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Takahashi et al.

(54) **PASTER ROLLER**

(75) Inventors: **Shinsuke Takahashi**, Kanagawa (JP); **Masaji Inoue**, Kanagawa (JP); **Nobuo Yoshida**, Kanagawa (JP); **Tatsuo Katsumata**, Kanagawa (JP)

Correspondence Address:
SUGHRUE MION, PLLC
2100 Pennsylvania Avenue, NW
Washington, DC 20037-3213 (US)

(73) Assignee: **FUJI PHOTO FILM CO., LTD.**

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(57) **ABSTRACT**

An air exhausting concave portion is provided on an outer peripheral surface of a paster roller that pushes a first web and a second web in their overlapped state. Both end portions of the outer peripheral surface of the paster roller are chamfered. The paster roller is formed like a crown shape.

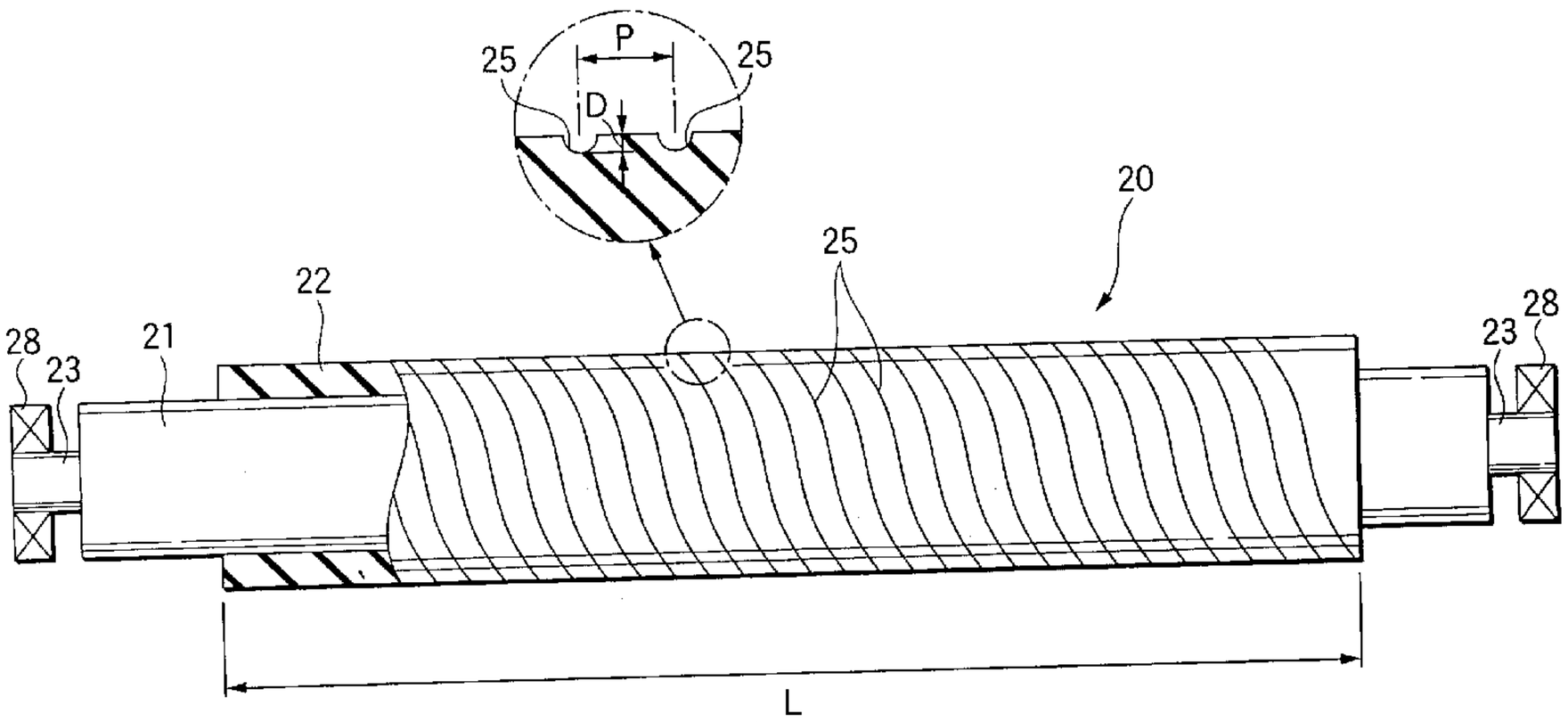
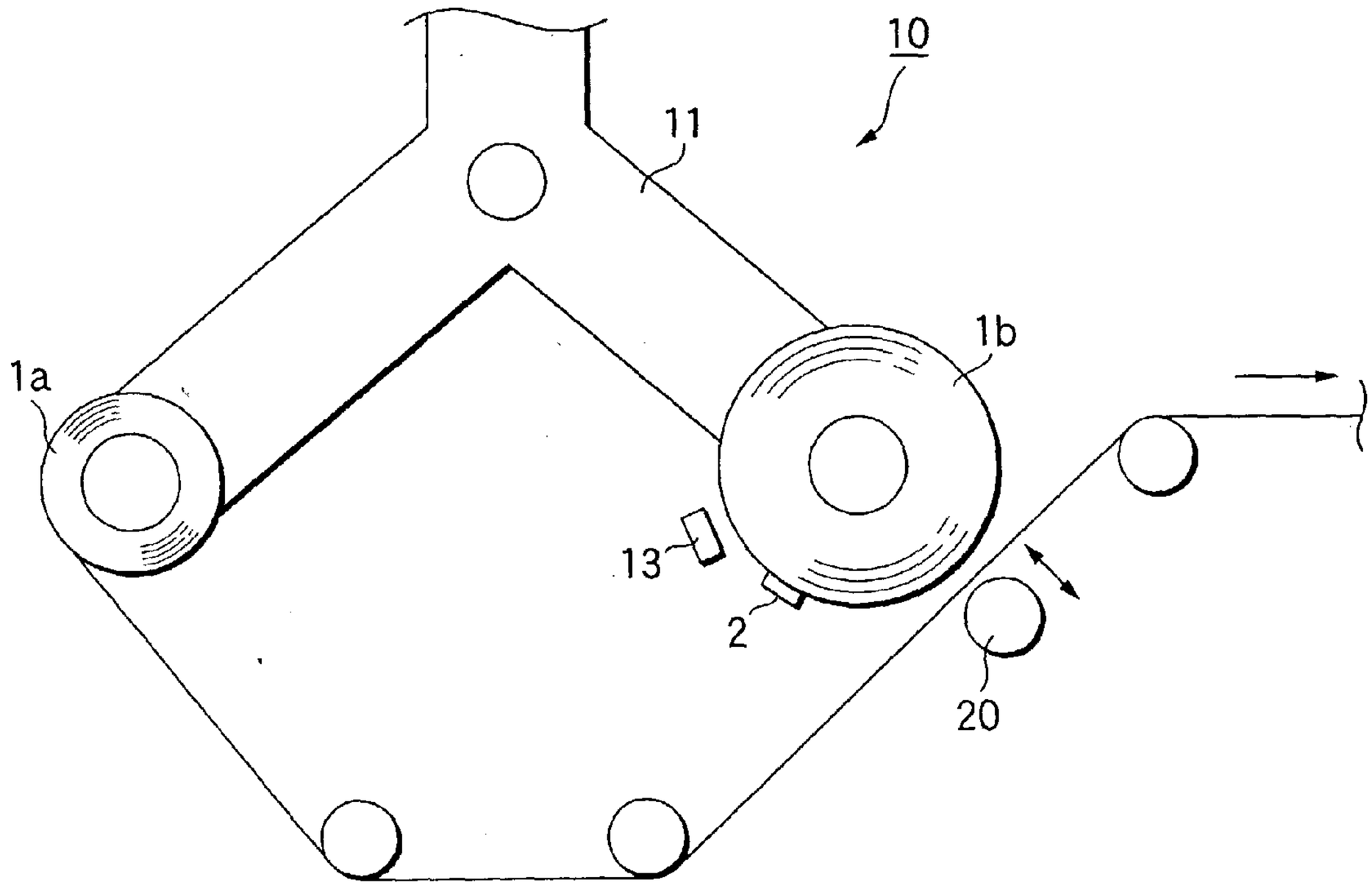


