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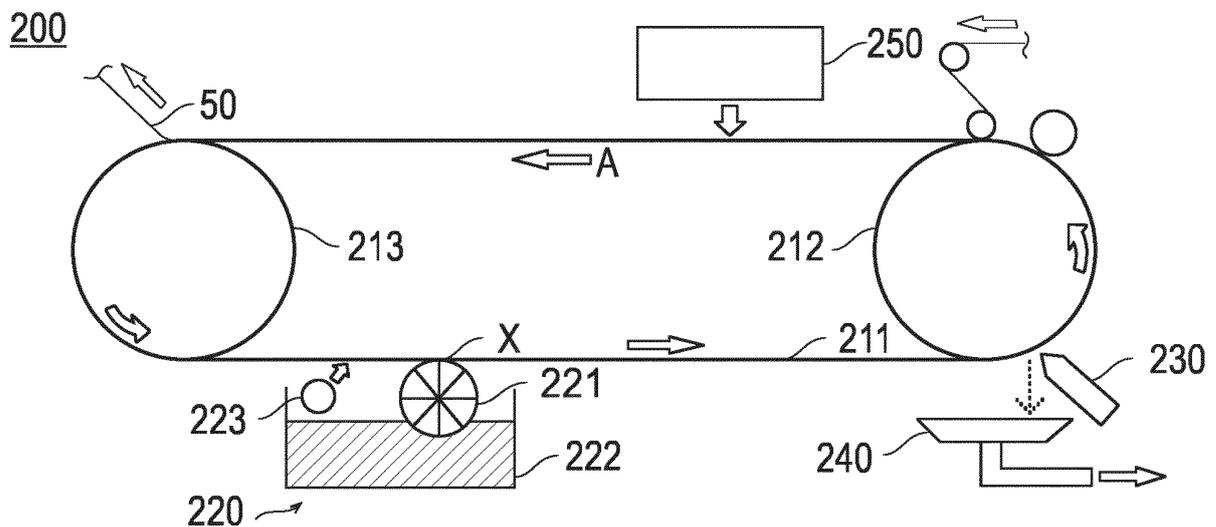
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(54) **CONVEYING BELT APPARATUS AND IMAGE RECORDING SYSTEM**

(57) A conveying belt apparatus (200) includes an endless conveying belt (211) on which an adhesive is coated in order to convey a recording medium (50), rollers (212, 213) that stretches and drives the conveying belt (211), a cleaning section (220) that cleans a foreign substance having adhered to the conveying belt with a cleaning liquid, and an air knife nozzle (230) that blows compressed air onto the conveying belt (211) on a

downstream side in a conveyance direction of the cleaning section (220), wherein within a range of a circumference curved-surface where a first roller (212) and the conveying belt (211) come in contact with each other, a blowing port of the air knife nozzle (230) is disposed so as to blow compressed air from a lower side than a virtual horizontal line toward the conveying belt (211) on an upper side.

FIG.2



Description

Cross-Reference to Related Application

[0001] The entire disclosure of Japanese patent application No. 2018-133032, filed on July 13, 2018, is incorporated herein by reference in its entirety.

BACKGROUND

1. TECHNICAL FIELD

[0002] The present invention relates to a conveying belt apparatus and an image recording system including a conveying belt apparatus.

2. DESCRIPTION OF RELATED ARTS

[0003] In recent years, as apparatuses that record high definition images to various recording media, such as paper and a cloth, image recording apparatuses by an ink jet system have been used widely. In particular, in the case where a recording medium is a long-sized web shape, a conveying belt apparatus including an endless conveying belt is used, and the recording medium is conveyed with being brought in contact with the conveying belt by using an adhesive.

[0004] At that time, due to misfeeding of a recording medium, frameless printing, bleed-through of ink droplets, and the like, there may be a case where ink droplets jetted from a recording head adhere to the conveying belt. In this case, there may occur troubles that, for example, the ink droplets having adhered to a conveying belt transfer to a recording medium having been newly supplied on the conveying belt and soil the recording medium.

