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An apparatus for line-to-line recording of different color component images

This invention relates to an apparatus for line-to-line recording of different color component images.

The component images, derived from a full color original, are recorded on successive individual photoconductive recording means by means of controlled recording beams wherein recording of different color component images takes place at imaging stations associated with said recording means. The apparatus comprises developing means for developing the color component images formed on said recording means, a transfer point associated with each of said recording means whereat the developed color component images on said recording means are transferred to a copy substrate material in succession, transport means for bringing said substrate material into transfer relation with said transfer points, and drive means for driving said recording means and said transport means.

Reproducing or copying color originals through a xerographic process has, in the past, entailed the sequential production of three color separation images of the colored original, with independent development thereof by cyan, magenta and yellow toners. The images so formed are transferred onto the copy substrate material in registered overlaying relationship, with the resulting composite color image being fused to provide a permanent full color reproduction of the original.

In the aforedescribed color process, black is obtained through an amalgam of the three color toners. However, it is often useful to provide a separate processing unit devoted solely to black. This addition enhances machine versatility since it is then possible to produce black and white copies directly and without the need to go through the color separation cycle. The addition of a separate black processing unit also enhances the quality and faithfulness of the black in color reproductions inasmuch as black is formed directly using black toner rather than a combination of multi-color toners.

However, while systems of the above type can provide full color reproductions, because of the need to process three and possibly four color separation images for each copy, the copy output is often very low. When a single photoconductive drum is used for example, normally each color separation image is created, developed, and transferred to the copy substrate material before the next is started.

Where multiple photoreceptor processing units have been suggested to speed up copy output, it has often been at the expense of greatly increased machine physical size required to accommodate three and possibly four photoreceptor processing units. Attempts to alleviate this problem and reduce machine size through the use of different diameter photoreceptor drums as disclosed in US Patent No. 3 690 756 results in a system wherein a multiplicity of different size photoreceptor drums must be stocked for replacement purposes, it being understood that photoreceptors are subject to fatigue and damage and hence must be replaced from time to time.

The present invention is intended to overcome these problems, and accordingly provides an apparatus for line-to-line recording of different color component images which is characterised in that said recording means are belts and that means are provided for operatively supporting the belts with the transfer points in close proximity to one another, the distance between the imaging station and the transfer point of each succeeding belt being equal to the distance between the imaging station and the image transfer point of the preceding belt plus the distance from the transfer point of the preceding belt to the transfer point of the succeeding belt whereby to assure transfer of the color component images in registered superimposed relationship with one another to form a full color copy of the original.

Figure 1 is a plan view of the color reproduction apparatus of the present invention;

Figure 2 is an enlarged view of one xerographic belt module illustrating details of the vacuum belt tensioning mechanism;

Figure 3 is a schematic view showing a color image signal generating means; and

Figure 4 is a plan view showing details of the imaging system for the color reproduction apparatus of Figure 1.

Referring particularly to Fig. 1 of the drawings, there is shown a high speed four color processor, designated generally by the numeral 10. As will appear, processor 10 provides color or black and white copies of originals on a suitable copy substrate material exemplified herein by copy sheets 12.

Processor 10 includes multiple xerographic type processing units 14, 16 and 18 for processing color component images or separations which when combined produce full color copies of color originals together with processing unit 20 for processing black only. It will be understood that where black and white copies are desired, only processing unit 20 need be activated.

Processing units 14, 16 and 18 process the three primary color components, namely cyan, magenta, and yellow respectively in a manner understood by those skilled in the art. It will be understood that processing unit 20 may be dispensed with and processing units 14, 16 and 18 relied upon to provide black through the xerographic color process.

As shown in the drawings, the design and arrangement of processor 10 permits the multiple processing units 14, 16, 18 and 20 to be disposed closely adjacent to one another with the image transfer stations 68, 69, 70 and 71 thereof in close succession along the copy sheet path.

A supply of copy substrate material, here shown as a stack 25 of copy sheets 12, is provided in a suitable paper tray 27. A sheet feeder in the form of feed belt 30 entrained about roller pair 32 serves to advance the topmost sheet from stack 25 forward into sheet inlet runway 34 of pneumatic sheet conveyor system 35. Suitable means (not shown) are provided to incrementally elevate base 27′ of tray 27 as sheets 12 are drawn off of the top of the sheet stack 25 to maintain the topmost sheet of stack 25 in operative contact with feed belt 20.

Roller pair 32, which are rotatably supported by suitable journaling means (not shown), are drivingly coupled to a suitable step motor 36. Motor 36, when actuated, rotates roller pair 32 for a predetermined interval in the direction shown by the solid line arrow to drive feed belt 30 and advance the topmost sheet on stack 25 forward into sheet inlet runway 34 and the nip of rollers 38, 39 of tri-roller inverter 42. Gate 41 restricts feeding of sheets from sheet stack 25 to one sheet at a time.

Pneumatic sheet conveyor system 35 includes sheet inlet runway 34, feeder runway 45, duplex return runway 46, inverter runway 47, and copy discharge runway 48, each runway comprising a closed chute-like passage 54 for copy sheets bounded by upper and lower walls 50, 51 and side walls 52. When communicated with a relatively low pressure air stream, copy sheets introduced into the runways 34, 45, 46, 47 and 48 are carried therewithin in the direction of air flow. As will appear, runways 34, 45, 46, 47 and 48 are operatively coupled together to form together with copy sheet transport belt 55, a transport or conveyor system for copy sheets 12.

A four way junction 57 couples sheet inlet runway 34, sheet feeder runway 45, duplex return runway 46, and inverter runway 47 together. Copy sheets advanced by feed belt 30 pass through inlet runway 34 via junction 57 to sheet feeder runway 45, runway 45 leading to and exiting adjacent to copy transport belt 55. Sheet feeder runway 45 includes an air inlet 59 in communication with air supply duct 60 for introducing transporting air into the copy sheet conveyor system. A sheet register comprised of roller pair 62, 63 adjacent the discharge end of runway 45 serves to engage and register the copy sheets therewithin with the images in process by developing units 14, 16, 18 and 20. Rollers 62, 63 are driven from main drive motor 65 in unison with copy transport belt 55 and with photoconductive belts 110 of processing units 14, 16, 18 and 20.

