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(54) **An electrophotographic printer with angular sheet alignment.**

(57) An electrophotographic printer with a pair (23) of sheet aligning rollers the rotation of which is temporarily arrested so that a sheet that is advanced to the nip of said rollers becomes with its leading edge aligned in parallel with said rollers, the sheet advance occurring through a slipping-driving including a driven roller section (30) and a sheet biasing ball (32).

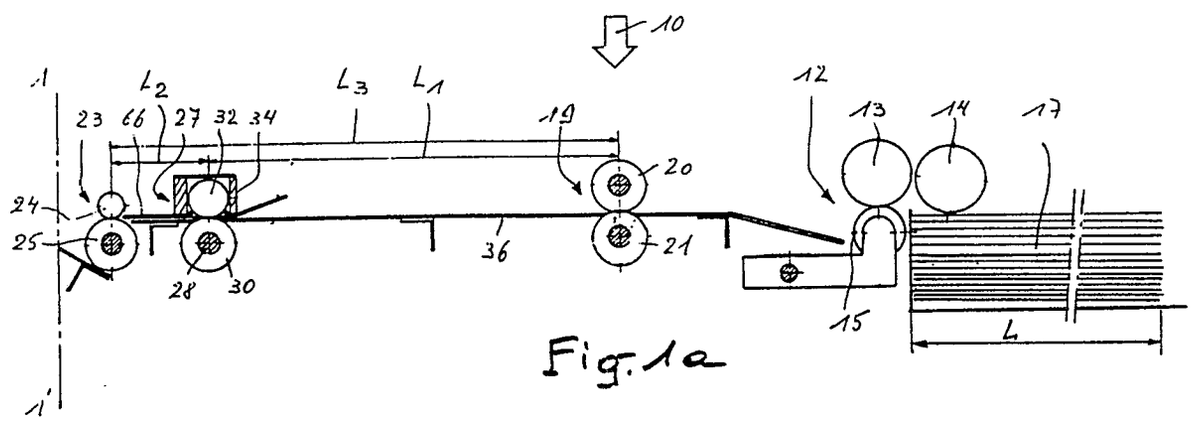

Fig.1a

EP 0 300 095 A1

An electrophotographic printer with angular sheet alignment

The present invention relates to an electrophotographic printer with a feeder for feeding a sheet of paper or film in a correct angular orientation towards an imaging station in which an image is produced on the sheet. More particularly, the invention relates to an electrophotographic printer in which a toner image is progressively transferred from a semiconductor drum onto a sheet of paper as such sheet moves in tangential contact with such drum.

The correct position of a sheet that is forwarded to an imaging station is important since usually the locus where the image is produced in such station is fixed so that it will depend on the actual position of a sheet at such locus whether or not the image will take a correct position on the sheet. Possible causes for an incorrect position of an image on the sheet are : a longitudinal, a transversal and an angular misalignment of the sheet. The present invention deals with the angular alignment of a sheet fed to an imaging station.

In conventional printing apparatus, paper sheets are picked from a stack of sheets by mechanisms comprising sucker cups and guide arms that ensure a reproducible position of a sheet at the imaging station where an image is printed by an inked printing drum on the sheet.

In known electrophotographic copying apparatus, paper sheets are usually withdrawn by friction fingers from a stack of sheets and fed by a first roller pair towards a second roller pair that is at standstill as the sheet arrives. The distance between both roller pairs is smaller than the length of the sheet so that the sheet will buckle as its leading edge enters the nip of the second roller pair. The sheet buckling causes a biasing force that tends to urge the leading edge of the sheet in firm contact with the nip of the second roller pair. This contact ensures an alignment of the leading edge of the sheet with the roller pair, also when the sheet had a skewed position as it approached towards said roller pair.

At the moment of imaging, the rotation of the second roller pair is started whereby the sheet is fed in a correct angular position into the imaging station. Practice shows that the correction possibilities of the described system are limited, and that the reliability is insufficient for the performance of critical work. The accuracy of the angular sheet aligment obtained by the described arrangement is generally in the order of magnitude of approximately 5 arc minutes, but at uncontrolled moments, the accuracy may become less and deviations up to 10 arc minutes are met in practice.

In known electrophotographic printers, such as laser or LED printers, the sheet feeding mechanisms are generally based on techniques derived from electrophotographic copiers, and so it will be understood that the precision of sheet feeding does often not match the quality requirements of the image production.

It is the object of the present invention to provide an electrophotographic printer with a sheet feeder which feeds a sheet of paper or film towards an imaging station with a greater angular precision than it is done by known feeders. The invention is particularly concerned with so-called E.P.P. apparatus, i.e. electronic printing and publishing apparatus.