[0005] Moreover, a recording medium, depending on its kind, may generate contaminants, such as paper powder, waste threads, and pretreatment agents. Subsequently, there may be a case where the above contaminants are mixed with ink droplets jetted toward and having adhered to a conveying belt and the resulting mixture adheres to the conveying belt as foreign substances.

[0006] In the case of having left the foreign substances having adhered to the conveying belt, there occur problems that the foreign substance will adhere to the back surface of a newly-supplied recording medium and lower product quality, or will influence friction between the conveying belt and a recording medium and make the conveyance of the recording medium unstable.

[0007] Therefore, in such a conveying belt apparatus or an image recording apparatus, generally, there is provided a cleaning section for cleaning by bringing a cleaning roller in contact with foreign substance having adhered to the surface of the conveying belt.

[0008] In such a cleaning section, in order to perform cleaning by a cleaning roller efficiently, the cleaning is performed by immersing a part of a cleaning roller, such

as a brush roller and a sponge roller, in a leaning liquid and by making the cleaning liquid adhere to the surface of the endless conveying belt by the rotation of the roller.

[0009] In an image recording apparatus disclosed in Patent Literature 1 (JP 2012-116619A), cleaning liquid droplets having remained on a conveying belt are removed by using a blade that comes in contact with the surface of the conveying belt on the downstream side in the conveyance direction of the conveying belt than a cleaning liquid adhesion position by a cleaning section and removes the cleaning liquid having adhered to the surface of the conveying belt. Moreover, in an ink jet recording apparatus disclosed in Patent Literature 2 (JP 2010-234579A), cleaning liquid droplets having remained on a conveying belt are removed by using an air knife nozzle that blows pressurized air to a horizontal surface of the conveying belt.

SUMMARY

[0010] However, in the case of a constitution that coats an adhesive on the surface of a conveying belt in order to convey a recording medium by making the recording medium adhere as mentioned in the above, if a cleaning roller of a cleaning section is brought in pressure contact with a conveying belt, there is a problem that pressure contact traces or concavo-convex portions easily occur on the surface of a conveying belt due to pressure contact traces.

[0011] In particular, in the case where a recording medium to be conveyed is a cloth, due to a matter that concavo-convex portions on the surface of a conveying belt or foreign substances separated from a recording medium are brought in pressure contact with an adhesive, scratches and concavo-convex portions are easily caused on its surface.

[0012] In the case of cleaning with a cleaning liquid the conveying belt on the surface of which scratches and concavo-convex portions have occurred, the cleaning liquid will enter and adhere to the inside of the scratches and concavo-convex portions. In this case, it is difficult to remove the cleaning liquid droplets which have invaded the scratches and concavo-convex portions on the surface of the conveying belt.

[0013] The present invention has been achieved in view of the above-described circumstances, and an object is to provide a conveying belt apparatus that removes effectively cleaning liquid droplets having remained on a surface of a conveying belt after the cleaning by a cleaning section relative to various types of conveying belt apparatuses and to provide an image recording system including a conveying belt apparatus.

[0014] To realize the above-mentioned object, a conveying belt apparatus reflecting one aspect of the present invention is a conveying belt apparatus (200) that includes an endless conveying belt (211) on which an adhesive to convey a recording medium is coated, a plurality of rollers (212, 213) that stretches and drives the con-

veying belt, a cleaning section (220) that cleans a surface of the conveying belt with a cleaning liquid, and an air knife nozzle (230) that blows compressed air onto the conveying belt on a downstream side in a conveyance direction of the cleaning section, characterized in that, wherein within a range where a first roller (212) among the plurality of rollers and the conveying belt come in contact with each other, a blowing port of the air knife nozzle is disposed so as to blow compressed air from a lower side than a virtual horizontal line passing along a center of the first roller toward the conveying belt on an upper side.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The advantages and features provided by one or more embodiments of the invention will become more fully understood from the detailed description given hereinbelow and the appended drawings which are given by way of illustration only, and thus are not intended as a definition of the limits of the present invention.

FIG. 1 is a schematic constitution diagram for describing an image recording system.

FIG. 2 is a schematic constitution diagram for describing a conveying belt apparatus.