Copy transport belt 55 comprises an endless perforated belt of suitable flexible material stretched about rotatable vacuum idler and driving drums 66, 67 respectively. Drums 66, 67 are rotatably supported by suitable journaling means (not shown). Driving drum 67 is driven by main motor 65 in the direction shown by the solid line arrow. Drums 66, 67 are hollow and have perforations 68 about the periphery thereof to permit sub-atmospheric pressure to be applied via the perforated copy transport belt 55 to tack copy sheets 12 thereto. The interior of drums 66, 67 communciate with a suitable source of sub-atmospheric pressure (not shown). Guide rollers 90, 91 guide belt 55 through a relatively sharply curved path downstream of drum 67 to facilitate separation of copy sheets 12 therefrom and into the nip formed by rollers 76, 77 of fuser 75. Guide rollers 90, 91 are rotatably supported by suitable journaling means (not shown).

To facilitate transfer of the copy sheets from sheet feeder runway 45 to copy transfer belt 55, the lower wall of runway 45 is extended at 51′. Extension 51′ has a configuration complementary to the arcuate shape of drum 46.

A succession of image transfer stations 68, 69, 70, and 71, each associated with a belt module 14, 16, 18 and 20 respectively, are disposed in close proximity to one another along the portion of copy transport belt 55 laying between drums 46, 47, belt modules 14, 16, 18, and 20 being disposed such that the uppermost portion of the photoconductive belt 110 is in predetermined pressure contact with transport belt 55.

A transfer corotron 73 is provided opposite each belt module 14, 16, 18, and 20 and interior of copy transport belt 55. Corotrons 73 serve to transfer the images developed on their respective belts 110 onto copy sheets 12 as the sheets are transported therepast by copy transport belt 55, such transfer taking place in accordance with well known principles of xerography. Where multi-color copies are being produced, the color component images are transferred in registered superimposed relation.

Following transfer of the developed image or images onto copy sheets 12, the sheets are carried by copy transport belt 55 to a fuser 75 whereat the images are fixed by heat. Fuser 75 comprises an upper heated fuser roll 76 cooperating lower pressure roll 77 in driving engagement with one another. Fuser rolls 76, 77 are drivingly connected to motor 65, motor 65 rotating rolls 76, 77 in the direction indicated by the solid line arrow.

A pneumatic junction 79 is provided downstream of fuser 75, junction 79 leading to duplex return runway 46 and to copy discharge runway 48 of pneumatic sheet conveyor system 35. Deflector gate 80 in junction 79 serves to selectively route copy sheets leaving fuser 75 into either runway 46 or 48.

Copy discharge runway 48 conveys the copy sheets bearing the fused image to a copy output station, exemplified herein by copy tray 82, wherein the finished copies are accumulated. Roller pair 83, 88 facilitate discharge of the copy sheets from copy discharge runway 48 into the tray 82. While the copy output station is illustrated as comprising a copy tray, other types of copy output stations, i.e., a sorter, may be contemplated.

Copies routed by deflector gate 80 into duplex return runway 46 are carried back to junction 57 where the copies are inverted to permit a second image to be formed on the unused side thereof. For this purpose, the copy sheets are passed by junction 57 and roller pair 39, 40 of tri-roller inverter 42 into deadend inverter runway 47. It will be understood that rollers 38, 39, and 40 of triroller inverter 42 are supported for rotation by suitable journaling means (not shown) and are driven by motor 65 in the direction shown by the solid line arrow.

As the trailing edge of a copy sheet exits from the nip of rollers 39, 40, the sheet trailing edge is carried by roller 39 downwardly and effectively directed into the nip of rollers 38, 39. Rollers 38, 39 in cooperation with the flow of transporting air reverse the direction of sheet movement and more the now inverted sheet into sheet feeder runway 45 for a second pass through the processing apparatus.

Duplex return runway 46 and sheet discharge runway 48 are provided with air inlets at 84 for communication with transporting air supply duct 60.

Processing units 14, 16, 18, and 20 each comprise a complete xerographic sub-assembly, the principle processing elements of which comprise a charging station 101, exposure station 103, developing station 104, cleaning station 105, and transfer station (the latter having been previously identified by numerals 68, 69, 70 and 71) in operative disposition about an endless photoconductive belt 110 supported on a belt module 111, 112, 113, and 114 respectively.

Referring particularly to Fig. 2, belt modules 111, 112, 113, 114 each comprise a generally triangular shaped support frame 115 having photoconductive belt support rollers 116, 117, and 118 mounted thereon at the apices of the triangle. Rollers 116, 117 and 118 are supported for rotation about fixed axes in frame 115 by means of suitable bearings (not shown) with roller 118 thereof being drivingly coupled to main motor 65. Belt module frames 115 are each recessed internally in varying degrees at 120. A hollow sub-atmospheric or vacuum chamber 122 is formed within the confines of each frame 115 by the frame side and end walls 124, 125 respectively, and by upper and lower frame cross members 126, 127 respectively, chamber 122 extending across the width of the respective belt modules. A transverse opening or port 128 in lower frame cross member 127 communicates vacuum chamber 122 with recessed portion 120 thereof. The interior surfaces of frame side walls 124 are suitably beveled at 131, 132 to provide side support to the loop portions 135 of photoconductive belts 110 formed therein during operation. Pressure relief ports 136 in end walls 125 permit ingress of air to enable the requisite belt attracting air flow patterns to be generated.

To assure registration of succeeding color component images with the preceding image or images, the belt modules 112, 113, 114 are sized so that the length *L* of the belt run from exposure station 103 to transfer stations 69, 70, 71 thereof is equal to the length *L* of the preceding belt module 111, 112, 113 plus the distance *d*. from the transfer station 68, 69 or 70 of the preceding belt module 111, 112, 113 respectively to the transfer station 69, 70 or 71 of the succeeding belt module 112, 113, 114 respectively.