According to the present invention, an electrophotographic printer with a sheet feeder for feeding a sheet to an imaging station in which an image is produced on the sheet, said feeder comprising a first feed roller pair for advancing a sheet to the imaging station, a second feed roller pair for taking over the sheet transport towards the imaging station from the first roller pair, sheet guide means between said first and second roller pair, and drive control means for arresting the rotation of the second roller pair so that a sheet that is forwarded by the first roller pair enters with its leading edge into the nip of the second roller pair whereby the leading end of the sheet becomes parallelly aligned with said second roller pair, and for restarting the rotation of the second roller pair after the sheet abutted against this roller pair, is characterised thereby that additional, laterally spaced sheet feeding means are provided between both said roller pairs, at a distance from the first roller pair that is smaller than the length of the sheet and at a distance from the second roller pair that is likewise smaller than the length of the sheet, said additional sheet feeding means comprising driven roller means at one side of the sheet path and cooperating non-driven laterally spaced individual sheet-biasing means at the other side of the sheet path for biasing a sheet that passes between such means and such driven roller means with a force on the driven roller means such that driving of the sheet is ensured towards the second roller pair but that slipping of the driving occurs as the sheet reaches the nip of the second roller pair, and that a lower and an upper sheet guide are provided between the additional sheet feeding means and the second roller pair for determining a straight path for the sheet between said additional sheet feeding means and the second roller pair.

The term "printer" as used in the present specification does not only embrace LED or laser printers that produce an image starting from in-

formation from a work station, but it also covers so-called laser copiers which have advanced editing features as compared with conventional copiers.

In a suitable embodiment of the printer, the driven roller means is provided at the lower side of the sheet path, and the sheet biasing means is formed by gravity-biased balls that run in a housing that allows vertical displacements of the balls but restricts their lateral displacements. Preferably, there are provided two separate sheet biasing means, one near each lateral end of the sheet path.

According to a further suitable embodiment of the printer, the rollers of the second roller pair have a relatively small diameter and a relatively hard peripheral surface, so that abutment of the leading edge of a sheet in the nip of such rollers causes an exact aligment of such edge in parallel with the axes of the rollers.

The electrophotographic printer according to the invention may deal with different sheet formats.

In case the length of a sheet is greater than the distance between the first roller pair and the second roller pair, the angular orientation of the sheet by the second roller pair will occur while the trailing end of the sheet that extends between the first roller pair and the additional feed means is buckled. This may be for instance the case if an A3 sheet format is treated.

In case the length of a sheet is smaller than the distance between the first and second roller pairs, the trailing end of the sheet will remain flat on the sheet supporting plate and become laterally displaced as the leading edge of the sheet is being oriented parallel with the second roller pair. This may be for instance the case for an A4 sheet format.

Finally, the electrophotographic printer according to the invention may be provided with two paper drive arrangements, namely a lower grade paper drive that extends from a supply stack of sheets to the sheet aligning roller pair, and a primary, high grade paper drive that extends from the first roller pair behind the sheet aligning roller pair up to the fixing station for the sheet.

The invention will be described hereinafter by way of example with reference to the accompanying drawings in which :

Fig. 1a is the right-hand part of a diagrammatic longitudinal sectional view of one embodiment of an electrophotographic printer according to the invention, whereas

Fig. 1b is the left-hand part of this view,

Fig. 2 is a diagrammatic plan view of the printer of Figs. 1a and 1b, and

Figs. 3a and 3b illustrate the entering of a sheet in the nip of a roller pair.

Referring to Figs. 1a, 1b and 2, a LED printer is illustrated for the production of images on plain paper sheets. Fig. 1a shows the right-hand part of the view of the printer, and Fig. 1b shows the left-hand part of this view. Both parts should in fact be linked to each other at the lines 1-1'. A portion of the left-hand part of the printer has been omitted in the plan view of Fig. 2.

The printer comprises basically a paper feeding section and an imaging section, as indicated by the arrows 10 and 11. Both sections have separate drive means, the paper feeding section being provided with a conventional paper drive, and the imaging section has a high-grade paper drive as will further be explained.

The paper feeding section 10 comprises the following elements.

A dispenser mechanism 12 provided with driven rollers 13, 14 and a non-driven pressure roller 15, for taking sheets one by one from a stack of sheets 17. The stack of sheets is provided with means known in the art for keeping the top of the stack within the reach of the rollers 14. The roller 13 takes a bodily stationary position whereas the rollers 14 are bodily pivotable about the axis of the roller 13 and are rotatably coupled with the roller 13 via a belt drive, not illustrated. The roller 13 is driven through an electromagnetic clutch 16 and a corresponding chain wheel by an endless chain 18.

Further, a first roller pair 19 with upper and lower roller sections 20, 21. The shaft of the roller sections 21 is driven by the chain 18, through a clutch 22. The roller sections are covered with a resilient material, for example rubber, and the upper sections are driven by contact with the lower ones.

