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(54) **APPARATUS FOR REDUCING FLASH FOR THERMAL TRANSFER PRINTERS**

VORRICHTUNG ZUR BLITZREDUZIERUNG FÜR THERMOTRANSFERDRUCKER

APPAREIL POUR RÉDUIRE LE FLASH DES IMPRIMANTES À TRANSFERT THERMIQUE

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Description

FIELD OF THE INVENTION

[0001] The present invention is directed to a method, device, and system for reducing flash during image transfer operations to media cards or other products, and more particularly to a printing assembly including a device configured to provide a cooling stream of air near the product for facilitating removal of the intermediate transfer media from the product.

BACKGROUND

[0002] Various methods can be used to print an image to a media. One such method is thermal transfer printing, in which heat is used to transfer images from an intermediate transfer media ("IT media") to a product, such as a media card. The IT media generally includes a layer that is designed to adhere to the product when the layer is heated.

[0003] Typically, during thermal transfer printing, print dye is applied to the IT media. Further downstream in the printing process, portions of the IT media are transferred onto the product. In some cases, the size of the IT media may not correspond exactly with the size of the product. For example, the IT media may be larger than the product, and the edges of the IT media may extend over the edges of the product when the IT media is applied to the product. When the liner of the IT media is removed from the product following application of the IT media, the portions of the IT media that extend over the product edges may not be cleanly removed from the product, resulting in flash. Flash can cause the product to have diminished functionality and/or diminished aesthetic appeal.

[0004] Applicant has discovered then that it would be desirable to provide a printer adapted to print to a product using IT media in a manner that reliably and cost-effectively reduces flash. As described in greater detail below, a variety of challenges were identified and overcome through Applicant's efforts to invent and develop such a printer.

[0005] An example of background art may be found in US 2007/122216 A1.

BRIEF SUMMARY

[0006] The present invention addresses the above needs and achieves other advantages by providing a printing assembly incorporating an image transfer assembly and a blower and/or cooling chamber configured to provide a cooling stream of air to a product being printed upon for facilitating the removal of intermediate transfer media from the product and reducing the occurrence of flash. Embodiments of the invention include the following.

[0007] In the following embodiments, an intermediate

transfer printing assembly and a method of transferring a transfer portion from a donor media are disclosed according to appended claims 1 to 11. In some cases, the printing assembly further includes at least one blower configured to provide a cooling stream of air substantially continuously through the cooling chamber during expulsion of the product from the transfer assembly. The product may define a pair of opposed transverse edges that are substantially perpendicular to a receiving direction, wherein the cooling chamber is configured to cool the product along substantially the entire length of the opposed transverse edges. Furthermore, the product may define an image-receiving surface including a surface feature, wherein the intermediate transfer media comprises a transfer portion and a non-transfer portion, and wherein the cooling chamber is configured to cool the image-receiving surface of the product proximate the surface feature to encourage transfer of the transfer portion and removal of the non-transfer portion when the intermediate transfer media is peeled. The surface feature may be selected from the group consisting of a magnetic stripe, a signature panel, a smart card contactless chip, a smart card contact chip, an RFID transponder, a printed antenna, a piggyback label, a pattern adhesive, a die cut feature, a clasp, a retaining feature, an embossed region, a thermography region, and a foil region.

[0008] The cooling chamber may be disposed in communication with a cooling apparatus to cool at least one of the product or the intermediate transfer media when the product is received into the transfer assembly. The transfer assembly may be a single-pass double-sided transfer assembly configured to transfer first and second images from the intermediate transfer media to opposed image-receptive surfaces of the product. Furthermore, the cooling chamber may be disposed in communication with a cooling apparatus to cool at least one of the product or the intermediate transfer media when the product is received into the transfer assembly. In some cases, the transfer assembly may be configured to receive the product and the intermediate transfer media into the transfer assembly along a first direction, and expel at least the product from the transfer assembly along a second direction, and the cooling chamber may be configured to cool at least one of the product or the intermediate transfer media as the product and the intermediate transfer media are received into the transfer assembly along the first direction and as at least the product is expelled from the transfer assembly along the second direction.

[0009] The printing assembly may further include at least one blower configured to provide a cooling stream of air through the cooling chamber, wherein the blower comprises two nozzles. The cooling chamber may be configured to cool at least one of the product or the intermediate transfer media when the product is generally proximate an intermediate transfer assembly engagement position. The cooling chamber may be configured to generally cease cooling when the product is generally proximate an intermediate transfer assembly disengagement

ment position. In addition, the transfer device may comprise at least one heated component, and the cooling chamber may comprise an enclosure configured to focus cooling proximate an interface of the product and the intermediate transfer media and substantially isolate cooling from the heated component of the transfer device. The enclosure may comprise a wall of the transfer assembly and at least one peel bar positioned proximate a surface of the product, the wall defining a slot configured to receive the product.

[0010] In some cases, the cooling chamber is disposed in communication with a cooling apparatus to cool at least one of the product or the intermediate transfer media when the product is received into the transfer assembly, wherein the transfer device comprises a heated component, and wherein the cooling chamber comprises an enclosure configured to focus cooling proximate at least one of the product or the intermediate transfer media proximate an engagement location and substantially isolate cooling from the heated component of the transfer device. The enclosure may comprise a wall of the transfer assembly and at least one peel bar positioned proximate a surface of the product, the wall defining a slot configured to receive the product.

[0011] In some embodiments, the printing assembly may further comprise at least one sensor configured to detect the position of the product relative to the transfer assembly and control circuitry disposed in communication with the at least one sensor and a cooling apparatus, the control circuitry being configured to engage the cooling apparatus to cool the cooling chamber based at least in part on a position of the product relative to the transfer assembly. The control circuitry may be configured to engage the cooling apparatus to cool the cooling chamber prior to an image transfer operation of the printing assembly.

[0012] In other embodiments, a method of transferring a transfer portion from a donor media is provided, the method comprising receiving a product and a donor media into a transfer assembly such that the donor media is compressed between a transfer device of the transfer assembly and the product, expelling the product from the transfer assembly such that a carrier portion of the donor media is peeled from the product, and cooling at least one of the product or the donor media when the product is expelled from the transfer assembly. The method may further include cooling the product when the product is received into the transfer assembly. In some cases, cooling the product comprises cooling the product for a predetermined period of time.

[0013] Furthermore, receiving the product and the donor media into the transfer assembly may comprise receiving the product and the donor media into the transfer assembly along a first direction, and expelling the product from the transfer assembly may comprise expelling the product from the transfer assembly along a second direction. The product may define a leading edge with respect to the first direction, a trailing edge with respect to

the first direction, and two opposed side edges disposed between the leading edge and the trailing edge, wherein cooling the product comprises cooling substantially the full length of the leading edge and the full lengths of the two opposed side edges of the product.

[0014] In addition, the method may include activating a cooling apparatus for a predetermined period of time to cool the product when the product is generally proximate a donor media engagement position. A position of the product relative to the transfer assembly may be detected, wherein cooling the product comprises cooling the product based on the detected position of the product. The product may define an image-receiving surface including a surface feature, wherein the donor media comprises a transfer portion and a non-transfer portion, and wherein cooling the product comprises cooling the image-receiving surface of the product proximate the surface feature to encourage transfer of the transfer portion and removal of the non-transfer portion when the donor media is peeled.

[0015] In still other embodiments, an intermediate transfer printing assembly is provided that is configured to transfer an image from an intermediate transfer media to a product, the intermediate transfer printing assembly comprising a transfer assembly comprising a transfer device. The transfer assembly is configured to transfer the image from the intermediate transfer media to the product by receiving the product and intermediate transfer media into the transfer assembly, compressing the intermediate transfer media between the transfer device and the product, expelling the product from the transfer assembly, and peeling the intermediate transfer media from the product such that the image is transferred from the intermediate transfer media to the product. The intermediate transfer printing assembly may also comprise a cooling apparatus disposed proximate the transfer assembly and configured to cool the product when the product is received into the transfer assembly. The cooling apparatus may be configured to cool the product when the product is expelled from the transfer assembly.

[0016] In some cases, the intermediate transfer assembly may further include at least one sensor configured to detect the position of the product relative to the transfer assembly and control circuitry disposed in communication with the at least one sensor. The control circuitry may be configured to engage the cooling apparatus when the product is generally proximate an intermediate transfer media engagement position and to disengage the cooling apparatus when the product is generally proximate an intermediate transfer media disengagement position. The product may define a pair of opposed transverse edges that are substantially perpendicular to a receiving direction, wherein the transfer assembly defines a cooling chamber configured to receive the product before the product is received into the transfer device, and wherein the cooling apparatus is configured to cool the chamber such that the product is cooled along substantially the entire length of the transverse edges. The cool-

ing apparatus may be selected from the group consisting of a fan, a blower, fins, baffles, liquid jackets, heat sinks, thermoelectric cold plates, and Peltier cooling devices.

[0017] In still other embodiments, a method of printing using an intermediate transfer printing assembly is provided. The method includes receiving a product and an intermediate transfer media into a transfer assembly, cooling the product when the product is received into the transfer assembly, compressing the intermediate transfer media between a transfer device of the transfer assembly and the product, and expelling the product from the transfer assembly such that the intermediate transfer media is peeled from the product.

[0018] In some cases, the product is cooled when the product is expelled from the transfer assembly. Cooling the product may comprise cooling the product for a predetermined period of time. The product may define a pair of opposed transverse edges that are substantially perpendicular to a receiving direction, wherein cooling the product comprises cooling substantially the entire length of the transverse edges. Furthermore, the product may define an image-receiving surface including a surface feature, wherein the intermediate transfer media comprises a transfer portion and a non-transfer portion, and wherein cooling the product comprises cooling the image-receiving surface of the product proximate the surface feature such that the transfer portion remains with the product and the non-transfer portion is removed from the product when the intermediate transfer media is peeled.

[0019] In still other embodiments, an intermediate transfer printing assembly configured to transfer an image from an intermediate transfer media to a product is provided. The intermediate transfer printing assembly comprises a transfer assembly comprising a pair of opposed heated rollers defining a nip therebetween and configured to compress the intermediate transfer media against the product. The transfer assembly is configured to transfer the image from the intermediate transfer media to the product. The intermediate transfer printing assembly also comprises control circuitry configured to independently control the temperature of the rollers and a cooling apparatus disposed proximate the transfer assembly and configured to cool the product when the product is received into the transfer assembly.

[0020] In some cases, one of the rollers is heated to a higher temperature than the other of the rollers. Also, the cooling apparatus may be selected from the group consisting of a blower and a heat sink. The cooling apparatus may be configured to cool the product when the product is expelled from the transfer assembly.

[0021] In still other embodiments, a transfer printing assembly is provided that is configured to transfer a transfer portion from a donor media. The transfer printing assembly comprises a transfer assembly comprising a pair of opposed rollers configured to compress the donor media against the product, wherein the transfer assembly is configured to transfer the transfer portion from the do-

nor media to the product. The transfer printing assembly also comprises control circuitry configured to independently control a temperature for each of the opposed rollers and a cooling apparatus disposed proximate the transfer assembly.

[0022] In some cases, the control circuitry controls one of the rollers to be heated to a higher temperature than the other of the rollers. The control circuitry may control one of the rollers to be heated to a first temperature for encouraging transfer of the transfer portion from the donor media. Furthermore, the cooling apparatus may be selected from the group consisting of a fan, a blower, fins, baffles, liquid jackets, heat sinks, thermoelectric cold plates, and Peltier cooling devices. The cooling apparatus may be configured to cool the product when the product is expelled from the transfer assembly.

[0023] In still other embodiments, a transfer printing assembly configured to transfer a transfer portion from a donor media to an image-receiving surface of a product is provided. The transfer printing assembly comprises a transfer assembly comprising a transfer device. The transfer assembly is configured to transfer the transfer portion from the donor media to the image-receiving surface of the product by receiving the product into the transfer assembly, compressing the donor media between the transfer device and the product, expelling the product from the transfer assembly, and removing the donor media from the product such that the transfer portion is transferred from the donor media to the product. The transfer printing assembly also comprises a cooling chamber proximate the transfer device adapted to receive the product after the donor media has been compressed between the transfer device and the product.

[0024] In some cases, the transfer printing assembly is an intermediate transfer printing assembly, and the donor media is an intermediate transfer media. In other cases, the donor media is selected from the group consisting of a ribbon, a signature panel, a magnetic stripe, a hologram, a scratch-off tape, and a foil. The product may define a pair of opposed transverse edges that are substantially perpendicular to a receiving direction, wherein the cooling chamber is configured to cool substantially the entire length of the transverse edges.

[0025] The image-receiving surface may include a surface feature, wherein the cooling chamber is configured to cool the image-receiving surface proximate the surface feature. The surface feature may be selected from the group consisting of a magnetic stripe and a smart card contactless chip. The transfer device may comprise a heated component, and the cooling chamber may comprise an enclosure configured to focus cooling proximate at least one of the product or the donor media proximate a peel location and substantially isolate cooling from the heated component of the transfer device. The printing assembly may further comprise a blower, wherein the blower comprises two nozzles, each nozzle positioned at either end of the cooling chamber such that a cooling stream of air is directed through the chamber.

[0026] In still other embodiments, an intermediate transfer printing assembly is provided that is configured to transfer an image to a product. The intermediate transfer printing assembly comprises an intermediate transfer media comprising an image disposed thereon, a transfer assembly, and a blower configured to intermittently provide a cooling stream of air proximate the product. The transfer assembly includes a transfer device and is configured to transfer the image from the intermediate transfer media to the product. In particular, the product and intermediate transfer media are received into the transfer assembly along a first direction, the intermediate transfer media is compressed between the transfer device and the product, the product is expelled from the transfer assembly along a second direction, and the intermediate transfer media is peeled from the product such that the image is transferred from the intermediate transfer media to the product.

[0027] In some cases, the blower is configured to selectively provide the cooling stream of air proximate the product when the product is expelled from the transfer assembly along the second direction, but not provide the cooling stream of air proximate the product when the product is received into the transfer assembly along the first direction. The product may define an edge, and the blower may be configured to direct the cooling stream of air towards the edge. In some embodiments, the transfer assembly may be a single-pass double-sided transfer assembly that is configured to transfer first and second images from the intermediate transfer media to opposed image-receptive surfaces of the product.

[0028] The printing assembly may also include one or more sensors and control circuitry disposed in communication with the sensor(s). The sensors may be configured to detect the position of the product relative to the transfer assembly. Furthermore, the control circuitry may be configured to engage the blower to provide the cooling stream of air proximate the product when the product is disposed in a first position relative to the transfer assembly and not provide the cooling stream of air proximate the product when the product is disposed in a second position relative to the transfer assembly.

[0029] In some cases, the blower may comprise a single plenum in fluid communication with two nozzles. The product may define two edges extending in the first direction, and each nozzle may be positioned proximate a respective edge of the product. The transfer assembly may also include at least one peel bar positioned proximate a surface of the product. The peel bar and the transfer device may collectively define a chamber, and each nozzle may be positioned in fluid communication with the chamber to direct the cooling stream of air through the chamber. In some cases, the blower may include a centrifugal fan.

[0030] In still other embodiments, an intermediate transfer printing assembly is provided that includes an intermediate transfer media comprising an image disposed thereon, a transfer assembly, at least one sensor

configured to detect the position of the product relative to the transfer assembly, a blower, and control circuitry disposed in communication with the sensor(s). The transfer assembly may include a transfer device and may be configured to transfer the image from the intermediate transfer media to the product. The blower may be configured to provide a cooling stream of air proximate the product. In addition, the control circuitry may be configured to engage the blower to provide the cooling stream of air proximate the product when the product is disposed in a first position relative to the transfer assembly and not provide the cooling stream of air proximate the product when the product is disposed in a second position relative to the transfer assembly.