FIG.1



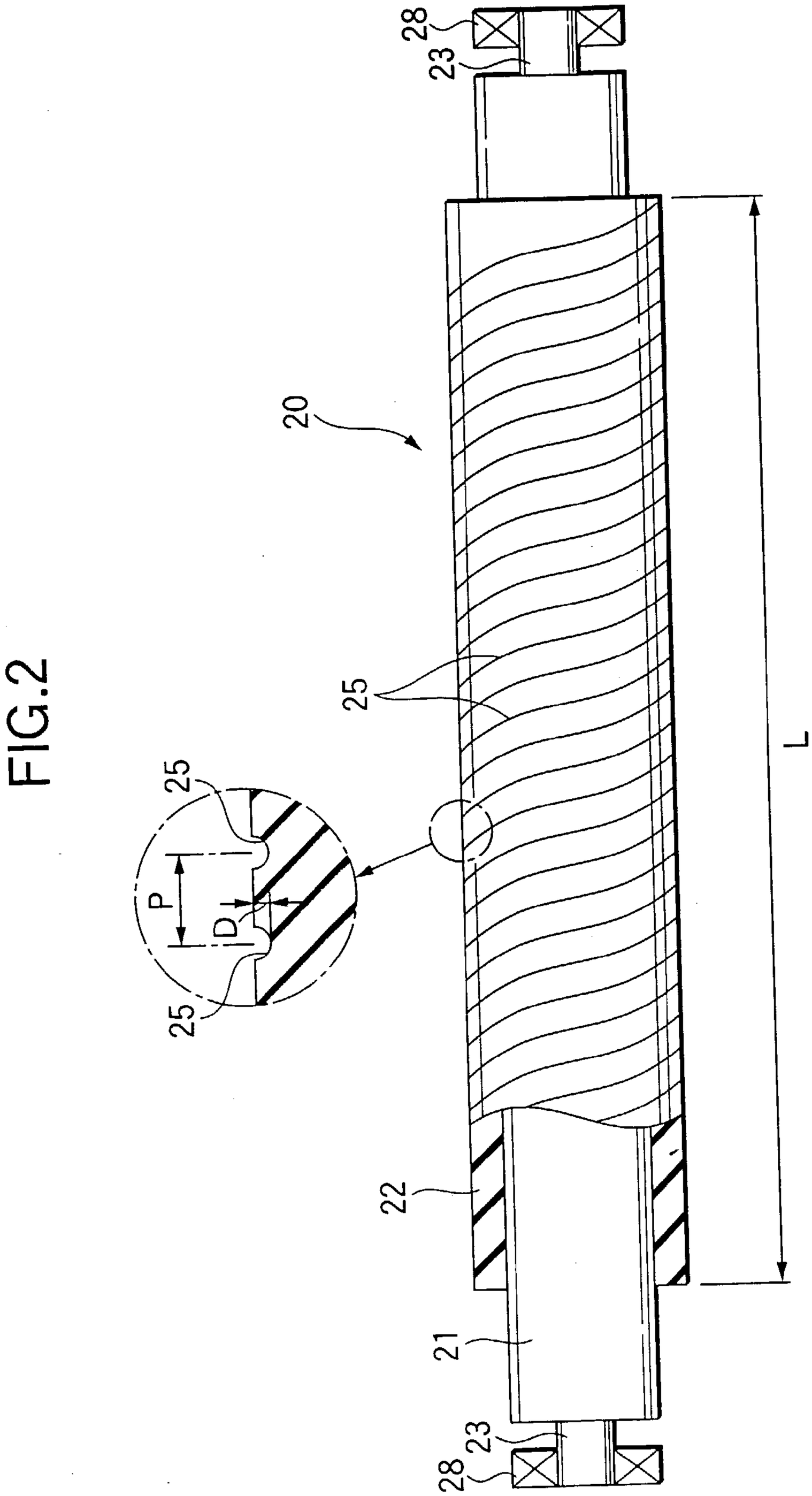


FIG.2

FIG.3A

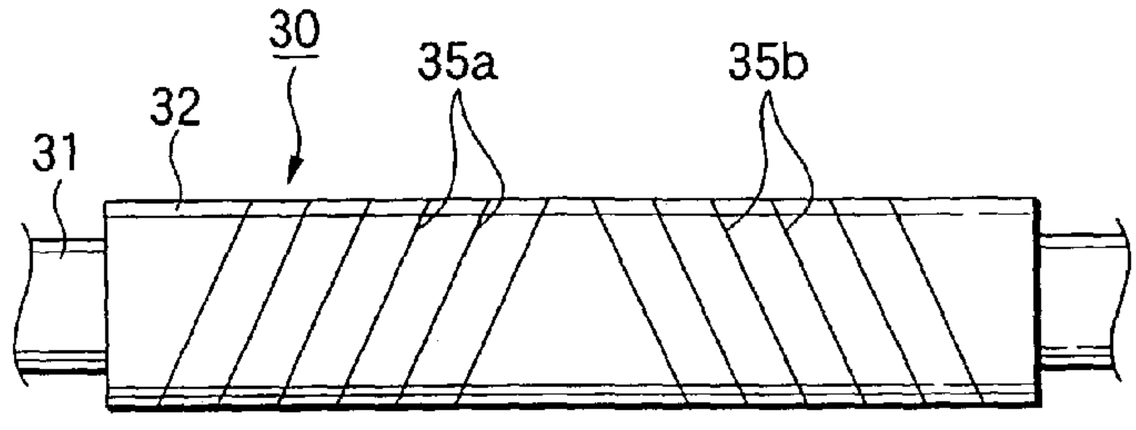


FIG.3B

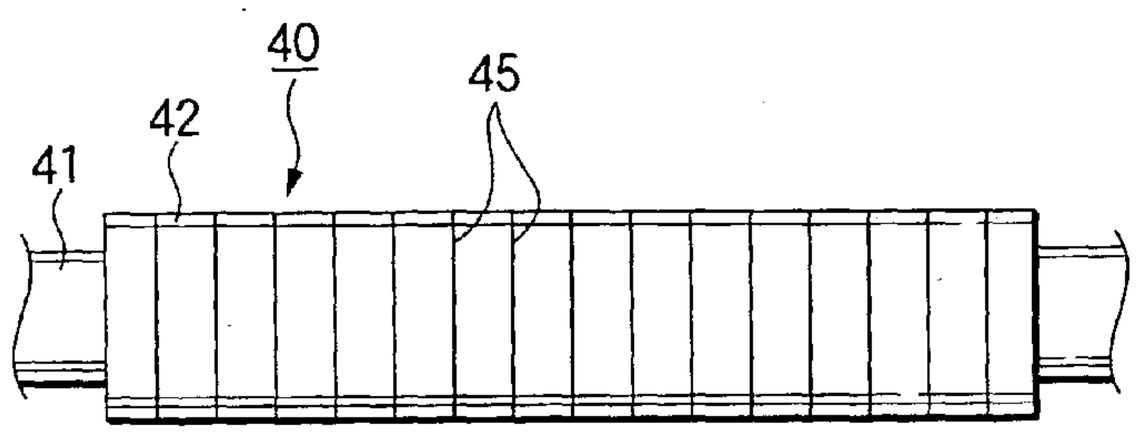


FIG.3C