Still further, a second roller pair 23 with an upper and a lower roller 24, resp. 25. The upper roller 24 has a relatively small diameter and a smooth and hard peripheral surface. The roller was made from a solid rod of stainless steel and is gear-coupled to the lower roller 25. This lower roller has likewise a smooth and hard peripheral surface. In the present example, the roller 25 was made from hard plastic, for example PVC. The roller 25 is driven through a magnetic clutch 26 and a corresponding chain wheel by the chain 18. The bearings of the roller 24 are vertically displaceable, and both are spring-biased (not illustrated) towards the roller 25 so that both rollers are in contact with each other in the absence of a sheet.

Finally, additional drive means 27 constituted by a shaft 28 with two laterally spaced roller sections 29 and 30, and co-operating balls 31, 32 that are journalled in stationary housings 33, 34 having a vertical cylindrical bore to permit free vertical displacements of the balls. The diameter of the bore exceeds the diameter of the balls by a few tenths of a millimeter. The roller sections 29 and 30 have a resilient covering, and the shaft 28 is driven

by the chain 18 through an electromagnetic clutch 35.

The distances L_1 between the drive means 27 and the first roller pair 19, and L_2 between the roller pair 23 and the drive means 27, are smaller than the length L of a sheet to be fed, whereas the distance L_3 between the second roller pair 23 and the first roller pair 19 may be smaller or greater than the length of such sheet.

A plate 36 serves for supporting a sheet during its travel through the paper feeding section 10, and a plate 66 near the end of the plate 36 determines a narrow passage for the sheet.

The different rollers, resp. roller sections, of the paper feeding section constitute the secondary paper drive and they are driven by a motor 37 that is rotationally coupled with the chain 18 and that rotates uninterruptedly during the operation of the apparatus. The different electromagnetic clutches are energized in timed relationship to obtain the desired paper feeding sequence. The energizing of the different clutches occurs under microprocessor control, in response to sensors that detect the position of the leading end of a sheet near the imaging section, to paper jam sensors, etc.

The imaging section 11 of the printer comprises the following elements.

A rotatable photoconductor drum 40. An exposure station 41 for line-wise exposing the drum in accordance with the image that must be exposed. In the present embodiment, the exposure station 41 comprises a LED-bar with a plurality of LED-arrays mounted in closely adjacent relationship, whereby two staggered rows of LED's are formed that each comprise also their related driving, buffer, shifting and resetting circuitry.

A developing station 42 for the application of a developing toner to the rotating drum.

A toner transfer station 43 with a corona wire for causing the transfer of the developed toner image from the drum onto a sheet of paper that is fed in contact therewith, and a paper release station 44 with a corona wire for causing the release of the sheet of paper from the drum surface to which it might adhere.

A cleaning station 45 for cleaning the drum from which the developed image has been removed.

And finally, a charging station 46 for uniformly electrostatically charging the drum prior to the next image-wise exposure.

The primary drive means of the imaging section comprises the following elements.

A pair of input roller sections 47, 48 for taking-over the sheet transport from the feeding section 10, and a pair of rollers 50, 51 for directing the sheet in contact with the drum 40.

Further, vacuum-belt means 53 for carrying the sheet with the fresh toner image away from the drum, and finally a fixing station 54 with a lower roller 55 and an upper roller 56 which is internally heated by an IR-heater. The fixed sheet is received in a tray 57.

The driving of the different rotatable members of the imaging section, and also of the semiconductor drum 40, is done by a timing belt 58 driven by an electric motor 59. The motor 59 may be a servo-controlled D.C. motor, an A.C. motor with inbuilt high-precision reduction gear, etc. The tension control and the loop control of the timing belt, the quality of the bearings of the rollers and the precision of their mounting in the frame, and also the rigidity and the precision of the frames have received special attention so that a sheet drive is obtained with a more uniform sheet speed and a better sheet path control than the secondary sheet drive of section 10. The cross-over from rollers 24, 25 to rollers 47, 48 ensures an efficient separation between both drives so that occasional imperfections in the sheet drive caused in the section 10, are not transmitted to the section 11.

The operation of the described electrophotographic printer is as follows for a sheet the length of which is smaller than L_3.

The apparatus being warmed up and the drive motors running, the clutches 16, 22 and 35 are energized in response to the signal from the imaging station that a print is to be made.

The rollers 13 and 14 take the upper sheet from the stack 17 of sheets and feed it towards the first roller pair 19. The removed sheet has taken a skewed position, for a reason that is unimportant in the present description, and this position is indicated by the rectangle 60 in broken lines and the skew angle Delta in Fig. 2.