[0031] In some cases, the sensor and control circuitry may be configured to selectively engage the blower to provide the cooling stream of air when the product is expelled from the transfer assembly, but not provide the cooling stream of air when the product is received into the transfer assembly. Furthermore, the product may define an edge, and the blower may be configured to direct the cooling stream of air towards the edge.

[0032] The transfer assembly may be a single-pass double-sided transfer assembly that is configured to transfer first and second images from the intermediate transfer media to opposed image-receptive surfaces of the product. In addition, the blower may include a single plenum in fluid communication with two nozzles. The blower may also include a centrifugal fan.

[0033] In other embodiments, an intermediate transfer printing assembly may be provided that includes an intermediate transfer media comprising an image disposed thereon and a transfer assembly comprising a transfer device. The transfer assembly may be configured to transfer the image from the intermediate transfer media to the product by receiving the product and intermediate transfer media into the transfer assembly along a first direction such that the intermediate transfer media is compressed between the transfer device and the product, expelling the product from the transfer assembly along a second direction such that the intermediate transfer media is peeled from the product, and providing a cooling stream of air proximate an interface between the intermediate transfer media and the product while the intermediate transfer media is peeled from the product.

[0034] The printing assembly may further include at least one sensor configured to detect the position of the product relative to the transfer assembly and control circuitry disposed in communication with the sensor(s). The control circuitry may be configured to engage the blower to provide the cooling stream of air proximate the product when the product is positioned for peeling of the intermediate transfer media from the product.

[0035] In some cases, the transfer assembly may include a blower that includes a single plenum in fluid communication with two nozzles that are configured to provide the cooling stream of air. Furthermore, the product may define two edges extending in the first direction, and

each nozzle may be positioned proximate a respective edge of the product. The blower may also include a centrifugal fan.

[0036] Therefore, as described below in greater detail, a printing assembly is provided for facilitating the removal of intermediate transfer media from the product and reducing the occurrence of flash.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0037] Reference is now made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

Figure 1 is a side view of a printer incorporating a blower in accordance with one embodiment of the invention;

Figure 2 is a side schematic illustration of an intermediate transfer media structured in accordance with the known prior art;

Figure 3 is a side schematic illustration of a transfer assembly with a peel bar in accordance with one embodiment of the invention;

Figure 4 is a side schematic illustration of the transfer assembly depicted in Figure 3 showing the blower in accordance with one embodiment of the invention;

Figure 5 is a schematic illustration of an intermediate transfer media applied to a product in accordance with one embodiment of the invention;

Figure 6 is a schematic perspective view of a single-pass double-sided image transfer assembly and a blower in accordance with another embodiment of the invention;

Figure 7 is a perspective view of a blower incorporating a single plenum and two nozzles in accordance with one embodiment of the invention;

Figure 8 is a perspective view of a transfer assembly showing nozzles of the blower positioned with respect to the transfer assembly and product in accordance with one embodiment of the invention;

Figure 9 is a perspective view of a transfer assembly including peel bars defining a cooling chamber in accordance with one embodiment of the invention;

Figure 10 is a schematic illustration of a printing assembly including a sensor and control circuitry in accordance with another embodiment of the invention;

Figure 11 is a schematic illustration of a printing as-

sembly including sensors positioned along a transport path of the product in accordance with one embodiment of the invention;

Figure 12 is a side schematic illustration of a transfer assembly showing the product in a first position with respect to the transfer assembly;

Figure 13 is a side schematic illustration of the transfer assembly of Figure 12 showing the product in an innermost position;

Figure 14 is a side schematic illustration of a transfer assembly of Figure 12 showing the product in a second position with respect to the transfer assembly;

Figure 15 is a side schematic illustration of a transfer assembly showing a cooling chamber in accordance with one embodiment of the invention;

Figure 16 is a perspective view of the transfer assembly of Figure 15; and

Figure 17 is a side schematic illustration of a printing assembly incorporating a blower and a cooling fan in accordance with one embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0038] A number of executions of the present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the inventions are shown. Indeed, the present invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

[0039] As described in greater detail below, a printing assembly is provided that includes an image transfer assembly and a cooling chamber configured to intermittently cool a product and/or the intermediate transfer media used to print on the product. The cooling chamber may be cooled through the operation of a cooling device or apparatus, such as a blower or a heat sink. In the case of a blower, the blower may include a centrifugal fan and may have a single plenum providing air to two nozzles. Alternatively, multiple blowers with multiple nozzles may be used to provide a cooling effect, as will be understood by one of ordinary skill in the art in the light of this disclosure.

[0040] There are many cooling devices known to one skilled in the art which could be used to cool a chamber, an assembly, a product, a donor media, or some combination thereof in light of the disclosure herein. Such devices include a fan, a blower, fins, baffles, liquid jackets, heat sinks, thermoelectric cold plates, and Peltier cooling

devices. Although various types of cooling devices may be used to cool the cooling chamber, for ease of explanation, the description below uses the example of a blower configured to provide a cooling stream of air into and through the cooling chamber.

[0041] In the case of a blower, the nozzles of the blower may be positioned such that the air flows over the edges of the product or other locations where flash may occur. The blower may be configured to provide air when the product is received into the transfer assembly and/or when it is expelled from the transfer assembly and/or while the intermediate transfer media is peeled from the product. The printing assembly may further include sensors and control circuitry for detecting the position of the product relative to the transfer assembly and controlling the blower based on the detected position.

[0042] Reducing the occurrence of flash according to embodiments of the present invention provides various advantages in addition to enhancing the aesthetic appeal of the product, as will be apparent to those of ordinary skill in the art in light of the disclosure that follows. For example, the described embodiments allow greater freedom over the time required to print to the product and may generally allow for faster printing times. In addition, a greater number of potential printing designs may be possible, such as designs that include printing that is unevenly distributed across the surface of the product, which are typically more difficult to print in thermal systems. Moreover, embodiments of the present invention may allow for printing to different types of substrates, such as substrates made of various materials, having different thicknesses, or including different coatings that may have different heat transfer characteristics.

[0043] Furthermore, paper or synthetic cards, tags, labels, wristbands, and other products may have a variety of surface features that may vary in terms of how they receive images, ink, or laminates. These features often provide special capabilities or enhanced visual effects that are key features of the product. Such features may include magnetic stripes, signature panels, a smart card contactless chip, a smart card contact chip, an RFID transponder, printed antennae, piggyback labels, pattern adhesive, die cut features, clasps or other retaining features, embossing, thermography, or foil. Thus, embodiments of the present invention may allow for printing to substrates that include such surface features.

[0044] For illustration purposes, the specification below describes intermediate transfer printing assemblies that are structured to print or otherwise process media cards. It is noted however, that the present invention is not limited to use with media cards and may, in fact, incorporate printing assemblies that are structured to print or otherwise process any type of "product," including but not limited to media cards, labels, RFID tags, smart cards, printable objects, and the like. Such products may be comprised of cellulose-based materials (e.g., paper, cardboard, wood, etc.), polymers, metals, laminates, composites, films, and other similar materials.

[0045] Further, also for illustration purposes, the specification describes image transfer stations that are incorporated within or used by printers. It is noted however, that embodiments of the present invention are not limited to use within printers and may, in fact, embody image transfer stations that are used within a variety of media processing devices, including but not limited to card printers, label printers, desk top printers, laminators, RFID readers, encoders, or other similar media processing assemblies.

[0046] In general, an image can be formed on an image-receiving surface in a variety of ways. In thermal transfer printing, for example, pressure and heat are used to melt a coating of donor media such that the coating (e.g., the dye) stays on the image-receiving surface of the product. Donor media may include, for example, an intermediate transfer media, a ribbon, a signature panel, a magnetic stripe, a hologram, a scratch-off tape, or a foil, among others. One example of thermal transfer printing is intermediate thermal transfer printing. In intermediate thermal transfer printing, ink from a ribbon is transferred to an intermediate transfer media such that an image is formed on the intermediate transfer media. The image is then transferred to the product by applying the intermediate transfer media to the product as will be discussed in greater detail below.

[0047] Although various embodiments of the invention may be used to facilitate thermal transfer printing and intermediate thermal transfer printing, the description below and the associated figures describe embodiments of the invention in the context of intermediate transfer printing. One of ordinary skill in the art will understand in the light of this disclosure that various embodiments of the invention, however, are also applicable to thermal transfer printing to facilitate removal of a carrier or backing portion of a ribbon (i.e., donor media) from the image-receiving surface of the product once dye (e.g., an image) has been transferred. For purposes of the foregoing specification and appended claims this removal process may be similar to an intermediate transfer peeling step as described in greater detail below. In one embodiment, the cooling chamber described below may be configured to cool the product as the product is expelled from the transfer assembly after the ribbon has been applied to the product to facilitate removal of the ribbon from the printed product.

[0048] Fig. 1 shows selected components of a printing assembly. Not all components of the printing assembly are shown, however, for purposes of clarity and ease of discussion. Referring to Fig. 1, the intermediate thermal transfer printing assembly **10** may include an intermediate transfer media ("IT media") **15**, a transfer assembly **20** including a transfer device **25** configured to transfer an image from the IT media **15** to the media card **30**, and a blower **35**. In some cases, the blower **35** may be incorporated into and form part of the transfer assembly **20**.

[0049] The inventors have identified several factors that may improve print quality and, in some embodi-

ments, may affect the occurrence of flash on media cards. Such factors include the speed of the card as it is moved through the transfer assembly **20**, the type and configuration of the transfer device **25**, the temperature of the transfer device **25**, the temperature of the ambient environment proximate the transfer device **25**, the dimensions and material composition of the card **30** being printed upon, the presence of a surface feature on the image-receiving surface of the card (such as an RFID chip or magnetic stripes), the position of the image with respect to the image-receiving surface of the card, the image content (for example, light versus dark images), and the type of IT media **15** used. The above factors are presented here merely for illustration and not for limitation as other factors may be readily apparent to one of ordinary skill in the art in view of this disclosure. An example of IT media that may be used in connection with various embodiments of the invention is dye-sublimation IT media ribbon from DNP IMS America Corporation, Part Number 800133-601.

[0050] The IT media **15** may be disposed between an IT media supply roll and an IT media take-up roll (not shown). The IT media supply roll may dispense the IT media **15** past a print station **40**, where print dye may be applied to the IT media **15**. Further downstream, the IT media **15** may extend past the transfer assembly **20**, where portions of the IT media **15** bearing print may be transferred onto the media card **30**.

[0051] The depicted printing assembly **10** may also include a color ribbon supply roll (not shown), a color ribbon take-up roll (not shown), and a ribbon printing head **45**. The color ribbon supply roll may supply a color ribbon **50** that has, for example, a sequence of colorant panels including yellow (Y), magenta (M), cyan (C) and/or black (K) panels for imprinting of a range of colors or light/dark shades onto the IT media **15**. The color ribbon **50** may be routed so as to be coextensive to the IT media **15** between the ribbon printing head **45** and a platen **55**. The ribbon printing head **45** may then be thermally engaged to impart a printed image to a portion of the IT media **15**.

[0052] The printed IT media **15** may then be routed downstream to the transfer assembly **20**, as shown. The transfer assembly **20** is comprised of a transfer device **25** that is configured to engage the IT media **15** to impart a printed image to a surface of the media card **30**. The transfer assembly **20** may include various types of transfer devices **25** for engaging the IT media **15**. For example, in Fig. 1, the transfer device **25** is a heated compression roller that is opposed by an idler roller **26**. Alternatively, the transfer device may be comprised of a pair of opposing heated compression rollers, arcuate platens defining opposed arcuate surfaces, reciprocating clamps, or other similar devices.

[0053] In some cases, such as in single-sided transfer assemblies (discussed in greater detail below), the transfer device comprises a pair of opposed heated rollers **25**, **26** defining a nip **101** therebetween (shown in Fig. 15) that are configured to compress the IT media **15** against

the media card **30**. Notably, the opposed heated rollers **25** need not be heated to identical temperatures. For example, the rollers may be controlled by control circuitry that is configured to independently control the temperature of the rollers, such that one of the rollers (e.g., roller **25**) can be heated to a higher temperature than the other of the rollers (e.g., roller **26**). In this regard, the roller **25** at the higher temperature may be configured to transfer the image from the IT media **15** to the image-receiving surface of the card, whereas the other roller **26**, while perhaps still heated, is maintained at a temperature below that necessary to thermally activate the release layer **15B** of the IT media. In one example, the roller **25** may be heated to a temperature in the range of approximately 155°F to 200°F, while the other roller **26** is heated to a temperature in the range of approximately 65°F to 85°F. **[0054]** The media card **30** may, in some cases, be drawn from a card feeder or otherwise supplied to the printing assembly **10**. Prior to arriving at the transfer assembly **20**, the media card **30** may pass through an encoding station **58**, where the media card **30** may be encoded with information. At the transfer assembly **20**, the media card **30** may be coextensively aligned with a printed portion of the IT media **15**.

[0055] The transfer assembly **20** is thus configured to transfer an image from the IT media **15** to the media card **30** by receiving the media card **30** and the IT media **15** into the transfer assembly **20**, compressing the IT media **15** between the transfer device **25** and the media card **30**, expelling the media card **30** from the transfer assembly **20**, and peeling the IT media **15** from the media card **30** such that the image is transferred from the IT media **15** to the media card **30**. In this regard, conventional IT media **15** is depicted in Figure 2. The conventional IT media **15** includes a carrier film **15A** for supporting a release liner **15B** and a print receiving portion **15C**. Images (e.g., graphics, text, barcodes, and other indicia) are printed or otherwise formed on the print receiving portion **15C**. Thus, when applied to the media card **30**, the print receiving portion **15C** would be disposed adjacent a image-receiving surface of the media card **30**.

[0056] The release layer **15B** may be thermally activatable for releasing the print receiving portion **15C**, which may be simultaneously pressed against and transferred to the image receiving surface of the card **30**. In many embodiments, it may not be desirable for all of the print receiving surface **15C** to be transferred. For example, in situations where the IT media is larger than the card **30**, or where the card **30** includes surface features (e.g., magnetic stripe, etc.) that are intended to remain generally free of the print receiving portion **15C**. Thus, the IT media may include a transfer portion and a non-transfer portion. In many embodiments, there is no physical or chemical distinction between the transfer portion and the non-transfer portion of the donor media (e.g., ribbon, IT media, etc.) Rather, the transfer assembly is configured to activate the transfer portion and is configured to not activate the non-transfer portion. Thus, when

the carrier film or backing layer of the donor media is peeled away, the transfer portion remains and the non-transfer portion is peeled away with the carrier film or backing layer.

[0057] In some embodiments, non-thermally activated media and media supporting laminate patches may be provided in addition to, or instead of, the printed images noted above. In this regard, the donor media (e.g., IT media **15**, laminate media, etc.) facilitates transfer of such laminate patches to a media card or other image-receiving media as will be apparent to one of ordinary skill in the art.

[0058] Returning to the depicted embodiment, once the IT media **15** has been applied to the media card **30** via the transfer device **25**, the IT media **15** may be peeled from the media card **30**, for example as the media card **30** is being expelled from the transfer assembly **20**. In some cases, as shown in Figs. 3 and 4, the IT media **15** is removed with the help of a peel bar **60**, which may engage the IT media **15** in the area of peeling and facilitate removal of the IT media **15** at a specified angle with respect to the media card **30**.

[0059] Referring to Fig. 4, the blower **35** may be configured to intermittently provide a cooling stream of air proximate the media card **30**. In some cases, the blower is configured to provide the cooling stream of air as the media card **30** is entering the transfer assembly **20**. In other cases, the cooling stream of air is applied as the media card **30** is being expelled from the transfer assembly, subsequent to the compression of the IT media to the media card. In still other cases, the cooling stream of air is applied both upon entry and exit of the media card from the transfer assembly, such as in single-pass double-sided printing operation, described below.

