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(54) **DEVICE FOR CLEANING CHILLED ROLLS**

REINIGUNGSVORRICHTUNG FÜR GEKÜHLTE WALZEN

DISPOSITIF DE NETTOYAGE DE ROULEAU DE REFROIDI

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Description

Technical Field

[0001] The present invention relates to a device for cleaning chilled rolls used in a twin roll caster.

Background Art

[0002] Known as one of techniques for directly producing a strip from molten metal is twin-roll continuous casting where molten metal is supplied to between a pair of rotated rolls to deliver a solidified metal strip therefrom.

[0003] Figs. 1 and 2 show a twin roll caster with a conventional cleaning device for chilled rolls, the twin roll caster comprising a pair of chilled rolls 1 arranged horizontally side by side, and a pair of side weirs associated with the rolls 1.

[0004] The chilled rolls 1 are constructed such that cooling water passes through the rolls and a nip G between the rolls may be expanded/contracted depending on thickness of a strip 3 to be produced.

[0005] The rotated speed and direction of the chilled rolls 1 are set such that outer peripheries of the respective rolls move from above to the nip G between the rolls at the same speed.

[0006] One of the side weirs 2 surface-contact one ends of the respective chilled rolls 1 and the other side weir 2, the other ends of the rolls 1.

[0007] A molten-metal delivery nozzle 4 is arranged between the paired side weirs 2 and just above the nip G between the rolls. Molten metal is poured from a ladle (not shown) via the nozzle 4 into a space defined by the rolls 1 and the side weirs 2 to form a molten metal pool 5.

[0008] Thus, with the molten metal pool 5 being formed, the rolls 1 are rotated while being cooled by circulation of cooling water therethrough, so that molten steel is solidified on the outer peripheries of the rolls 1, the solidified shells 6 on the respective outer peripheries of the chilled rolls 1 being brought together to be delivered downwardly from the nip G as the steel strip 3.

[0009] In this case, in order to make the steel strip 3 to have thickness of a target value, pushing forces are applied to bearing boxes (not shown) pivotally supporting necks of the respective rolls 1 so as to move the rolls toward each other.

[0010] As casting runs are repeated, oxides including for example manganese and silicon are attached to the outer peripheries of the rolls 1. The attached oxides increased in thickness hinder heat transfer from the molten steel to the rolls 1 and interfere the production of the solidified shells 6 on the outer peripheries of the rolls 1.

[0011] In order to overcome this, a cylindrical brush 7 is arranged for each of the rolls 1 such that the brush abuts on the outer periphery of the roll all over an axial length of the roll. The brush 7 is rotated by a motor (not shown) in the same direction as that of the roll 1 to clean the outer periphery of the roll 1, thus removing any attached oxidation layer (see, for example, Patent Literatures 1 and 2).

[0012] Portions of the respective brushes 7 not facing to the rolls 1 are sheathed by cowlings 8, respectively.

[0013] Each of the cowlings 8 is formed with a set of dust suction ports 9 spaced apart from each other axially of the roll 1 such that the respective sets of suction ports 9 are symmetrical, the dust suction ports 9 being connected to an exhaust blower 10 for prevention of dust from scattering during the cleaning.

[Patent Literature 1] JP8-309488A
[Patent Literature 2] JP2000-644A

Summary of Invention

Technical Problems

[0014] The brush 7 comprises a barrel 11 and grouped cleaning wires 12 implanted generally over an outer periphery of the barrel 11. It is not easy to suck, out of the cowlings 8, the dust intruding between the densely implanted wires 12.

[0015] When attention is paid to cleanness of the brush 7 cleaning the outer periphery of the chilled roll 1 all over the axial length thereof, it is found out that dust left is little on the wires and the barrel constituting the brush 7 at regions α adjacent to the dust suction ports 9; the further the positions are away from the dust suction ports 9, the more the dust is left.

[0016] Such cleanness of the brush 7 is reflected in the chilled roll 1; dust, which is left much at the portions of the brush 7 away from the dust suction ports 9, partly emigrates to the outer periphery of the chilled roll 1 and hinders heat transfer from the molten steel to the roll 1.

[0017] In other words, on the outer periphery of each of the chilled rolls 1, the development, of the solidified shell 6 is smooth at the portions of the brush 7 in the regions α adjacent to the dust suction ports 9 and is not smooth at the other portions due to hindrance of heat transfer by the dust.

[0018] Thus, the steel strip 3 delivered from the paired chilled rolls 1 is made up of the solidified shells 6 applied to each other at their well-developed ridges shown in Fig. 2, there remaining unsolidified zones at valleys between the ridges axially of the chilled rolls 1.