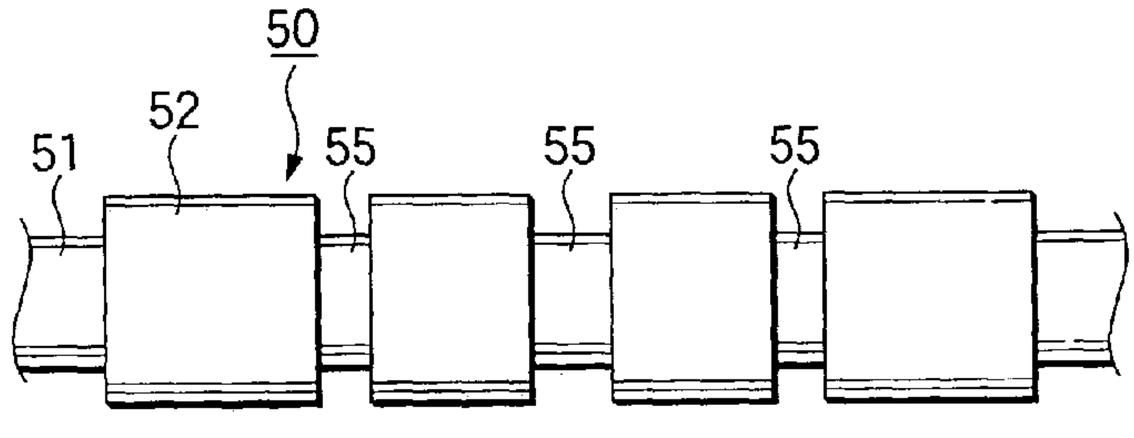
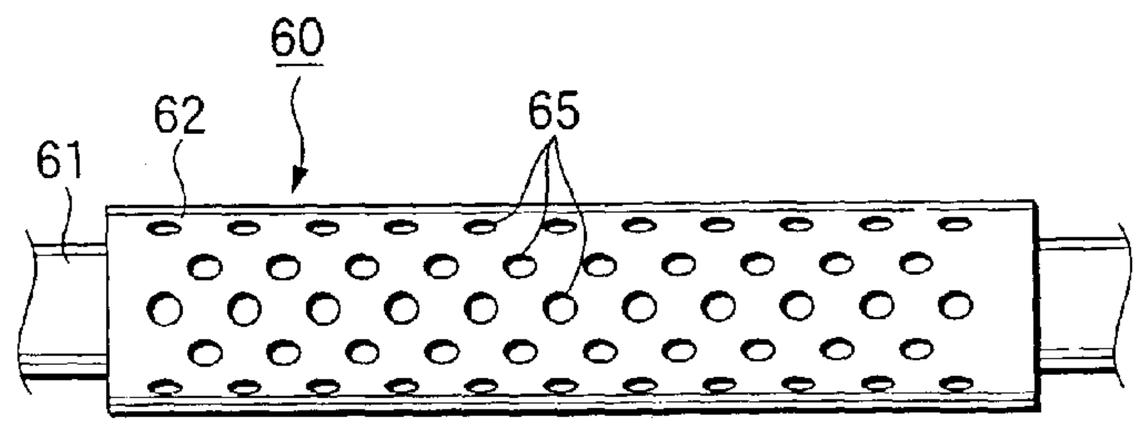


FIG.3D



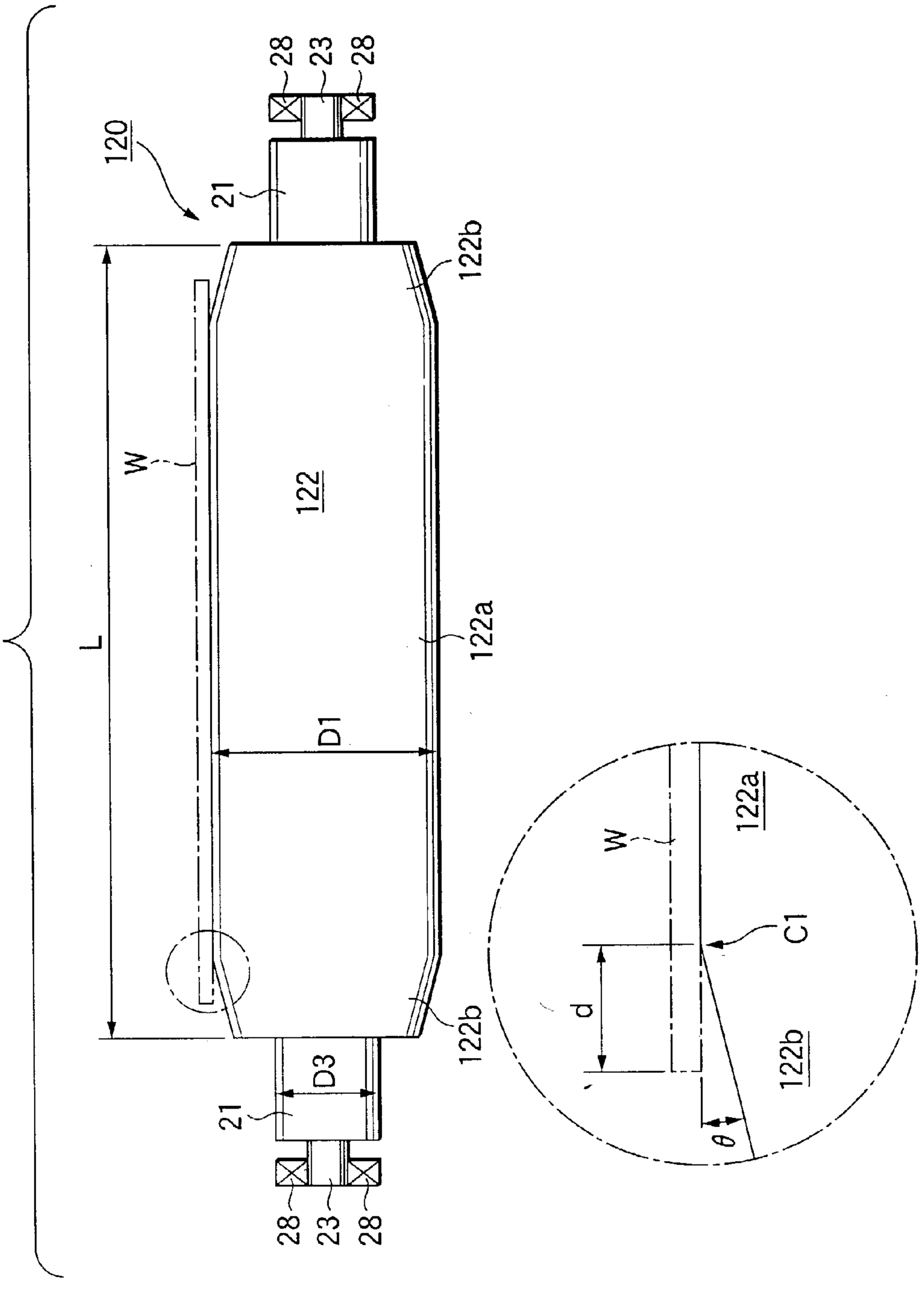
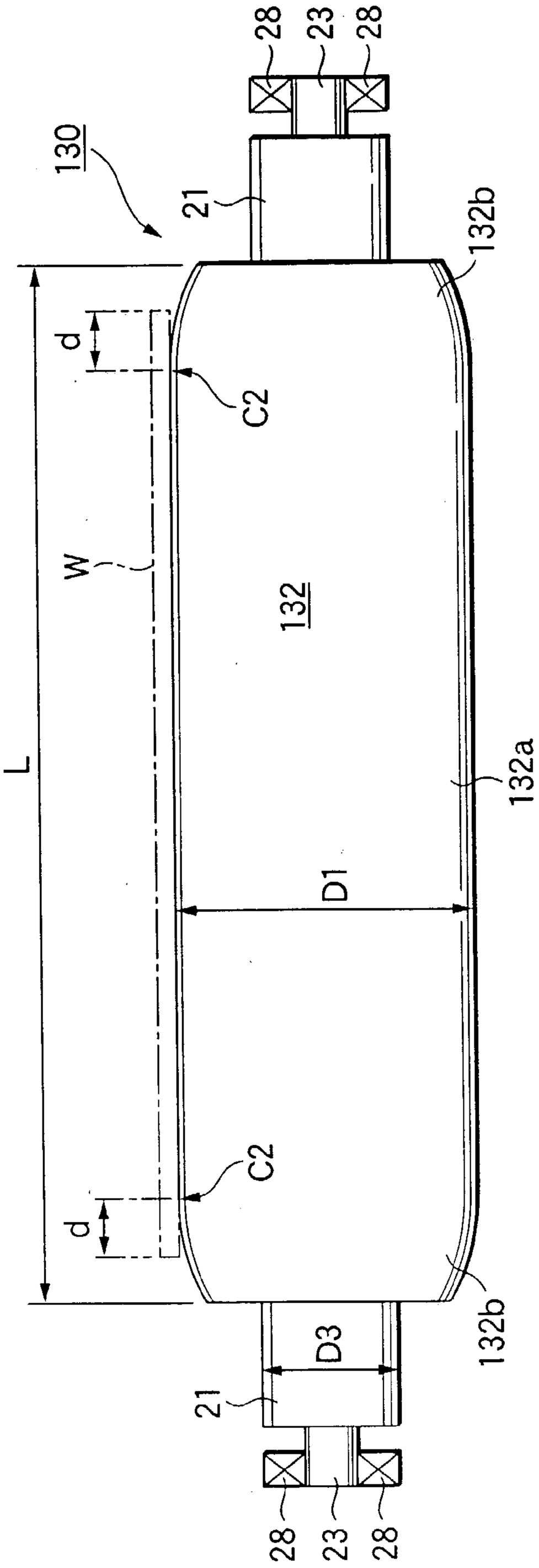