[0060] In any case, and while not intending to be limited by theory, the cooling stream may cause the IT media **15** to crystallize such that when the IT media **15** is peeled from the media card **30**, the portions of the IT media **15** that have become more brittle due to the crystallization process are able to break more cleanly (i.e., reducing flash) from other portions of the IT media **15** that have adhered to the media card **30**. As a result, portions of the IT media **15** that may extend past the edges of the media card **30**, which would otherwise become flash, can be removed at the same time that the IT media **15** is peeled from the media card **30**. In other words, the cooling stream of air may facilitate the removal of the non-transfer portion of the IT media **15** such that substantially only the transfer portions intended to remain on the image-receiving surface of the card do indeed remain.

[0061] Fig. 5 depicts the cooling of portions of the IT media **15**, as described above. In Fig. 5, for example, the media card **30** defines two opposed aligned edges **32**, **34** that are substantially aligned with the direction **A** (e.g., the receiving direction, or the direction in which the card moves as it is received into the transfer assembly **20**) and two opposed transverse edges **31**, **33** that are substantially perpendicular to the receiving direction **A**. Thus,

in some cases, one of the transverse edges is a "leading" edge **31** with respect to the direction **A** in which the media card **30** is received into the transfer assembly **20**, the other transverse edge is a trailing edge **33** with respect to the direction **A**, and the two aligned edges are two opposed side edges **32**, **34** disposed along the direction **A** between the leading and trailing edges **31**, **33**. The IT media **15** may extend over one or more edges of the media card **30**, resulting in flash **16**, **17**, **18**. For example, in Fig. 5, the IT media **15** extends over the side edges **32**, **34**.

[0062] In addition, as described above, an image-receiving surface of the card **30** may include surface features that hinder the clean removal of the IT media **15** (e.g., the non-transfer portions of the IT media) from the card. For example, portions of the IT media **15** may have the tendency to become flash in the areas associated with a magnetic stripe or a smart card contact chip located on a surface of the card **30**. In other embodiments, such as, where a donor media is a ribbon, for example, flash may refer to dye portions or remnants that inadvertently remain behind on the product or card following a peel operation. Such flash may be detrimental to print quality as will be readily apparent to one of ordinary skill in the art in view of this disclosure.

[0063] In applications in which the media card **30** is enveloped by the IT media **15** for double-sided printing, such as is illustrated in Figs. 8 and 9 and described below, the engagement of the IT media with the leading edge **31** may make clean removal of the IT media from that edge difficult during typical peeling processes. However, by directing a cooling stream of air **36** towards the media card **15**, and especially towards the flash areas **16**, **17** of the side edges **32**, **34** and/or the flash area **18** of the leading edge **31**, as well as the flash area **19** on a surface of the card where a surface feature **23** may be disposed, the IT media **15** in those areas may crystallize, allowing for a more successful peeling operation that removes the excess IT media **15** in the flash areas. In other words, as a result of the cooling of the IT media **15** in the flash areas **16**, **17**, **18**, **19**, the peeling of the IT media carrier film **15A** creates a break in the IT media **15** through the print receiving portion **15C** that is aligned with the edges **31**, **32**, **34** of the media card **30** and/or the edges of the surface feature (e.g., a magnetic stripe **23** or smart card contactless chip), thereby removing the excess IT media **15** in the flash areas **16**, **17**, **18**, **19**. Thus, in some cases, the cooling stream of air **36** may be directed towards one or more edges of the media card **30** and/or the image-receiving surface of the card, for example, to enable peeling operations that result in IT media **15** edges that are substantially flush with the media card edges **31**, **32**, **33**, **34** and reduce flash in the areas of surface features that may otherwise promote flash.

[0064] As mentioned above, in some embodiments, the media card **30** and the IT media **15** are received into the transfer assembly **20** along a first direction **A** and are expelled from the transfer assembly **20** along a second

direction **B**. For example, the transfer assembly may be a single-pass double-sided transfer assembly that is configured to transfer first and second images from the IT media **15** to opposed image-receptive surfaces of the media card **30** in a single pass of the media card **30** through the transfer assembly **20**, such as described in U.S. Application No. 11/406,548, filed on April 19, 2006, entitled "Single-Pass Double-Sided Image Transfer Process and System,". For instance, in Fig. 6, a single-pass double-sided transfer assembly **21** is shown in which the media card **30** and IT media **15** are received into the transfer assembly **21** along the **A** direction and are expelled along the **B** direction. As the media card **30** and IT media **15** are received into the transfer assembly **21** and pass through the transfer device **25** (in this case, for example, a pair of heated compression rollers), first and second images are imparted on opposed surfaces of the media card **30**. Once the media card **30** reaches a certain position (for example, when the media card **30** is received into the transfer assembly **21** to a position **C**, shown in dashed lines), the tension in the IT media **15** may facilitate expulsion of the media card **30** from the transfer assembly **21** along the **B** direction.

[0065] In some embodiments, the blower **35** is configured to provide the cooling stream of air proximate the media card **30** when the media card **30** is received into the transfer assembly **20**, **21** along a first direction **A** and when the media card **30** is expelled from the transfer assembly **20**, **21** along the second direction **B**. Thus, as the media card **30** is received into the transfer assembly, as shown in Fig. 12, the blower may provide a predetermined amount of air flow, such that the resulting volume of air being provided is large enough to direct a flow of air across the full length *l* of a transverse edge (e.g., the leading edge **31**, shown in Fig. 5). For example, the inventors have discovered that a minimum flow rate of approximately 2.6 cfm provides a significant reduction of flash at the leading edge **31**. An example of a fan that may be used in connection with various embodiments of the invention is the Cooltron blower fan, Model Number FBD5015B24W7-11, rated for an air flow of 4.90 cfm.

[0066] As the media card **30** is advanced from a first position **X** relative to the transfer assembly **20**, **21** generally associated with engagement of the media card with the IT media **15**, the IT media may begin to crystallize as a result of the cooling stream in the area of engagement with the leading edge **31**, thereby facilitating subsequent peeling in that area. In one embodiment, the cooling stream of air may be provided proximate the media card **30** for a predetermined period of time from when the media card first engages or is approaching the IT media in the direction **A** (Fig. 12). For example, for a media card **30** traveling at a speed of approximately 1.5 inches per second, the cooling stream of air may be provided for approximately 4.8 seconds. Thus, the blower may continue to provide a cooling stream of air as the media card **30** is moved in the direction **A** into the transfer assembly from the first position **X** to an innermost position **Y** (Fig.

13). As the media card **30** is expelled from the transfer assembly, the media card may be moved in the direction **B** from the innermost position **Y** to a second position **X'** generally associated with disengagement of the product from the IT media **15** (Fig. 14). In some cases, the first and second positions **X**, **X'** are proximate each other or are substantially the same position. Once the media card **30** is disposed in the second position **X'** and is moving in the second direction, the blower may be directed to cease to provide the cooling stream of air. Thus, the cooling stream of air may cease to be provided when the IT media **15** is substantially peeled from the media card **30**. In other words, the cooling stream of air, in some cases, may be provided continuously during receipt and expulsion of the product from the transfer assembly.

[0067] Accordingly, the cooling stream of air may be activated to cool the media card **30** and/or the IT media **15** when the media card is generally proximate an intermediate transfer assembly engagement position, such as the first position **X**. Similarly, the cooling stream of air may be deactivated to generally cease cooling when the media card **15** is generally proximate an intermediate transfer assembly disengagement position, such as the second position **X'**.

[0068] The blower **35** may be configured to be switched on and off such that the cooling stream of air is provided when the blower is switched on and is not provided when the blower is switched off. Alternatively, the blower **35** may be configured to continuously generate a cooling stream of air, but may include a valve configured to block the flow of air at certain times (e.g., when the media card **30** is being received by the transfer assembly **20**). Similarly, the blower **35** may include a diverter or may otherwise direct the cooling stream of air away from the media card **30** when the media card **30** is being received by the transfer assembly **20**.

[0069] Turning now to Fig. 7, the blower **35** may include a single plenum **65** in fluid communication with two nozzles **70**, one nozzle or more than two nozzles may be used according to the configuration of the system. The plenum **65** may, for example, be connected to the nozzles **70** via hoses **75**, tubes, piping, or other components configured to allow airflow therethrough. The blower **35** may also include a centrifugal fan **80**. In some embodiments, two or more centrifugal fans may be used to ensure that an appropriate flow of air is generated. The centrifugal fan **80** or fans may be configured to provide a certain volume of air at a selected pressure, such as, for example, a pressure of approximately 19 mm of H₂O or higher, which may facilitate the targeting of certain portions of the media card **30** and IT media **15** (such as the flash areas **16**, **17**, **18**) without affecting the heated application of the IT media **15** to the media card **30** occurring at the transfer device **25** (shown in Figs. 4 and 5). In some embodiments, each nozzle **70** may be configured to direct air towards the media card **30** while reducing the flow of air towards the transfer device **25**. For example, as shown in Fig. 7, the nozzles **70** may include a closed side **71**

and an open side **72**, with the closed side **71** positioned towards the transfer device **25** and the open side **72** positioned away from the transfer device **25**, such that air is encouraged to flow towards the media card **30** and away from the transfer device **25**. This feature is also illustrated in Fig. 8.

[0070] In some cases, the transfer assembly **21** may include a wall **105** disposed between the transfer device **21** and the nozzles **70**, as shown in Fig. 15. For example, the wall **105** may be an extension of the printer housing or a housing of the transfer assembly **21**, and the position of the wall may help to insulate the transfer device **25**, which may include a heated component (e.g., thermal roller), from the cooling effect of the cooling stream of air being provided by the nozzles **70**, and vice versa. In some embodiments, the wall may focus the cooling stream of air toward a peeling location (e.g., location at which point the IT media or other donor media begins peeling away from the product or card) or towards an interface **66** of the IT media **15** with the media card **30**. In other embodiments, to allow card/IT media access to the transfer device **25**, the wall **105** may define a slot **110** that is configured to receive and expel the product from the transfer device **25**.

[0071] In some cases, as mentioned above and shown in Fig. 9, the transfer assembly **20** includes one or more peel bars **60** configured to facilitate removal of the IT media **15** from the media card **30**. The peel bar **60** may be positioned proximate the surface of the media card **30** to facilitate peeling of the IT media **15** from the image-receiving surface of the card.

[0072] Thus, in the embodiments shown in Figs. 15 and 16, the wall **105** and the peel bar(s) **60** together may define an enclosure that acts as a cooling chamber **85**. For example, the cooling chamber **85** enclosure may be configured to focus the cooling effect of the cooling stream of air proximate the media card **30**, such as proximate the interface **66** of the IT media **15** with the card. In this regard, each nozzle **70** may be positioned at an end of the cooling chamber **85**, as shown, such that the cooling stream of air is directed through the cooling chamber and passes over the surfaces of the media card **30** and along the targeted edges **31**, **32**, **33**, **34**. In other words, the nozzles **70** may be positioned opposite each other and transverse to the path of the media card **15** as it is received/expelled from the transfer assembly **20**, **21** such that the media card generally passes between the nozzles as the card moves with respect to the transfer assembly.

[0073] In some embodiments, the blower **30** or some other cooling apparatus may direct the cooling stream of air through the cooling chamber to pre-cool the chamber prior to the image transfer operation (Fig. 12) to promote crystallization of the IT media **15** before introduction of the media card **30**. This pre-cool operation may also provide time for the cooling apparatus (e.g., blower **30**) to go from a rest or off mode to a cool or on mode and thereby ensure that a sufficient flow of cool air is present

in the cooling chamber when the card is introduced. In another embodiment, the cooling apparatus (e.g., blower **30**) may be engaged to provide a cooling stream of air proximate the card/donor media engagement position discussed in connection with Figure 12. In still other embodiments, the cooling apparatus (e.g., blower **30**) may be engaged at some other point during the transfer operation so that the cooling stream of air is primarily provided only as the card is expelled from the transfer assembly into the cooling chamber.

[0074] Each of the above cooling apparatus engagement techniques may be used to effect a lower temperature in the cooling chamber by the time the media card is passed through the chamber during expulsion of the card from the transfer assembly (e.g., cooling the chamber for a longer period of time). After the image has been transferred to the media card **30** (Fig. 16), the continued flow of the cooling stream of air through the cooling chamber **85** may similarly focus the cooling effect on the side edges **32**, **34** due to the position of the nozzles **70** proximate the side edges, as well as on the leading edge **31** due to the volume of air that is being pushed through the cooling chamber as the media card **30** is expelled.

[0075] In addition to focusing the cooling on the product, the enclosure of the cooling chamber **85** may also serve to substantially isolate the cooling from any heated component (e.g., heater rollers, etc.) of the transfer device **21**. In this way, the IT media **15** may be effectively heated by the transfer device **25** as the media card **30** is received by the transfer assembly **21** so as to release the print receiving portion **15C** of the IT media **15** and impart the images to the media card **30**, without substantial counteraction by the cooling stream of air. In the same way, the enclosure can shield the cooling chamber **85** from the heat emitted by the heated component of the transfer device **25**, thereby increasing the temperature differential between the transfer device and the cooling chamber. Thus, the cooling stream of air flowing through the cooling chamber can more effectively facilitate peeling of the IT media **30**, as described above.

[0076] In some embodiments, the cooling chamber **85** may be disposed proximate the transfer assembly **20**, **21** and may be adapted to receive the media card **30** after the IT media **15** has been compressed between the transfer device and the media card. Thus, the cooling chamber **85** may be configured to cool the media card **30** and/or the IT media **15** as the media card is expelled from the transfer assembly **20**, **21**. In some cases, the cooling chamber **85** may be configured to cool the media card **30** and/or the IT media **15** when the product is received into the transfer assembly, or both when it is received and expelled. Furthermore, the cooling chamber **85** may be configured to cool the media card **30** and/or the IT media **15** when the product is generally proximate the intermediate transfer assembly engagement position and may be configured to generally cease cooling when the media card is generally proximate the intermediate transfer assembly disengagement position.

[0077] In one embodiment, each nozzle may be positioned proximate a respective edge of the media card **30** to focus the flow of the cooling stream of air on the edges most likely to experience flash issues. For example, in printing operations in which a long edge of the media card **30** is the leading edge (long edge leading, or LEL operations), the short edges (or the edges aligned with the direction of travel of the media card **30** into and out of the transfer assembly **20**) may be more prone to flash problems than the long edges. This may be due to the decreased amount of IT media **15** along the short edges and the decreased bonding that may occur within the IT media **15** to encourage removal of the excess portions of IT media **15** from the edges. In this case, the nozzles **70** may be configured as shown in Fig. 8 to target the side edges **32, 34** most likely to experience flash. In another example, the nozzles may be positioned such that the cooling stream of air is provided proximate an interface **66** between the IT media and the media card **30** while the IT media **15** is peeled from the media card **30** (see Figs. 3 and 9).

[0078] In some cases, as described above, the leading edge **31** with respect to direction **A** may also be prone to flash problems due to the relatively small thickness of the card (which may be, for example, about 0.03 inches). This small thickness may, for example, result in decreased bonding of the IT media **15** in the area of the leading edge **31** in single-pass double-sided transfer operations, and using a sufficient flow of air through the nozzles may allow the cooling stream of air to flow across substantially the entire length **L** of the leading edge **31** to reduce the flash in that area, as described above in connection with Fig. 5.

[0079] Referring to Fig. 10, in some embodiments, the printing assembly **10** includes one or more sensors **90** and control circuitry **95** disposed in communication with the sensor(s). The sensors **90** may be configured to detect the position of the media card **30** relative to the transfer assembly **20** and may transmit signals to the control circuitry **95** that are used when controlling activation of the blower **35** based, at least in part, on the location of the media card **30**. Thus, the control circuitry **95** may be configured to engage the blower **35** to provide the cooling stream of air proximate the media card **30** when the media card **30** is disposed in a first position **X** relative to the transfer assembly generally associated with engagement of the product with the intermediate transfer media (e.g., the intermediate transfer media engagement position, shown in Fig. 12), continue engaging the blower as the media card is moved in the direction **A** from the first position **X** to an innermost position **Y** relative to the transfer assembly and is then moved in the second direction **B** from the innermost position **Y** to a second position **X'** (Fig. 13), and disengage the blower when the media card is disposed in the second position **X'** generally associated with disengagement of the product from the intermediate transfer media (e.g., the intermediate transfer media disengagement position, shown in Fig. 14). Thus, in

some cases, the control circuitry may be configured to engage the cooling chamber **85** to cool the media card **30** or the IT media **15** based on a position of the card relative to the transfer assembly **20**.