[0019] Moreover, the steel strip 3 after its shrinkage due to the solidification may have irregular thickness distribution widthwise of the strip, resulting in cracks on the strip.

[0020] The invention was made in view of the above and has its object to provide a device for cleaning chilled rolls which can keep brushes to have high cleanness.

Solution to Problems

[0021] In order to attain the above object, a device for cleaning chilled rolls according to the invention compris-

es brushes each comprising a rotatable cylindrical barrel formed with a number of suction through-holes extending from an outer periphery to inside, said barrel extending in parallel with an axis of the roll, grouped cleaning wires implanted on the outer periphery of the barrel and having tips abutting on an outer periphery of the roll upon rotation of the barrel and a dust suction port at one of ends of said barrel and in communication with an inner space of the barrel, said dust suction port being connected to an exhaust mechanism.

[0022] Specifically, the grouped cleaning wires may be implanted on the outer periphery of the barrel such that the wires form a helical bank extending from an end to the other end of the barrel.

[0023] Alternatively, the grouped cleaning wires may be implanted on the outer periphery of the barrel such that wires form a plurality of helical banks extending from an end to the other end of the barrel.

[0024] The grouped cleaning wires are varied in length, diameter and/or material quality between the banks. Portions of the brush not facing to the roll may be sheathed by a cowling.

Advantageous Effects of Invention

[0025] A device for cleaning chilled rolls according to the invention can exhibit the following excellent effects and advantages.

[0026] (1) The great number of suction through-holes are formed on the barrel with the outer periphery on which wires are implanted, so that dust generated upon cleaning can enter via the suction through-holes into an inner space within the barrel and is discharged via the dust suction port to outside. As a result, the brush can be kept to have high cleanness.

[0027] (2) When the grouped cleaning wires are implanted on the outer periphery of the barrel such that the wires form one or a plurality of helical bank extending from an end to the other end of the barrel, the number of wires concurrently abutting on the outer periphery of the roll is reduced. As a result, with no need of urging the brush against the roll with great force, contact pressure of the grouped wires against the roll can be ensured and attached oxide layer can be reliably removed from the roll.

[0028] (3) Thus, the strip delivered from the chilled rolls has tendency of having not irregular thickness distribution widthwise of the strip but averaged one, cracks being prevented from occurring.

Brief Description of Drawings

[0029]

Fig. 1 is a schematic view showing a twin roll caster with a conventional cleaning device for chilled rolls;
Fig. 2 is a schematic plan view with respect to Fig. 1;
Fig. 3 is a schematic view showing a twin roll caser with a device for cleaning chilled rolls of the invention;
Fig. 4 is a schematic vies showing the brush in Fig. 3;
Fig. 5 is a schematic view showing a variation of the brush; and
Fig. 6 is a schematic view showing a further variation of the brush.

Reference Signs List

[0030]

1	chilled roll
10	exhaust blower
13	brush
14	suction hole
15	barrel
16	grouped wires
18	dust suction port
20	cowling
22	grouped wires
23	grouped wires

Description of Embodiments

[0031] An embodiment of the invention will be described in conjunction with drawings.
Figs. 3 and 4 show a twin roll caser with a device for cleaning chilled rolls according to the invention in which parts similar to those of Figs. 1 and 2 are represented by the same reference numerals.

[0032] Employed in the device for cleaning the chilled rolls is a technique such that a brush 13 arranged for each of chilled rolls 1 is rotated by a motor (not shown) in the same direction as that of the roll 1 to clean an outer periphery of the roll 1, thereby removing any attached oxide layer.

[0033] The brush 13 comprises a cylindrical barrel 15 formed with a number of suction through-holes 14 extending from an outer periphery of the barrel to inside, grouped cleaning wires 16 implanted on the outer periphery of the barrel 15 such that the wires 16 form a helical bank extending from an end of the barrel 15 to the other end thereof, a dust suction port 18 in the form of a hollow shaft coaxially associated with the barrel 15 through a ring plate 17 fitted into the end of the barrel 15 and a support shaft 19 coaxially fixed to the barrel 15 through a plate (not shown) fitted to the other end of the barrel 15, the brush being arranged in parallel with an axis of the chilled roll 1 in such a manner that tips of the grouped wires 16 are caused to sequentially abut on the outer periphery of the roll 1 through rotation of the barrel 15.