FIG. 3 is a detailed illustration for describing an air knife nozzle shown in FIG. 2.

FIG. 4A is an illustration for describing cleaning liquid droplets in a concavo-convex portion on a horizontal surface of a surface of a conveying belt shown in FIG. 3.

FIG. 4B is an illustration for describing cleaning liquid droplets in a concavo-convex portion within a range of a circumference curved-surface of a surface of a conveying belt shown in FIG. 3.

DETAILED DESCRIPTION OF EMBODIMENTS

[0016] Hereinafter, with reference to attached drawings, an embodiment of the present invention will be described in detail. However, the scope of the invention is not limited to the disclosed embodiments. In this connection, in the description for the drawings, the same constitutional element is provided with the same reference symbol, and the overlapping description is omitted. Moreover, the dimensional ratios in the drawings are exaggerated on account of description, and, may be different from the actual ratios.

[0017] FIG. 1 is a schematic constitution diagram for describing an image recording system 10. The image recording system 10 includes a feeding apparatus 100, a conveying belt apparatus 200, and a winding apparatus 300. The feeding apparatus 100, the conveying belt ap-

paratus 200, and the winding apparatus 300 are connected in order from the upstream side to the downstream side in a sheet conveyance direction.

[0018] Successively, a detailed constitution of the conveying belt apparatus 200 will be described.

[0019] FIG. 2 is a schematic constitution diagram for describing the conveying belt apparatus 200. The conveying belt apparatus 200 includes a plurality of rollers 212 and 213 disposed with a predetermined distance, an endless conveying belt 211 stretched around the rollers 212 and 213, a cleaning section 220 that cleans foreign substances having adhered to the conveying belt 211 with a cleaning liquid, and an air knife nozzle 230 that blows compressed air onto the conveying belt 211 on the downstream side in the conveyance direction than the cleaning section 220.

[0020] A top surface on the conveying belt 211 between the rollers 212 and 213 is a conveyance surface to convey a recording medium 50. At the time of a normal image recording operation, by rotating the rollers 212 and 213 at a predetermined speed in the counterclockwise direction in FIG. 1, the conveying belt 211 is driven and rotated, and a recording medium 50 caused to brought in close contact with the conveyance surface is conveyed.

[0021] As the recording medium 50, for example, paper, a cloth, a plastic film, a glass plate, and the like, those are used usually for inkjet recording, can be used. The recording medium 50 may be in the form of a sheet cut into a predetermined size. However, in the description of the embodiment, the recording medium 50 is particularly preferably a long-sized recording medium 50 that is continuously sent out from an original winding on which it has been wound in the form of a roll, and in particular, is a long-sized cloth. In the case of the cloth, since ink droplets are easy to cause bleed-through or strike-through, there is a high fear that the ink droplets will adhere to the surface of the conveying belt 211. Here, an example in which a cloth is used as the recording medium 50, will be described.

[0022] Hereinafter, the conveying belt apparatus 200 according to the present embodiment will be described with reference to drawings.

[0023] The recording medium 50 shown in FIG. 2 is placed on the top surface of the conveying belt 211, is conveyed in the A direction by the rotational movement of the conveying belt 211, and thereafter, is peeled off from the top surface of the conveying belt 211 and discharged.

[0024] The conveying belt 211 is stretched around the roller 212 and the roller 213 and is driven. At least one of the rollers 212 and 213 is a driving roller. For example, the roller 213 is a driving roller and the roller 212 is a driven roller. In the below, this roller 212 is also referred to as a first roller. The recording head 250 is disposed adjacently to the conveying belt 211 on the downstream side (an upper side or top surface of the conveying belt 211 in FIG. 2) in the conveyance direction than the roller

212 of the conveying belt 211. The recording head 250 jets ink droplets from a number of nozzles on a nozzle surface of the recording head 250 downwardly onto the recording medium 50 according to printing image data, thereby recording a desired image in combination with the conveyance of the recording medium 50 by the rotation of the conveying belt 211. A location immediately below the recording head 250 is an image recording position, and this image recording position is disposed on the downstream side in the conveyance direction than the roller 212.