[0080] In addition to or instead of the position of the media card **30**, the sensors **90** may detect various other conditions and may control the activation of the blower **35** via the control circuitry **95** based on those conditions. For example, the sensors **90** may detect the temperature of the cooling chamber wall, the temperature of the media, the temperature of the IT media, the temperature of the air entering the blower **35**, the temperature of the air exiting the nozzles **70** and entering into the cooling chamber, the temperature of the air exiting the cooling chamber, as well as the temperature of the air inside the cooling chamber and may activate or deactivate the cooling chamber in response to the detected conditions.

[0081] For example, sensors **90** may detect the leading and/or trailing edge of the media card **30** as it is advanced towards and/or away from the transfer assembly **20**. Thus, referring to Fig. 11, as the media card **30** enters the transfer assembly **20** and engages the IT media **15**, the sensor **90** can detect the leading edge **31** and communicate the detection to the control circuitry **95**, which may then turn on the blower **35**. When the leading edge **31** of the media card **30** is detected a second time by the sensor **90** (i.e., as the media card **30** is moving out of the transfer assembly **20** in the direction **B** and the IT media **15** has been substantially peeled from the card, as shown in Fig. 14), the control circuitry **95** may turn off or otherwise disengage the blower **35** until the entry of the next media card **30** into the transfer assembly **20** is detected.

[0082] As will be apparent to one of ordinary skill in the art in view of this disclosure, the inventive concepts described herein do not require that the blower be turned on and/or turned off or activated and/or deactivated in all applications. Indeed, in one exemplary embodiment, the blower need not be turned off/deactivated and the cooling stream of air may be provided or not provided proximate the product, cooling chamber, and/or IT media using valves and/or other similar airflow controlling devices.

[0083] The sensors **90** may be configured to sense other conditions, in addition to or instead of the position of the media card **30**. For example, a sensor **90** may be configured to detect the position of the IT media **15** or may be configured to sense airflow or temperature conditions. For example, one or more sensors **90** may be configured to detect the ambient temperature, the temperature of the media card **30**, the temperature of the IT media **15**, or the temperature of the cooling stream of air before or after it is provided to the media card **30**. In this way, the sensors **90** may be able to help determine when the cooling stream of air should be directed to the media card **30** and to which locations of the media card **30** the cooling stream of air should be directed.

[0084] In some embodiments, the printing assembly **10** includes a cooling fan **120** that, in addition to cooling down the electrical components housed in the printing

assembly and not necessarily shown in the figures, also cooperates with the blower plenum 65 to reduce the temperature of the air being provided by the blower(s) 35. With reference to Fig. 17, for example, the cooling fan 120 may be located at one end of the printing assembly 10 on one side of the plenum 65 and may draw air through an air inlet vent 125 disposed on the other side of the plenum, as shown. Thus, the path 130 of the air flowing through the inlet vent 125 and into the cooling fan 120 may cause the air to flow around the plenum 65, taking with it any excess heat building up around the plenum and effectively reducing the temperature inside the plenum by at least a few degrees. As a result, air going into the plenum 65 through the plenum inlet 135 can be maintained at a temperature that is closer to the temperature of the ambient air outside the printing assembly 10 than it would be without the benefit of the air flowing from the air inlet vent 125 to the cooling fan 120. The inventors have noted that without the ventilation of the plenum 65 by the cooling fan 120, the flash at the leading edge 31 of the media card 30, in particular, is less effectively reduced.

[0085] Many modifications and other embodiments of the invention set forth herein will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

Claims

1. A method of transferring a transfer portion from a donor media, the method comprising:

receiving a product (30) and a donor media (15) into a transfer assembly (25) such that the donor media is compressed between a transfer device of the transfer assembly and the product; expelling the product from the transfer assembly such that a carrier portion of the donor media is peeled from the product; and cooling at least one of the product or the donor media when at least a portion of the product has been expelled from the transfer assembly, **characterised in that** cooling the at least one of the product or the donor media comprises directing air flow away from the transfer device using a nozzle (70) having:

a closed side (71) positioned toward the transfer device; and

an open side (72) positioned away from the transfer device, the closed side opposing the open side.

2. The method of Claim 1, further comprising cooling the product when the product is received into the transfer assembly.
3. The method of Claim 1, further comprising deactivating the cooling of the at least one of the product or the donor media after a pre-determined period of time.
4. The method of Claim 1, wherein receiving the product and the donor media into the transfer assembly comprises receiving the product and the donor media into the transfer assembly along a first direction, and wherein expelling the product from the transfer assembly comprises expelling the product from the transfer assembly along a second direction different than the first direction.
5. The method of Claim 4, wherein the product defines a leading edge with respect to the first direction, a trailing edge with respect to the first direction, and two opposed side edges disposed between the leading edge and the trailing edge, wherein cooling the product comprises cooling substantially the full length of the leading edge and the full lengths of the two opposed side edges of the product.
6. The method of Claim 1, further comprising detecting a position of the product relative to the transfer assembly, wherein the cooling of the at least one of the product or the donor media is based on the detected position of the product.
7. The method of Claim 1, wherein the product defines an image-receiving surface including a surface feature, wherein the donor media comprises a transfer portion and a non-transfer portion, wherein cooling the at least one of the product or the donor media comprises cooling the image-receiving surface of the product proximate the surface feature to encourage transfer of the transfer portion and removal of the non-transfer portion when the donor media is peeled.
8. An intermediate transfer printing assembly configured to transfer an image from an intermediate transfer media to a product, the intermediate transfer printing assembly comprising:

a transfer assembly comprising a transfer device, wherein the transfer assembly is configured to transfer the image from the intermediate transfer media to the product by:

receiving the product and intermediate

- transfer media into the transfer assembly, compressing the intermediate transfer media between the transfer device and the product,
- expelling the product from the transfer assembly, and peeling the intermediate transfer media from the product such that the image is transferred from the intermediate transfer media to the product; and
- a cooling apparatus disposed proximate the transfer assembly and configured to cool the product when at least a portion of the product has been expelled from the transfer assembly, **characterised in that** the cooling apparatus comprising:
- a nozzle having a closed side positioned toward the transfer device; and an open side positioned away from the transfer device, the closed side opposing the open side.
9. The intermediate transfer assembly of Claim 8, further comprising:
- at least one sensor configured to detect the position of the product relative to the transfer assembly; and control circuitry disposed in communication with the at least one sensor and configured to engage the cooling apparatus when the product is generally proximate an intermediate transfer media engagement position, and to disengage the cooling apparatus when the product is generally proximate an intermediate transfer media disengagement position.
10. The intermediate transfer assembly of Claim 8, wherein the product defines a pair of opposed transverse edges that are substantially perpendicular to a receiving direction, wherein the transfer assembly defines a cooling chamber configured to receive the product before the product is received into the transfer device, and wherein the cooling apparatus is configured to cool the chamber such that the product is cooled along substantially the entire length of the transverse edges.
11. The intermediate transfer assembly of Claim 8, wherein the cooling apparatus is selected from the group consisting of a fan, a blower, fins, baffles, liquid jackets, heat sinks, thermoelectric cold plates, and Peltier cooling devices.

Patentansprüche

1. Verfahren, um einen Transferabschnitt von einem Spendermedium zu übertragen, wobei das Verfahren umfasst:
- ein Produkt (30) und ein Spendermedium (15) in einer Übertragungseinheit (25) so aufnehmen, dass das Spendermedium zwischen der Übertragungsvorrichtung der Übertragungseinheit und dem Produkt komprimiert wird; das Produkt aus der Übertragungseinheit so ausstoßen, dass die Trägerschicht des Spendermediums vom Produkt abgezogen wird; und das Produkt oder das Spendermedium abkühlen, nachdem ein Teil des Produktes aus der Übertragungseinheit ausgestoßen wurde, wobei das Verfahren **dadurch gekennzeichnet ist, dass** das Produkt oder das Spendermedium durch einen Luftstrom abgekühlt werden, der unter Verwendung einer Düse (70) von der Übertragungsvorrichtung weg abgelenkt wird, die Folgendes aufweist:
- eine geschlossene Seite (71), die zur Übertragungsvorrichtung hin angeordnet ist; und eine offene Seite (72), die von der Übertragungsvorrichtung weg angeordnet ist, wobei sich geschlossene Seite und offene Seite gegenüberliegen.
2. Verfahren gemäß Anspruch 1, ferner umfassend das Produkt abkühlen, wenn das Produkt in die Übertragungseinheit aufgenommen wird.
3. Verfahren gemäß Anspruch 1, ferner umfassend das Abkühlen des Produkts oder des Spendermediums nach einer vorbestimmten Zeit deaktivieren.
4. Verfahren gemäß Anspruch 1, wobei das Produkt und das Spendermedium in die Übertragungseinheit aufzunehmen umfasst, das Produkt und das Spendermedium entlang einer ersten Richtung in die Übertragungseinheit aufzunehmen und wobei das Produkt aus der Übertragungseinheit auszustoßen umfasst, das Produkt entlang einer zweiten Richtung, die sich von der ersten Richtung unterscheidet, aus der Übertragungseinheit auszustoßen.
5. Verfahren gemäß Anspruch 4, wobei das Produkt in Bezug auf die erste Richtung eine Vorderkante, in Bezug auf die erste Richtung eine Hinterkante und zwei gegenüberliegende Seitenkanten definiert, die zwischen der Vorderkante und der Hinterkante angeordnet sind, wobei das Produkt abkühlen umfasst, die Vorderkante und die zwei gegenüberliegenden Seitenkanten des Produkts im Wesentlichen über die gesamte Länge abzukühlen.

6. Verfahren gemäß Anspruch 1, ferner umfassend die Position des Produkts relativ zur Übertragungseinheit zu erkennen, wobei das Kühlen des Produkts oder des Spendermediums auf der erkannten Position des Produkts basiert.

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7. Verfahren gemäß Anspruch 1, wobei das Produkt eine Bildempfangsoberfläche mit Oberflächenmerkmal definiert, wobei das Spendermedium einen Transferabschnitt und einen Nichttransferabschnitt umfasst, wobei das Produkt oder das Spendermedium abzukühlen umfasst, die in der Nähe des Oberflächenmerkmals befindliche Bildempfangsoberfläche des Produkts abzukühlen, um die Übertragung des Transferabschnitts und die Entfernung des Nichttransferabschnitts zu fördern, wenn das Spendermedium abgezogen wird.

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8. Zwischentransferdruckanordnung, die dafür ausgelegt ist, ein Bild von einem Zwischentransfermedium auf ein Produkt zu übertragen, wobei die Zwischentransferdruckanordnung umfasst:
eine Übertragungseinheit mit einer Übertragungsvorrichtung, wobei die Übertragungseinheit dafür ausgelegt ist, ein Bild von einem Zwischentransfermedium durch folgende Schritte auf ein Produkt zu übertragen:

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ein Produkt und ein Zwischentransfermedium in eine Übertragungseinheit aufnehmen,
das Zwischentransfermedium zwischen der Übertragungsvorrichtung und dem Produkt komprimieren,
das Produkt aus der Übertragungseinheit ausstoßen und
das Zwischentransfermedium vom Produkt so ablösen, dass das Bild vom Zwischentransfermedium auf das Produkt übertragen wird; und
eine in der Nähe der Übertragungseinheit angeordnete Kühlvorrichtung, die dafür ausgelegt ist das Produkt abzukühlen, wenn zumindest ein Teil des Produkts aus der Übertragungseinheit ausgestoßen wurde, wobei die Kühlvorrichtung **dadurch gekennzeichnet ist, dass** sie umfasst:

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eine Düse mit einer zur Übertragungsvorrichtung hin geschlossenen Seite; und
eine offene Seite, die von der Übertragungsvorrichtung weg angeordnet ist, wobei sich geschlossene Seite und offene Seite gegenüberliegen.

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9. Zwischenübertragungseinheit gemäß Anspruch 8, ferner umfassend:

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mindestens einen Sensor, der dafür ausgelegt ist, die Position des Produkts relativ zur Über-

tragungseinheit zu erfassen; und
eine mit dem Sensor in Verbindung stehende Steuerschaltung, die dafür ausgelegt ist, die Kühlvorrichtung zu aktivieren, wenn sich das Produkt in der Nähe einer Zwischentransfermedium-Eingriffsposition befindet und die Kühlvorrichtung zu deaktivieren, wenn sich das Produkt in der Nähe einer Zwischentransfermedium-Auswurfposition befindet.

10. Zwischenübertragungseinheit gemäß Anspruch 8, wobei das Produkt zwei gegenüberliegende Querkanten definiert, die sich im Wesentlichen senkrecht zur Aufnahmerichtung erstrecken, wobei die Übertragungsvorrichtung eine Kühlkammer definiert, die das Produkt aufnehmen soll, bevor das Produkt in die Übertragungsvorrichtung aufgenommen wird und wobei die Kühlvorrichtung dafür ausgelegt ist, die Kammer derart abzukühlen, dass das Produkt im Wesentlichen entlang der gesamten Länge der Querkanten abgekühlt wird.

11. Zwischenübertragungseinheit gemäß Anspruch 8, wobei die Kühlvorrichtung aus einem Ventilator, einem Gebläse, Lamellen, Umlenkbleden, Flüssigkeitsumhüllungen, Kühlkörpern, thermoelektrischen Kühlplatten und Peltier-Kühlvorrichtungen besteht.

Revendications

1. Un procédé de transfert d'une partie de transfert à partir d'un média donneur, le procédé comprenant :

la réception d'un produit (30) et d'un media donneur (15) dans un ensemble de transfert (25) de sorte que le media donneur soit comprimé entre un dispositif de transfert de l'ensemble et le produit ;
expulser le produit de l'ensemble de transfert de sorte qu'une partie porteuse de media donneur soit décollée du produit ; et
refroidir au moins un des produits ou du media donneur lorsqu'au moins une partie du produit a été expulsée de l'ensemble de transfert, **caractérisé en ce que** le refroidissement d'au moins l'un des produits ou du media donneur consiste à éloigner le flux d'air du dispositif de transfert utilisant une buse (70) ayant :

un côté fermé (71) positionné vers le dispositif de transfert ; et
un côté ouvert (72) placé à distance du dispositif de transfert, le côté fermé étant opposé au côté ouvert.

2. Le procédé selon la revendication 1, comprenant en outre le refroidissement du produit lorsque le produit

est reçu dans l'ensemble de transfert.