[0034] The above-mentioned wording "grouped cleaning wires 16 implanted ... such that the wires 16 form a helical bank" encompass both a technique of implanting a bunch of a predetermined number of wires to each of implant holes formed on the barrel 15 and a technique of attaching to the barrel 15 a channel brush comprising the grouped wires tied down by a channel-shaped long

holder so as to have any given thickness.

[0035] Portions of each of the brushes 13 not facing to the roll 1 are sheathed by a cowling 20.

[0036] In order to prevent dust from being scattered during the cleaning, a hollow shaft-like dust suction port 18 communicating with an inner space in the barrel 15 is connected to a compulsory exhaust mechanism in the form of exhaust blower 10 through a rotary joint (not shown) for rotation of the brush 13 as well as a piping 21.

[0037] When a twin roll caster is to be operated, the brushes 13 are rotated by motors (not shown) in the same directions as those of the chilled rolls 1 to clean the outer peripheries of the chilled rolls 1 to thereby remove the attached oxide layers while the exhaust blower 10 is activated to catch the dust in the respective cowlings 20.

[0038] Since the grouped wires 16 are implanted on the outer periphery of the barrel 15 such that the wires 16 form a helical bank extending from the one to the other end of the barrel 15, the grouped wires 16 only in a limited area concurrently abut on the outer periphery of the roll 1, so that a widthwise profile of the outer periphery of the roll 1 does not directly affect the brush 13. As a result, with no need of urging the brush 13 against the roll 1 with great force, contact pressure of the grouped wires 16 against the roll 1 can be ensured and any attached oxide layer can be reliably removed from the outer periphery of the roll 1. Moreover, since the urging force of the brush 13 may be small, a mechanism such as pushing cylinder for urging the brush 13 against the roll 1 may be of small size and drive energy required for rotation of the brush 13 may be reduced.

[0039] Furthermore, since the dust during the cleaning enters via the great number of suction holes 14 into the inner space of the barrel 15 and is instantly discharged out of the cowling 20 via the dust suction port 18 and since the implanted density of the grouped wires 16 is low, the dust has much difficulties for its entering into the grouped wires 16, thus the cleanness of the brush 13 can be kept high. In other words, even if the dust enters into the grouped wires 16 and/or adheres on the barrel 15, such dust can be quickly an reliably sucked and discharged through the suction holes 14 and from the barrel 15, Since the brush 13 is sheathed by the cowling 20, the dust can be favorably prevented from being scattered around the brush 13. This also makes it easy to generate negative pressure around the brush 13 within the cowling 20 relative to the environment outside the cowling 20, so that dust recovery by actuation of the exhaust blower 10 can be efficiently conducted.

[0040] Thus, facilitated is production of solidified shells 6 on the outer peripheries of the rolls 1 (see Fig. 2); the steel strip 3 delivered from the rolls has tendency of having not irregular but equal widthwise thickness distribution, resulting in prevention of cracks on the strip.

[0041] Fig. 5 shows a variation of the brush 13 where, in addition to the helical bank by the grouped cleaning wires 16, grouped cleaning wires 22 are implanted on the outer periphery of the barrel 15 to provide a further helical bank from the one to the other end of the barrel, whereby totally the two banks are provided.

[0042] The grouped wires 16 and 22 may be of the same kind for uniform cleaning effect; if the grouped wires 16 and 22 are varied in length (from the outer periphery of the barrel 15 to the tips of the wires), diameter and/or material quality between the banks, different cleaning effects can be obtained.

[0043] Fig. 6 shows a further variation of the brush 13 where grouped cleaning wires 23 are implanted to provide a plurality of equidistantly arranged banks on the outer periphery of the barrel 15 from the one to the other end of the barrel 15.

[0044] The respective banks of the grouped wires 23 extend obliquely of the axis of the barrel 15 and implanted positions of each of the banks on the one and the other ends of the barrel 15 are offset circumferentially of the barrel 15, the grouped wires 23 only in a limited area concurrently abut on the outer periphery of the roll 1 (see Fig. 3), so that a widthwise profile of the outer periphery of the roll 1 does not directly affect the brush 13. As a result, with no need of urging the brush 13 against the roll 1 with great force, contact pressured of the grouped wires 23 against the roll 1 can be ensured and any attached oxide layer can be reliably removed from the outer periphery of the roll 1.

[0045] Moreover, since the dust during the cleaning enters via the great number of suction holes 14 into the inner space of the barrel 15 and is instantly discharged out of the cowling 20 (see Fig. 2) via the dust suction port 18 and since the implanted density of the grouped wires 23 is low, the dust has much difficulties for its entering into the grouped wires 23, thus the cleanness of the brush 13 can be kept high. In other words, even if the dust enters into the grouped wires 23 and/or adheres on the barrel 15, such dust can be quickly and reliably sucked and discharged through the suction holes 14 and from the barrel 15.