Photoconductive belts 110 comprise any suitable photoconductor material such as selenium supported on a suitable flexible substrate or backing, such as myler. To promote serviceability and reduce cost, the photoconductive belts 110 for all belt modules 111, 112, 113, 114 are the same size, with an overall length greater than the minimum belt run formed by belt modules 111, 112, 113, 114.

To accommodate the aforedescribed spatial relationship between successive belt modules while permitting interchangeable belts 110 to be used, the depth of the recess 120 for each belt module 111, 112, 113, 114 varies. In the arrangement shown, recess 120 of belt module 111 is largest with the recesses 120 of the succeeding belt modules 112, 113 and 114 being progressively smaller. As a result, the size of the belt loop 135 established in the several recesses during operation of the system 10 is progressively smaller with each successive belt module 111, 112, 113, 114. Evacuation of chamber 122 while processsing copies creates a pressure differential across the segment of the photoconductive belt 110 adjacent the belt module recesses 120 which draws the belt segment into the recess to form belt loop 135 and tension the photoconductive belts about rollers 116, 117, 118 or belt modules 111, 112, 113, 114.

Developing stations 104 comprise any suitable image developing devices. Developing stations 104 are exemplified herein by a developer housing 150 having pickup roll 152 and magnetic or mag brush type intermediate feed and developer rolls 154, 155 respectively housed therewithin. The lower portion of developer housing 150 forms a sump 157 for the supply of developing material, pickup roll 152 being in operative disposition therewith in sump 157. Pickup roll 152 has a succession of cavities 158 in the periphery thereof for transporting developing material from sump 157 into operative juxtaposition with intermediate feed roll 154.

Developing material from pickup roll 152 is magnetically attracted to the surface of feed roll 154 by the magnetic field created by magnets

159 thereof, resulting in the formation of a developer blanket 160. Following trimming thereof by trim bar 162, the blanket of developing material is carried upwardly by roll 154 to developer roll 155. Developer roll 155, in turn, carries the developer, attracted thereto by magnets 163 thereof, into operative relation with the surface of photoconductive belt 110 at developing station 104. Rolls 152, 154, 155 of developing stations 104 are rotatably supported in developer housing 150 thereof by suitable journaling means (not shown) and are driven in the direction shown by the solid line arrows by main motor 65.

Cleaning stations 105 each comprise, in the exemplary arrangement shown, a rotatable cleaning brush 165 disposed in housing 166, brush 165 being supported for rotation by suitable journaling means (not shown) such that bristles 167 thereof are in wiping contact with the surface of photoconductive belt 110. Cleaning brush 165 is driven by main motor 65. Left-over developing material and any other debris, removed from belt 110 by brush 165 is carried from housing 166 by means of suction, the lower portion of housing 166 being connected to vacuum exhaust duct 168 for this purpose.

Digital signals representing the primary color separations, i.e. red, green, and blue, of a colored original to be reproduced, together with black may be provided in any suitable manner. For example, and referring to Fig. 3, a colored original 200, which is disposed upon a suitable support such as platen 201, may be scanned by a conventional video type color camera 203. The color output signals of camera 203 are fed through input channels 204, 205, 206 to a suitable matrix control network 210 wherein the signals may be otpimized in accordance with predetermined algorithms. The resulting color separation signals are stored in a suitable memory 213 under the direction of computer 212 pending use.

Network 210 additionally generates digital signals representing the fourth color image i.e. black. The black image signals are obtained through comparative analysis of the red, green, and blue color separation signals in accordance with a predetermined algorithm. The black image signals are fed to memory 213 through input channel 207.

Referring to Fig. 4 of the drawings, a flying spot type imaging system is thereshown effective to provide image rays representative of the three primary color separations and black at exposure stations 103 of developing units 14, 16, 18, 20 in response to the image signals stored in memory 213. For this purpose, a suitable source of light, i.e. laser 222 is provided. The light beam 223 produced by laser 222 is directed by mirror 224 through lens 225 and into four faceted mirror 226. Mirror 226 divides the beam 223 into four distinct light beams 230, 231, 232, 233 which, through the action of lens 225, are focused at four channel acousto-optical modulator 228.

The color separation image signals, together with the black image signals in memory 213 are inputed to the respective beam control gates 240, 241, 242, 243 of modulator 228, along signal output channels 244, 245, 246, 247. It will be understood that the image signals stored in memory 213 are addressed by computer 212 in synchronism with the operating speed of the reproduction system 10.

As will be understood by those skilled in the art, the individual control gates 240, 241, 242, 243 of modulator 228 respond to the binary state (i.e. "1" or "0") of the image signals applied thereto through channels 244, 245, 246, 247 respectively to direct the light beams 230, 231, 232, 233 associated therewith either toward a suitable beam stop 255 or toward the individual facets 257 of four faceted mirror 258. Beam stop 255 intercepts light directed thereagainst to block further passage thereof.

Light striking mirror 258 is reflected therefrom to expander lens 260 which restores the light into four parallel paths 261, 262, 263, 264. It is understood that the discrete light patterns along the parallel light paths 261, 262, 263, 264 are representative of the three color separation images and black comprising the full color original 200. From lens 260, the now parallel light paths are directed by mirror 265 onto the facets 266 of rotating scanning polygon 267. Polygon 267 is rotated by motor 268 at a speed proportional to the movement of photoconductive belts 110.

The multiple scanning light paths 261, 262, 263, 264 reflected from facets 266 of polygon 267 are focused by main imaging lens 270 onto the surface of photoconductive belts 110 at imaging stations 103 of the processing units 14, 16, 18, 20. A triangular shaped four faceted mirror 271 routes the light paths into separate branches 261′, 262′, 263′, 264′ leading to the various imaging stations 103, branches 261′, 264′ being routed by single mirrors 273 to the imaging stations of processing units 14 and 20 while branches 262′, 263′ are routed by three mirror combination 274 to the imaging stations of processing units 16 and 18.

In operation of processing system 10, the light beam generated by laser 222, which serves as the exposure medium for the photoconductive belts 110, is broken up into four independent paths 261, 262, 263, 264, one for each exposure station 103 of processing units 14, 16, 18, 20. The continuity of the four light beams 230, 231, 232, 233 is controlled in accordance with the image signals from memory 213 through acousto-optical modulator 288. The imaging beams scan or traverse across the photoconductive belts at imaging stations 103 from edge to edge, with each photoconductive belt 110 being exposed simultaneously.