The sheet becomes engaged by the roller pair 19 and this roller pair takes over the sheet drive as the trailing edge of the sheet left the roller pair 12. During the further transport of the sheet the skew position of the latter may remain unaltered or may increase, depending on the precision of the different elements that have an influence on the sheet transport, such as the precision of the roller bearings and of their positioning, the pressure distribution between the rollers of a roller pair, the aligment of the roller pairs, etc.

The length L of the sheet is greater than the distance L_1, so that the leading end of the sheet becomes engaged by the sheet drive 27 before the trailing end of the sheet becomes disengaged from the roller pair 19.

The transport of the sheet continues until the leading sheet corner enters the nip between the rollers 24, 25 of the roller pair 23. This situation is illustrated in Fig. 2, where the rectangle 61 drawn in broken lines shows the skewed sheet, and 62 is

the leading sheet corner that makes the first contact with the roller pair 23. At the moment the described contact occurs, the contact between the trailing sheet end and the roller pair 19 has been broken. However, in the meantime, the sheet drive has been taken over by the drive means 27 since the bias of the balls 31, 32 on the sheet is sufficiently great to create a sufficient friction between the sheet and the roller sections 29, 30 for said roller sections to the sheet drive after the sheet drive by the roller pair 19 was stopped.

However, the bias of the balls 31, 32 is also sufficiently small to permit the roller sections 29, 30 to slip on the sheet surface as the sheet is unable to advance any further. This situation occurs as the sheet abutted against the stopped roller pair 23. While the sheet corner 62 is unable to further advance, the remainder of the leading edge of the sheet remains remote from the roller pair 23 over a distance that increases from zero (at the corner 62) to a maximum at the opposite sheet corner 63. This separation has been illustrated by the wedgelike opening 64 in Fig. 2. As a consequence thereof, the sheet drive continues at the side of the corner 63, so that the sheet will start to rotate in its own plane about the corner 62 until finally the leading edge of the sheet abuts in precise parallel relationship against the rollers 24, 25. At this moment, a correct angular sheet position has been obtained since the rollers 24, 25 are accurately aligned parallel with the semiconductor drum 40.

The roller sections 29, 30 continue to rotate, and a 100 %'s slip occurs between said roller sections and the arrested sheet. During said continued driving force, and also during the adjustment of the angular sheet position, the leading sheet portion that is involved in the driving forces is kept well straight by a sheet guidance formed by the closely spaced guide plates 36 and 66.

After a short while, usually less than 1 second after the sheet abutted against the roller pair 23, the clutch 26 is energized whereby the sheet drive is resumed. The now rotating rollers 24, 25 pull the sheet from the sheet feeding section 10 and introduce it into the imaging section 11 where the rollers 47, 48 and 50, 51 take over the sheet drive.

The accuracy of the described angular alignment depends on the diameter and the hardness of the sheet aligning rollers 24 and 25. This is explained hereinafter in detail with reference to Figs. 3a and 3b which show an enlarged view of a roller gap and a sheet abutting therein.

Referring to Fig. 3a, there are shown two opposed sections of a pressure roller pair 6, 7 and a sheet 8 entering with its leading edge 9 into the nip of said rollers. The angle of the convergent gap into which the sheet is fed is indicated by the angle Alpha and is determined by the tangents to the roller surfaces at the point of contact with the sheet. The illustrated situation is a theoretic one since the rollers that are used in the art to align a sheet have a resilient covering that becomes slightly impressed under the force exerted by an abutting sheet. Thereby the leading sheet edge will actually take a position as shown in broken lines, and the leading tangents to the roller surfaces at these points of contact determine an angle Beta that is smaller than the theoretic angle Alpha.

Referring to Fig. 3b, there are shown two enlarged sections of the rollers 24, 25 that have a peripheral surface that is undeformable under the influence of the abutting sheet 8. It is clear that the angle Gamma between the tangents in the points of contact is much larger than the angles Alpha and Beta described hereinbefore as a consequence of the small diameter of the roller 24. This means that the "wedging" effect of the roller arrangement is less than that of the known arrangements, and in consequence smaller tolerances on the accuracy of the web alignment will be obtained.

The elasticity of the sheet itself was not considered in the description hereinbefore. It is clear that the leading sheet edge will undergo some deformation upon its abutment in the roller nip, and thus the sheet will enter the nip slightly more advanced than illustrated. This does not alter, however, the importance of the differences between the arrangements according to Figs. 3a and 3b.

The distance between the rollers 50, 51 and the rollers 24, 25 is preferably greater than the length L of the sheet so that the sheet is completely free from occasionally disturbing effects caused by the lower grade secondary sheet drive, as the image transfer will start.

Means, known in the art, is provided for correlating the initiation of the linewise exposure by the station 41 with the arrival of the sheet at a given position, so that the toner image transferred from the drum 40 will take a correct longitudinal position on the sheet as this is moved in contact with the drum. The sheet bearing the transferred toner image is received on a vacuum conveyer belt 53, and then fed through a station 54 where the image is heat-fixed. Finally the sheet is received in a collector tray 57.