3. Le procédé selon la revendication 1, comprenant en outre la désactivation du refroidissement d'au moins l'un du produit ou du media donneur après une période de temps prédéterminée. 5
4. Le procédé selon la revendication 1, dans lequel la réception du produit et du media donneur dans l'ensemble de transfert comprend la réception du produit et du media donneur dans l'ensemble de transfert dans une première direction, et dans laquelle l'expulsion du produit de l'ensemble de transfert le long d'une seconde direction différente de la première direction. 10
5. Le procédé selon la revendication 4, dans lequel le produit définit un bord d'attaque par rapport à la première direction, un bord de fuite par rapport à la première direction, et deux bords latéraux opposés disposés entre le bord d'attaque et le bord de fuite, dans lequel le refroidissement du produit comprend sensiblement le refroidissement sur toute la longueur du bord d'attaque et sur toute la longueur des deux bords latéraux opposés du produit. 15
6. Le procédé selon la revendication 1, comprenant en outre la détection d'une position du produit par rapport à l'ensemble de transfert, dans lequel le refroidissement d'au moins l'un du produit ou du media donneur est basé sur la position détectée du produit. 20
7. Le procédé selon la revendication 1, dans lequel le produit définit une surface réceptrice d'image comprenant une caractéristique de surface, dans lequel le media donneur comprend une partie de transfert et une partie sans transfert, dans laquelle le refroidissement d'au moins l'un du produit ou du media donneur comprend le refroidissement de la surface de réception d'image du produit à proximité de la caractéristique de surface pour encourager le transfert de la partie de transfert et l'enlèvement de la partie non transférée lorsque le media donneur est décollé. 25
8. Un ensemble d'impression à transfert intermédiaire configuré pour transférer une image d'un support de transfert intermédiaire vers un produit, l'ensemble d'impression à transfert intermédiaire comprenant : l'ensemble de transfert comprenant un dispositif de transfert, dans lequel l'ensemble de transfert est configuré pour transférer l'image du support de transfert intermédiaire au produit en : 30

recevant le produit et le support de transfert intermédiaire dans l'ensemble de transfert, comprimant le support de transfert intermédiaire entre le dispositif de transfert et le produit, 35

expulsant le produit de l'ensemble de transfert et décollant le support de transfert intermédiaire du produit de sorte que l'image soit transférée du support de transfert intermédiaire au produit ; et un appareil de refroidissement disposé à proximité de l'ensemble de transfert et configuré pour refroidir le produit lorsqu'au moins une partie du produit a été expulsée de l'ensemble de transfert, **caractérisé en ce que** l'appareil de refroidissement comprend : 40

une buse ayant un côté fermé positionné vers le dispositif de transfert ; et un côté ouvert placé à distance du dispositif de transfert, le côté fermé étant opposé au côté ouvert. 45

9. L'ensemble de transfert intermédiaire selon la revendication 8, comprenant en outre : au moins un capteur configuré pour détecter la position du produit par rapport à l'ensemble de transfert ; et le circuit de commande disposé en communication avec au moins un capteur et configuré pour engager l'appareil de refroidissement lorsque le produit est généralement à proximité d'une position intermédiaire d'engagement du support de transfert et désengager l'appareil de refroidissement lorsque le produit est généralement à proximité d'une position de désengagement du support de transfert intermédiaire. 50
10. L'ensemble de transfert intermédiaire selon la revendication 8, dans lequel le produit définit une paire de bords transversaux opposés qui sont sensiblement perpendiculaires à une direction de réception, dans laquelle l'ensemble de transfert définissant une chambre de refroidissement configurée pour recevoir le produit avant que le produit soit reçu dans le dispositif de transfert, et dans lequel l'appareil de refroidissement est configuré pour refroidir la chambre de sorte que le produit soit refroidi sensiblement sur toute la longueur des bords transversaux. 55
11. L'ensemble de transfert intermédiaire selon la revendication 8, dans lequel l'appareil de refroidissement est choisi dans le groupe comprenant un ventilateur, une soufflante, des ailettes, des déflecteurs, des chemises de liquide, des dissipateurs thermiques, des plaques froides thermoélectriques et des dispositifs de refroidissement Peltier. 60