Prior to exposure of the photoconductive belts 110, the source of vacuum (not shown) for vacuum chambers 122 of belt modules 111, 112, 113, 114 is energized to draw the excess portion of belts 110 into the recessed areas 120 and tension the belts. Main motor 65 is energized to drive photoconductive belts 110 and operate the several xerographic processing components, i.e. developing station 104, associated therewith. Power is supplied to charge and transfer corotrons 102, 73 respectively, the former serving to place a uniform electrostatic charge on belts 110 in preparation for imaging. The source of pressure air to air supply ducts 60 of pneumatic sheet conveyor system 35 is energized.

At a predetermined time during the copying cycle, step motor 36 is actuated to drive sheet feed belt 30 and advance the topmost sheet 12 in tray 27 forward into the sheet inlet runway 34 and the nip of rolls 38, 39. The sheet is carried into sheet feeder runway 45 with the leading edge thereof registered by register roll pair 62, 63 with the leading edge of the color separation images developed on photoconductive belts 110.

Exposure of the charged photoconductive belts 110 at exposure stations 103 selectively discharges the belt in accordance with the light pattern applied thereto to create latent color separation electrostatic images on each photoconductive belt 110. The latent electrostatic images so produced are developed by the respective cyan, magenta, yellow and black developers of processing units 14, 16, 18, 20 to form the four color separation images. The developed separation images are transferred in succession at image transfer stations 68, 69, 70, 71 to the copy sheet carried therepast by copy transport belt 55. The copy sheet, bearing the composite color image, is carried to fuser 75 whereat the color image is fixed. The copy sheet may be thereafter transported via copy discharge runway 48 to output tray 82 or where a second or duplex image is desired on the unused side thereof, returned to the sheet feeder runway 45 via duplex return runway 46 and inverter runway 47.

While the invention has been described with reference to the structure disclosed, it is not confined to the details set forth, but is intended to cover such modifications or changes as may come within the scope of the following claims.

Claims

1. An apparatus for line-to-line recording of different color component images of a full color original on successive individual photoconductive recording means (110) by means of controlled recording beams (261′, 262′, 263′, 264′) wherein recording of different color component images takes place at imaging stations associated with said recording means;

developing means (155) for developing the color component images formed on said recording means;

a transfer point associated with each of said recording means whereat the developed color component images on said recording means are transferred to a copy substrate material (12) in succession;

transport means (35, 55) for bringing said substrate material into transfer relation with said transfer points; and

drive means (65) for driving said recording means and said transport means, characterized in that said recording means are belts and that means (116, 117, 118, 122) are provided for operatively supporting said belts with the transfer points in close proximity to one another, the distance between the imaging station and the transfer point of each succeeding belt being equal to the distance between the imaging station and the transfer point of the preceding belt plus the distance from the transfer point of the preceding belt to the transfer point of the succeeding belt whereby to assure transfer of said color component images in registered superimposed relationship to form a full color copy of said original.

2. The apparatus according to claim 1 characterized by belts of equal length.

3. The apparatus according to claim 2 characterized by plural rotatably mounted belt supporting rolls, (116, 117, 118) forming a belt run for each of said belts, the length of each belt being greater than the belt runs formed by said rolls, and vacuum tensioning means (122) operative to draw each belt inwardly to tension the belt about the supporting rolls.

4. The apparatus according to claim 3 characterized by a first belt supporting roll (118) adjacent each imaging station and a second belt supporting roll (116) adjacent each transfer point, cleaning means (105) upstream of each imaging station for removing residual developer from each belt prior to recording a new color component image, a third belt supporting roll (117) adjacent each cleaning means, said vacuum tensioning means (122) being disposed between said first and third belt supporting rolls.

5. The apparatus according to claim 1 characterized by means forming a path for said copy substrate material, and a generally triangular photoconductive belt module associated with each of said recording beams, each of said belt modules including an endless photoconductive belt with means for supporting said belt for operative movement in an endless path, said belt modules being positioned in closely spaced side-by-side relationship with one apex of each of said belt modules in operative disposition with said copy substrate path at said transfer points at minimally spaced intervals therealong.

6. The apparatus according to claim 5 characterized by said developing means including a developing device associated with each of said belts, said developing devices being disposed at a second apex of each belt to facilitate dis-

position of said belt modules in close side-by-side relationship.

7. The apparatus according to claim 5 characterized by developing means including a developing device associated with each of said belts at a developing station, the imaging and developing stations being disposed opposite second and third apices of said belt module respectively to facilitate disposition of said belt modules in close side-by-side relationship.

8. The apparatus according to claim 1 in which said belt supporting means is characterized by at least two rotatable spaced apart belt supporting rolls, said rolls defining a belt run therebetween;

means (65) for drivingly rotating at least one of said rolls (118);

an endless photoconductive belt disposed over said rolls, the length of said belt being greater than the length of the belt run defined by said rolls;

means forming a vacuum chamber (122) interior of said belt run; and

means for evacuating said chamber to draw the excess length of said belt into said chamber whereby to form a U-shaped belt loop (135) while tensioning said belt to provide operative engagement with said rolls.

9. The apparatus of claim 8 characterized by said vacuum chamber having predetermined air escape ports (136) on either side of said belt to control vacuum force on said belt.

10. The apparatus of claim 8 characterized by said evacuating means having control means for regulating the size of said belt loop and tension on said belt.