It will be understood that the clutch 16 became de-energized as soon as the dispensed sheet was gripped by the roller pair 19, in order not to feed a next sheet on the foregoing one. Similarly, the clutches of the downstream roller pairs became de-energized as the sheet was transported beyond reach of these roller pairs. These driving sequences, as well as the means for detecting malfunction or jam, belong to the state of the art and therefore no further details are given on this aspect

hereinafter.

In case a sheet is fed with length L greater than the distance L_3, the trailing sheet end is still in contact with the roller pair 19 as the leading sheet edge abuts in the nip of the second roller pair 23. Continued rotation of the roller pair 19, during standstill of the roller pair 23, causes the trailing sheet portion to buckle over the distance L_1.

The buckle that was formed in the trailing sheet portion gives sufficient freedom to the leading portion of the sheet to orient itself in exact parallelism with the roller pair 23 upon abutment of the leading sheet edge against said roller pair, and under the continued driving force of the sheet driving means 27.

The following data illustrate the described printer.

Sheets : A4 (L = 210 × 297 mm) and A3 (L = 297 × 420 mm) format.
L_1 : 190 mm
L_2 : 235 mm
L_3 : 45 mm
diameter of roller 25 : 24.1 mm
roller periphery : hard polyvinylchloride
diameter of roller 24 : 12.05 mm
roller construction : stainless steel
bias between rollers 24 and 25 : 10 N (5 N at each roller end)
diameter of roller sections 30 :24 mm
width of roller sections 30 :15 mm
diameter of balls 31, 32 :14 mm
mass of each ball :15 g.
angular sheet deviations, measured after the pair of rollers 24, 25 : always less than 3 arc minutes.

The invention is not limited to the described embodiment of an electrophotographic printer.

The printer may as well operate with a laser exposure station, instead of LED means.

The sheet aligning rollers 24, 25 may occasionally be provided with brake means that prevent any possible rotation of the rollers during their non-driven phase under the abutment force of a sheet.

The diameter of the roller 24 may be less than half the diameter of the roller 25. Also, both said rollers may have a diameter that is small as compared with the diameter of the other sheet driving rollers.

The printer may also be provided with means for controlling the lateral position of a sheet that became angularly aligned, since it is clear that the correction operation in accordance with the present invention may cause a lateral deviation of a sheet from its correct path. An electrophotographic printer which comprises means for co-ordinating the lateral position of the image in the image station with the lateral position of an angularly oriented sheet, is disclosed in our co-pending patent application entitled : "An electrophotographic printer with lateral image alignment", filed on even date herewith.

The printer may also be arranged for return of the sheet in reversed position towards the imaging section so as to provide both sheet sides with an image before the sheet is discharged from the apparatus. In such recto-verso arrangement, there may occasionally be provided a second sheet-aligning arrangement in case the effect of the alignment for the first exposure cannot be maintained up to the second exposure.

The printer may also be arranged for operation with more than two sheet formats.

In case the distance between the roller pair 23 and the pair of rollers 50, 51 is not greater than the length L of a sheet, it may be advantageous to arrange the apparatus in such a way that the sheet driving speed of the secondary drive very slightly exceeds the sheet driving speed of the primary drive, e.g. by an amount of 0.5 %, so that occasional disturbing effects of the secondary drive become effectively de-coupled from the primary drive.

Finally, the laterally spaced individual sheet-biasing means may also be formed by other elements than the illustrated balls, e.g. by spring-biased idler roller sections.

Claims

1. An electrophotographic printer with a sheet feeder (10) for feeding a sheet towards an imaging station (41) in which an image is produced on the sheet, said feeder comprising a first feed roller pair (19) for advancing a sheet towards the imaging station, a second sheet aligning feed roller pair (23) for taking over the sheet transport towards the imaging station from the first roller pair, sheet guide means between said first and second roller pairs, and drive control means for arresting the rotation of the second roller pair so that a sheet that is forwarded by the first roller pair abuts with its leading edge into the nip of the second roller pair whereby the leading end of the sheet becomes parallelly aligned with said second roller pair, and for restarting the rotation of the second roller pair after the sheet abutted against said roller pair, characterised in that additional, laterally spaced sheet feeding means (27) are provided between both said roller pairs, at a distance (L_1) from the first roller pair (19) that is smaller than the length (L) of the sheet and at a distance (L_2) from the second roller pair (23) that is likewise smaller than the length of the sheet, said additional sheet feeding means comprising driven roller means (29, 30) at one side of the sheet path and co-operating non-driven laterally spaced individual sheet-biasing

means (31, 32) at the other side of the sheet path for biasing a sheet that passes between such means and such driven roller means with a force on the driven roller means (29, 30) such that driving of the sheet is ensured towards the second roller pair (23) but that slipping of the driving occurs as the sheet abuts against the nip of the second roller pair, and that a lower (36) and an upper (66) sheet guide are provided between the additional sheet feeding means (27) and the second roller pair (23) for determining a straight path for the sheet between said additional sheet feeding means and the second roller pair.

