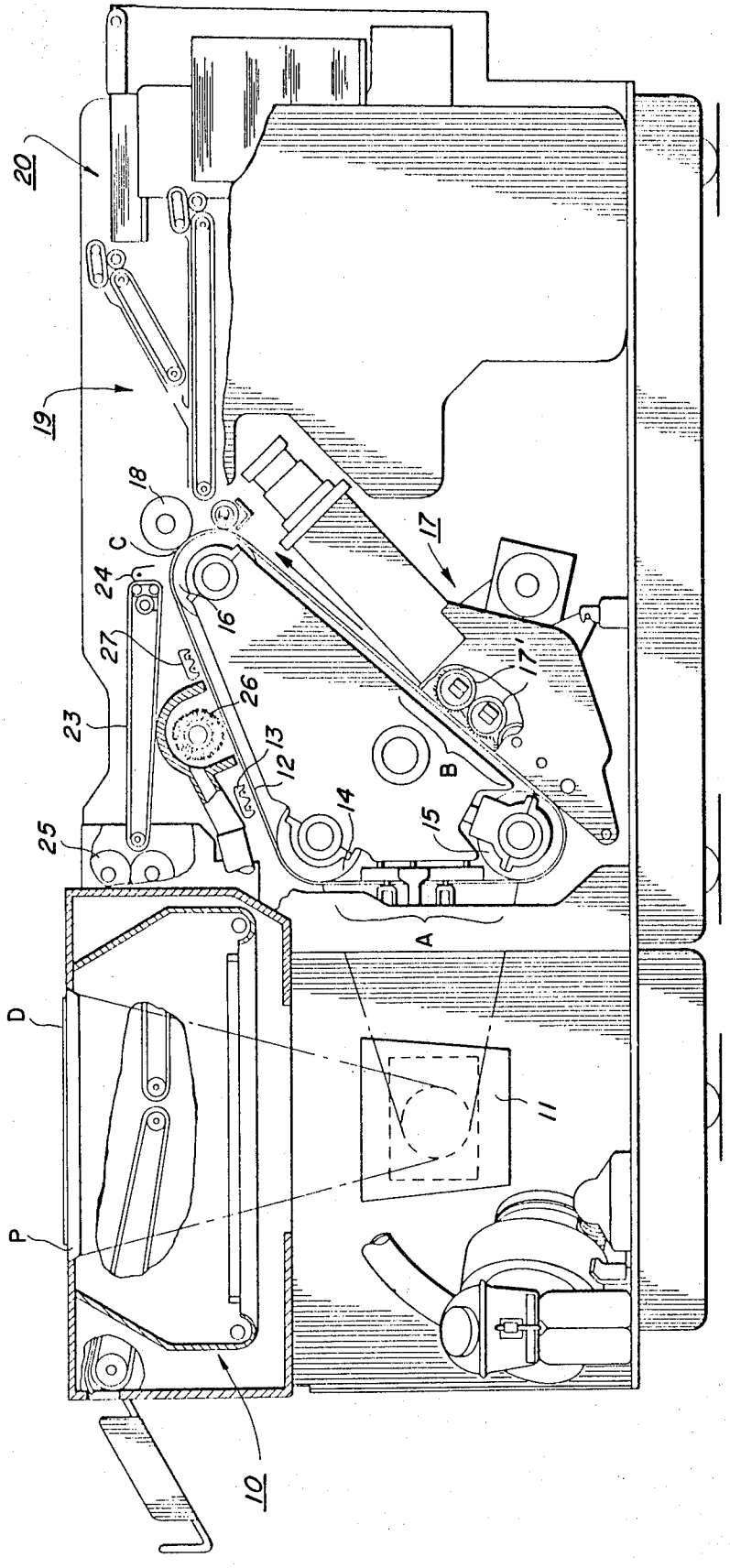


FIG. 1

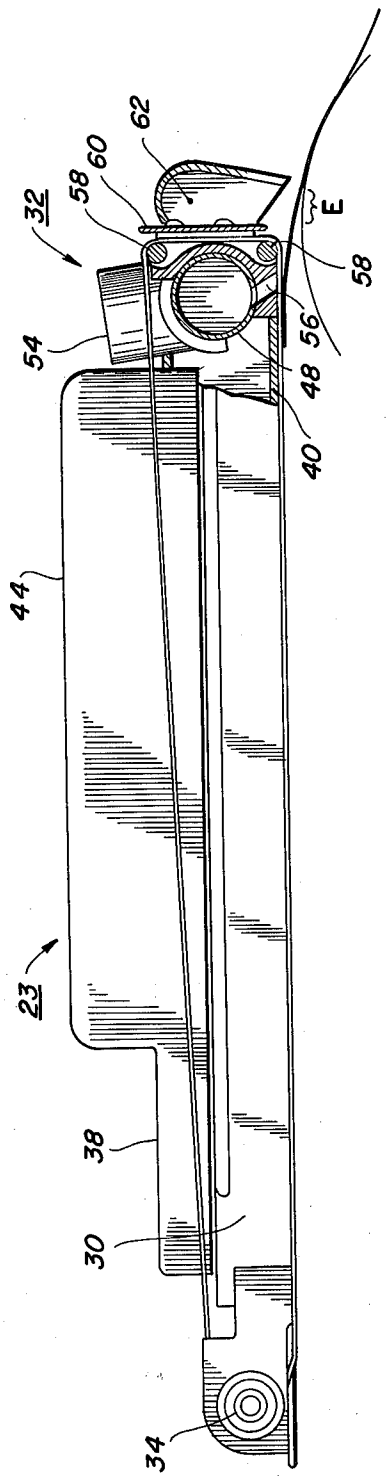


FIG. 2

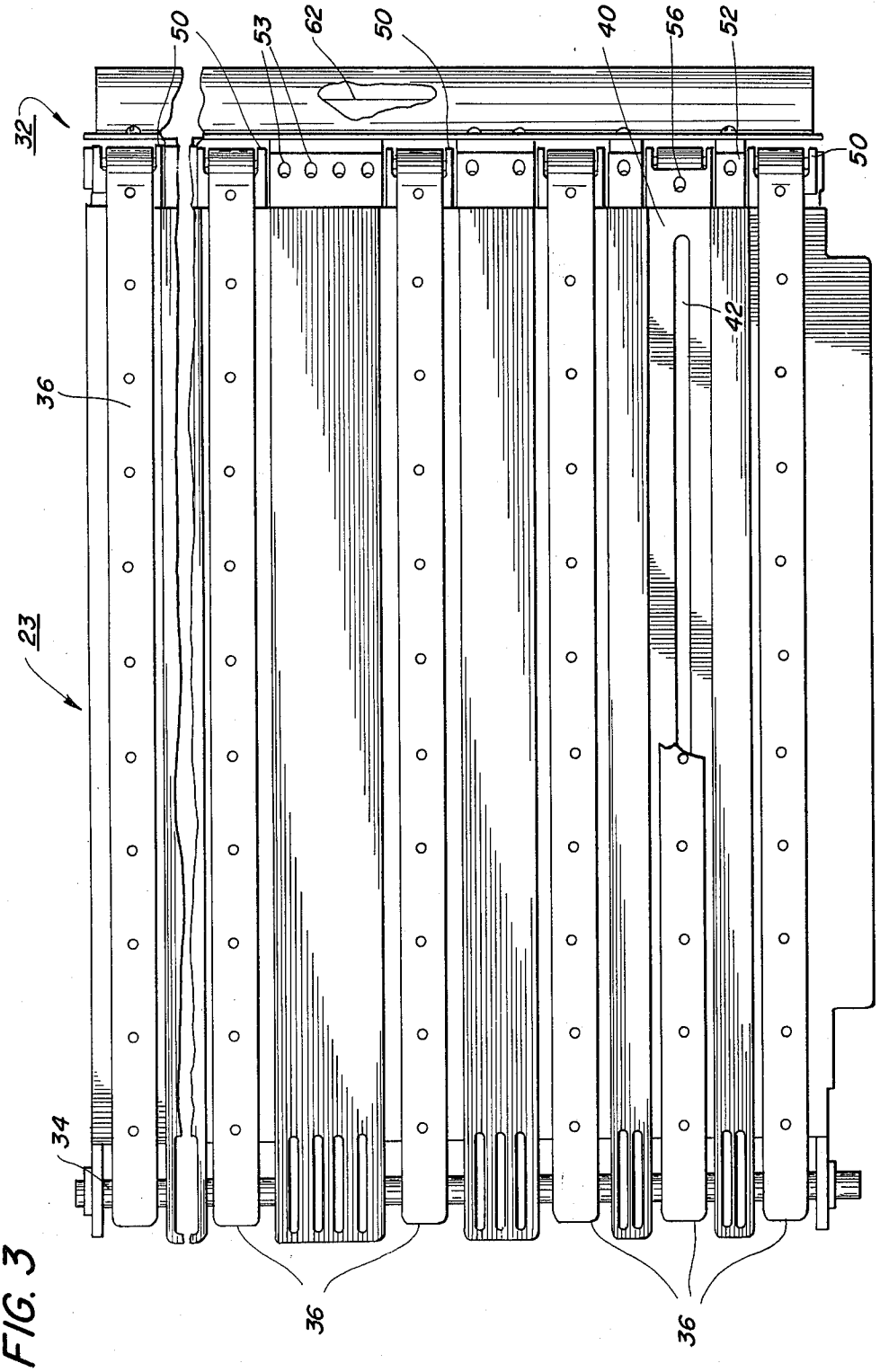


FIG. 3

VACUUM TRANSPORT

BACKGROUND OF THE INVENTION

In conventional xerography, a xerographic surface comprising a layer of photoconductive insulating material affixed to a conductive backing is used to support latent electrostatic images. In the process, the xerographic surface is electrostatically charged and the charged surface is then exposed to a light pattern of the image being reproduced to thereby discharge the surface in the areas where the light strikes the surface. The undischarged areas of the surface thus form an electrostatic charge pattern in conformity with the configuration of the original pattern.

The latent electrostatic image may then be developed by contacting it with a finely divided electrostatically attractable material, ordinarily a pigmented resinous powder, referred to