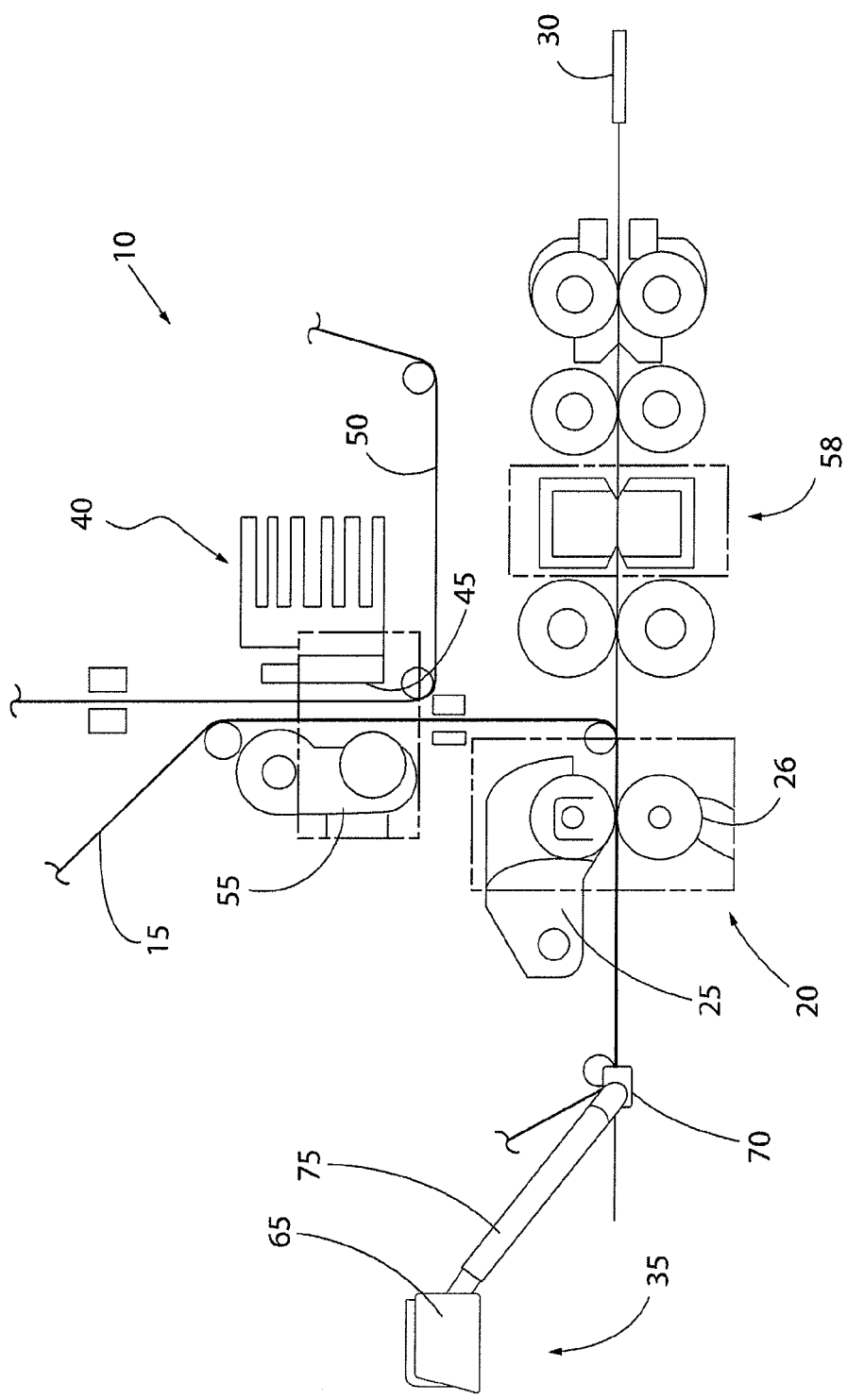


FIG. 1

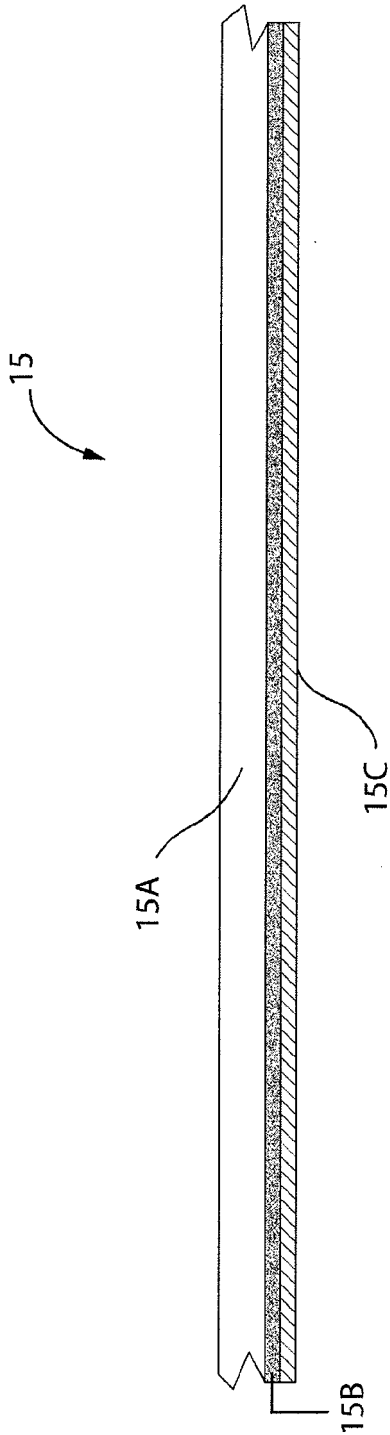


FIG. 2 - Prior Art

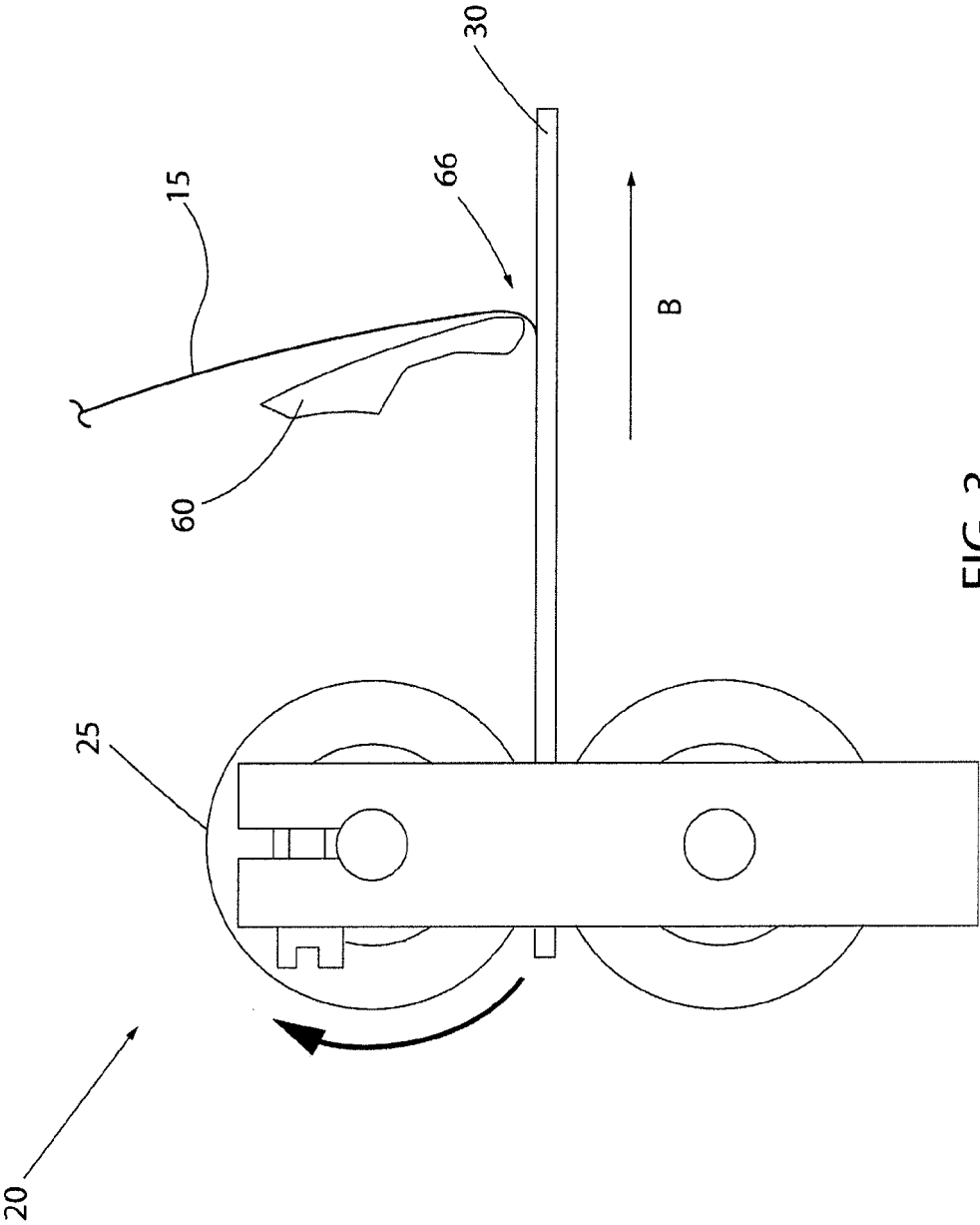


FIG. 3

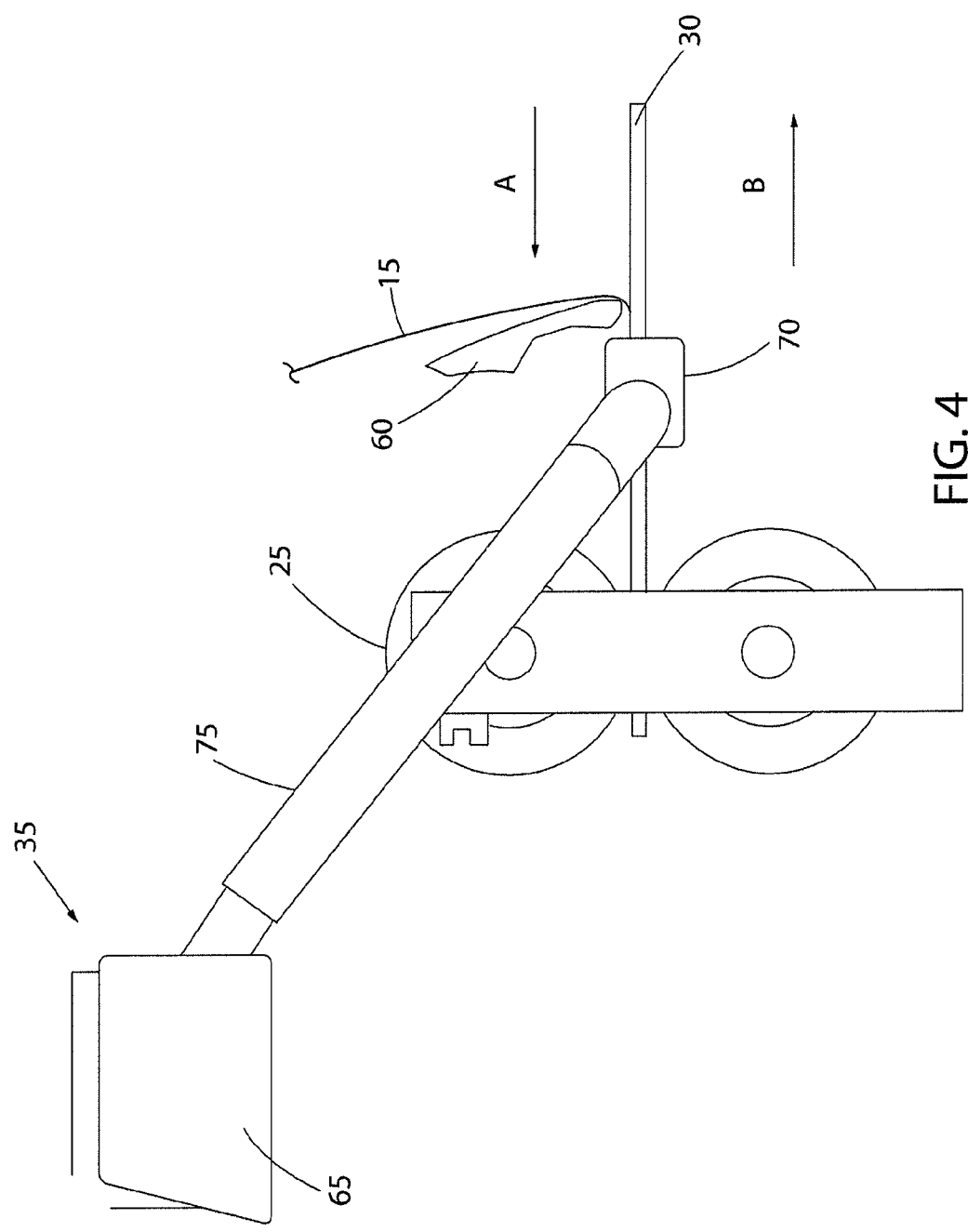


FIG. 4

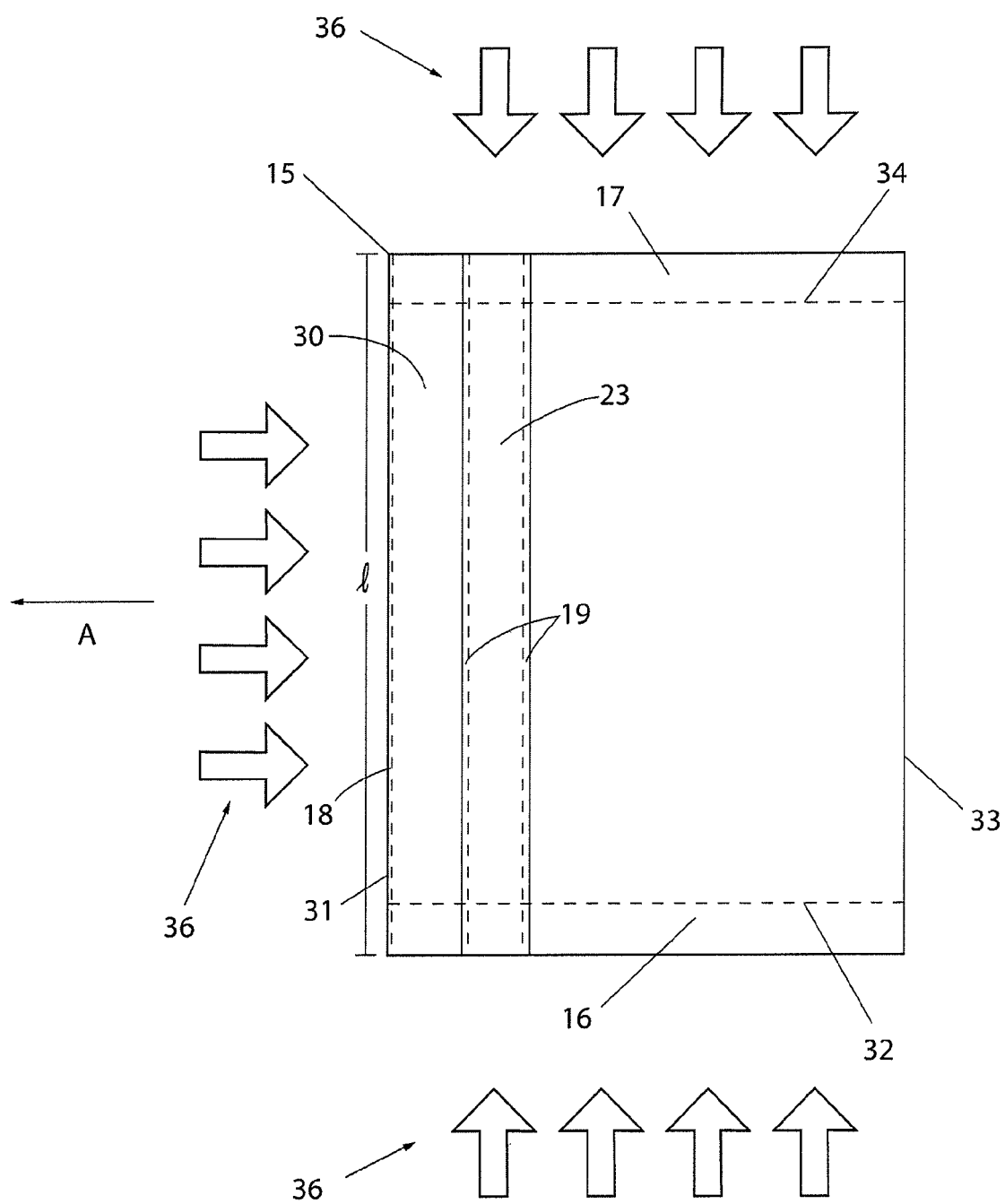


FIG. 5

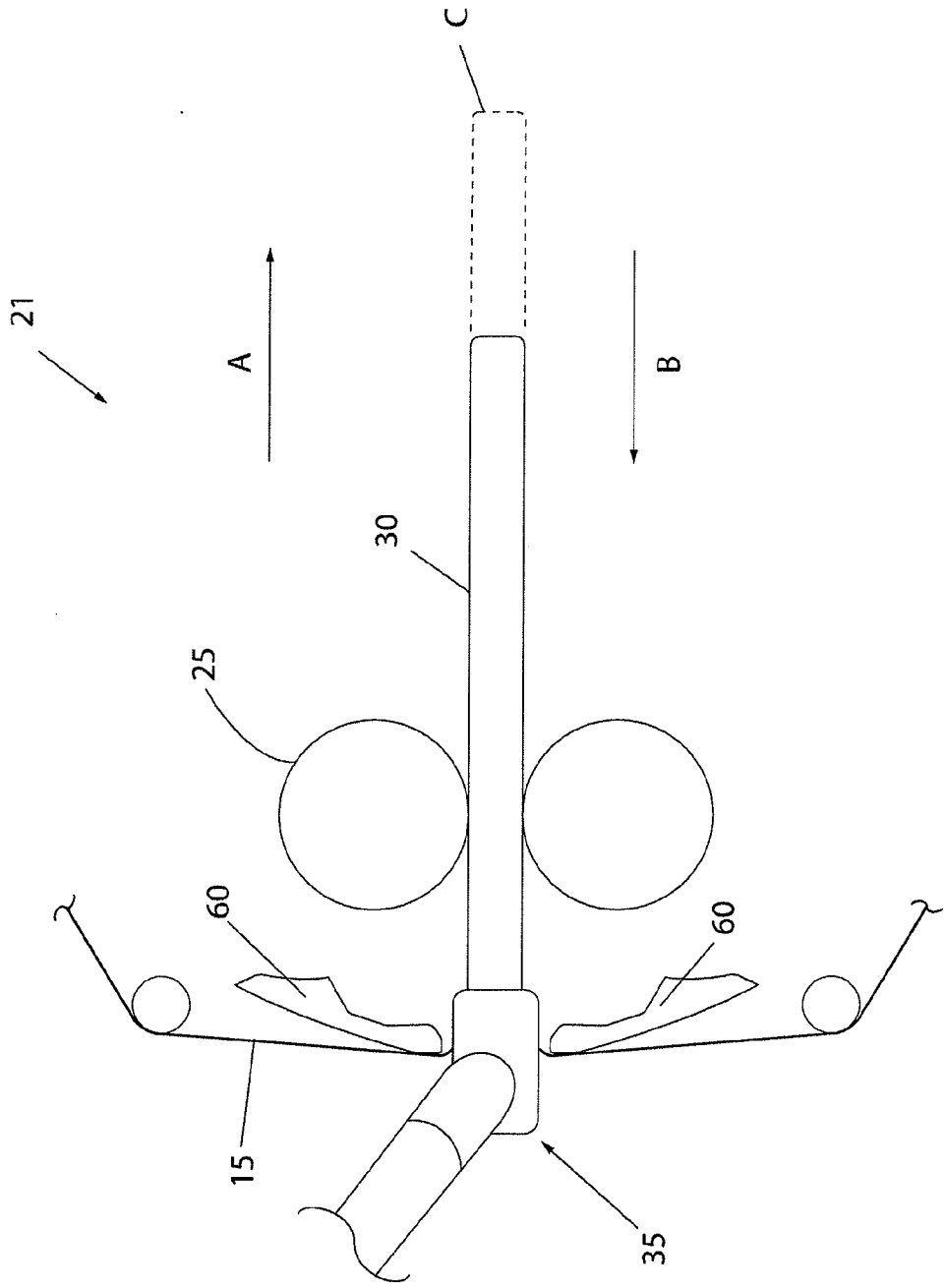


FIG. 6

