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(54) **CLEANER MEMBER**

(57) The present invention relates to a cleaner member (30) for removing debris from an endless belt, to a printer apparatus comprising such cleaner member (30) and to a method for operating such printer apparatus. The cleaner member (30) according to the present invention comprises three helical grooves.

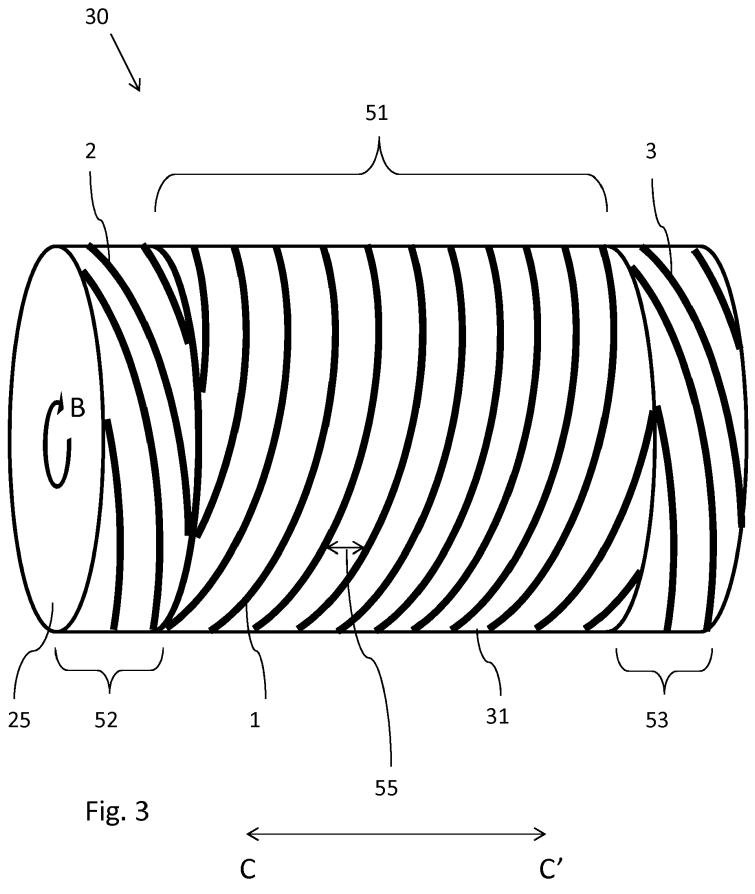

Fig. 3

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Description

[0001] The present invention relates to a cleaner member for removing debris from an endless belt, to a printer apparatus comprising such cleaner member and to a method for operating such printer apparatus.

Background of the invention

[0002] Printer devices are known in the art. Several types of printer devices are known, for example printer devices using toner to form an image on a recording medium. Such printer device may comprise an endless transfer belt for receiving a toner image and transferring said image to a final image recording medium. The endless transfer belt may become contaminated by impurities, such as paper dust or toner. Impurities may contaminate the printer device and may therefore decrease the quality of the printing process. Therefore, a cleaning member may be used in a printer device to remove impurities, such as paper dust and toner powder residues, from a surface of the endless transfer belt, from which a toner image is transferred and fixed on a receiving paper or other receiving material. Where necessary, a cleaning member of this kind can also be used in transport means which feed a print back to an image transfer station so that the reverse side can also be provided with an image, or which discharge the print to a collecting station a completed fixed print. The cleaning member may be constructed as a rotatable roller which moves over the endless belt for cleaning and is provided with a surface layer of polymeric material (e.g. toner) which is sticky at the operating temperature of the fixing device.

[0003] Cleaner members typically comprise a groove. A small layer of toner may be present on the outer surface of the cleaner member. Paper dust may stick to the toner and thus, paper dust may be removed by contacting the cleaner member with the transfer belt. Further, the cleaner member typically comprises a groove, such as a helical groove. Upon contact with a transfer belt comprising toner, toner may be forced through the groove of the cleaner member to an inner part of the cleaner member. Because of the groove, impurities, such as toner may be removed from the transfer belt to an inner part of the cleaning member. It also allows renewing the small layer of toner present on the outer surface of the cleaner member, to maintain the sticky property of the outer layer, such that paper dust can be removed continuously.

[0004] However, a disadvantage of a cleaner member having a helical groove is that toner may be transported by the cleaner member in the direction of the groove to an end portion of the cleaning member without being transferred to an inner part of the cleaner member. Consequently, toner may build up at an end portion of the cleaner member and may pollute the printing system.

[0005] It is an object of the present invention to provide a cleaning member that does not show the above disadvantage.

Summary of the Invention.

[0006] The object of the invention is achieved in a cleaner member for removing debris from an endless belt, the cleaner member comprising a substantially cylindrical body, the cleaner member having a first part, a second part and a third part, the second part being positioned at a first end portion of the cleaning member, the third being positioned at a second end portion of the cleaner member, the first part being provided with a first helical groove, the second part being provided with a second helical groove, the third part being provided with a third helical groove, wherein the first helical groove is of a right-handed helical groove and wherein the second helical groove and the third helical groove are left-handed helical grooves, OR wherein first helical groove is a left-handed helical groove and wherein the second helical groove and the third helical groove are right-handed helical grooves.

The cleaner member according to the invention may be used in a printer apparatus, also known as image forming apparatus, comprising an endless belt. The endless belt may be a transfer belt configured to temporarily carry a toner image and transfer said toner image to a final recording medium, such as a sheet of paper. During printing operation, the endless belt may be contaminated, for example by dust or other contaminants originating from the final recording medium, e.g. paper. In a printer apparatus, the cleaner member is configured to remove contaminants (debris) from such endless belt. The cleaner member may -in operation- be in engaging contact with the endless belt; the outer surface of the cleaner member may contact the surface of the endless belt. The outer surface of the cleaner member may be provided with a layer, preferably a thin layer of toner. The toner layer may be a sticky layer. Due to the sticky nature of the toner layer provided on the outer surface of the cleaner member, dust and other debris present on the endless belt may stick to the cleaner member and may be removed from the endless belt, thereby cleaning the endless belt.