herein as "toner." The toner particles are attracted to the electrostatic image from the carrier to produce a visible toner image on the xerographic surface.

After the image is developed, a transfer member, ordinarily copy paper, is caused to move in synchronized contact with the photoconductive surface. During this time an electrical potential opposite from the polarity on the toner is applied to the side of the paper remote from the photoconductive surface to electrostatically attract the toner image from the xerographic surface to the copy paper. The copy paper, which is an insulator, retains the charge while inducing a reverse charge on the non-discharged areas of the xerographic surface. This charge orientation creates an electrostatic bond between the paper and the xerographic surface. Removal of the copy sheet which is electrostatically bonded to the surface, without disturbing the toner image loosely adhering thereto, has long been a problem in the xerographic art.

In order to separate the copy sheet from the xerographic surface, the charge on the copy sheet may be neutralized or reduced with a corona discharge device while the sheet is on the xerographic surface. Assuming the copy sheet is partially neutralized thereby, a vacuum stripping device may be employed for pulling the leading edge of the copy sheet from the xerographic surface for subsequent movement of the copy sheet away from the xerographic surface by a suitable paper transport.

For optimum stripping, the vacuum stripping ports must be as close to the photoreceptor as possible, and must be located in close proximity to the area of the paper being sprayed by corona from the detacking corona emission device. Further, the transport belts, which are to convey the stripped paper from the photoreceptor must also be located as close as possible to the vacuum ports, the corona emission device, and the photoreceptor.