[0025] The cleaning section 220 cleans the surface of the conveying belt 211 using a cleaning liquid. The cleaning section 220 is disposed in the vicinity of the roller 213 on the upstream side (the lower side or undersurface of the conveying belt 211 in FIG. 2) in the conveyance direction than the roller 212 of the conveying belt 211.

[0026] The cleaning section 220 includes a cleaning roller 221, a cleaning bucket 222 that stores the cleaning liquid in which this cleaning roller 221 is immersed, and a sprinkler nozzle 223. The cleaning liquid is, for example, water.

[0027] The sprinkler nozzle 223 performs cleaning by causing the cleaning liquid in the cleaning bucket 222 to be jetted from water sprinkling ports disposed toward the surface of the conveying belt 211 overall the width direction of the conveying belt 211 with the driving of the sprinkler nozzle 223 and by making the cleaning liquid adhere to the surface of the conveying belt 211.

[0028] A cleaning liquid adhesion position X is a position where a cleaning liquid jetted from this sprinkler nozzle 223 adheres to the surface of the conveying belt 211. On the surface of the conveying belt 211, this cleaning liquid adhesion position X may be disposed on a portion being bridged over the roller 213, or, may be disposed on the upstream side in the conveyance direction than the roller 212 as shown in FIG. 2.

[0029] The cleaning roller 221 includes brush bristles implanted around a shaft. This cleaning roller 221 is disposed on the downstream side in the conveyance direction than the sprinkler nozzle 223 of the conveying belt 211 and is bridged over the width direction of the conveying belt 211. The brush bristles always bring in pressure contact with the surface of the conveying belt 211. The cleaning roller 221 is driven so as to be rotated in the reverse direction (counterclockwise direction as shown in FIG. 1) to the conveyance direction of the conveying belt 211.

[0030] The tips of the brush bristles of the cleaning roller 221 are partially immersed in the cleaning bucket 222 in which the cleaning liquid has been stored. Accordingly, when the cleaning roller 221 is rotated, the cleaning liquid is scraped up with the brush bristles. Then, the cleaning roller 221 cleans the surface of the conveying belt 211 with the cleaning liquid while rubbing the surface.

[0031] In the present embodiment, in order to improve the adhesiveness between the conveying belt 211 and the recording medium 50, an adhesive that is coated on

the conveying belt 211 has hardness Hs of 90 or less (according to JIS K6253 type A). However, in this case, scratches and concavo-convex portions are easily caused on the surface of the conveying belt 211 by brush bristles.

[0032] In the above-mentioned embodiment, shown has been an example in which the cleaning section 220 includes the sprinkler nozzle 223 that makes a cleaning liquid adhere to the surface of the conveying belt 211 recording medium 50. However, the cleaning section 220 is not particularly limited as long as makes a cleaning liquid adhere to the surface of the conveying belt 211 after a recording medium 50 has been peeled from the conveying belt 211.

[0033] FIG. 3 is a detailed illustration for describing the air knife nozzle 230. The conveying belt apparatus 200 removes the cleaning liquid having adhered to the surface of the conveying belt 211 using the air knife nozzle 230 disposed adjacently to the upstream side in the conveyance direction while moving the conveying belt 211 in an arrow direction. The air knife nozzle 230 is arranged inclinedly so as to blow compressed air toward the conveying belt 211 within a range of a circumference curved-surface in which the roller 212 and the conveying belt 211 come in contact with each other, i.e., within a range in which the conveying belt 211 is wound around the roller 212. Moreover, a blowing port (a tip of a triangle in FIG. 3) of the air knife nozzle 230 blows compressed air from the lower side than the virtual horizontal line L1 passing along the center of the roller 212 towards the conveying belt 211 on the upper side.