[0007] The cleaner member may comprise a substantially cylindrical body. The cylindrical body may comprise a hollow space in the interior of the cylindrical body. Toner and debris may be transferred from the outer surface of the cleaner member to the hollow space via one of the cylindrical grooves. The hollow space may be configured to receive debris and toner. The debris and toner may be stored in said hollow space. The debris and toner stored in the hollow space in the interior of the cleaner member may not come into contact with the endless belt and may therefore not pollute the endless belt.

In operation, the cleaner member may be rotated in a direction perpendicular to the axis of the substantially cylindrical body. The cleaner member comprises a groove that allows debris and toner to be transferred from the outer surface of the cleaner member and the outer surface of the endless belt to the hollow space in the interior of the cleaner member. In operation, the endless

belt may rotate. A nip may be formed by the endless belt and the cleaner member. In the nip, toner and debris present on the outer surface of the cleaner member and/or the endless belt may be forced into the hollow space in the cleaner member through the helical groove. At a position of the endless belt where the groove of the cleaner member contacted the endless belt, toner and debris may remain on the endless belt. Therefore, the grooves formed in the cleaner member may be helical grooves. As a consequence, during a subsequent contact between the endless belt and the cleaner member, the remaining toner and debris may be forced through the helical groove.

The cleaner member may comprise a first part and a second part. The second part of the cleaner member may be provided at a first end portion of the cylindrical body (in the direction of the longitudinal axis of the substantially cylindrical body). The first part may be positioned away from the end portion. The cleaner member may further comprise a third part. The third part of the cleaner member may be provided at a second end portion of the cylindrical body (in the direction of the longitudinal axis of the substantially cylindrical body).

A first helical groove may be provided on the first part of the cleaner member. The helix angle of the first helical groove may be non-zero. In case the helix angle is non-zero, than the line of toner that resided on the endless belt after contacting the cleaner member may be removed after a further rotation of the endless belt, without moving the relative position of the endless belt and the cleaner member. In case the helix angle of the first helical groove would be zero, then it may not be possible to remove the line of toner that resided on the endless belt after contacting the cleaner member without moving the relative position of the endless belt and the cleaner member. The first helical groove may be either a left-handed helical groove or a right-handed helical groove. The helical groove may -to a small extent- transport debris and toner in a direction of the groove towards an end portion of the cleaner member. Optionally, the first part of the cleaner member may comprise more than one helical groove. Preferably, a helix angle of a further helical groove is equal to a helix angle of the first helical groove.

To prevent contamination of the printer apparatus, a second helical groove is provided in the second part of the cleaning member. The second helical groove is either a right-handed or a left-handed helical groove. One of the first helical groove and the second helical groove may be a right-handed helical groove and the other one of the first helical groove and the second helical groove may be a left-handed helical groove. In case debris and/or toner is transported by the first helical groove towards the second part of the cylindrical body, then the debris and/or toner may arrive at the second part of the cylindrical body provided with the second helical groove. The second helical groove that advances in an opposite direction with regard to the first helical groove may stop the debris and/or toner to move towards the end portion, thereby preventing contamination of the printing system.

To further prevent contamination of the printer apparatus, a third helical groove is provided in the third part of the cleaning member. The handedness of the third helical groove may be the same as the handedness of the second helical groove. If the second helical groove is right-handed, the third helical groove may also be right-handed. If the second helical groove is left-handed, the third helical groove may also be left-handed. The third helical groove may prevent contamination of the printer apparatus analogously to the second helical groove.

[0008] In an embodiment, the first helical groove has a helix angle α, and wherein the second helical groove has a helix angle β, wherein : $-(\alpha+2°) < ß < -(\alpha-2°)$.

A helix angle is the angle between any helix and an axis perpendicular to the longitudinal axis of the substantially cylindrical body. Preferably, the helix angle of the second helical groove (ß) may be in the range of:: $-(\alpha+2°) < ß < -(\alpha-2°)$. Preferably, $ß \neq 0$.

[0009] In an embodiment, the third helical groove has a helix angle γ, wherein the helix angle γ of the third portion is substantially the same as the helix angle ß of the second helical groove.

Both end portions may be provided with a helical groove that is different from the first helical groove provided in the first part of the cleaner member. The first part may be positioned in between the second and third part.

[0010] In an embodiment, $1° < \alpha < 25°$.

The helical groove may have a helix angle α that is in between 8° and 35°. In case the helix angle α is smaller than 8°, then debris and toner may stay on the endless belt, even if the endless belt contacts the cleaner member for a second time after a full rotation of the endless belt. More preferably, the helix angle α is in the range of 2°-8°, for example in the range of 3°-5°, such as 4°.

[0011] In an embodiment, the pitch of the first helical groove is in the range of from 0.4 cm to 3.0 cm.

The pitch of the helical groove is the distance, measured along the longitudinal axis of the substantially cylindrical clean member that is covered by one complete rotation of the screw. Preferably, the pitch is not smaller than 0.4 cm, because then -in operation- the contact area between the endless belt and the cleaner member may be too small to effectively transfer toner and debris from the endless belt to the cleaner member. Preferably, the pitch does not exceed 3.0 cm, because then toner residue present on the endless belt may not be able to reach the helical groove when the cleaner member contacts the endless belt. Preferably, the pitch of the first helical groove is in the range of from 0.5 cm to 2.0 cm.