SUMMARY OF THE INVENTION

The present invention relates to a reproduction machine wherein a copy sheet is electrostatically tacked to a moving image support member, the machine including a transport apparatus for removing the copy sheet from the support member and transporting the sheet toward the next station in the machine, the transport apparatus having a plurality of perforated belts communicating with a slotted vacuum plenum, the belts being mounted for movement relative to the plenum by a plurality of rolls, two sets of small diameter rolls being provided adjacent the moving image support member, the two sets of rolls being mounted to provide a flat belt run at the lead edge of the transport substantially perpendicular to the base portion of the transport to allow the transport to be mounted closely adjacent a corona emission detack device and the moving support member for optimum stripping of the copy sheet from the support member, the transport being provided with a plurality of vacuum ports on the lead edge thereof between the small diameter rollers, and a plurality of vacuum ports adjacent the small diameter rollers beneath the belts mounted thereon for stripping the lead edge of the copy sheet at substantially the same location whereat the corona emission detacking device neutralizes the charge on the lead edge of the copy sheet.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic sectional view of an electrostatic reproduction machine embodying the principles of the present invention;

FIG. 2 is an enlarged elevational view in crosssection of the transport assembly positioned between the transfer station and the fuser assembly of the machine;

FIG. 3 is a bottom view of the transport assembly of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For a general understanding of an electrostatic processing system in which the invention may be incorporated, reference is had to FIG. 1. In the illustrated machine, an original D to be copied is placed upon a transparent support platen P fixedly arranged in an illumination assembly generally indicated by the reference numeral **10.** While upon the platen, an illumination system flashes light rays upon the original thereby producing image rays corresponding to the informational areas on the original. The image rays are projected by means of an optical system **11** to an exposure station A for exposing the photosensitive surface of a moving xerographic plate in the form of a flexible photoconductive belt **12.** In moving in the direction indicated by the arrow, prior to reaching the exposure station A, that portion of the belt being exposed would have been uniformly charged by a corona device **13** located at a belt run extending between belt supporting rollers **14** and **16.** The exposure station extends between the roller **14** and a third support roller **15.**

The exposure of the belt surface to the light image discharges the photoconductive layer in the areas struck by light, whereby there remains on the belt a latent electrostatic image in image configuration corresponding to the light image projected from the original on the supporting platen. As the belt surface continues its movement, the electrostatic image passes around the roller **15** and through a developing station B located at a third run of the belt wherein there is positioned a developing apparatus generally indicated by the reference numeral **17.** The developing apparatus **17** comprises a plurality of brushes **17'** which carry developing material to the adjacent surface of the upwardly moving inclined photoconductive belt **12** in order to provide development of the electrostatic image.

The developed electrostatic image is transported by the belt **12** to a transfer station C located at a point of

tangency on the belt as it moves around the roller **16** whereat a sheet of copy paper is moved at a speed in synchronism with the moving belt in order to accomplish transfer of the developed image. There is provided at this station a transfer roller **18** which is arranged on the frame of the machine for contacting the non-transfer side of each sheet of copy paper as the same is brought into transfer engagement with the belt **12.** The roller **18** is electrically biased with sufficient voltage so that a developed image on the belt **12** may be electrostatically transferred to the adjacent side of a sheet of paper as the same is brought into contact therewith. There is also provided a suitable sheet transport mechanism **19** adapted to transport sheets of paper seriatim from a paper handling mechanism generally indicated by the reference numeral **20** to the developed image on the belt as the same is carried around the roller **16.** A programming device operatively connected to the mechanism **20** and the illumination device for producing an electrostatic latent image on the belt **12,** is effective to present a developed image at the transfer station C in time sequence with the arrival of a sheet of paper.