Revendications

1. Dispositif d'enregistrement ligne par ligne d'images de composantes de couleurs différentes d'un original en couleur sur des moyens d'enregistrement photoconducteurs individuels successifs (110) au moyen de faisceaux d'enregistrement commandés (261', 262', 263', 264'), au l'enregistrement des images des composantes de couleurs différentes se produit à des postes de formation d'image associés aux moyens d'enregistrement; et comprenant:

— des moyens de développement (155) pour le développement des images des composantes de couleur formées sur les moyens d'enregistrement;

— un point de transfert associé à chacun des moyens d'enregistrement où les images des composantes de couleur développées sur les moyens d'enregistrement sont transférées à la suite à un matériau de substrat de copie (12);

— des moyens de transport (35, 55) pour amener le matériau du substrat en relation de transfert avec les points de transfert; et un moyen d'entraînement (65) pour entraîner les moyens d'enregistrement et les moyens de transport;

caractérisé en ce que les moyens d'enregistrement sont des bandes, et en ce que des moyens (116, 117, 118, 122) sont prévus pour supporter les bandes avec les points de transfert très proches les uns des autres, la distance entre le poste de formation d'image et le point de transfert de chaque bande de la série de bandes étant égale à la distance entre le poste de formation d'image et le point de transfert de la bande précédente plus la distance entre le point de transfert de la bande précédente et le point de transfert de la bande suivant, ce qui permet d'assurer un transfert des images des composantes de couleur par superposition afin de former une copie en couleur de l'original.

2. Dispositif selon la revendication 1, caractérisé en ce que les bandes ont la même longueur.

3. Dispositif selon la revendication 2, caractérisé en ce qu'il comprend plusieurs rouleaux de support de bande montés en rotation (116, 117, 118) formant un trajet pour chacune des bandes, la longueur de chaque bande étant supérieure aux trajets de la bande formé par les rouleaux, et un moyen de mise sous tension par vide (122) fonctionnant de façon à entraîner chaque bande vers l'intérieur de façon à la tendre autour des rouleaux de support.

4. Dispositif selon la revendication 3, caractérisé en ce qu'il comprend un premier rouleau (118) de support de bande contigu à chaque poste de formation d'image et un second rouleau (116) de support de bande contigu à chaque point de transfert, un moyen de nettoyage (105) en amont de chaque poste de formation d'image pour enlever le matériau de développement résiduel de chaque bande avant l'enregistrement d'une nouvelle image de composante de couleur, un troisième rouleau (117) de support de bande contigu à chaque moyen de nettoyage, le moyen de mise sous tension par vide (122) étant disposé entre les premier et troisième rouleaux de support de bande.

5. Dispositif selon la revendication 1, caractérisé en ce qu'il comprend un moyen formant un trajet pour le matériau du substrat de copie, et un module de bande photoconductrice généralement triangulaire associé à chaque faisceau d'enregistrement, chaque module de bande comprenant une bande photoconductrice sans fin avec un moyen pour supporter la bande afin d'en permettre le déplacement dans un trajet sans fin, les modules de bande étant placés côte à côte, très près les uns des autres, avec le sommet de chaque module disposé de façon opérationnelle près du trajet du substrat de copie aux points de transfert séparés d'une distance minimale.

6. Dispositif selon la revendication 5, caractérisé en ce que les moyens de développement comprennent un dispositif de développement associé à chacune des bandes, ces dispositifs de développement étant disposés à un second sommet de chaque bande de façon à faciliter la

disposition côte à côte des modules de bande.

7. Dispositif selon la revendication 5, caractérisé en ce qu'il comprend des moyens de développement incorporant un dispositif de développement associé à chacune des bandes à un poste de développement, les postes de formation d'image et de développement étant disposés à l'opposé des second et troisième sommets des modules de bande, respectivement, de façon à faciliter la disposition côte à côte des modules.

8. Dispositif selon la revendication 1, caractérisé en ce que les moyens de support de bande comportent au moins deux rouleaux de support de bande rotatifs, distants l'un de l'autre, ces rouleaux définissant entre eux un trajet de bande;

— un moyen (65) pour entraîner en rotation au moins l'un des rouleaux (118);

— une bande photoconductrice sans fin disposée sur les rouleaux, la longueur de la bande étant supérieure à la longueur du trajet de bande défini par les rouleaux;

— un moyen formant une chambre (122) sous vide à l'intérieur du trajet de bande; et

— un moyen pour mettre sous vide la chambre de façon à entraîner la longueur en surplus de la bande dans la chambre, à la suite de quoi il y a formation d'une boucle (135) de bande en forme de U avec une mise sous tension de la bande de façon à obtenir le contact de la bande avec les rouleaux.

9. Dispositif selon la revendication 8, caractérisé en ce que la chambre sous vide comporte des orifices d'échappement d'air prédéterminés (136) de chaque côté de la bande de façon à commander la force exercée par le vide sur la bande.

10. Dispositif selon la revendication 8, caractérisé en ce que le moyen de mise sous vide comporte un moyen de commande pour réguler les dimensions de la boucle de bande et la tension de la bande.

Patentansprüche

1. Vorrichtung zur zeilenweisen Aufzeichnung verschiedener Farbauszüge eines Gesamtfarben-Originals auf einzelnen nacheinander angeordneten photoleitfähigen Bändern (110) mittels gesteuerter Aufzeichnungsstrahlen (261', 262', 263', 264'), wobei die Aufzeichnung verschiedener Farbauszüge in den Bändern zugeordneten Abbildungsstationen stattfindet, mit einer Entwicklungseinrichtung (155) zum Entwickeln der auf den Bändern gebildeten Farbauszüge, einem jedem Band zugeordneten Übertragungspunkt, an welchem die auf den Bändern befindlichen entwickelten Farbauszüge nacheinander auf ein Kopieträgermaterial (12) übertragen werden, einer Transporteinrichtung (35, 55), mittels welcher das Trägermaterial in eine zur Übertragung geeignete Lage zu den Übertragungspunkten der Bänder gebracht wird, und einer Antriebseinrichtung (65) für die Bänder und die Transporteinrichtung, gekennzeichnet durch eine Einrichtung (116, 117, 118, 122), welche die Bänder mit den Übertragungspunkten betriebsmäßig in enger Lage zueinander hält, wobei der Abstand (L) zwischen der Abbildungsstation und dem Übertragungspunkt des jeweils nachfolgenden Bandes gleich dem Abstand (L) zwischen der Abbildungsstation und dem Übertragungspunkt des vorangehenden Bandes plus dem Abstand (D) vom Übertragungspunkt des vorangehenden Bandes zum Übertragungspunkt des nachfolgenden Bandes ist, um eine Übertragung der Farbauszüge in genauer Ausrichtung übereinander zur Herstellung einer Gesamtfarbenkopie des Originals sicherzustellen.