[0012] In an embodiment, the cleaner member further comprises an axis for driving the cleaner member, wherein the axis of the cleaner member has a smaller radius than the radius of the substantially cylindrical shape and wherein the axis and the substantially cylindrical body are connected by at least one bar.

In operation, the cleaner member may rotate around an axis. The axis may e.g. be positioned in the interior of

the substantially cylindrical body. The axis may be driven by suitable driving members. The axis may also provide mechanical stability to the cleaner member. The axis may be connected to the substantially cylindrical body by suitable connectors.

[0013] In an aspect of the invention, a printer apparatus comprising an endless transfer belt for receiving a toner image and transferring said toner image to a final image recording medium is provided, the printer apparatus further comprising a cleaner member according to any of the preceding claims.

[0014] In an embodiment, the endless transfer belt has a width, and wherein the endless belt is configured to receive a toner image having a maximum image width, wherein the first part of the cleaning member has a width that is larger than the maximum image width. When a toner image is applied onto the endless belt, the toner image may be transferred to a recording medium, such as a sheet of paper. The toner image and the recording medium may contaminate the endless belt. For example, not all toner may be transferred to the recording medium such that residual toner stays on the endless belt, and paper dust originating from the recording medium may stick to the endless belt. In order to remove this debris, the endless belt may be brought into contact with the cleaner member. Preferably, the first part of the cleaner member has a width that is larger than a maximum width of the maximum image width, such that all debris resulting from the printing process may be removed from the endless belt by the cleaner member.

Preferably, the width of the first part of the cleaner member is larger than a width of the second part of the cleaner member. Preferably, the width of the first part of the cleaner member is larger than a width of the third part of the cleaner member. More preferably, the width of the first part of the cleaner member is larger than the sum of the width of the second part of the cleaner member and the width of the third part of the cleaner member.

[0015] In an aspect of the invention, a method for operating a printer apparatus is provided, the method comprising an endless transfer belt for receiving a toner image and transferring said toner image to a final image recording medium, the printer apparatus further comprising a cleaner member according to the present invention, the method comprising the steps of:

a. In a printing mode, providing a toner image to the endless transfer belt and transferring the toner image to a final image recording medium;
b. In a cleaning mode, providing a toner image to the endless transfer belt and transferring the toner image to the cleaner member.

[0016] Hence, the present invention involves a method for operating a printing apparatus comprising a cleaner member according to the present invention.

Brief Description of the Drawings

[0017]

Fig. 1 is a schematic view of an image forming apparatus to which the invention is applicable;
Fig. 2 illustrates a maintenance operation of the cleaner member of the image forming apparatus;
Fig. 3 shows a schematic view of a cleaner member according to a first embodiment of the present invention.
Fig. 4 shows a schematic view of a cleaner member according to a second embodiment of the present invention.
Fig. 5 shows a cross-section of the cleaner member according to an embodiment of the present invention.
Fig. 6 shows a front view of the cleaner member according to a second embodiment of the present invention.

Detailed Description of the Drawings

[0018] In the drawings, same reference numerals refer to same elements.

[0019] Fig. 1 shows an example of an image forming apparatus having a photoconductive drum 10, a drum-type image carrier 12 and a transport system 14 arranged for feeding sheets 16 of a recording medium, e. g. paper, through a transfuse nip 18 formed between the image carrier 12 and a heated fuse roller 20.

[0020] An image forming system 22 is arranged at the periphery of the photoconductive drum 10 for creating an electrostatic charge image on the surface of the drum. By way of example, the image forming system 22 may comprise a laser exposure system for exposing and discharging the drum in accordance with image information supplied thereto.

[0021] A developer station 24 is arranged for developing the electrostatic charge image with (black) toner, thereby to form a toner image on the surface of the electrographic drum 10. At a nip formed between the drum 10 and the image carrier 12, the toner image is transferred onto the surface of the image carrier 12 by means of adhesion and/or electrostatic forces in a cold process. When the toner image thus formed on the surface of the image carrier 12 reaches the transfuse nip 18, it is transferred in a hot process onto the sheet 16 and is fused thereon by the heat generated by the fuse roller 20.

[0022] As has symbolically been shown in Fig. 1, a first toner image 26 is just being transferred onto the sheet 16 while a second toner image 28 is just being formed at the developer station 14 and transferred onto the image carrier 12. The image forming apparatus may be configured to apply toner image of a certain sizes, corresponding to certain widths, to the image carrier 12. There may be a maximum image width. The maximum image width may be determined e.g. by the size of the

photoconductive drum.

[0023] A cleaner member 30 is arranged at the periphery of the image carrier 12 at a position downstream of the transfuse nip 18 and has the purpose to remove from the surface of the image carrier any dust that may have been released by the sheets 16.

[0024] The transport system 14 comprises several pairs of transport rollers 32 and guide plates 34 defining a transport path for the sheets 16. Some of the transport rollers 32 are driven under the control of a control unit 36 which also controls the image forming system 22 as well as the operation of the other components of the image forming apparatus.

[0025] When the recording sheets 16 are successively passed through the apparatus and printed, they will release a certain amount of dust which will be deposited on the image carrier 12 and then collected by the cleaner member 30. As a consequence, after a certain time of operation, depending on the quality of the recording sheets, the amount of dust collected on the surface of the cleaner member 30 will have become so large that the cleaning capacity decreases, and it is necessary to restore the cleaning capacity of the cleaner member 30. To this end, a cleaning operation is performed that will now be described in conjunction with Fig. 2.

[0026] Continuous toner layers 38 and 40 are formed on the surface of the drum 10 and of the image carrier 12. In this case, however, the transport system 14 is controlled to suspend the supply of recording medium sheets for a certain time, so that the transport path is empty. As a result, the toner layer 40 is not transferred onto any recording medium, but is passed on until it reaches the nip formed between the image carrier 12 and the cleaner member 30. If necessary, the fuse roller 20 may be somewhat retracted from the image carrier in order to prevent toner from being transferred onto the fuse roller. The toner that reaches the cleaner member 30 is transferred from the image carrier 12 onto the cleaner and forms a toner layer 42 on the surface of the cleaner member.