The sheet is stripped from the belt **12** after transfer of the image thereto by a stripper transport **23** and a detack corona emission device **24,** to be hereinafter described, and thereafter conveyed by the stripper transport **23** into a fuser assembly generally indicated by the reference numeral **25** wherein the developed and transferred xerographic powder image on the sheet is permanently affixed thereto. After fusing, the finished copy is discharged from the apparatus at a suitable point for collection externally of the apparatus. The toner particles remaining as residue on the developed image, background particles, and those particles otherwise not transferred are carried by the belt **12** to a cleaning apparatus positioned on the run of the belt between rollers **14** and **16** adjacent the charging device **13.** The cleaning device, comprising a rotating brush **26** and a corona emission device **27** for neutralizing charges remaining on the particles, is connected to a vacuum source (not shown) for removing the neutralized toner particles from the belt prior to the formation of subsequent images thereon.

Referring now to FIGS. **2** and **3,** the stripper transport assembly **23** is comprised of a plenum assembly generally indicated at **30,** a stripper roll assembly **32,** a rear roller assembly **34,** and a plurality of endless belts **36.** The plenum assembly **30** is comprised of a top section **38** suitably affixed to a bottom section **40** having elongated slots **42** provided therein. The top section **38** is provided with a conduit **44** which is in fluid communication with the suction side of a suitable vacuum pump (not shown).

The stripper roller assembly **32** is comprised of a stationary hollow shaft **48** having a plurality of roller support elements **50** and a plurality of spacers **52** attached thereto. A conduit **54** in communication with the interior of shaft **48** is adapted for connection to a suitable vacuum source (not shown) to provide a flow of air through the interior of shaft **48.**

Each of the roller support elements **50** is provided with a passageway **56** therein communicating with the interior of shaft **48** for passage of air through the perforations in the belts and the passageways **56** into the interior of shaft **48.** Each of the spacers **52** is also provided with a plurality of openings **53** in communication with the shaft **48.** It can be seen by reference to FIG. **3** that the openings **53** in spacers **52** are provided at the extreme leading edge of the transport while the openings in the roller support elements **50** are provided as close as possible to the small diameter rollers **58** thereon to affect the lead edge of the copy paper as soon as it is in close proximity to the transport. It can also be seen by reference to FIG. **2** that the forward rollers **58** in stripper roller assembly **32** have a very small diameter compared to the rollers in the roller assembly **34** to allow placement of the forward edge of the transport extremely close to the photoreceptor surface for improved stripping.

For optimum copy quality and stripping performance, both the position of the stripper transport and the area of the copy affected by the detack corona emission device is critical relative to the photoreceptor surface. A shield **60** is provided on the lead edge of the stripper transport **23** for cooperation with the detack corona emission device **24.** The shield **60** not only protects the belts from the corona emissions but acts as a shield for the corona emission device to direct the corona emissions downwardly onto the paper passing thereunder.

This position of the corona emission device relative to the point of stripping of the paper from the photoreceptor is also critical in determining copy quality. The farthest upstream point of the area E sprayed by the corona emission device should approximately coincide with the point of stripping of the paper from the photoreceptor since improper charge levels on the paper resulting from the corona emissions at the strip point or at the point of arrival of the paper at the vacuum transport can cause incomplete image transfer, toner disturbances, or hollow characters. This disclosed arrangement allows placement of the corona emission device at the optimum location relative to the stripper transport and strip point and results in a corona shield which is fairly open, thereby facilitating cleaning of the corona emission wire **62** when the corona emission device is displaced from the machine for servicing.

By providing small diameter rolls on the vacuum transport adjacent the photoreceptor, the length and the radius of the arc traversed by the belt is minimized allowing the belts and the vacuum ports thereunder to be located at the optimum stripping location. Further, as stated heretofore, the use of small diameter rolls also results in a transport having a substantially "flat" leading end surface as contrasted to known devices employing a large roll assembly resulting in a substantially arcuate leading end which interferes with placement of the detacking corona emission device and prevents location of the stripping ports at the optimum stripping location. The "flat" end is particularly suitable for optimum placement of the detack corona emission device adjacent thereto. In most instances, the use of small diameter rollers adjacent the photoreceptor will also require a set of rollers thereabove to support the belts and allow sufficient space within the confines of the belts for the vacuum plenum and the shaft required to provide vacuum at the spaces between the belts and the ports under the belts adjacent the small diameter rollers.