2. An electrophotographic printer according to claim 1, wherein said driven roller means (29, 30) is provided at the lower side of the sheet path, and said sheet biasing means is formed by gravity-biased balls (31, 32) that run in a housing (33, 34) permitting vertical displacements of the balls but restricts their lateral displacements.

3. An electrophotographic printer according to any of claims 1 to 2, wherein two sheet biasing means are provided, one near each lateral end of the sheet path.

4. An electrophotographic printer according to claim 2, wherein the driven roller means is formed by driven roller sections (29, 30) on a common shaft (28).

5. An electrophotographic printer according to claim 1, wherein the distance L_3 between the first (19) and the second roller pair (23) exceeds the length (L) of the sheet.

6. An electrophotographic printer according to any of claims 1 to 5, wherein one roller (25) of the second roller pair (23) has a hard peripheral surface and is driven, and the other roller (24) of said roller pair has equally a hard peripheral surface, and is spring-biased onto the first one and gear-coupled therewith.

7. An electrophotographic printer according to claim 6, wherein the other roller (24) has a diameter that is smaller than the diameter of the driven roller (25).

8. An electrophotographic printer according to claim 7, wherein the diameter of the other roller (24) is less than half the diameter of the driven roller (25).

9. An electrophotographic printer according to any of claims 1 to 8, which is provided with two paper drive arrangements, namely a secondary, lower grade paper drive that extends from the supply stack (17) of sheets to the sheet aligning roller pair (23), and a primary, high grade paper drive that extends from the first roller pair (47, 48) behind the sheet aligning roller pair to the fixing station (54) for the sheet.

10. An electrophotographic printer according to any of claims 1 to 9, wherein the imaging station (11) is formed by a semiconductor drum (40) for bearing a toner image, and from which said toner image is progressively transferred onto a sheet as such sheet is fed in tangential contact with such drum.

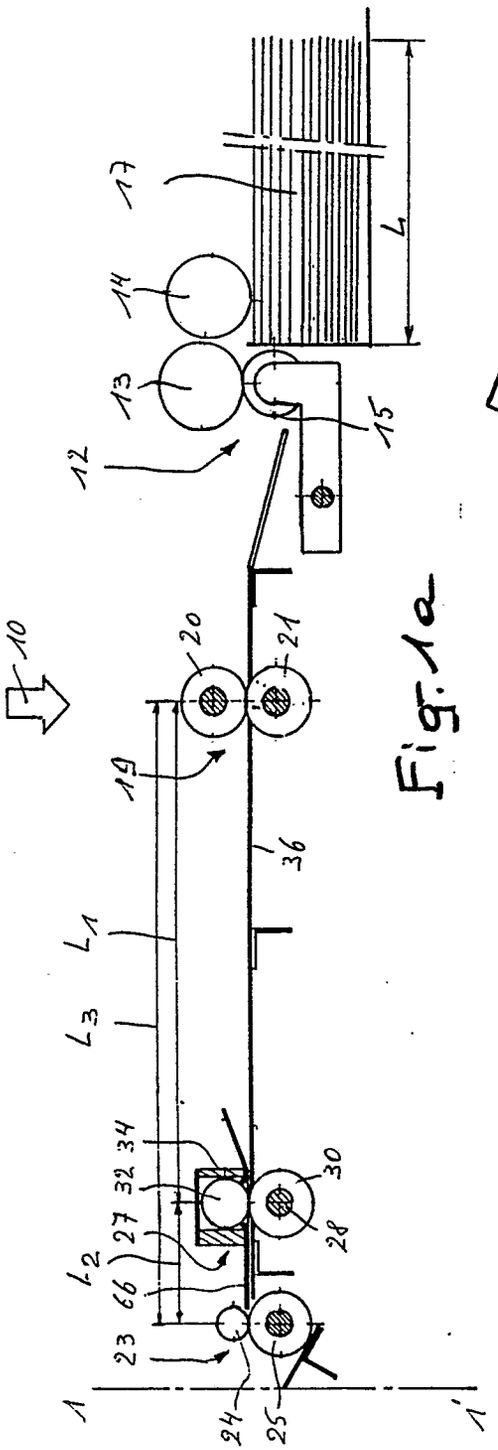
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Fig.1a