28
23
28
120
21
122b
W
L
122
122a
D1
D3
21
122b
28
23
28
W
122a
C1
d
122b
θ

FIG.4

FIG.5



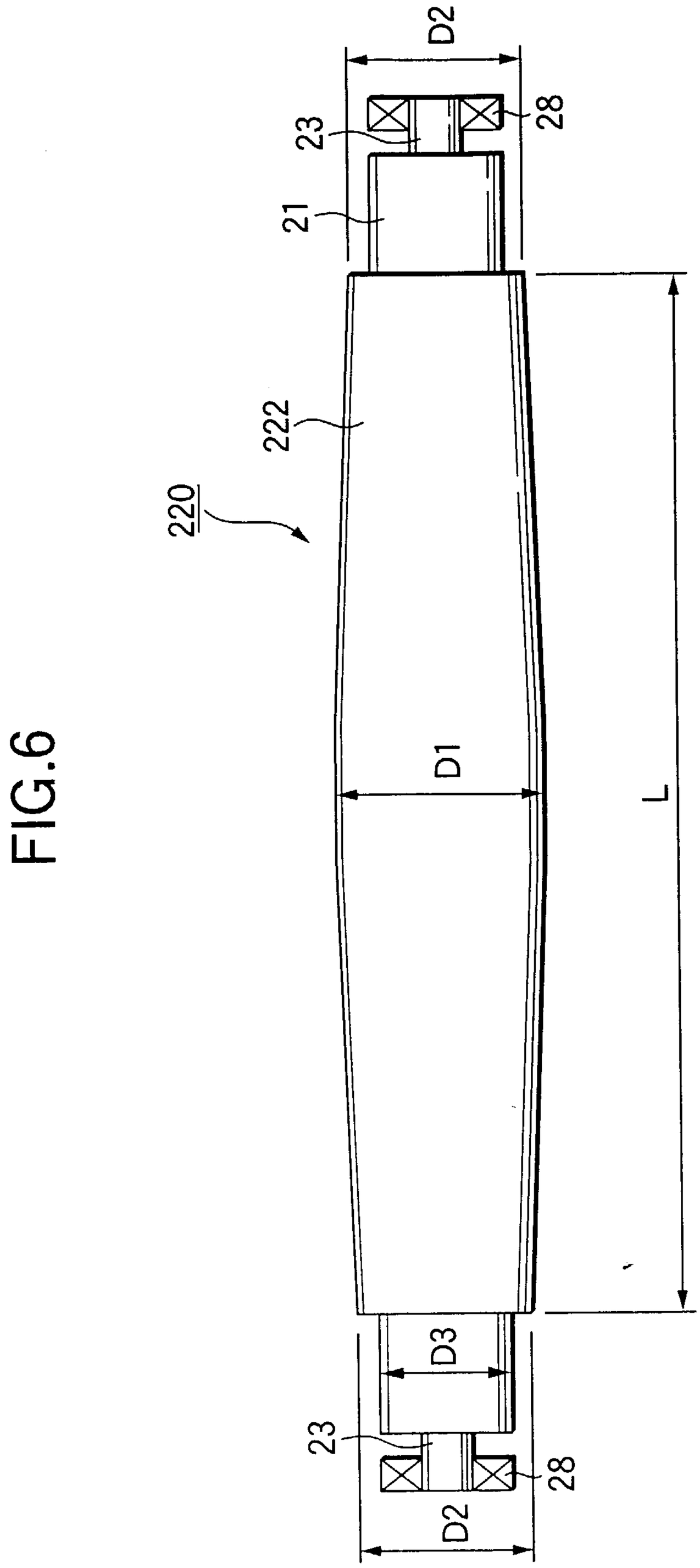


FIG.6

PASTER ROLLER

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a technology for jointing a first web and a second web by pushing them in an overlapped state.

[0002] In a production line for a magnetic recording medium and other stripe bodies, a web made of plastic, paper, metal foil, etc. is extracted from the a roller. Then predetermined processes, such as coating, etc. are applied to the web.

[0003] In a related art, in order to exchange the web roller (old roller) from which the web is pulled out and whose remaining amount of the web becomes small for the unused web roller (new roller), and in order to stop the production line as few as possible, various technologies were proposed.

[0004] For example, in JP-A-11-91997, a paper jointing system is disclosed. The paper jointing system joints the rear end of the web wound on the old roller and the top end of the web wound on the new roller by overlapping them and pushing them by virtue of the brush.

[0005] Also, in JP-A-9-12185, the other conventional system is disclosed. The system joints the rear end of the web on the old roller for the magnetic recording medium and the top end of the web on the new roller by pushing them by virtue of a paster roller (press roller or joint roller).

[0006] In this system, when the remaining amount of the web on the old roller is small, the new roller is rotated at a speed almost equal to that of to the older roller. Then, while sensing the position of an adhesive tape on the new roller by a sensor provided in vicinity of the new roller, the web of the old roller is pushed against the outer peripheral surface of the new roller at a predetermined timing by the paster roller. As a result, the top end of the web on the new roller can be jointed to the rear end of the web of the old roller via the adhesive tape on the new roller.

[0007] In the web jointing system, even when the web of the old roller is pushed against the outer peripheral surface of the new roller by the paster roller, there is a possibility that they are jointed insufficiently by the adhesive tape in some cases. If the jointing by the adhesive tape is insufficient, there are caused the disadvantages such that the web is broken down at the jointed location during the transportation of the web, etc.

[0008] Also, in the web jointing system in the related art, when the web of the old roller is pushed against the outer peripheral surface of the new roller by the paster roller, sometimes the web of the old roller is cut. Such cutting of the web causes the considerable reduction in production efficiency because the production line must be stopped to fix it.

SUMMARY OF THE INVENTINON

[0009] The present invention has been made in view of the above circumstances, and an object of the present invention provides a paster roller that is capable of pushing the second web against the first web firmly and preventing the web cutting to contribute the improvement of the productivity.

[0010] The above object of the present invention can be achieved by providing a paster roller comprising: an air exhausting concave portion provided on an outer peripheral surface thereof for releasing an air between a first web and the outer peripheral surface, when the outer peripheral surface pushes the first web to a second web in their overlapped state.

[0011] Recently the thinning of the web such as the magnetic recording medium has been promoted. There is caused the case that, with such thinning of the web, the behavior of the web of the old roller becomes unstable by an air between the paster roller and the web of the old roller. That is, there is caused the case that the web of the old roller cannot be pushed uniformly against the outer peripheral surface of the new roller because of the influence of this air. In particular, it is found that, when the web carrying speed is high, there is such a tendency that the web of the old roller cannot be pushed uniformly against the outer peripheral surface of the new roller.

[0012] If the above structure of the present invention is employed, an air exhausting concave portion can be provided on an outer peripheral surface of the paster roller. Therefore, when the paster roller is moved toward the web of the old roller by the air cylinder, etc., an air between the paster roller and the first web can be removed from the concave portion. In this manner, since the first web can be pushed uniformly against the second web by the paster roller, the first web and the second web can be pushed surely even if the web carrying speed is high, and thus the firm web jointing can be attained.

[0013] In this case, the advantages of the present invention become more remarkable if the web is thinner, and the advantages of the present invention become particularly remarkable if the thickness of the first and second webs is 10 μm or less, preferably 7 μm or less. Also, the advantages of the present invention become more remarkable if the web carrying speed is relatively fast (e.g., 200 m/min or more).

[0014] Also, in the present invention, it is preferable that the spiral groove should be provided on the outer peripheral surface of the paster roller. Such groove can be formed by the simple machining and also can be easily cleaned during the use of the paster roller. It is preferable that the groove shape should be formed like the semi-circular shape or the circular arc shape in section, but the rectangular shape may be employed. The groove shape is not particularly limited. A groove pitch can be set to 1 to 10 mm, for example. A groove depth can be set to 0.1 to 1 mm, for example.

[0015] In addition, in the present invention, it is preferable that the paster roller should be constructed to have a core bar and a coated elastic body provided on the outer peripheral surface of the core bar. As the material of the coated elastic body, the resin such as the rubber may be employed, for example. The web supplying system (the web jointing system) into which the above paster roller is installed can be constructed as follows. That is, the web supplying system comprises a first shaft to which the old roller is installed, a second shaft which is provided at a predetermined interval from the first shaft and to which the new roller is installed, and the paster roller for pushing the webs in the situation that the rear end of the web of the old roller and the top end of the web of the new roller are overlapped, and an air exhausting concave portion is provided on the outer peripheral surface of the paster roller. The web supplying system can joint the rear end of the web of the old roller and the top

end of the web of the new roller by pushing the paster roller against them so as to supply the web of the new roller subsequently to the web of the old roller.

[0016] The above object of the present invention can be achieved by providing a paster roller comprising: chamfered portions formed at both end portions of an outer peripheral surface thereof.