[0027] The maintenance operation may be continued or repeated until the toner layer 42 on the cleaner 30 has reached a sufficient thickness. Then, when new sheets are printed in the same way as in Fig. 1, the surface of the image carrier 12 will not only be free of dust but also free of any toner residues, so that an excellent print quality can be achieved. As is known in the art, the toner layer 42 will remain on the cleaner member 30 and will bury the dust that has been accumulated thereon, thereby restoring the cleaning capacity of the cleaner member 30, so that new sheets may be printed in excellent quality, until the next cleaning process becomes necessary. Optionally, the maintenance operation may be preceded by an image carrier cleaning operation, to ensure that the surface of the image carrier is free of dust when the cleaner member cleaning operation as shown in Fig. 3 is performed. Preferably, the first width of the first part of the cleaner member (not shown) is larger than the maximum width of the toner image, thereby allowing the cleaner member to take up the entire image in case of transfer of the toner image from the image carrier 12 to the cleaner member 30.

The cleaning process that has been described above is applicable also in an apparatus in which images are not printed on separate sheets but on a recording medium in the form of a continuous web. Then, of course, care must be taken that no toner is transferred onto the fuse roller 20 during the clean image step shown in Fig. 2.

If the image forming apparatus is capable of printing on sheets or webs that may have different widths, it will be understood that the maintenance operation should be performed for the maximum width of the recording medium, so that dust will be removed from the image carrier 12 on the entire (axial) length thereof and the toner layer 42 will be applied on the entire length of the cleaner 30. When printing on a continuous web, a known web change mechanism may be used for automatically selecting the web with the largest width.

In the example that has been described here, the image forming system comprises the image forming system 22 and the developer station 24. In a modified embodiment, the direct induction process (DIP), for example, might be employed for forming the toner image directly on the surface of the drum 10 which will then be a DIP drum.

Moreover, the invention is not limited to a two-step image transfer process, in which the toner image is first transferred from the drum 10 to the image carrier 12 (serving as an intermediate carrier) and then onto the recording medium. In a modified embodiment, the toner image could be formed directly on the surface of the image carrier 12. Furthermore, the drum 10 and/or the image carrier 12 may be an endless belt instead of a drum.

[0028] Fig. 3 shows a schematic view of a cleaner member 30 according to a first embodiment of the present invention. The cleaner member 30 has a substantially cylindrical body 31. The essentially cylindrical body comprises a first part 51, a second part 52 and a third part 53. In the embodiment shown in Fig. 3, the first part 51 is positioned in between the second part 52 and the third part 53. The first part 51 of the cleaner member is provided with a first helical groove 1. The first helical groove 1 allows material (e.g. toner or paper duct) to enter the inside of the substantially cylindrical body (not shown). The cleaner member comprises a hollow part 25, which is located in the interior of the substantially cylindrical body 31. The groove may connect the hollow part 25 with the exterior of the cleaner member 30. The first helical groove 1 has a pitch 55. Preferably, the pitch 55 is in the range of from 0.4 cm to 3.0 cm. The part of the cylindrical body in between the turnings of the first helical groove 1 is configured -in operation in a printing apparatus comprising an endless belt- to be in contact with the endless belt. The part of the cylindrical body in between the turnings of the first helical groove 1 may in operation- be covered with a thin layer of toner. The first helical groove is a right-handed helical groove. In operation, the cleaner member may rotate in a direction B. Due to the rotation

and the presence of the first helical groove, contaminants may move in direction C when the cleaner member contacts the endless belt (not shown).

The second part 52 of the substantially cylindrical body is provided with a second helical groove 2. The second helical groove 2 is a left-handed helical groove. In operation, the second groove may prevent contaminants that are present near the border of the first part 51 and second part 52 to further advance in the direction C and may push contaminants back in direction C'. In this way, it is ensured that contaminants, e.g. toner, stay attached to the cleaner member and may not prevent other parts of the printing apparatus. The third part 53 of the substantially cylindrical body is provided with a third helical groove 3. The third helical groove 3 is a left-handed helical groove, like the second helical groove 2.

[0029] Fig. 4 shows a schematic view of a cleaner member 30 according to a second embodiment of the present invention. The cleaner member 30 has a substantially cylindrical body 31. In Fig. 4, a first part 51 and a second part 52 of the essentially cylindrical body are shown. The first part 51 of the cleaner member is provided with a first helical groove 1, whereas the second part 52 of the cleaner member is provided with a second helical groove 2. The first helical groove 1 as well as the second helical groove 2 allow material (e.g. toner or paper dust) to enter the inside of the substantially cylindrical body (not shown).

[0030] Fig. 5 shows a cross-section of the cleaner member 30, wherein the cross-section is taken along the line A-A' (see Fig. 4). The cross section shows the cleaner member 30 comprising the substantially cylindrical body 31. The substantially cylindrical body 31 forms a hollow space 25. The hollow space 25 can be (partially) filled with contaminants comprising toner 70. When operating the cleaner member, the amount of contaminant 70 accommodated in the interior of the cleaner member 30 may gradually increase, thereby gradually decreasing the hollow space 25. The cleaner member 30 further comprises an axis 60 for driving the cleaner member. The radius of the axis is smaller than the radius of the cylindrical body. As a consequence, the axis 60 can be accommodated in the interior of the substantially cylindrical body 31. The axis 60 and the substantially cylindrical body are connected via bars 61. In Fig. 5, 4 bars 61 are depicted, but alternatively the cleaner member 30 may comprise a different number of bars 61. The bars 61 may provide stiffness to the cleaner member and may enable the cleaner member to rotate upon rotation of the axis 60. The axis 60 may be connected to suitable driving means (not shown) for moving the axis.