[0034] In FIG. 3, a tangent line L2 is a tangent line of a circumference in which a point where a virtual line L3 extended from the blowing port of the air knife nozzle 230 crosses the circumference of the roller 212 is made a contact point Y. The air knife nozzle 230 is arranged such that an angle θ between the tangent line L2 on the downstream side in the rotation direction and the virtual line L3 extended from the blowing port of the air knife nozzle 230 is 5 degrees or more and less than 90 degrees. In the case where the angle is less than 5 degrees or 90 degrees, there is a possibility that it is difficult for the compressed air blown from the blowing port of the air knife nozzle 230 to enter concavo-convex portions on the surface of the conveying belt 211. Therefore, a more preferable angle is around 45 degrees (i.e. 30 degrees or more and less than 60 degrees). With this, since compressed air enters the concavo-convex portions of the surface of the conveying belt 211, it is possible to remove cleaning liquid droplets certainly.

[0035] Moreover, the air knife nozzle 230 is disposed such that the blowing port is directed to the upstream side in the conveyance direction of the conveying belt 211. With this, the removed cleaning liquid droplets flow down into a recovery saucer 240 disposed in the vicinity of the roller 212 and those are collected.

[0036] Moreover, the blowing port of the air knife nozzle 230 is disposed so as to be directed from a lower side

than the virtual horizontal line passing along the center of the roller 212 toward the conveying belt 211 on an upper side. Since the conveying belt 211 and the roller 212 come in close contact with each other within a range of a circumference curved-surface of the roller 212, even if the conveying belt 211 vibrates due to compressed air of the air knife nozzle 230, the influence does not spread. Therefore, the vibration does not influence up to the image recording position of the recording head 250 located on the downstream side in the conveyance direction. With this, it is possible to record an image on the recording medium 50 stably with ink droplets jetted from the upper side toward the lower side by the recording head 250.

[0037] Next, description is given to the reason why the blowing port of the air knife nozzle 230 is constituted so as to blow compressed air toward within a range of a circumference curved-surface. FIG. 4A and FIG. 4B each is an illustration for describing cleaning liquid droplets 70. FIG. 4A shows cleaning liquid droplets 70 in a concavo-convex portion 60 on the horizontal surface of the surface of the conveying belt 211. FIG. 4B shows cleaning liquid droplets 70 in a concavo-convex portion 60 of the surface of the conveying belt 211 located within a range of a circumference curved-surface where the conveying belt 211 is wound around and comes in contact with the roller 212. Into scratches and concavo-convex portions caused on the surface of the conveying belt 211 shown in FIG. 4A, cleaning liquid droplets 70 enter by cleaning at the cleaning liquid adhesion position X. Since scratches and concavo-convex portions are extended due to a matter that the conveying belt 211 is prolonged due to a curvature formed on a peripheral surface of the roller 212 located within a range of the above-mentioned circumference curved-surface shown in FIG. 4B, balance in the surface tension of the cleaning liquid droplet W is made to collapse. With this, it becomes easy to remove the cleaning liquid droplets 70 using the air knife nozzle 230. In this connection, the conveying belt 211 is made from thermoplastic polyurethane (TPU), and tension per unit width required to extend an overall length by 1% of the original length is around 30 Ns/mm.

[0038] In this way, in the present embodiment, the blowing port of the air knife nozzle is disposed so as to blow compressed air from a lower side than the virtual horizontal line L1 passing along the center of the first roller towards the conveying belt on an upper side within a range where the roller 212 as the first roller among the plurality of rollers and the conveying belt 211 come in contact with each other. With this, liquid droplets removed from the conveying belt 211 by the compressed air falls below, whereby it becomes easy to collect them. Moreover, with such a constitution, since the blowing port is located far away from the image recording position of the recording head 250 located on an upper side than the virtual horizontal line L1, vibration due to compressed air does not influence the image recording position.

[0039] With regard to the constitution of each of the conveying belt apparatus 200 and the image recording

system 10 described in the above, the main constitution has been described for describing the feature of the above-mentioned embodiment. Accordingly, the constitution is not limited to the above-mentioned constitution, and within a scope of claims, various modification can be made. Moreover, it is not intended that the constitution equipped in general image recording systems 10 is excluded.

[0040] Although embodiments of the present invention have been described and illustrated in detail, the disclosed embodiments are made for purpose of illustration and example only and not limitation. The scope of the present invention should be interpreted by terms of the appended claims.