[0017] Here, it is preferable that the chamfered portions should contain portions of the outer peripheral surface of the paster roller that are opposed to portions in the range from 20 mm to 50 mm from both end portions of the web, which contacts to the outer peripheral surface of the paster roller, in the width direction. In addition, the chamfered portion includes a flat portion that is inclined at a predetermined inclination angle or as the curved surface in a sectional view. At this time, the inclination angle relative to the center axis of the paster roller should be set preferably to 3° or more and 20° or less, and more preferably to 5° or more and 15° or less. In particular, 8° or more and 12° or less is preferable.

[0018] Also, the connected portion between the chamfered portion and other portions on the outer peripheral surface of the paster roller may be constructed to form the edge or to be connected smoothly without the edge.

[0019] An substantially cylindrical core bar or an substantially column core bar can be employed as the core bar, for example. The aluminum, etc. can be exemplified as the material of the core bar, but the material of the core bar is not particularly limited to this.

[0020] The resin such as the rubber can be employed as the material of the coated elastic body. It is preferable that the coated elastic body should have the hardness (HsA) in the range from 40 to 70, which is measured by the spring type hardness test (A type) defined in JIS (Japanese Industrial Standard) K6301. Also, HsA should be set higher if the web carrying speed is high.

[0021] As the result of the earnest examination made by the inventors of the present invention, it is found that the above cutting of the web is caused bent paster roller. Namely, since the paster roller is bent when the paster roller is pushed against the outer peripheral surface of the new roller via the web of the old roller, both end portions of the paster roller in the axial direction impacts strongly against the web of the old roller. This is because that the cylinders provided near both end portions of the paster roller, or the like are operated, when the paster roller is pushed against the web of the old roller, and therefore the bending moment becomes maximum in the center of the paster roller.

[0022] According to the above structure of the present invention, the pushing force acting to both end portions of the web in the width direction can be reduced, when the paster roller pushes against the web and thus the web is pushed over the entire range in the width direction by the substantially uniform pushing force. It is caused that both end portions of the paster roller in the axial direction, which impact strongly against the web, are chamfered. Therefore, even if the paster roller is pushed against the web of the old roller, both end portions in the axial direction never hit strongly against the web of the old roller and thus the cutting of the web can be prevented without fail. In this manner, the improvement of the productivity can be achieved.

[0023] In this case, the advantages of the present invention become more remarkable if the web is thinner. The web-cutting preventing effect of the present invention become particularly remarkable if the thickness of the first and second webs is 10 μm or less, particularly 7 μm or less.

[0024] The web supplying system into which the above paster roller is installed can be constructed as follows. That is, the web supplying system comprises a first shaft to which an old roller is installed, a second shaft which is provided at a predetermined interval from the first shaft and to which a new roller is installed, and a paster roller for pushing the webs in the situation that the rear end of the web of the old roller and the top end of the web of the new roller are overlapped, and both end portions of the outer peripheral surface of the paster roller are chamfered. The web supplying system can joint the rear end of the web of the old roller and the top end of the web of the new roller by pushing the paster roller against them so as to supply the web of the new roller subsequently to the web of the old roller.

[0025] The above object of the present invention can be achieved by providing a paster roller for pushing the first web and the second web in their overlapped state, wherein the paster roller is formed as a predetermined crown shape. For examination, the predetermined crown shape is defined by rotating a bus-line having an inclination or curve the height of which is changed by from 0.5 mm to 2.5 mm at a position 1000 mm apart therefrom.

[0026] The crown shape signifies that the outer peripheral shape of the pushing portion of the paster roller, that pushes against the first and second webs, is formed as a barrel shape having a predetermined crown (a difference between an outer peripheral diameter of the center portion of the pushing portion and an outer peripheral diameter of both end portions in the axial direction). That is, this crown shape means such a shape that the pushing portion of the paster roller has the maximum outer peripheral diameter in the center portion in the axial direction, and the outer peripheral diameter is reduced gradually from the center portion to both end portions in the axial direction, and the outer peripheral diameter becomes minimum in both end portions in the axial direction.

[0027] It is preferable that a range of 0.5 mm or more and 2.5 mm or less per a width 1000 mm of the paster roller should be selected as the crown.

[0028] The pushing portion of the paster roller is constructed to have the core bar and the coated elastic body provided on the outer peripheral surface of the core bar, but is not limited to this structure.

[0029] The substantially cylindrical core bar or the substantially column core bar can be employed as the core bar, for example. The aluminum, etc. can be exemplified as the material of the core bar, but the material of the core bar is not particularly limited to this material.

[0030] The resin such as the rubber can be employed as the material of the coated elastic body. It is preferable that the coated elastic body should have HsA from 40 to 70. Also, HsA should be set higher if the web carrying speed is high. If the above structure of the present invention is employed, since the paster roller is formed like the substantially crown shape, the center portion of the paster roller in the axial direction can push against the web when the paster roller is

bent as above, so that the paster roller can push against the web of the old roller substantially uniformly over the entire range in the axial direction. Therefore, even if the paster roller is pushed against the web of the old roller, both end portions of the pushing portion in the axial direction never hit strongly against the web of the old roller and thus the cutting of the web can be prevented without fail. Further, even if the paster roller is pushed against the web by the weak force that cannot joint the webs in the related art, the webs can be jointed satisfactorily. In other words, since the force for pushing the paster roller against the web can be transmitted substantially uniformly to the entire range in the axial direction, the extra force to correct the unevenness of the pushing force due to the bending of the paster roller is not needed, and thus the webs can be satisfactorily jointed. In this manner, the improvement of the productivity can be achieved.

[**0031**] In this case, the advantages of the present invention become more remarkable if the web is thinner. The web-cutting preventing effect of the present invention become particularly remarkable if the thickness of the first and second webs is 10 μm or less, particularly 7μm or less.

[**0032**] The web supplying system into which the above paster roller is installed can be constructed as follows. That is, the web supplying system comprises a first shaft to which an old roller is installed, a second shaft which is provided at a predetermined interval from the first shaft and to which a new roller is installed, and a paster roller for pushing the webs in the situation that the rear end of the web of the old roller and the top end of the web of the new roller are overlapped, and the paster roller is formed like the crown shape. The web supplying system can joint the rear end of the web of the old roller and the top end of the web of the new roller by pushing the paster roller against them so as to supply the web of the new roller subsequently to the web of the old roller.

BRIEF DESCRIPTION OF THE DRAWIGS

[**0033**] **FIG. 1** is a conceptual view showing a web supplying system to which an embodiment of the present invention is applied;

[**0034**] **FIG. 2** is a partial sectional view showing an embodiment of the present invention;

[**0035**] **FIG. 3** is a schematic view showing another embodiment of the present invention;

[**0036**] **FIG. 4** is a schematic view showing another embodiment of the present invention;

[**0037**] **FIG. 5** is a schematic view showing another embodiment of the present invention; and

[**0038**] **FIG. 6** is a schematic view showing another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[**0039**] Embodiments of the present invention will be explained in detail with reference to the drawings hereinafter. **FIG. 1** is a schematic view of a web supplying system **10** for the magnetic recording medium, into which a paster roller **20** as an embodiment of the present invention is installed. As a web roller for the magnetic recording medium (new roller), such a web roller is employed that, for example, an outermost peripheral diameter is 500 mm, a web width is 1000 mm, a length of rolled web is 8000 m, and a web thickness is 10 μm or less. It is of course that there is no limit in these dimensions.

[**0040**] In this web supplying system **10**, an old roller **1***a* and new roller **1***b* are fitted to top ends of the three-axle turret arm **11** that is rotatably supported. The turret arm **11** is not limited to the three axle type, and the two axle type, etc. may be employed. An adhesive tape **2** such as the double-faced adhesive tape is provided to the outermost peripheral end portion of the web of the new roller **1***b*. A sensor **13** for sensing the position of the adhesive tape **2** is provided in vicinity of the new roller **1***b*. Also, the paster roller **20** is provided in vicinity of the new roller **1***b*. The web of the old roller **1***a* is passed between an outer peripheral surface of the new roller **1***b* and an outer peripheral surface of the paster roller **20**. Both the outer peripheral surface of the new roller **1***b* and the outer peripheral surface of the paster roller **20** do not come into contact with the web of the old roller **1***a*.