[0046] In the above embodiment and variations, the suction holes through which dust is sucked are arranged only on the barrel 15; however, suction holes may be also provided on the cowlings 20. More specifically, it is conceivable that the dust on and near the brush 13 may be sucked through the suction holes on the barrel 15 and the suction holes on the cowling 20. Then, catching of the dust may be conducted further reliably. The grouped wires 16 and 22 may be right-handed helical or left-handed helical. The rotational direction of the brush 13 itself has no limitation.

[0047] It is to be understood that a device for cleaning a chilled roll according to the invention is not limited to the above embodiment and that various changes and modifications may be made without leaving the spirit of the invention.

Industrial Applicability

[0048] A device for cleaning a chilled roll according to

the invention may be applied to a twin roll caster which produces a strip from metal other than steel.

Claims

1. A device for cleaning chilled rolls (1) which comprises brushes (13) each comprising a rotatable cylindrical barrel (15) formed with a number of suction through-holes (14) extending from an outer periphery to inside, said barrel (15) extending in parallel with an axis of the roll (1), grouped cleaning wires (16,22;23) implanted on the outer periphery of the barrel (15) and having tips abutting on an outer periphery of the roll (1) upon rotation of the barrel (15) and a dust suction port (18) at one end of said barrel (15) and in communication with inner space of the barrel (15), said dust suction port (18) being connected to an exhaust mechanism (10).

2. A device for cleaning chilled rolls as claimed in claim 1, wherein the grouped cleaning wires (16,22) are implanted on the outer periphery of the barrel (15) such that the wires (16, 22) form a helical bank extending from an end to the other end of the barrel (15).

3. A device for cleaning chilled rolls as claimed in claim 1, wherein the grouped cleaning wires (22;23) are implanted on the outer periphery of the barrel (15) such that the wires (22;23) form a plurality of helical banks extending from an end to the other end of the barrel (15).

4. A device for cleaning chilled rolls as claimed in any one of claims 1-3, wherein the grouped cleaning wires (16,22;23) are varied in length, diameter and/or material quality between the banks.

5. A device for cleaning chilled rolls as claimed in any one of claims 1-3, wherein portions of the brush (13) not facing to the roll (1) are sheathed by a cowling (20).

6. A device for cleaning chilled rolls as claimed in claim 4, wherein portions of the brush (13) not facing to the roll (1) is sheathed by a cowling (20).

Patentansprüche

1. Vorrichtung zum Reinigen von gekühlten Walzen (1), die Bürsten (13) umfasst, wovon jede eine drehbare zylindrischen Trommel, die mit einer Anzahl von Ansaug-Durchgangslöchern (14) ausgebildet ist, die sich von einer äußeren Umfangsfläche nach innen erstrecken, wobei sich die Trommel (15) parallel zu einer Achse der Walze (1) erstreckt, in Gruppen angeordnete Reinigungsdrähte (16, 22; 23), die auf der äußeren Umfangsfläche der Trommel (15) eingesetzt sind und Spitzen aufweisen, die bei einer Drehung der Trommel (15) an einer äußeren Umfangsfläche der Walze (1) anliegen, und eine Staub-Ansaugöffnung (18) an einem Ende der Trommel (15) und in Verbindung mit dem Innenraum der Trommel (15), wobei die Staub-Ansaugöffnung (18) mit einer Absaugeinrichtung (10) verbunden ist, umfasst.

2. Vorrichtung zum Reinigen von gekühlten Walzen nach Anspruch 1, wobei die in Gruppen angeordneten Reinigungsdrähte (16, 22) so auf der äußeren Umfangsfläche der Trommel (15) eingesetzt sind, dass die Drähte (16, 22) eine schraubenlinienförmige Reihe bilden, die sich von einem Ende zum anderen Ende der Trommel (15) erstreckt.

3. Vorrichtung zum Reinigen von gekühlten Walzen nach Anspruch 1, wobei die in Gruppen angeordneten Reinigungsdrähte (22; 23) so auf der äußeren Umfangsfläche der Trommel (15) eingesetzt sind, dass die Drähte (23; 23) mehrere schraubenlinienförmige Reihen bilden, die sich von einem Ende zum anderen Ende der Trommel (15) erstrecken.