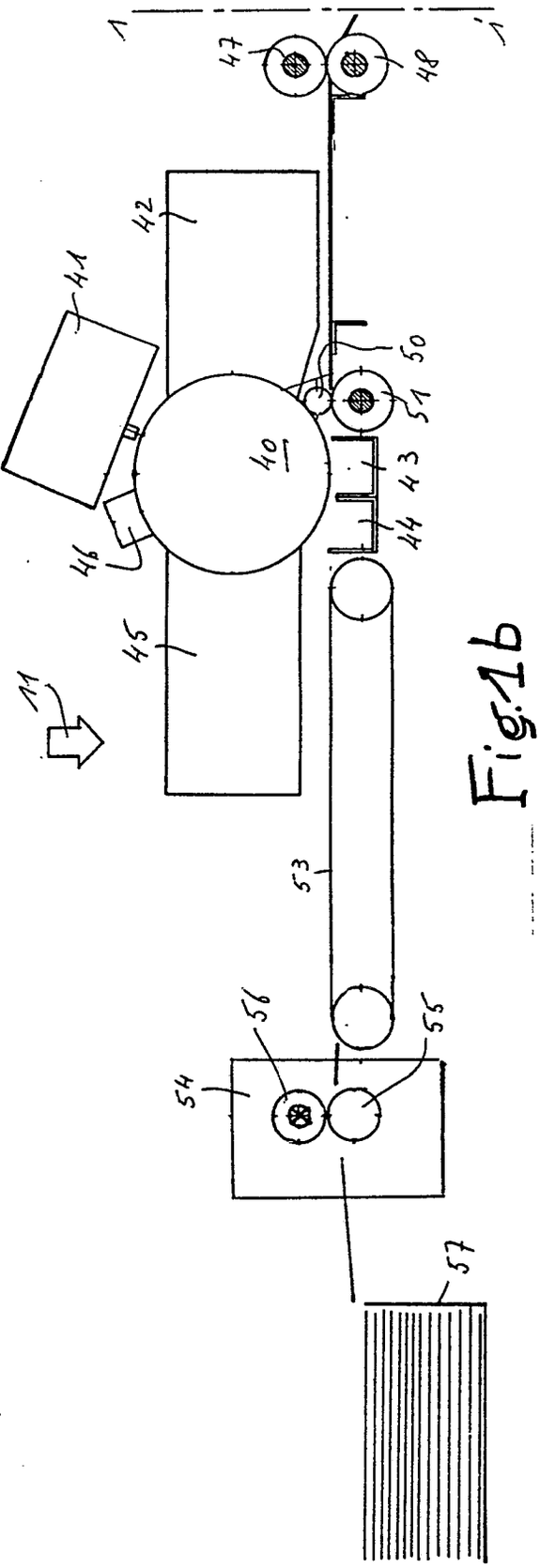
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Fig.1b

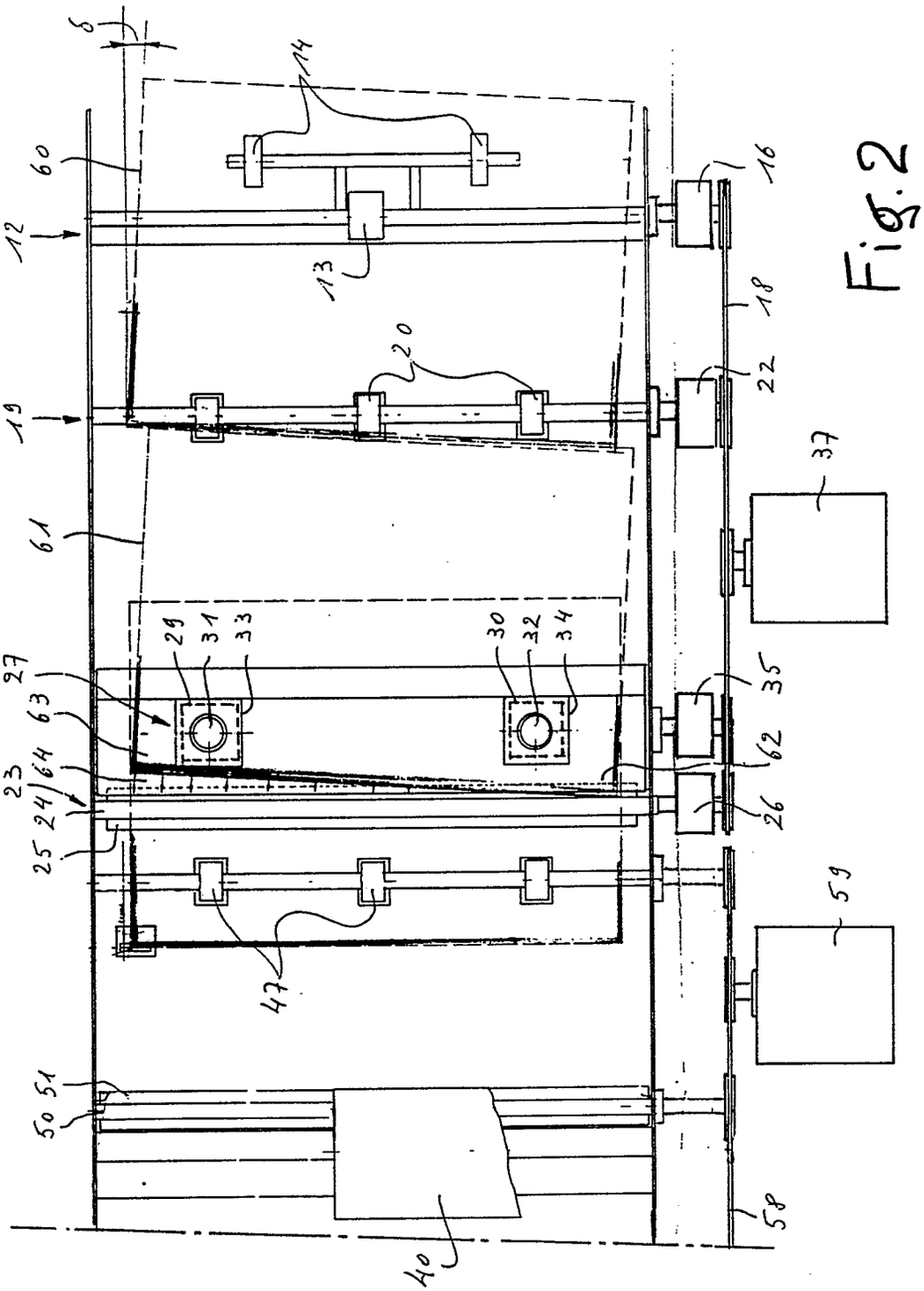
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Fig. 2