While I have described a preferred embodiment of my invention, it should be understood that the invention is not limited thereto, but may be otherwise embodied within the scope of the following claims.

What is claimed is:

1. In a reproduction machine wherein a transfer member is electrostatically tacked to a moving image support member, a vacuum transport for removing the transfer member from the image support member and transporting the transfer member away from the support member including:

a frame member;

a plurality of small diameter rolls in axial alignment mounted on one end of said frame member forming a first roller assembly, the axis of said rolls being disposed parallel to the leading edge of said transfer member adjacent said support member;

a second roller assembly mounted on said one end of said frame member, the roller axis of said second roller assembly being disposed parallel to and spaced from the axis of said small diameter rolls;

a third roller assembly mounted on the other end of said frame member;

a plurality of endless perforated belts operatively mounted in said transport for movement around said roller assemblies;

means for forming first vacuum ports immediately behind each of said small diameter rolls; and,

means forming second vacuum ports between each of said small diameter rolls, said second vacuum ports being positioned adjacent said support member and parallel to the leading edge of said transfer member, movement of said transfer member on said support member adjacent said small diameter rolls causing said transfer member to be separated from said support member by the flow of air through said first and second vacuum ports for engagement with said belts and movement by said belts away from said support member.

2. A reproduction machine wherein a transfer member is electrostatically tacked to a moving image support member comprising:

a corona emission device adapted to reduce the electrostatic attraction between the transfer member and the moving image support member;

a vacuum transport disposed adjacent said corona emission device for removing the transfer member from the image support member and transporting the transfer member away from the support member, said transport including:

a frame member;

a plurality of small diameter rolls in axial alignment mounted on one end of said frame member forming a first roller assembly, the axis of said rolls being disposed parallel to the leading edge of said transfer member adjacent said support member;

a second roller assembly mounted on said one end of said frame member, the roll axis of said second roller assembly being disposed parallel to and spaced from the axis of said small diameter rolls;

a third roller assembly mounted on the other end of said frame member;

a plurality of endless perforated belts operatively mounted in said transport for movement around said roller assemblies;

means forming first vacuum ports immediately behind each of said small diameter rolls;

means forming second vacuum ports between each of said small diameter rolls, said second vacuum ports being positioned adjacent said support member and parallel to the leading edge of said transfer member, movement of said transfer member on said support member adjacent said small diameter rolls causing said transfer member to be separated from said support member by the flow of air through said first and second vacuum ports for engagement with said belts and movement by said belts away from said support member;

a corona emission shield plate mounted on said transport immediately adjacent said small diameter rolls, said plate serving to direct corona emissions from said corona emission device onto the transfer member immediately adjacent said small diameter rolls to reduce the electrostatic attraction between the support member and the transfer member to allow removal of said transfer member by said transport.

3. In a reproduction machine wherein a transfer member is electrostatically tacked to a moving image support member:

a transport for removing the transfer member from the image support member and transporting the transfer member away from the support members; and,

a corona emission device located adjacent said transport for spraying the transfer member with charged ions, said corona emission device including shield means adapted to direct the charged ions onto a limited area of the transfer member, said limited area being that area on the transfer member between the point on the image support member whereat the transfer member is separated from the image support member and the point at which the transfer member is contacted by said transport, the shield means thereby directing ions only on the area of the transfer member which is unsupported in the space between said image support member and said transport to provide optimum stripping of the transfer member from the image support member while assuring optimum copy quality resulting from the charge produced on the transfer member by said corona emission device.

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