4. Vorrichtung zum Reinigen von gekühlten Walzen nach einem der Ansprüche 1-3, wobei die in Gruppen angeordneten Reinigungsdrähte (16, 22; 23) in Länge, Durchmesser und/oder Materialbeschaffenheit zwischen den Reihen variieren.

5. Vorrichtung zum Reinigen von gekühlten Walzen nach einem der Ansprüche 1 - 3, wobei Abschnitte der Bürsten (13), die nicht der Walze (1) zugewandt sind, durch eine Verkleidung (20) ummantelt sind.

6. Vorrichtung zum Reinigen von gekühlten Walzen nach Anspruch 4, wobei Abschnitte der Bürsten (13), die nicht der Walze (1) zugewandt sind, durch eine Verkleidung (20) ummantelt sind.

Revendications

1. Dispositif pour nettoyer des cylindres refroidis (1) qui comprend des brosses (13) comprenant chacune un tambour cylindrique (15) rotatif comportant un certain nombre de trous traversants d'aspiration (14) s'étendant d'une périphérie extérieure vers l'intérieur, ledit tambour (15) s'étendant parallèlement à un axe du cylindre (1), des fils de nettoyage groupés (16, 22 ; 23) implantés sur la périphérie extérieure du tambour (15) et ayant des extrémités en butée sur une périphérie extérieure du cylindre (1) lors de la rotation du tambour (15) et un orifice d'aspiration de poussière (18) à une extrémité du tambour (15) et en communication avec un espace interne du tam-

bour (15), ledit orifice d'aspiration de poussière (18) étant relié à un mécanisme d'échappement (10).

2. Dispositif pour nettoyer des cylindres refroidis selon la revendication 1, dans lequel les fils de nettoyage groupés (16, 22) sont implantés sur la périphérie extérieure du tambour (15) de sorte que les fils (16, 22) forment un banc hélicoïdal s'étendant d'une extrémité vers l'autre extrémité du tambour (15).

3. Dispositif pour nettoyer des cylindres refroidis selon la revendication 1, dans lequel les fils de nettoyage groupés (22 ; 23) sont implantés sur la périphérie extérieure du tambour (15) de sorte que les fils (22 ; 23) forment une pluralité de bancs hélicoïdaux s'étendant d'une extrémité vers l'autre extrémité du tambour (15).

4. Dispositif pour nettoyer des cylindres refroidis selon l'une quelconque des revendications 1 à 3, dans lequel les fils de nettoyage groupés (16, 22 ; 23) ont une longueur, un diamètre et/ou une qualité de matériau qui varient entre les bancs.

5. Dispositif pour nettoyer des cylindres refroidis selon l'une quelconque des revendications 1 à 3, dans lequel les parties de la brosse (13) ne faisant pas face au cylindre (1) sont recouvertes d'un capot (20).

6. Dispositif pour nettoyer des cylindres refroidis selon la revendication 4, dans lequel les parties de la brosse (13) ne faisant pas face au cylindre (1) sont recouvertes d'un capot (20).