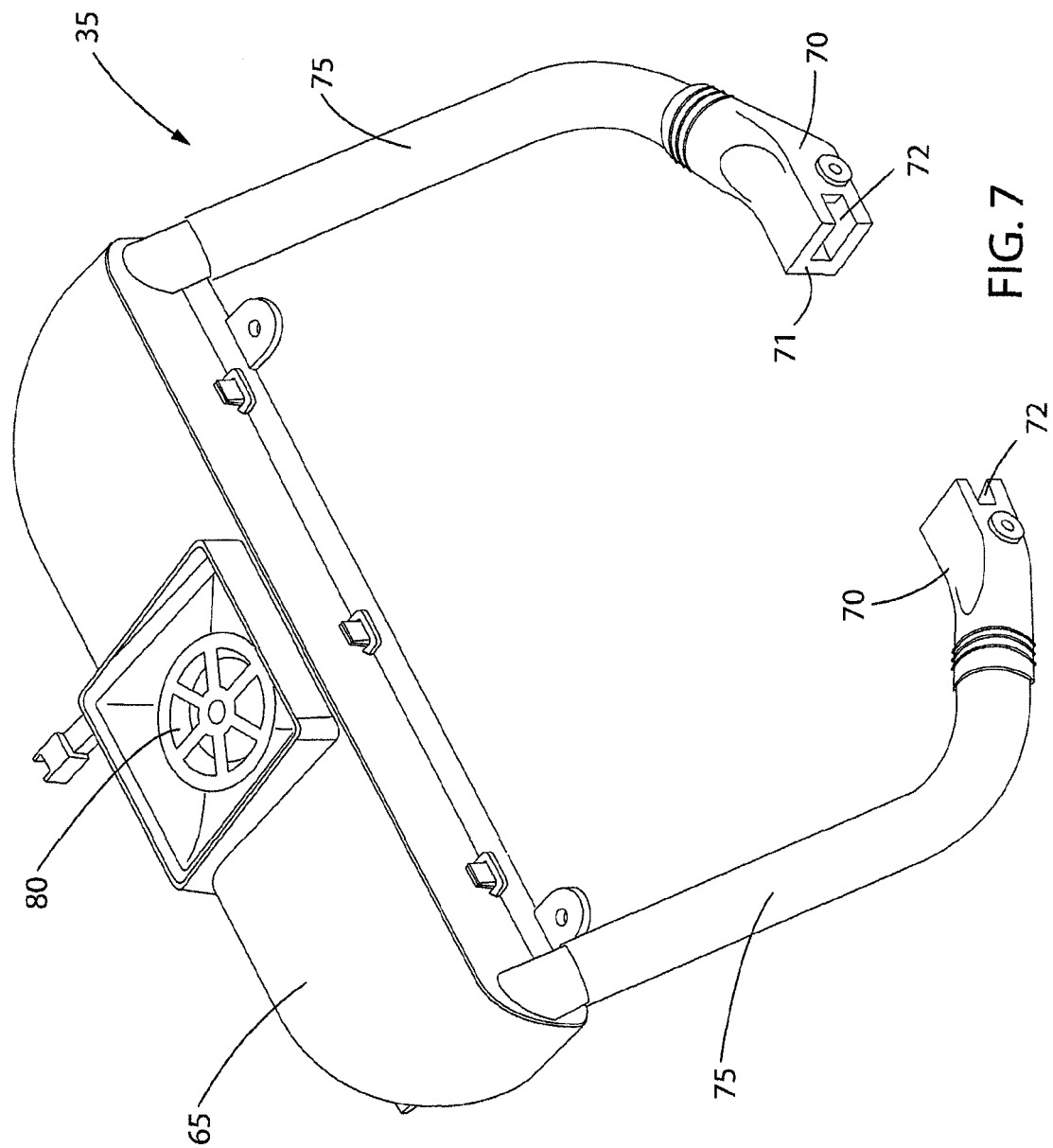


FIG. 7

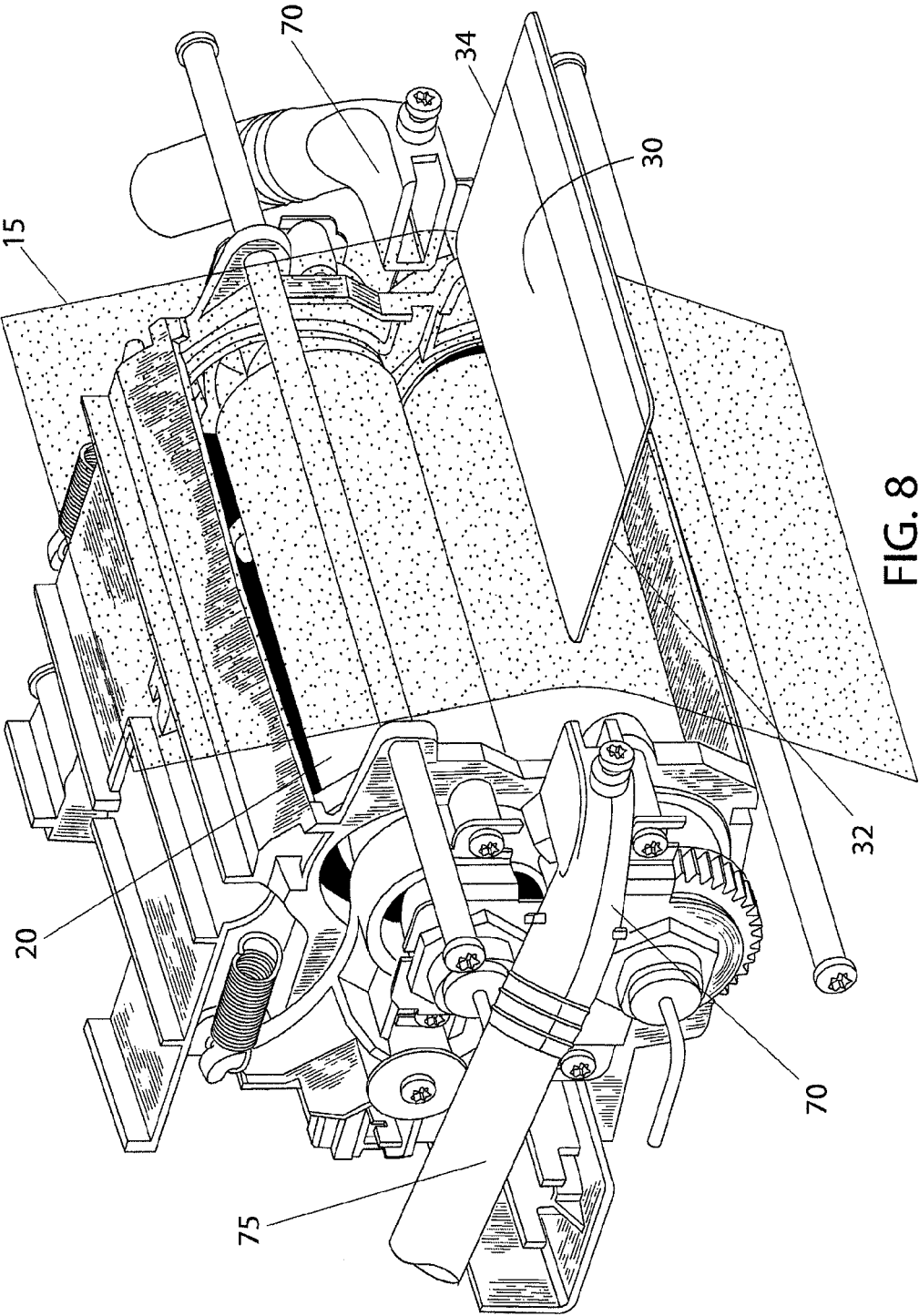


FIG. 8

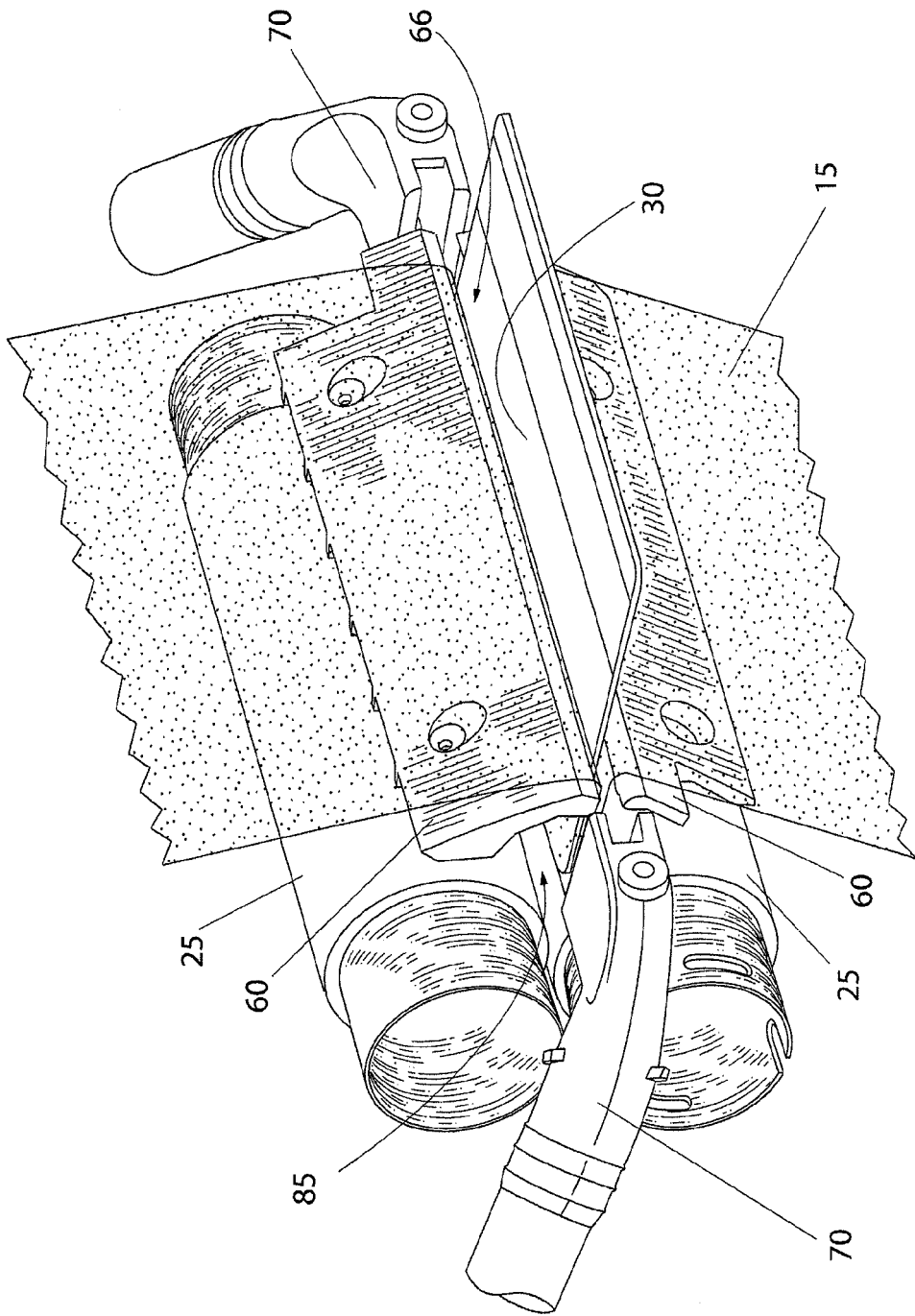


FIG. 9

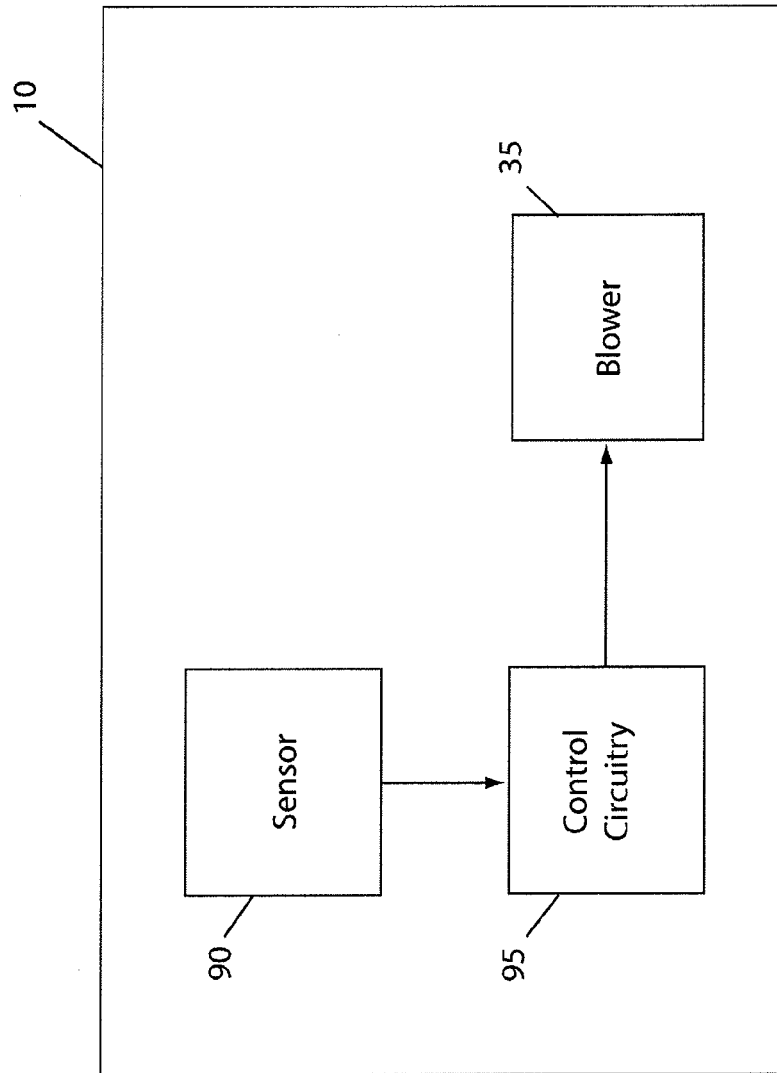


FIG. 10

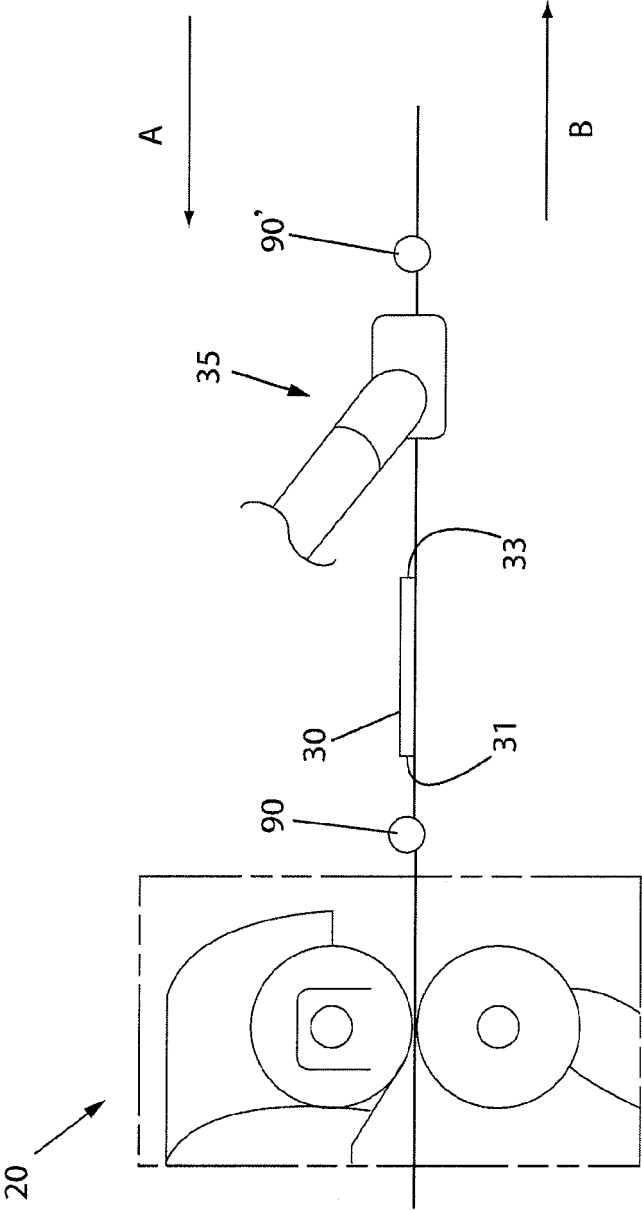


FIG. 11

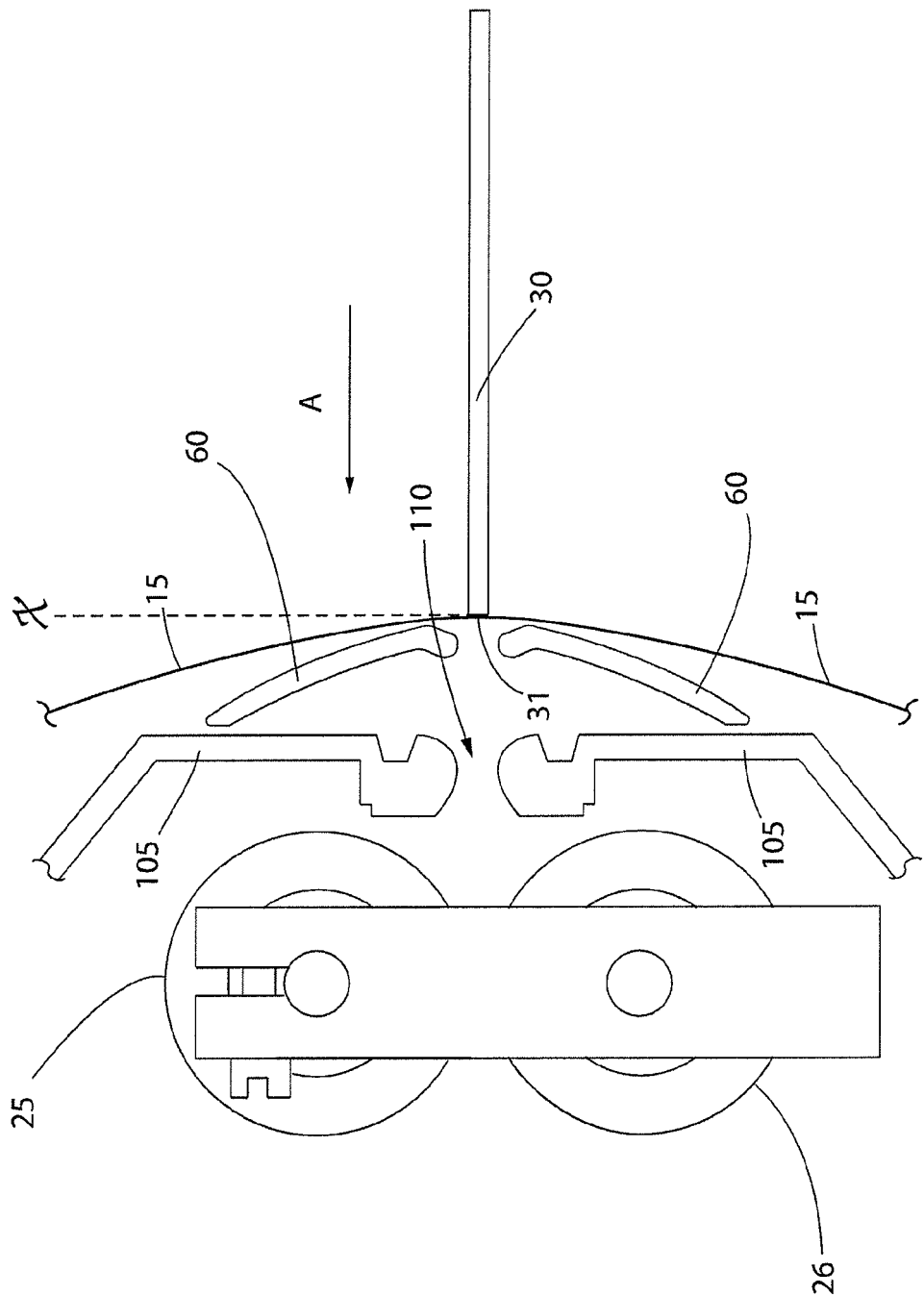


FIG. 12