[**0041**] When a remaining amount of the web on the old roller **1***a* is reduced, the new roller **1***b* is rotated at the similar speed to the old roller **1***a*. Then, while sensing the position of the adhesive tape **2** by the sensor **13**, the web of the old roller **1***a* is pushed against the adhesive tape **2** on the outer peripheral surface of the new roller **1***b* at a predetermined timing by the paster roller **20**. The paster roller **20** is driven by the cylinder actuator, or the like. At this time, in the related art, there are the anxiety that the web of the old roller **1***a* cannot be pushed uniformly against the adhesive tape **2** on the outer peripheral surface of the new roller **1***b* or the anxiety that the web is cut off. Nevertheless, in this web supplying system **10**, such anxiety can be eliminated since the paster roller **20** described later is employed.

[**0042**] As shown in **FIG. 2**, the paster roller **20** has an substantially cylindrical core bar **21** made of aluminum, and a rubber (HsA in the range from 40 to 70) **22** provided to an outer peripheral surface of the core bar **21**. Then, a spiral groove **25** serving as an air exhausting concave portion is provided in the substantially overall area of the outer peripheral surface of the rubber **22**, i.e., the outer peripheral surface of the paster roller **20** in the axial direction.

[**0043**] A journal **23** is provided to both end portions that are projected from both ends of the rubber **22** on the core bar **21**. The journal **23** is rotatably supported by a bearing **28**.

[**0044**] As shown in the enlarged portion in **FIG. 2**, the groove **25** has an substantially semi-circular shape in section. A groove pitch is set to 1 to 10 mm. A groove depth D is set to 0.1 to 1 mm. This groove **25** can be formed by one grooving operation by using the cutting tool, the turning tool, etc. Also, this groove **25** is easily cleaned.

[**0045**] For example, an axial dimension L of the rubber **22** can be set to 1200 mm that is slightly larger than the web width. Of course, this dimension is not particularly limited. However, it is preferable that, as described above, the dimension L should be set larger than the web width. This is because, if the roller end portion hits on the product surface of the old roller, it is possible that the portion becomes no good.

[**0046**] If the above paster roller **20** is moved toward the web of the old roller **1***a* shown in **FIG. 1** by the air cylinder,

etc., the air between the paster roller **20** and the web of the old roller **1***a* can be exhausted smoothly from the groove **25** on the outer peripheral surface of the paster roller **20**. Therefore, the web of the old roller **1***a* can be pushed uniformly against the adhesive tape **2** on the outer peripheral surface of the new roller **1***b* by the paster roller **20**. The paster roller **20** is rotated together with the rotation of the new roller **1***b* when it is brought into contact with the outer peripheral surface of the new roller **1***b* via the web of the old roller **1***a*. At this time, since the groove **25** is formed spirally, the groove position at the contact surface between the paster roller **20** and the web of the old roller **1***a* (the position at which the web of the old roller **1***a* is not pushed by the paster roller **20**) is shifted with the rotation of the paster roller **20** in the axial direction of the paster roller. For this reason, the web of the old roller **1***a* can be pushed substantially uniformly by the paster roller **20** to leave no space.

[**0047**] According to the present structure, even if the web carrying speed is large, the rear end of the old roller **1***a* and the top end of the new roller **1***b* can be jointed without fail. The improvement of the productivity can be achieved by such web supplying system **10**.

[**0048**] **FIGS. 3A** to **3**D are a schematic view showing paster rollers **30**, **40**, **50**, **60** as another embodiment of the present invention respectively.

[**0049**] In a paster roller **30** shown in **FIG. 3**A, differently-directed spiral grooves **35***a*, **35***b* are provided on one side area and the other side area with respect to the center portion of the outer peripheral surface of a rubber **32** in the axial direction respectively. The grooves **35***a*, **35***b* are, so to speak, line symmetry. According to the paster roller **30** in which such bilaterally symmetrical grooves **35***a*, **35***b* are provided, the first web and the second web can be pushed uniformly.

[**0050**] In a paster roller **40** shown in **FIG. 3B, a** plurality of ring-like grooves **45** are provided at an equal distance to extend the overall area of the outer peripheral surface of a rubber **42** in the axial direction. According to the paster roller **40** in which such grooves **45** are provided, the first web and the second web can be pushed uniformly.

[**0051**] In a paster roller **50** shown in **FIG. 3C, a** plurality of slits **55** as the concave portion are provided at a distance to predetermined locations of a rubber **52** in the axial direction. A core bar **51** may be exposed from the locations at which the slits **55** are provided. According to the paster roller **50** in which such slits **55** are provided, the web can be adapted itself to the outer peripheral shape of the new roller and thus the first web and the second web can be pushed uniformly.

[**0052**] In a paster roller **60** shown in **FIG. 3D, a** very large number of dimples **65** are provided over the entire area of the outer peripheral surface of a rubber **62** in the axial direction. According to the paster roller **50** in which such dimples **65** are provided, the first web and the second web can be pushed uniformly. Also, the dimples **65** may be formed to be connected mutually.

[**0053**] **FIG. 4** shows a paster roller as still another embodiment of the present invention. As shown in **FIG. 4, a** paster roller **120** has the substantially cylindrical core bar **21** made of aluminum, and a rubber (HsA in the range from **40** to **70**) **122** as a coated elastic body provided to the outer peripheral surface of the core bar **21**. A diameter D**3** of the outer peripheral surface of the core bar **21** is uniform. The journal **23** is provided to both end portions that are projected from both ends of the rubber **122** on the core bar **21**. The journal **23** is rotatably supported by the bearing **28**. The outer peripheral surface of the rubber **122** consists of a cylindrical surface portion **122***a*, that is located in the center portion in the axial direction and has a outer peripheral diameter D**1**, and chamfered portions **122***b*, that are positioned adjacent to both end portions of the cylindrical surface portion **122***a* in the axial direction and are inclined at a predetermined inclination angle. In order to illustrate the position at which the chamfered portions **122***b* are formed, the situation that the web W contacts to the outer peripheral surface of the cylindrical surface portion **122***a* of the rubber **122** is shown by a chain double-dashed line.

[**0054**] One end portion of the web W (left side in **FIG. 4**) in the width direction and the rubber **122** that contacts to the area near the end portion are shown in detail in the enlarged portion in **FIG. 4**. The chamfered portion **122***b* is chamfered at an inclination angle θ from a connected portion C**1** that is separated by a distance d from the end portion of the web W in the width direction to the inner direction of. the web (rightward direction in the enlarged portion in **FIG. 4**), when the web W is brought into contact with the outer peripheral surface of the cylindrical surface portion **122***a*. That is, the outer peripheral surface of the chamfered portion **122***b* is inclined rather than the outer peripheral surface of the cylindrical surface portion **122***a* to the core bar **21** side.

[**0055**] For example, the conditions that the dimension L of the rubber **122** in the axial direction is 1100 mm, the diameter D**1** of the outer peripheral surface of the cylindrical surface portion **122***a* of the rubber **122** is 100 mm, the diameter D**3** of. the outer peripheral surface of the core bar **21** is 80 mm, the distance d from the end portion of the web to a starting point of the chamfered portion **122***b* is 50 mm, and the inclination angle θ of the chamfered portion **122***b* is 10° may be employed. But it is of course that there is no limitation of the dimension. However, it is preferable that, as described above, the dimension L should be set larger than the web width. This is because, if both end portions of the paster roller hit on the product surface of the old roller, it is possible that the portion becomes No Good. Also, it is preferable that the connected portion C**1** of the outer peripheral surfaces of the cylindrical surface portion **122***a* and the chamfered portion **122***b* should be constructed not to form the edge.

[**0056**] According to the paster roller **120** described above, both end portions of the paster roller **120**, that hit strongly onto the web W when the web W is pushed, in the axial direction, are formed as the chamfered portion **122***b*. Therefore, the pushing force acting to both end portions of the web W in the width direction can be reduced, and thus the web W can be pushed by the substantially uniform pushing force over the overall area of the web W in the width direction. As a result, even if this paster roller **120** is pushed against the web of the old roller, both end portions are never strongly brought into contact with the web of the old roller, and thus the cutting of the web can be prevented without fail. In this manner, the improvement of the productivity can be achieved.

[**0057**] **FIG. 5** shows a paster roller **130** as yet still another embodiment of the present invention. The paster roller **130**

has the substantially cylindrical core bar **21** made of aluminum, and a rubber (HsA in the range from 40 to 70) **132** as a coated elastic body provided to the outer peripheral surface of the core bar **21**. The rubber **132** consists of a cylindrical surface portion **132***a* having an outer peripheral diameter D**1**, and gently-curved chamfered portions **132***b* positioned adjacent to both end portions of the cylindrical surface portion **132***a* in the axial direction. Connected portions C**2** between the cylindrical surface portion **132***a* and the chamfered portions **132***b* are connected smoothly not to form edges on the outer peripheral surface.