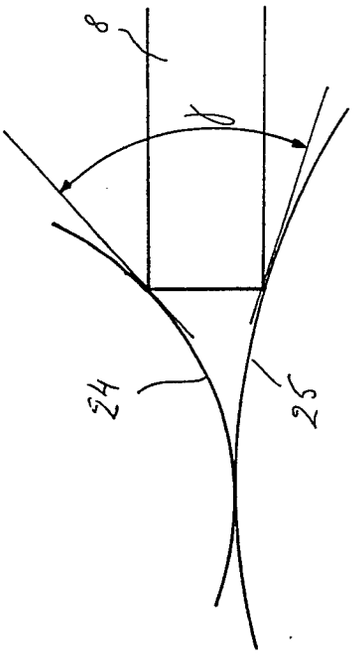

Fig. 3b

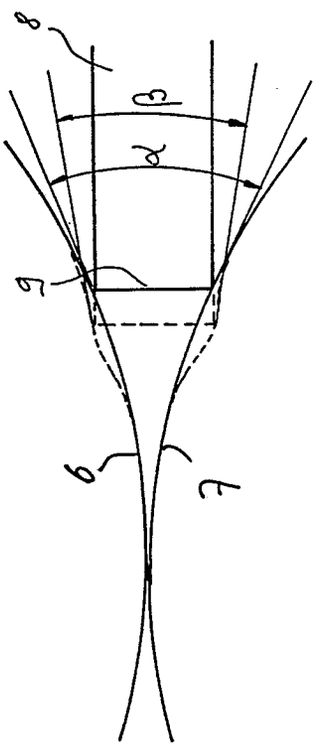

Fig. 3a

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 87 20 1375

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	US-A-4 349 188 (YOUNG) * Column 5, line 25 - column 6, line 7; abstract; figures 1,3 *	1-4,9, 10	G 03 G 15/00 B 65 H 9/16 B 65 H 9/14 B 65 H 5/06
Y	EP-A-0 153 598 (MITA INDUSTRIAL CO. LTD) * Page 11, line 10 - page 15, line 3; figure 3 *	1-4,9, 10	
A	US-A-4 669 719 (FRATANGELO) * Abstract; column 4, line 41 - column 5, line 35; figures 2,4 *	1,2,10	
A	PATENT ABSTRACTS OF JAPAN, vol. 8, no. 26 (M-273)[1463], 3rd February 1984; & JP-A-58 183 551 (CANON K.K.) 26-10-1983	1,2	
A	PATENT ABSTRACTS OF JAPAN, vol. 7, no. 275 (M-261)[1420], 8th December 1983; & JP-A-58 152 738 (FUJI XEROX K.K.) 10-09-1983	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	FR-A-2 389 564 (MASCHINENFABRIK AUGSBURG-NURNBERG AG) * Page 8, line 27 - page 9, line 3; figures 1,2,4,5 *	1,2	G 03 G 15/00 B 65 H 9/16 B 65 H 9/14 B 65 H 5/06 B 65 H 9/10

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22-03-1988	CIGOJ P.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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