FIG. 1

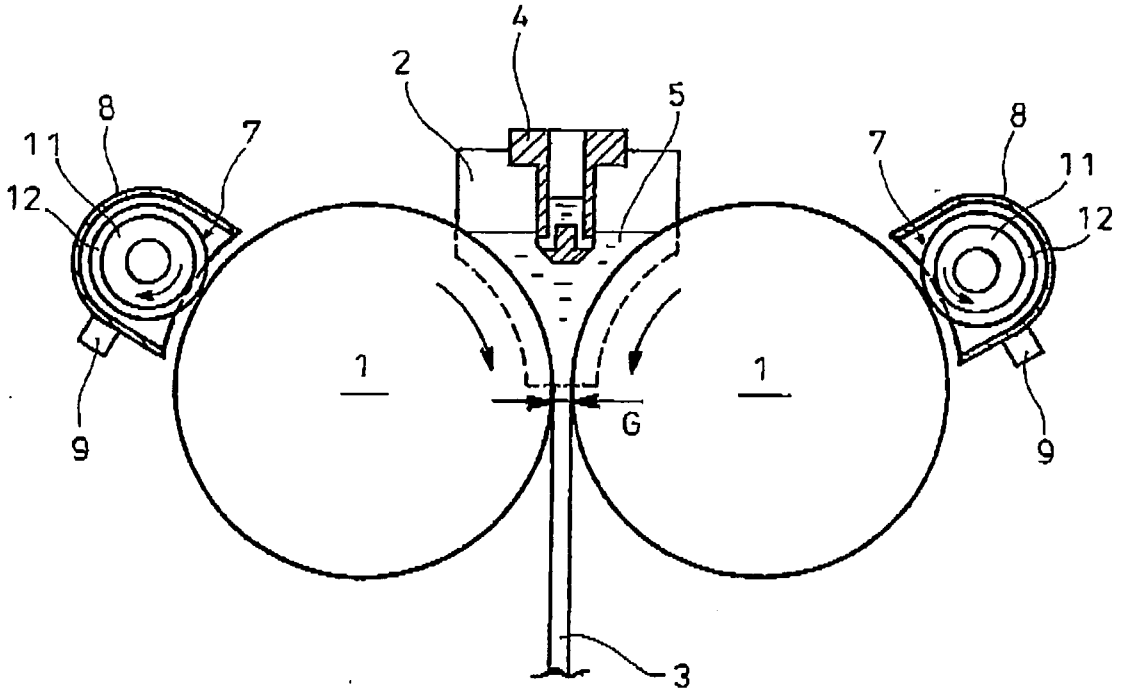


FIG. 2

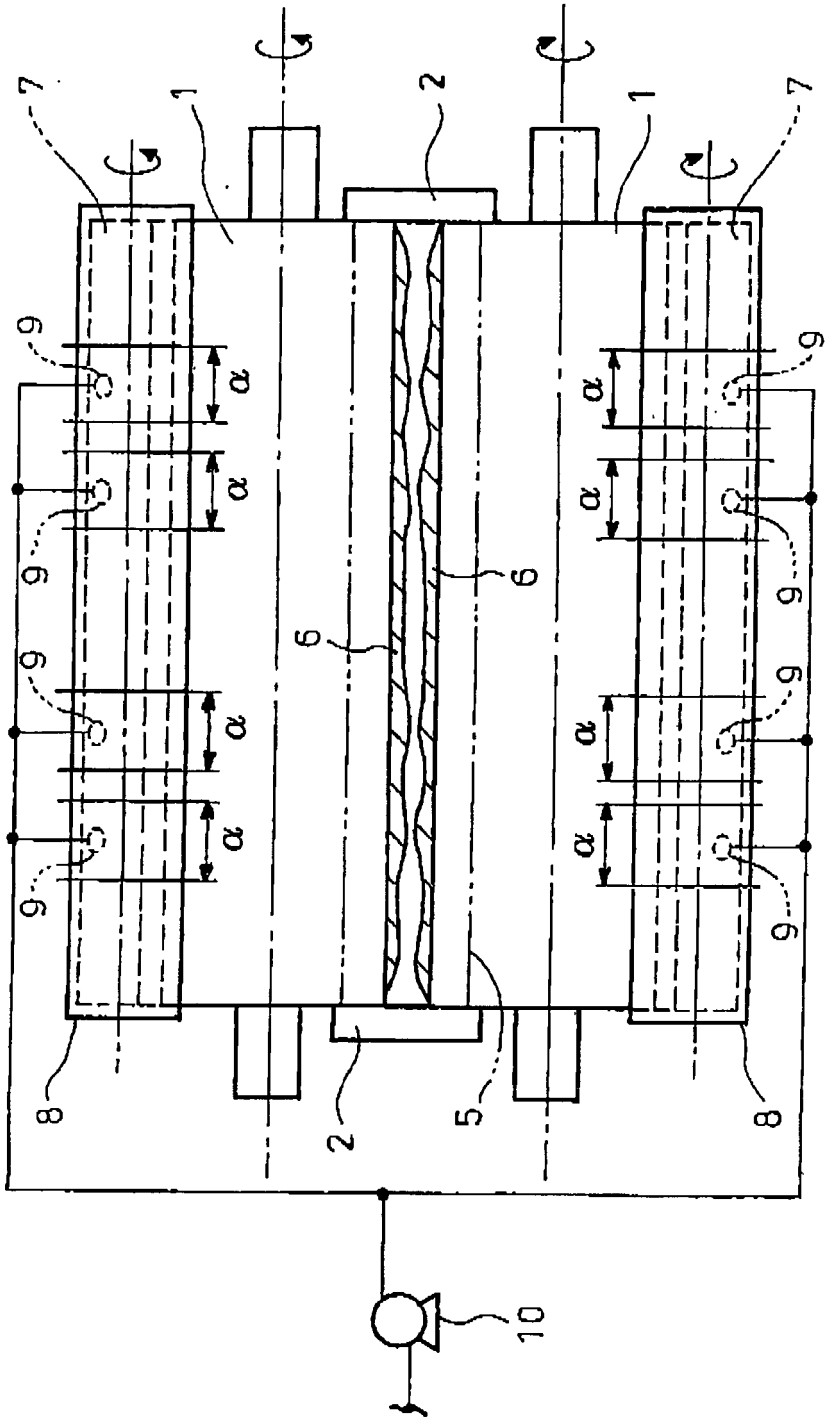