2. Vorrichtung nach Anspruch 1, gekennzeichnet durch Bänder gleicher Länge.

3. Vorrichtung nach Anspruch 2, gekennzeichnet durch mehrere drehbar gelagerte, einen Bandlauf für jedes der Bänder bildende Bandträgerrollen (116, 117, 118), wobei die Bänder jeweils eine größere Länge besitzen als die durch die Rollen gebildeten Bandläufe, und durch eine Vakuum-Spanneinrichtung (122), welche die Bänder jeweils nach innen zieht, sodaß sie um die Trägerrollen gespannt sind.

4. Vorrichtung nach Anspruch 3, gekennzeichnet durch eine jeweils im Bereich der Abbildungsstation angeordnete erste Bandträgerrolle (118) und eine jeweils im Bereich des Übertragungspunktes vorgesehene zweite Bandträgerrolle (116), durch eine Reinigungsvorrichtung (116) vor jeder Abbildungsstation zum Entfernen von Entwicklerresten vom jeweiligen Band vor dem Aufzeichnen eines neuen Farbauszugs, und durch eine jeweils im Bereich der Reinigungseinrichtung angeordnete dritte Bandträgerrolle (117), wobei die Vakuum-Spanneinrichtung (122) jeweils zwischen der ersten und dritten Bandträgerrolle angeordnet ist.

5. Vorrichtung nach Anspruch 1, gekennzeichnet durch eine einen Pfad für das Kopieträgermaterial bildende Einrichtung und ein jedem Aufzeichnungsstrahl zugeordnetes, im wesentlichen dreieckiges, photoleitfähiges Bandmodul, wobei jedes Bandmodul ein endloses photoleitfähiges Band mit einer Einrichtung aufweist, mittels welcher das Band wirksam auf einem Endlospfad bewegbar gelagert ist, wobei die Bandmodule dicht nebeneinander angeordnet sind und jeweils ein Scheitelpunkt jedes Bandmoduls an den Übertragungspunkten mit sehr kleinem Abstand voneinander in wirksamer Lage zu dem Kopieträgerpfad angeordnet ist.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die Entwicklungseinrichtung eine jedem der Bänder zugeordnete Entwicklungsvorrichtung aufweist, wobei die Entwicklungsvorrichtungen jeweils an einem

zweiten Scheitelpunkt des betreffenden Bandes angeordnet sind, um die Anordnung der Bandmodule in engem Abstand nebeneinander zu erleichtern.

7. Vorrichtung nach Anspruch 5, gekennzeichnet durch eine Entwicklungseinrichtung, welche eine jedem Band an einer Entwicklungsstation zugeordnete Entwicklungsvorrichtung aufweist, wobei die Abbildungs- und Entwicklungsstationen gegenüber einem zweiten bzw. dritten Scheitelpunkt des Bandmoduls angeordnet sind, um die Anordnung der Bandmodule in engem Abstand nebeneinander zu erleichtern.

8. Vorrichtung nach Anspruch 1, wobei die Bandträgereinrichtung gekennzeichnet ist durch mindestens zwei drehbare, im Abstand voneinander angeordnete Bandträgerrollen, welche zwischen sich einen Bandlauf bilden, eine Einrichtung (65) zum antriebsmäßigen Drehen mindestens einer der Rollen (118), ein über die Rollen gelegtes photoleitfähiges Endlosband, wobei die Länge des Bandes größer ist als die Länger des durch die Rollen gebildeten Bandlaufs, eine eine Vakuumkammer (122) innerhalb des Bandlaufs bildende Einrichtung, und eine Einrichtung zum Erzeugen eines Vakuums in der Kammer, um das längenmäßig überschüssige Stück des Bandes in die Kammer zu ziehen, sodaß sich eine U-förmige Bandschleife (135) bildet, während das Band gespannt wird, um es in Wirkanlage an die Rollen zu bringen.

9. Vorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß die Vakuumkammer beiderseits des Bandes Öffnungen (136) zum vorbestimmten Luftdurchtritt aufweist, um die durch das Vakuum auf das Band wirkende Kraft zu steuern.

10. Vorrichtung nach Anspruch 8, dadurchgekennzeichnet, daß die Vakuumeinrichtung eine Steuereinrichtung zum Regeln der Bandschleifengröße und der auf das Band wirkenden Spannung aufweist.