[0031] Fig. 6 shows a front view of the cleaner member 30. The cleaner member comprises a first part 51 and a second part 52. The first part of the cleaner member 51 comprises a first helical groove 1. The first helical groove 1 has a helix angle α. The helix angle α is defined with regard to a line perpendicular to the axis of the cleaner member 30 having a substantially cylindrical body 31. The second part of the cleaner member 52 comprises a second helical groove 2. The second helical groove 2 has a helix angle ß. The helix angle ß is defined with regard to a line perpendicular to the axis of the cleaner member 30 having a substantially cylindrical body 31. The third part of the cleaner member 51 is not shown.

[0032] Detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which can be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually and appropriately detailed structure. In particular, features presented and described in separate dependent claims may be applied in combination and any combination of such claims are herewith disclosed. Further, the terms and phrases used herein are not intended to be limiting; but rather, to provide an understandable description of the invention. The terms "a" or "an", as used herein, are defined as one or more than one. The term plurality, as used herein, is defined as two or more than two. The term another, as used herein, is defined as at least a second or more. The terms including and/or having, as used herein, are defined as comprising (i.e., open language). The term coupled, as used herein, is defined as connected, although not necessarily directly.

Claims

1. Cleaner member (30) for removing debris from an endless belt, the cleaner member (30) comprising a substantially cylindrical body, the cleaner member having a first part (51), a second part (52) and a third part (53), the second part being positioned at a first end portion of the cleaning member, the third being positioned at a second end portion of the cleaner member, the first part being provided with a first helical groove (1), the second part being provided with a second helical groove (2), the third part being provided with a third helical groove (3), wherein the first helical groove (1) is a right-handed helical groove and wherein the second helical groove (2) and the third helical groove (3) are left-handed helical grooves, OR wherein first helical groove (1)is a left-handed helical groove and wherein the second helical groove (2) and the third helical groove (3) are right-handed helical grooves.

2. Cleaner member according to claim 1, wherein the first helical groove (1) has a helix angle α, and wherein the second helical groove (2) has a helix angle ß, wherein : $-(\alpha+2°) < ß < -(\alpha-2°)$

3. Cleaner member according to any of the preceding

claims, wherein the third helical groove (3) has a helix angle γ, wherein the helix angle γ of the third portion is substantially the same as the helix angle ß of the second helical groove.

4. Cleaner member according to claim 2, wherein $1° < \alpha < 25°$.

5. Cleaner member according to any of the preceding claims, wherein the pitch of the first helical groove (1) is in the range of from 0.4 cm to 3.0 cm.

6. Cleaner member according to any of the preceding claims, wherein the cleaner member (30) further comprises an axis (60) for driving the cleaner member (30), wherein the axis (60) of the cleaner member (30) has a smaller radius than the radius of the substantially cylindrical shape and wherein the axis (60) and the substantially cylindrical body are connected by at least one bar.

7. Printer apparatus comprising an endless transfer belt for receiving a toner image and transferring said toner image to a final image recording medium, the printer apparatus further comprising a cleaner member (30) according to any of the preceding claims.

8. Printer apparatus according to claim 7, wherein the endless transfer belt has a width, and wherein the endless belt is configured to receive a toner image having a maximum image width, wherein the first part of the cleaning member (51) has a width that is larger than the maximum image width.

9. Method for operating a printer apparatus, the method comprising an endless transfer belt for receiving a toner image and transferring said toner image to a final image recording medium, the printer apparatus further comprising a cleaner member (30) according to any of the claims 1-6, the method comprising the steps of:

a. In a printing mode, providing a toner image to the endless transfer belt and transferring the toner image to a final image recording medium;
b. In a cleaning mode, providing a toner image to the endless transfer belt and transferring the toner image to the cleaner member (30).