Claims

1. A conveying belt apparatus (200), comprising:

an endless conveying belt (211) on which an adhesive to convey a recording medium is coated;

a plurality of rollers (212, 213) that stretches and drives the conveying belt;

a cleaning section (220) that cleans a surface of the conveying belt with a cleaning liquid; and an air knife nozzle (230) that blows compressed air onto the conveying belt on a downstream side in a conveyance direction of the cleaning section,

characterized in that, wherein within a range where a first roller (212) among the plurality of rollers and the conveying belt come in contact with each other, a blowing port of the air knife nozzle is disposed so as to blow compressed air from a lower side than a virtual horizontal line passing along a center of the first roller toward the conveying belt on an upper side.

2. The conveying belt apparatus according to claim 1, wherein the blowing port of the air knife nozzle is disposed so as to blow compressed air toward within a range of a circumference curved-surface where the conveying belt is wound around and comes in contact with the first roller.

3. The conveying belt apparatus according to claim 1 or 2, wherein on a downstream side in a conveyance direction than the first roller of the conveying belt, there is provided an image recording position of a recording head that performs recording by jetting ink droplets from an upper side toward a lower side onto the recording medium being conveyed by the conveying belt.

4. The conveying belt apparatus according to any one of claims 1 to 3, wherein the adhesive has hardness

Hs of 90 or less in measurement in accordance with JIS K6253 type A method.

5. The conveying belt apparatus according to any one of claims 1 to 4, wherein the blowing port of the air knife nozzle is disposed to be directed toward an upstream side in a conveyance direction of the conveying belt. 5
6. The conveying belt apparatus according to any one of claims 1 to 5, wherein an angle (θ) between a tangent line (L2) of a circumference of the first roller on a downstream side in a rotation direction of the circumference and at a point (Y) where a virtual line (L3) extended from the blowing port of the air knife nozzle crosses the circumference, and the virtual line is 5 degrees or more and less than 90 degrees. 10 15
7. An image recording system, comprising: 20
a recording head; and
the conveying belt apparatus according to any one of claims 1 to 6.