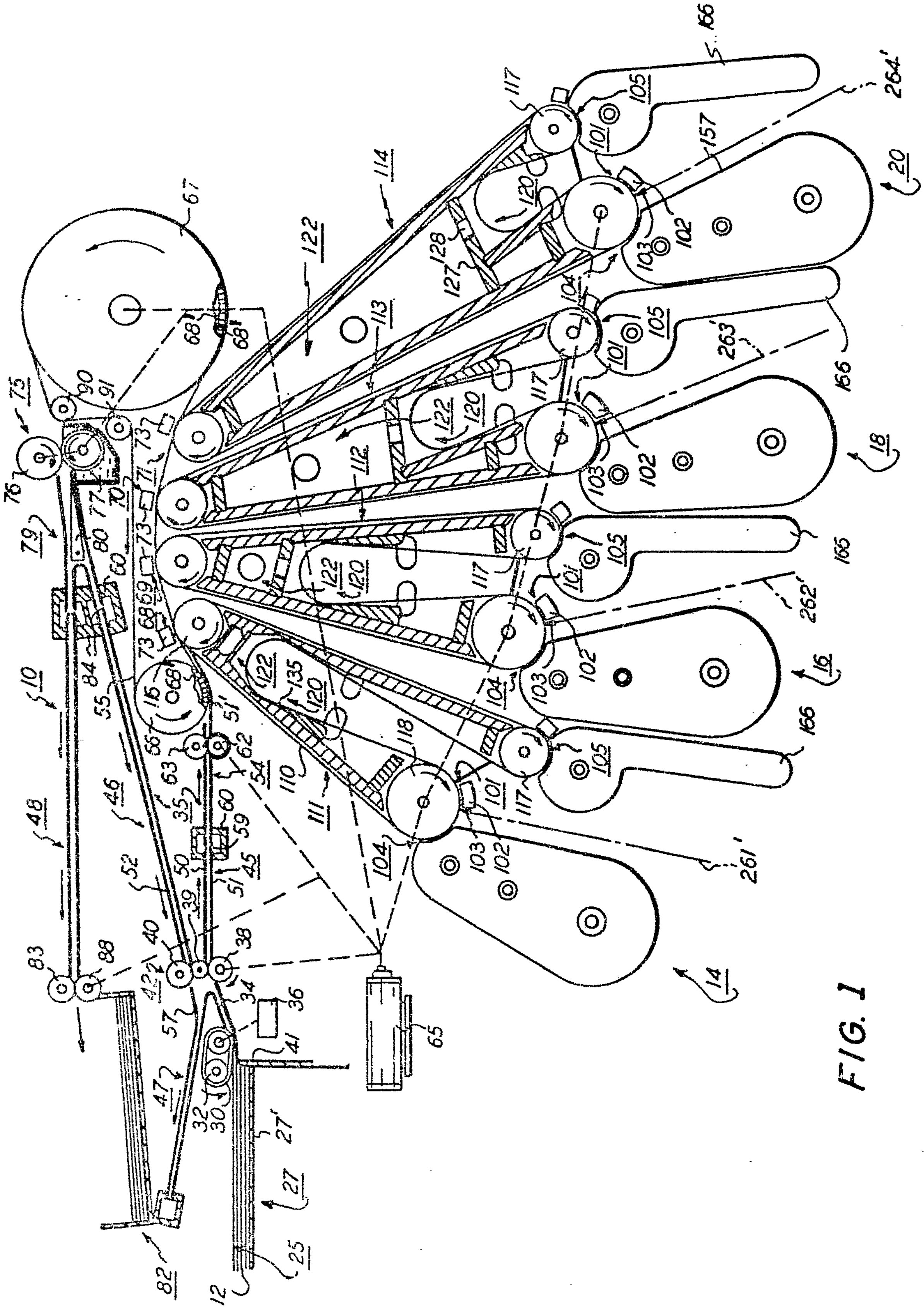

FIG. 1

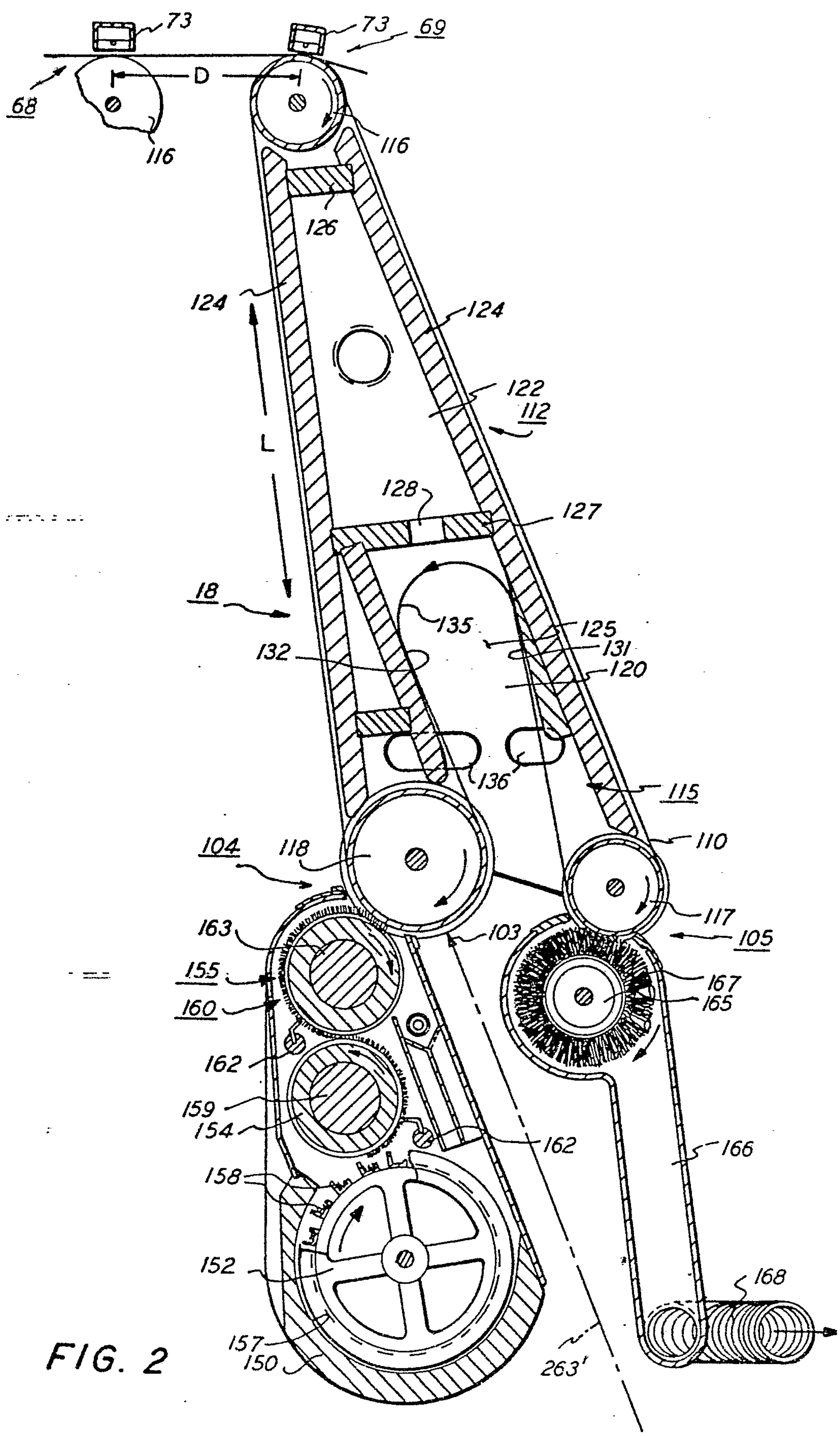
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FIG. 2