[**0058**] Since no edge is formed on the outer peripheral surface of the rubber **132** in the paster roller **130** constructed as above, the pressure is never partially concentrated to the web when the paster roller **130** is installed into the above web supplying system **10** (see **FIG. 1**) and is pushed against the web. Accordingly, the cutting of the web can be prevented firmly.

[**0059**] In this case, other structures and operations not explained herein are similar to the above embodiment shown in **FIG. 4**.

[**0060**] **FIG. 6** shows a paster roller as yet still another embodiment of the present invention. As shown in **FIG. 6, a** paster roller **220** has the substantially cylindrical core bar **21** made of aluminum, and a rubber (HsA in the range from 40 to 70) **222** as the coated elastic body provided to the outer peripheral surface of the core bar **21**. Then, the diameter D**1** of the outer peripheral surface of the rubber **222** in the center portion in the axial direction is formed larger than a diameter D**2** of the outer peripheral surface in both end portions in the axial direction. In more detail, the rubber **222** has a crown shape in which the diameter D**1** of the outer peripheral surface in the center portion in the axial direction becomes maximum. That is, the diameter of the outer peripheral surface of the rubber **222** is gradually increased from both end portions to the center portion in the axial direction. Then, the outer peripheral surface is smoothly connected in the center portion in the axial direction, so that no edge is formed at the connected portion on the outer peripheral surface.

[**0061**] The diameter D**3** of the outer peripheral surface of the core bar **21** is uniform. The journal **23** is provided to both end portions that are projected from both ends of the rubber **222** on the core bar **21**. The journal **23** is rotatably supported by the bearing **28**.

[**0062**] For example, the conditions that the dimension L of the rubber **222** in the axial direction is 1100 mm, the diameter D**1** of the outer peripheral surface of the center portion the rubber **222** in the axial direction is 100 mm, the diameter D**2** of the outer peripheral surface of both end portions of the rubber **222** in the axial direction is 98.5 mm, and the diameter D**3** of the outer peripheral surface of the core bar **21** is 80 mm may be employed. But it is of course that there is no limitation of the dimension. However, it is preferable that, as described above, the dimension L should be set larger than the web width. This is because, if both end portions of the paster roller hit on the product surface of the old roller, it is possible that the portion becomes No Good.

[**0063**] Since the outer peripheral shape of the rubber **222** is formed like the crown shape in the mentioned-above paster roller **220**, the center portion of the rubber **222** in the axial direction can push against the web when the paster roller **220** is bent, so that the rubber **222** can push against the web of the old roller **1***a* (see **FIG. 1**) substantially uniformly over the entire area of the rubber **222** in the axial direction. As a result, if the paster roller **220** is pushed against the web of the old roller **1***a*, both end portions of the rubber **222** in the axial direction never strongly contact to the web of the old roller **1***a*, whereby the web cutting can be prevented without fail. In addition, even when the paster roller **220** is pushed against the web by the weak force by which the webs cannot be jointed in the related art, the webs can be jointed satisfactorily. That is, because the force for pushing the paster roller **220** against the web can be transmitted substantially uniformly to the overall area of the rubber **222** in the axial direction, there is no need that the extra force should be applied to correct the unevenness of the pushing force because of the bending of the paster roller **220**, and thus the webs can be jointed satisfactorily. In this manner, the improvement of the productivity can be achieved.

[**0064**] The present invention is not limited to above embodiments, and appropriate variation, improvement, etc. may be applied. The above embodiments may be combined together.

[**0065**] For example, the air exhausting effect maybe accelerated by applying the chemical surface process to the outer peripheral surface of the paster roller.

[**0066**] For example, the inner peripheral surface of the hollow cylindrical core bar may be supported by the reinforcing member. Also, the rubber may be formed integrally with the member constituting the core bar **21**.

EXAMPLES

[**0067**] (Test 1)

[**0068**] The web roller on which the web made of PET (polyethylene terephthalate) film, whose web width is 1000 mm and whose web thickness is 6 μm, is rolled. On the outer peripheral surface of the web roller, the ultra-low pressure prescale is rolled was fitted to the web supplying system **10** as the new roller **1***b* shown in **FIG. 1**. Also, the same web roller on which the prescale is not rolled was fitted as the old roller **1***a*, and then the web was supplied by the feeding tension of 100 N/m at the speed of 200 m/min.

[**0069**] In addition, as the paster roller, there were prepared two type paster rollers in which, in the paster roller **120** shown in **FIG. 4**, the dimension L of the rubber **122** in the width direction is set to 1100 mm, the hardness of the rubber **122** is set to HsA **60**, the diameter D**3** of the outer peripheral surface of the core bar **21** is set to 80 mm, and the distance d from the end portion of the web to the connected portion between the cylindrical surface portion and the chamfered portion is 50 mm, but the inclination angle of the chamfered portion is changed.

[**0070**] Out of two type paster rollers, the paster roller having the inclination angle θ of 10° was set as Example 1 and the paster roller having the inclination angle θ of 5 was set as Example 2.

[**0071**] The paster roller of Example 1 or Example 2 was installed into the above web supplying system, and then the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller or the cylinder pressure

was measured while pushing the paster roller against the new roller via the web supplied from the old roller respectively and also the web on the old roller was watched and evaluated.

[0072] At this time, by way of comparison, the similar watch and evaluation were executed by using the paster roller that has the conventional cylindrical outer peripheral surface in which the chamfered portion is not formed.

[0073] In the test using the paster roller of Example 1, by setting the cylinder pressure acting to the paster roller to 300 kPa, the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller were measured. Also the web of the old roller was watched. The case where the conventional paster roller shown as Comparative Example 1 is employed was watched under the similar condition (the cylinder pressure 300 kPa).

[0074] In addition, in the test using the paster roller of Example 2, as the condition not to cause the cutting of the web, the cylinder pressure to provide the maximum value 980 kPa of the pushing pressure acting to the outer peripheral surface of the new roller and the minimum value of the pushing pressure were measured, and also the jointed state between the web of the old roller and the web of the new roller was watched. Also, as to the conventional paster roller shown as Comparative Example 2, the similar watching was executed at the maximum value of the pushing pressure to 980 kPa.

[0075] Results of the above evaluation test are given in Table 1.

TABLE 1

	Example 1	Comparative Example 1	Example 2	Comparative Example 2
Inclination angle (degree)	10	0	5	0
Cylinder pressure (kPa)	300	300	200	100
Pushing pressure MAX (kPa)	1180	2350	980	980
Pushing pressure MIN (kPa)	880	880	680	490
Pushing pressure MAX-MIN (kPa)	300	1470	300	490
Situation	Good	Cut	Good	Adhesive peeling off
Evaluation	Good	No Good	Good	No Good

[0076] As shown in Table 1, according to the paster roller shown in Example 1, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 1180 kPa, the minimum value was 880 kPa, and the difference between them was 300 kPa. Then, the distribution of the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller became minimum in the center portion of the paster roller in the width direction, and was increased toward both ends in the axial direction, and became maximum at both end portions in the axial direction. Also, the cutting of the web supplied from the old roller did not appear.

[0077] In contrast, according to the paster roller shown in Comparative Example 1, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 2350 kPa, the minimum value was 880 kPa. The difference between the maximum value and the minimum value was 1470 kPa, and the cutting of the web supplied from the old roller appeared. In this case, the distribution of the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller was similar to Example 1.

[0078] Based on the results described above, according to the paster roller shown in Example 1, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was reduced to 1170 kPa in contrast to 2350 kPa of the paster roller in the related art. Therefore, according to Example 1, the pushing pressure to the end portions of the web in the width direction could be reduced and thus the web was never cut. In addition, according to this Example 1, the difference between the maximum value and the minimum value of the pushing pressure could be reduced to 300 kPa in contrast to 1470 kPa of the paster roller in the related art. Therefore, according to Example 1, since the pushing pressure to the end portions of the web in the width direction was reduced, the pushing pressure acting to the web in the width direction became substantially uniform and thus the web of the old roller and the web of the new roller could be satisfactorily jointed without the cutting of the web.

[0079] Also, as shown in Table 1, according to the paster roller shown in Example 2, the cylinder pressure was 200 kPa, the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller was 680 kPa, and the web of the old roller and the web of the new roller could be satisfactorily jointed. The distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 1.

[0080] In contrast, according to the paster roller shown in Comparative Example 2, the cylinder pressure was 100 kPa, the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller was 490 kPa, and the web of the new roller could not be satisfactorily jointed to the web of the old roller. In this case, the distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 1.