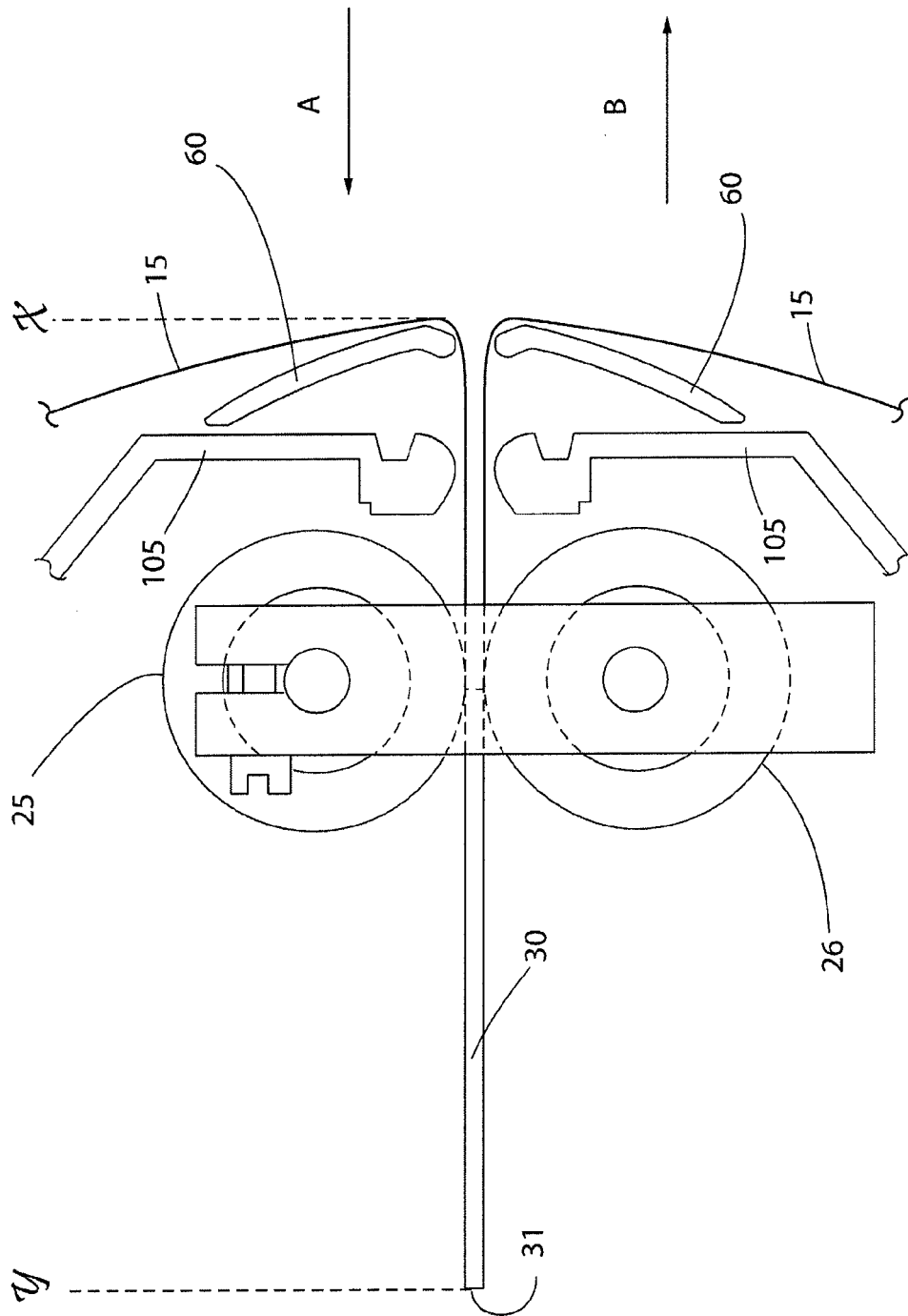


FIG. 13

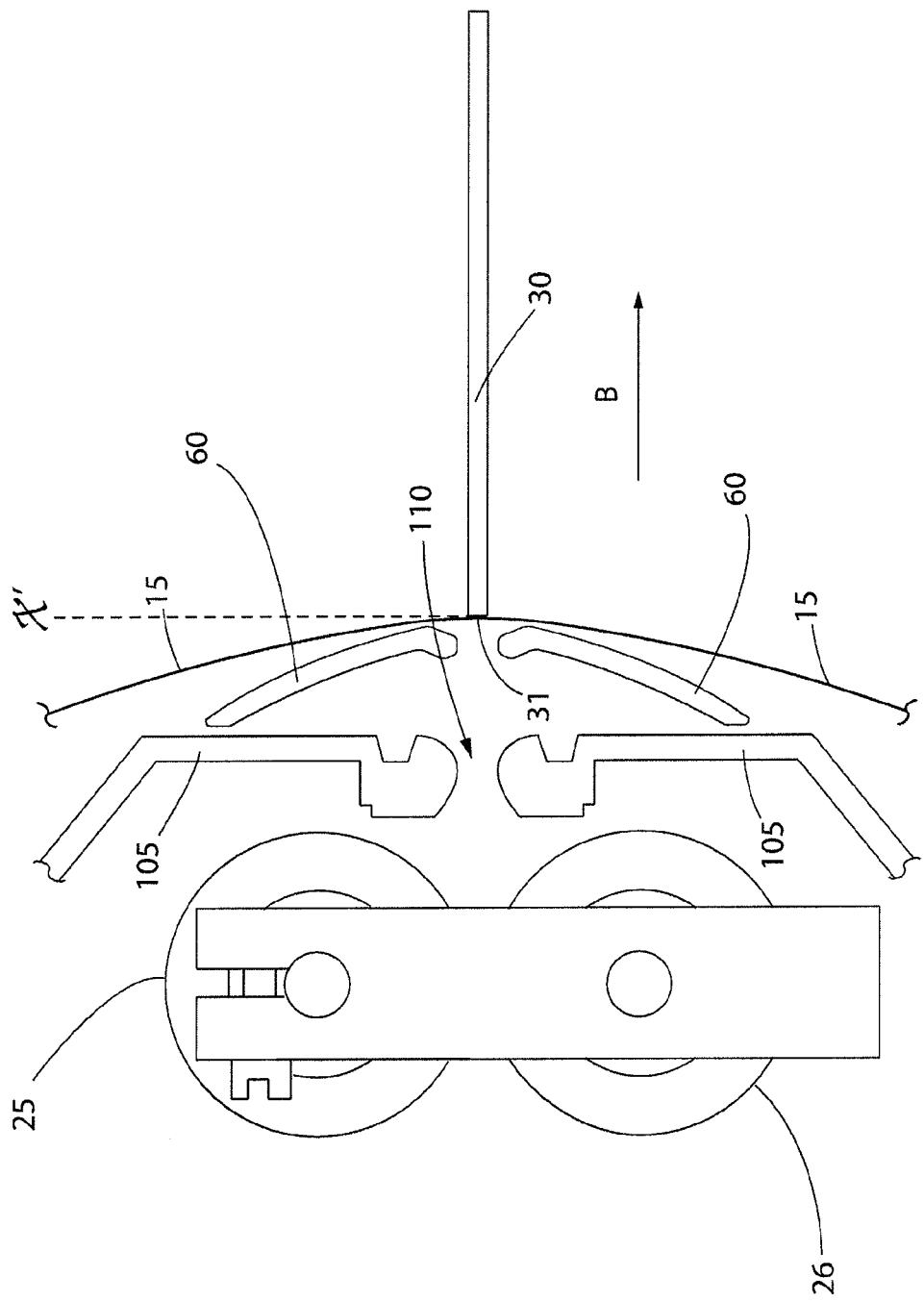


FIG. 14

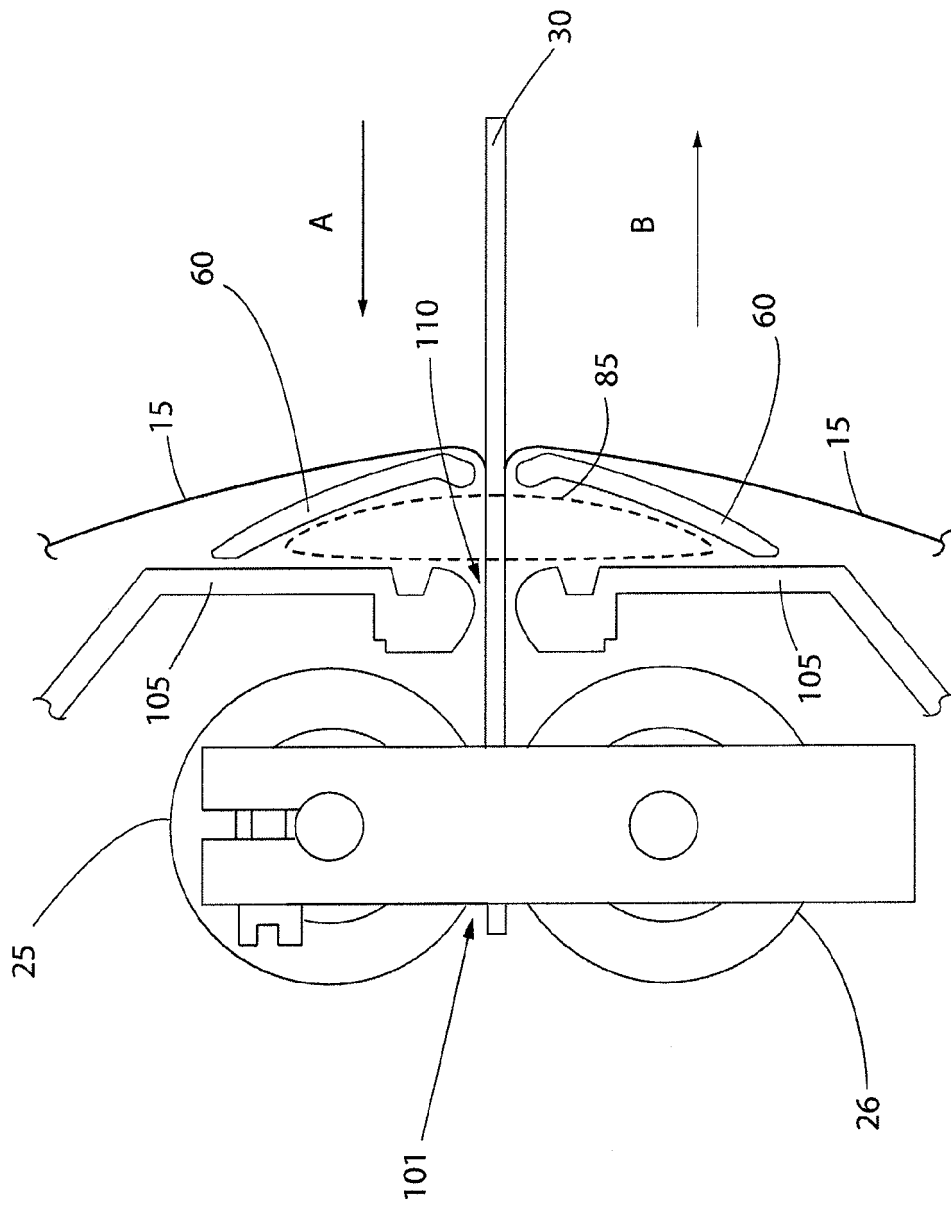
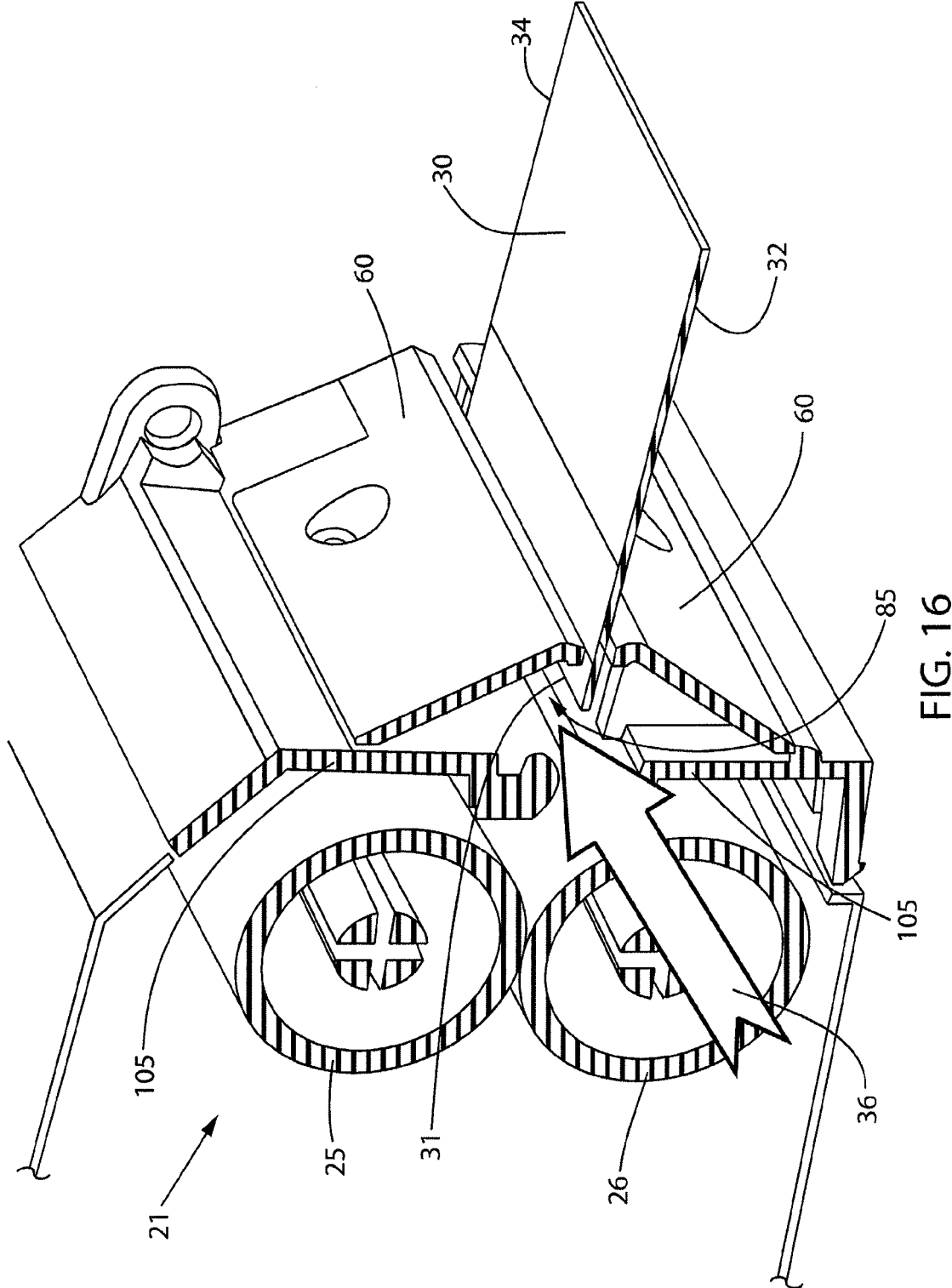


FIG. 15



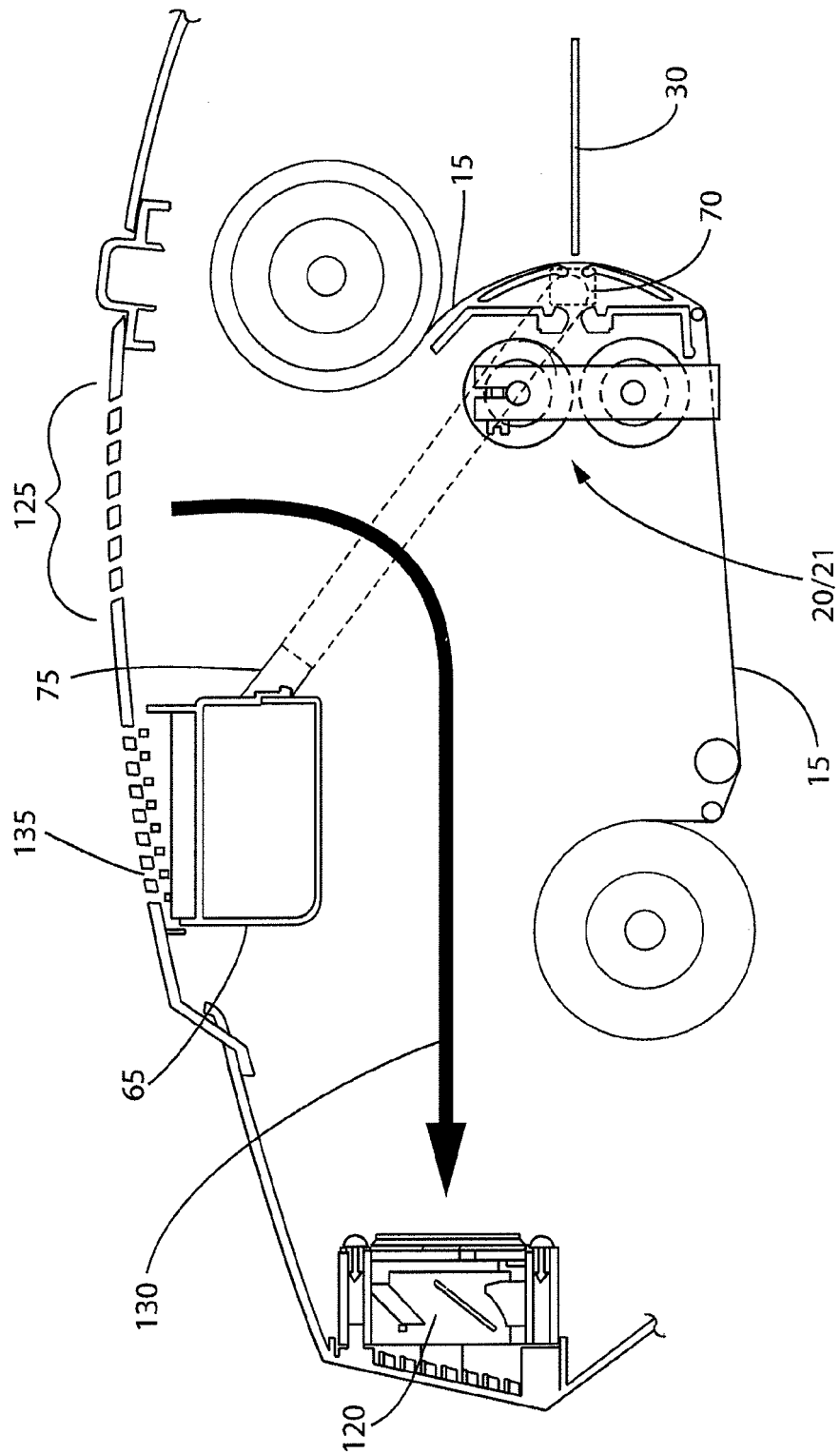


FIG. 17

REFERENCES CITED IN THE DESCRIPTION

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