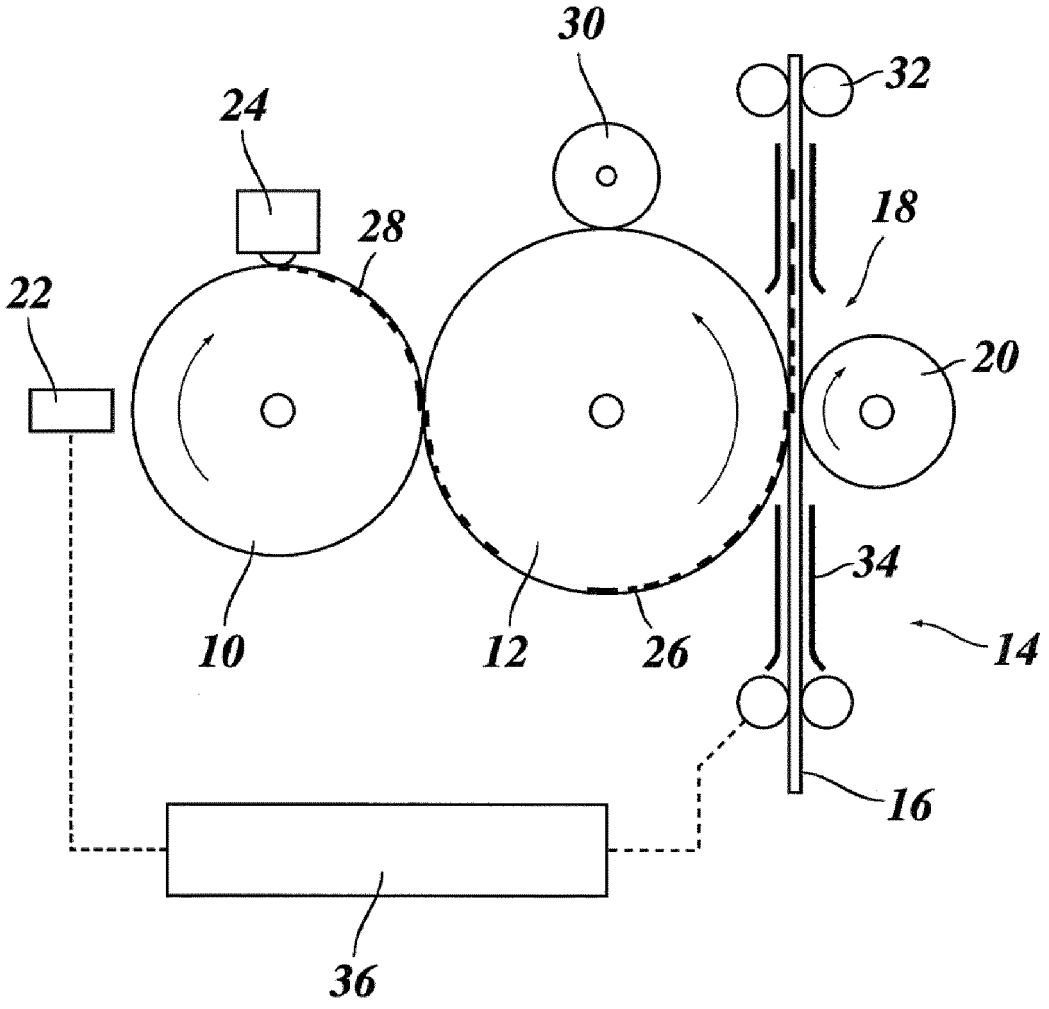

Fig. 1

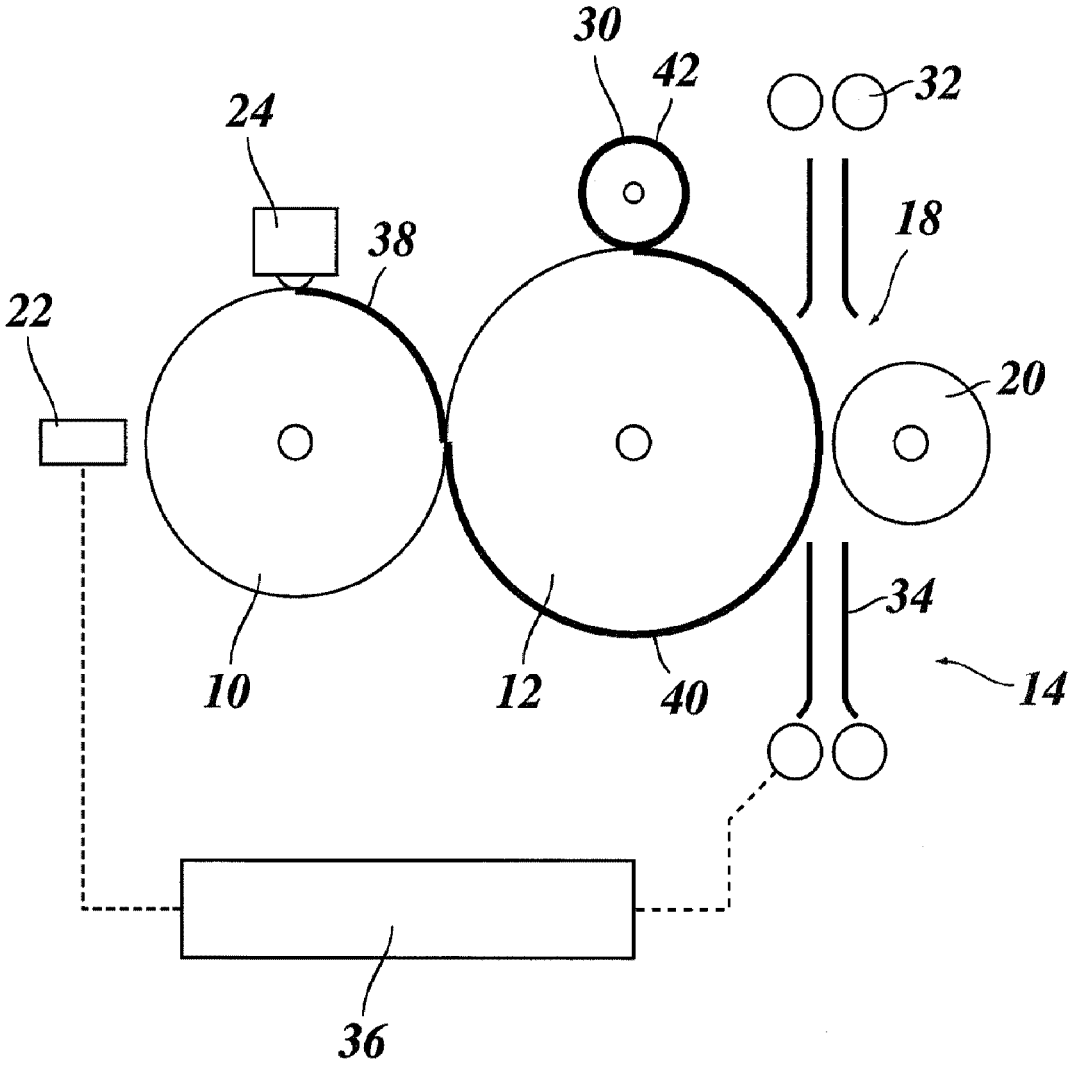

Fig. 2

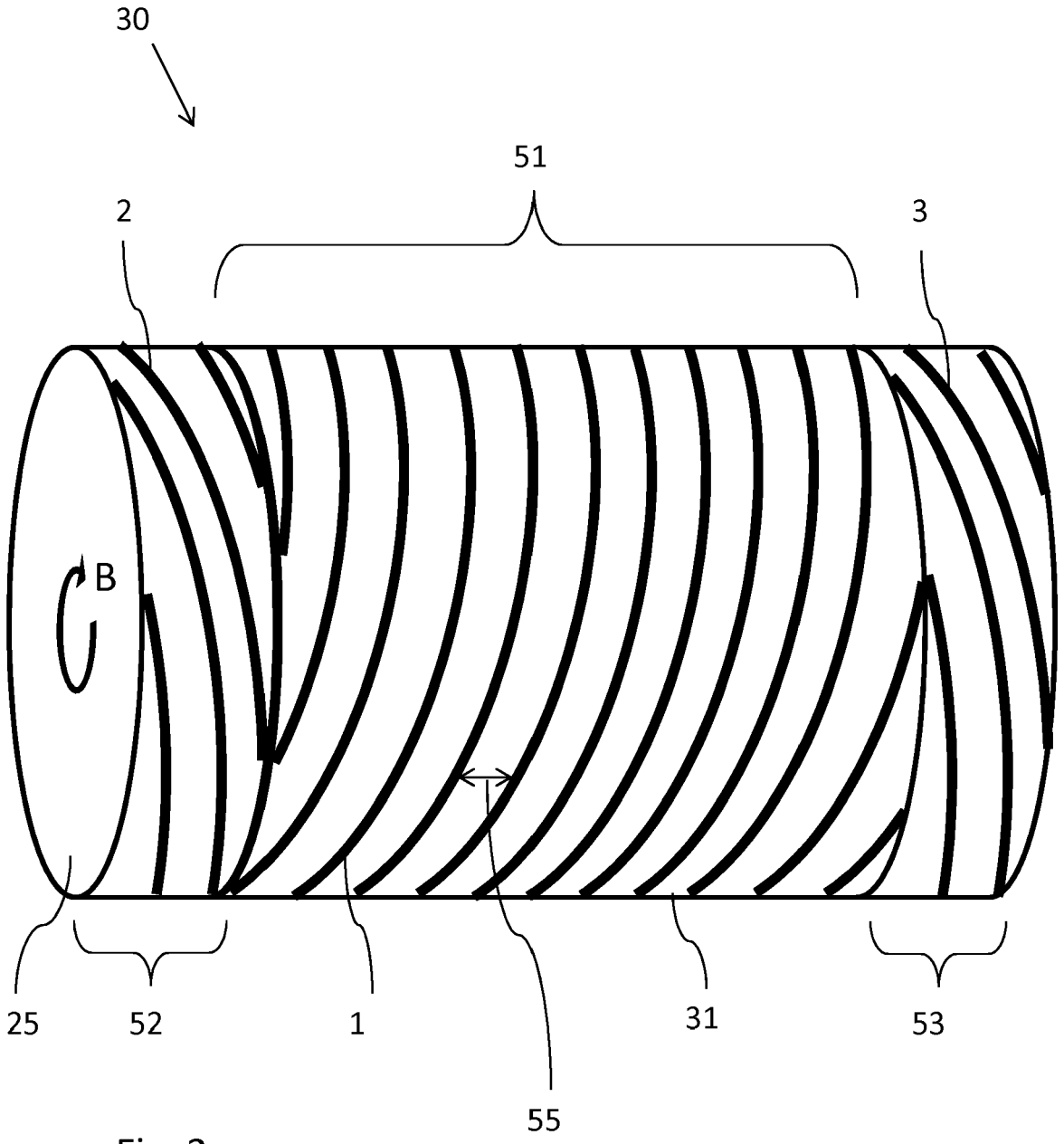

Fig. 3

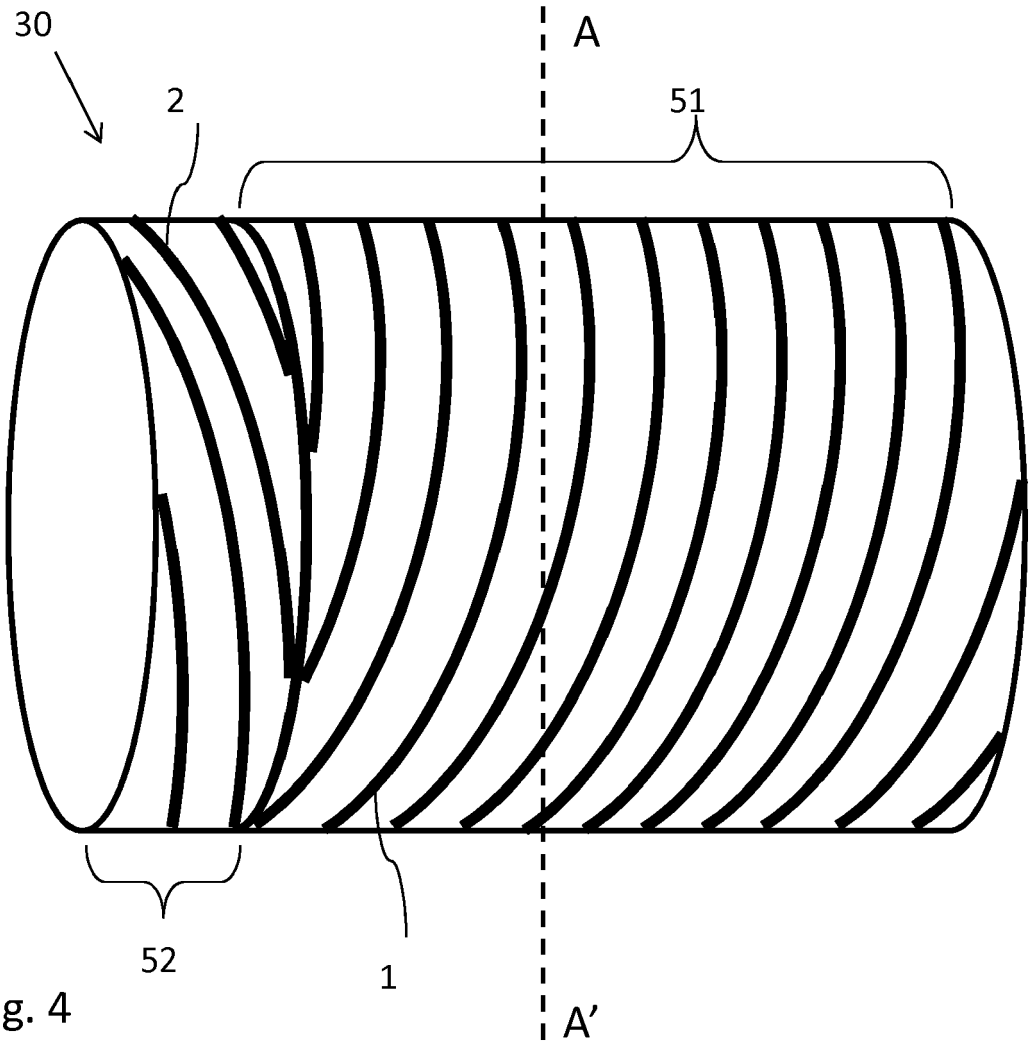

Fig. 4

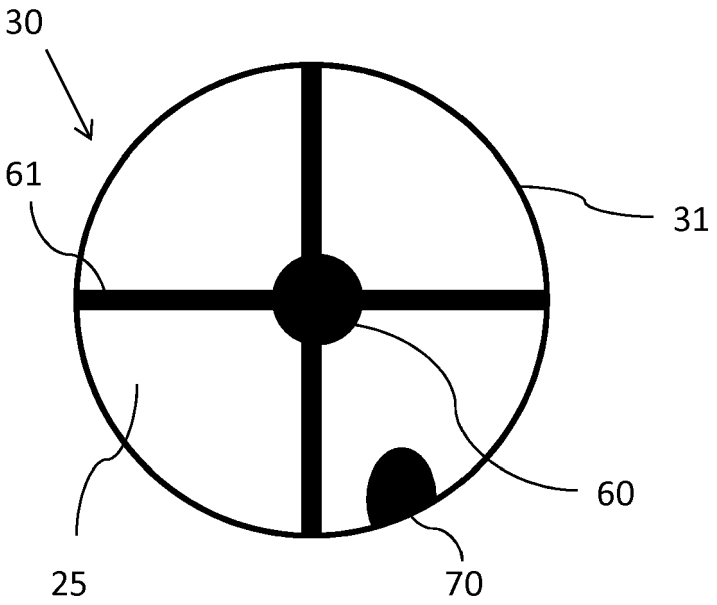

Fig. 5

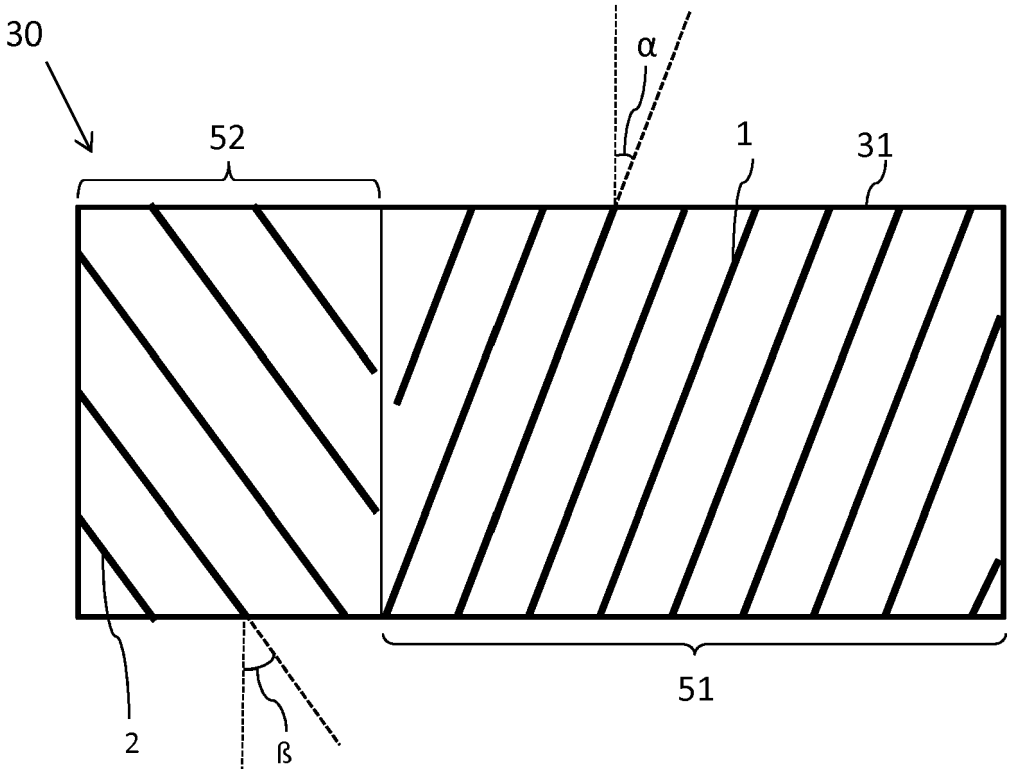

Fig. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 15 2250

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2005/207803 A1 (DEGUCHI MASANOBU [JP] ET AL) 22 September 2005 (2005-09-22) * abstract; figure 10b * * paragraphs [0127], [0229] *	1-9	INV. G03G15/16
A	JP 2004 191406 A (RICOH KK) 8 July 2004 (2004-07-08) * abstract *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 June 2017	Pavón Mayo, Manuel

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
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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