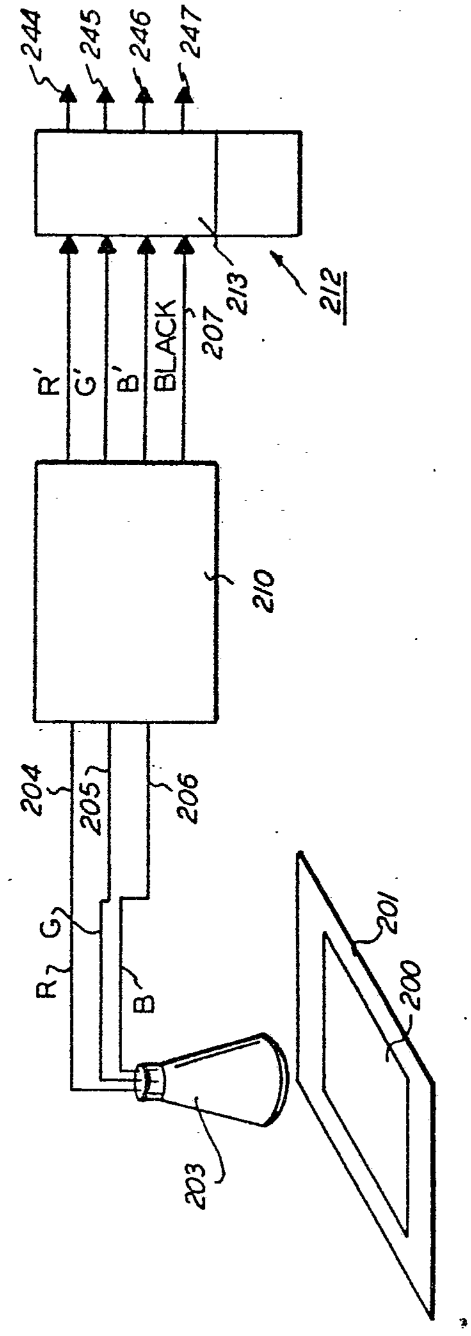
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FIG. 3

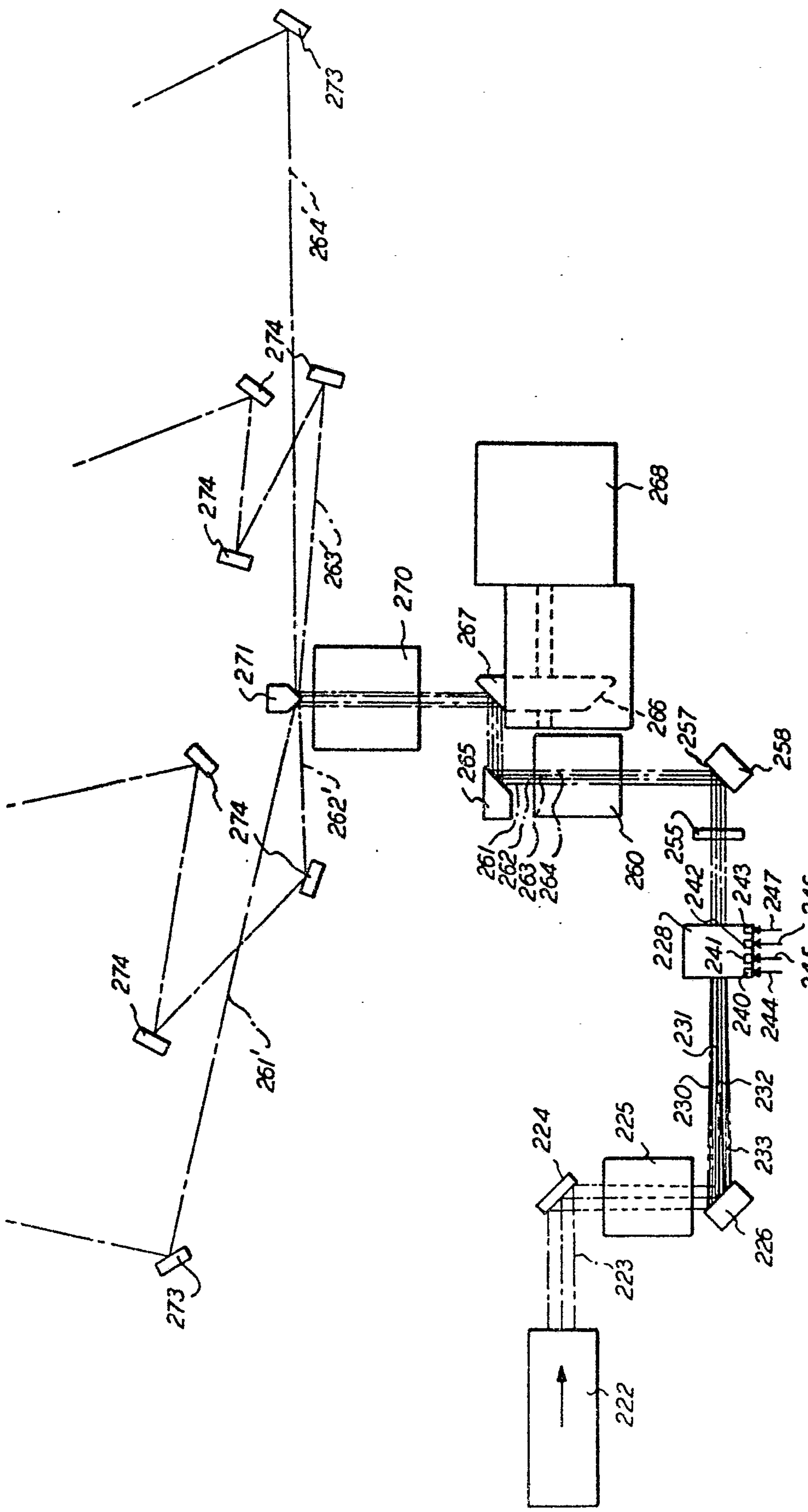
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FIG. 4