FIG. 3

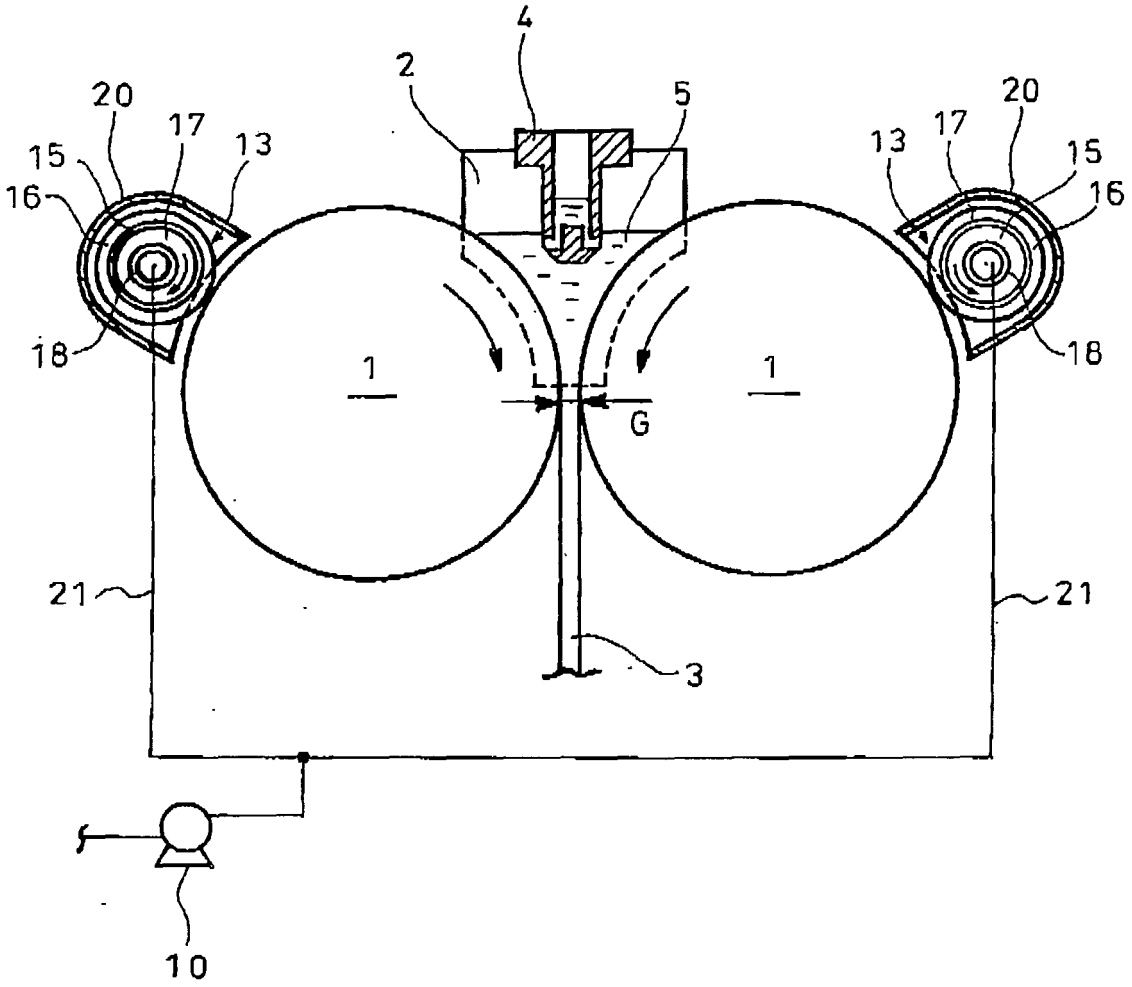


FIG. 4