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FIG.1

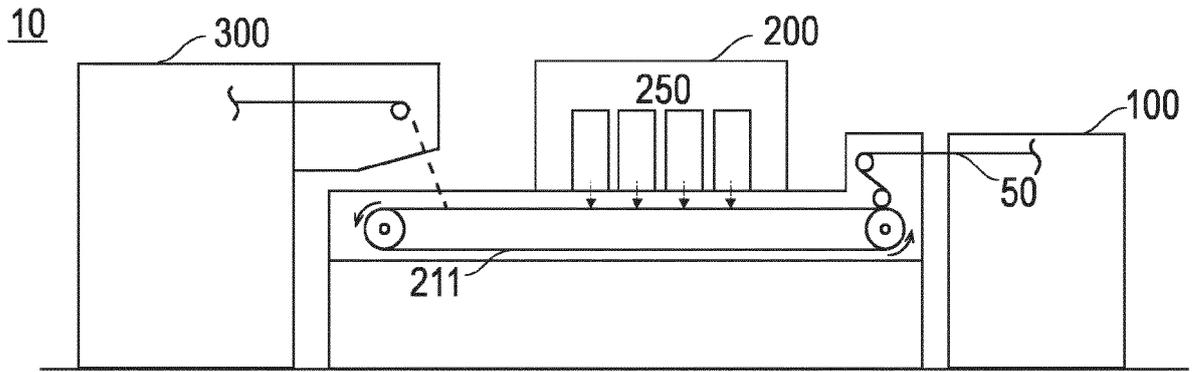


FIG.2

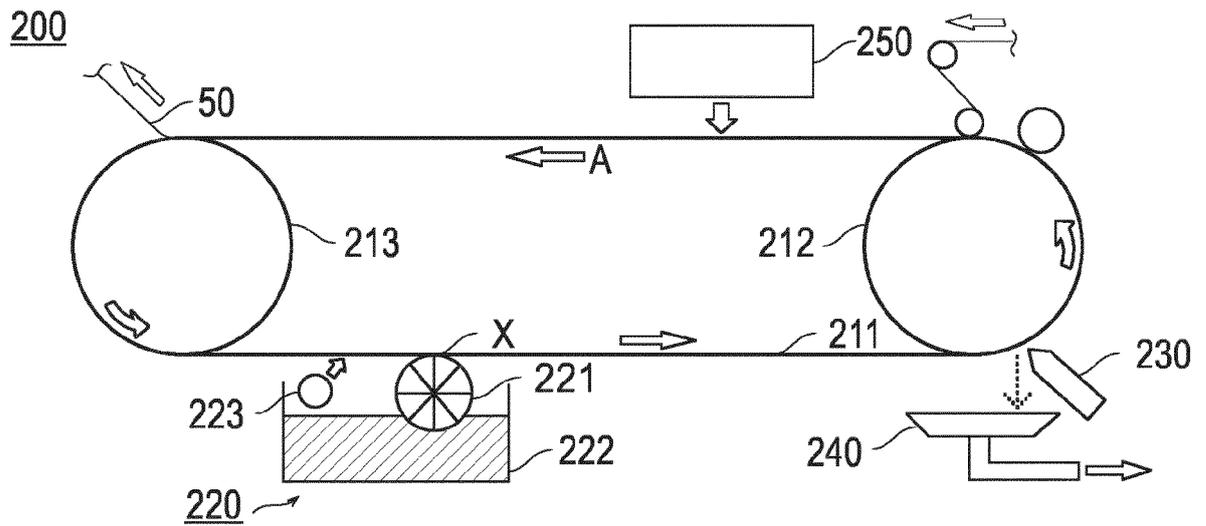


FIG.3

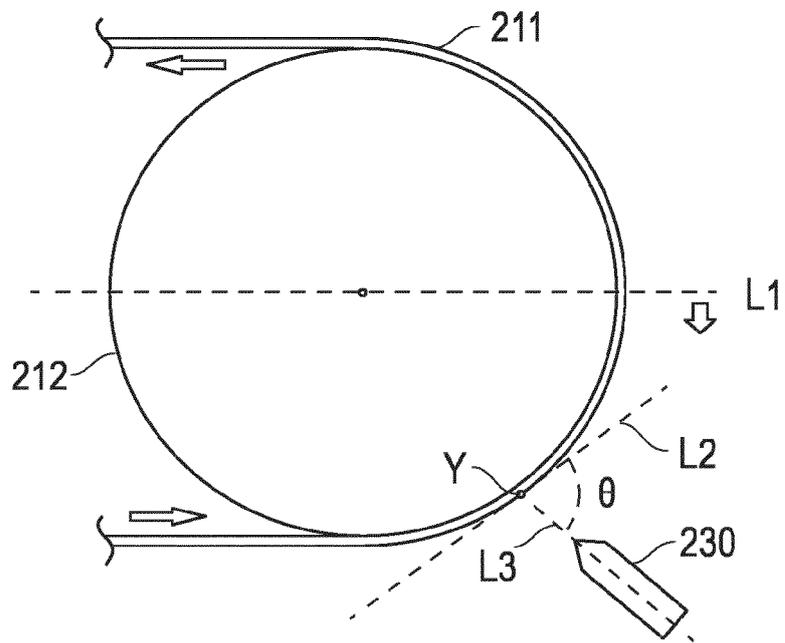


FIG.4A

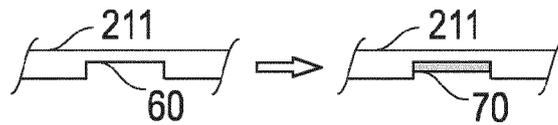
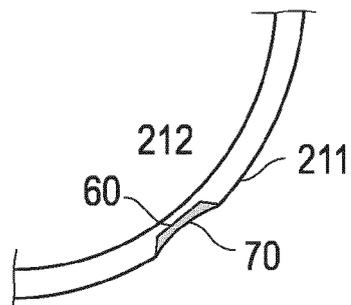


FIG.4B





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Application Number
EP 19 17 4295

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 November 2019	Examiner Athanasiadis, A
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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