[0081] Based on the results described above, according to the paster roller shown in Example 2, the cylinder pressure could be increased two times rather than Comparative Example 2 and the minimum value of the pushing pressure could be increased without the increase of the maximum value of the pushing pressure. Therefore, since the difference between the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller could be reduced to 300 kPa in contrast to 490 kPa in Comparative Example 2, the force for pushing the paster roller **20** against the web could be transmitted substantially uniformly to the overall area of the rubber **122** in the axial direction. As a result, even if the cylinder pressure was increased to correct the unevenness of the pushing force due to the bending of the paster roller, the web of the old roller and the web of the new roller could be jointed satisfactorily without the increase of the maximum value of the pushing pressure.

[0082] (Test 2)

[0083] The web roller on which the web made of PET film, whose web width is 1000 mm and whose web thickness is 6 μm, is rolled. On the outer peripheral surface of the web roller, the ultra-low pressure prescale is rolled. The web roller was installed into the web supplying system **10** as the new roller **1***b* shown in **FIG. 1**. Also, the same web roller on which the prescale is not rolled was installed as the old roller **1***a*, and then the web was supplied by the feeding tension of 98 N/m at the speed of 200 m/min.

[0084] In addition, as the paster roller, there were prepared two type paster rollers in which, in the paster roller **220** shown in **FIG. 6**, the dimension L of the rubber **222** in the width direction is set to 1100 mm, the hardness of the rubber **222** is set to HsA of 60, the diameter D**3** of the outer peripheral surface of the core bar **21** is set to 80 mm, and the crown is changed.

[0085] Any one of two type paster rollers, the one paster roller in which the crown is 1.5 mm (the maximum outer peripheral diameter D**1**: ϕ100 mm, and the minimum outer peripheral diameter D**2**: ϕ98.5 mm) was set as Example 3, and the other paster roller in which the crown is 0.5 mm (the maximum outer peripheral diameter D**1**: ϕ100 mm, and the minimum outer peripheral diameter D**2**: ϕ99.5 mm) was set as Example 4.

[0086] The paster roller of Example 3 or Example 4 was installed into the above web supplying system, and then the pushing pressure of the paster roller acting onto the outer peripheral surface of the new roller was measured while pushing the paster roller against the new roller via the web supplied from the old roller respectively and also the web on the old roller was watched and evaluated.

[0087] At this time, by way of comparison, the similar watching and evaluation were executed by using the paster roller that has the conventional cylindrical outer peripheral surface.

[0088] In the test using the paster roller of Example 3, by setting the cylinder pressure acting to the paster roller to 294 kPa, the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller were measured. Then, the web of the old roller was watched. Also, the case where the conventional paster roller shown as Comparative Example 3 is employed was watched under the similar condition (the cylinder pressure 294 kPa).

[0089] In addition, in the test using the paster roller of Example 4, the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller were measured by setting the cylinder pressure to 196 kPa. The jointed state between the web of the old roller and the web of the new roller was watched. Also, as to the conventional paster roller shown as Comparative Example 4, the similar watching was executed at the same cylinder pressure.

[0090] Results of the above evaluation test are given in Table 2.

TABLE 2

	Example 3	Comparative Example 3	Example 4	Comparative Example 4
Crown	1.5	0	0.5	0
Cylinder pressure (kPa)	294	294	196	196
Pushing pressure MAX (kPa)	980	1470	880	980
Pushing pressure MIN (kPa)	880	780	680	490
Pushing pressure MAX-MIN (kPa)	100	690	200	490
Situation	Good	Cut	Good	Adhesive peeling off
Evaluation	Good	No Good	Good	No Good

[0091] As shown in Table 2, according to the paster roller shown in Example 3, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 980 kPa, the minimum value was 880 kPa, and the difference between them was 100 kPa. Then, the distribution of the pushing pressure of the paster roller acting to the outer peripheral surface of the new roller became minimum in the center portion of the paster roller in the width direction, and was increased toward both ends in the axial direction, and became maximum at both end portions in the axial direction. Also, the cutting of the web supplied from the old roller did not appear.

[0092] In contrast, according to the paster roller shown in Comparative Example 3, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 1470 kPa, the minimum value was 780 kPa, the difference between the maximum value and the minimum value was 690 kPa, and the cutting of the web supplied from the old roller appeared. In this case, the distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 3.

[0093] Based on the results described above, according to the paster roller shown in Example 3, the difference between the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller could be reduced to 100 kPa in contrast to 690 kPa of the paster roller in the related art. Therefore, according to Example 3, the pushing pressure acting to the web in the width direction became substantially uniform, and thus the web of the old roller and the web of the new roller could be satisfactorily jointed without the cutting of the web.

[0094] Also, as shown in Table 2, according to the paster roller shown in Example 4, the cylinder pressure was 200 kPa, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 880 kPa, the minimum value was 680 kPa, and the difference between them was 200 kPa. The web of the old roller and the web of the new roller could be satisfactorily jointed. In this case, the

distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 3.

[0095] In contrast, according to the paster roller shown in Comparative Example 4, the maximum value of the pushing pressure acting to the outer peripheral surface of the new roller was 980 kPa, the minimum value was 490 kPa, and the difference between the maximum value and the minimum value was 490 kPa. The web of the new roller could not be jointed satisfactorily to the web of the old roller. In this case, the distribution of the pushing pressure acting to the outer peripheral surface of the new roller was similar to Example 3.

[0096] Based on the results described above, according to the paster roller shown in Example 4, the difference between the maximum value and the minimum value of the pushing pressure acting to the outer peripheral surface of the new roller could be reduced to 200 kPa in contrast to 490 kPa in Comparative Example 4. Therefore, the force for pushing the paster roller against the web could be transmitted substantially uniformly to the overall area of the rubber **22** in the axial direction. As a result, the application of the extra force to correct the unevenness of the pushing force due to the bending of the paster roller **20** was not needed, and also the web of the old roller and the web of the new roller could be satisfactorily jointed by the small pushing pressure.

[0097] As described above, according to the present invention, the paster roller that is capable of pushing the second web against the first web firmly and preventing the web cutting to contribute the improvement of the productivity can be provided.

[0098] While only certain embodiments of the invention have been specifically described herein, it will apparent that numerous modifications may be made thereto without departing from the spirit and scope of the invention.

What is claimed is:

1. A paster roller comprising:

an air exhausting concave portion provided on an outer peripheral surface thereof for releasing an air between a first web and the outer peripheral surface,

when the outer peripheral surface pushes the first web to a second web in their overlapped state.

2. The paster roller as set forth in claim 1, wherein the air exhausting concave portion comprises a spiral groove provided on the outer peripheral surface of the paster roller.

3. The paster roller as set forth in claim 2, wherein the groove has a pitch in the range from 1 mm to 10 mm, and a depth on the range from 0.1 mm to 1 mm.

4. A paster roller comprising:

chamfered portions formed at both end portions of an outer peripheral surface thereof.

5. The paster roller as set forth in claim 4, wherein the chamfered portions contain portions of the outer peripheral surface of the paster roller that are opposed to portions in the range from 20 mm to 50 mm from both end portions of the web, which contacts to the outer peripheral surface of the paster roller, in the width direction.

6. The paster roller as set forth in claim 4, wherein each of the chamfered portions includes a flat portion that is inclined at a predetermined inclination angle ranged from 3° to 20° relative to the center axis of the paster roller in a sectional view.

7. The paster roller as set forth in claim 4, further comprising:

a core bar formed a substantially cylindrical shape; and

a coated elastic body provided on the outer peripheral surface of the core bar.

8. The paster roller as set forth in claim 7, wherein the core bar is made of aluminum.

9. The paster roller as set forth in claim 7, wherein the coated elastic body is made of resin, and the coated elastic body has hardness (HsA) in the range from 40 to 70.

10. A paster roller for pushing a first web and a second web in their overlapped state, wherein the paster roller is formed into a crown shape, and the paster roller has a predetermined crown.

11. The paster roller as set forth in claim 10, wherein the predetermined crown has a range from 0.5 mm to 2.5 mm per a width 1000 mm of the paster roller.

12. The paster roller as set forth in claim 10, further comprising:

a core bar formed a substantially cylindrical shape; and

a coated elastic body provided on the outer peripheral surface of the core bar for pushing portion of the paster roller.

13. The paster roller as set forth in claim 12, wherein the core bar is made of aluminum, the coated elastic body is made of resin, and the coated elastic body has hardness (Has) in the range from 40 to 70.

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