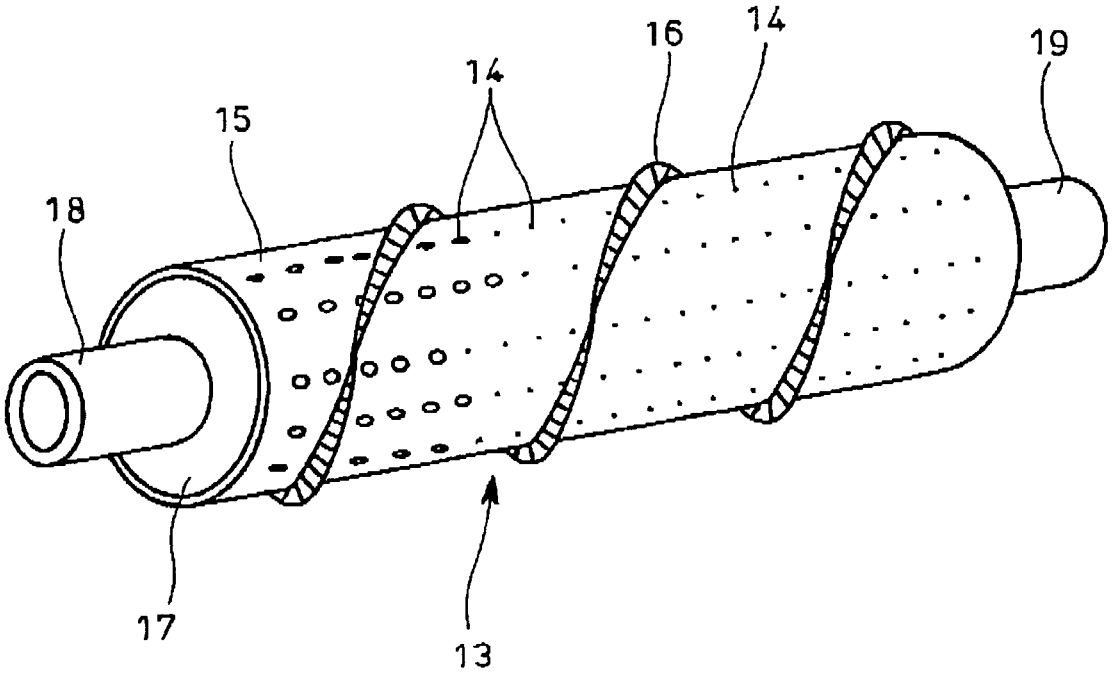


FIG. 5

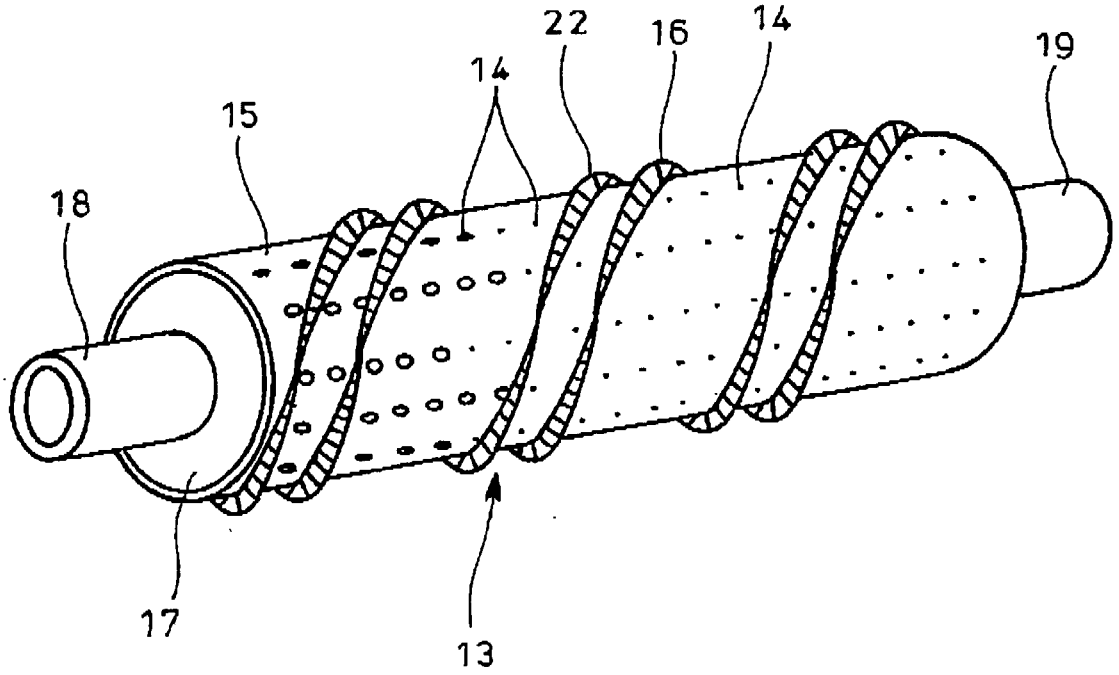
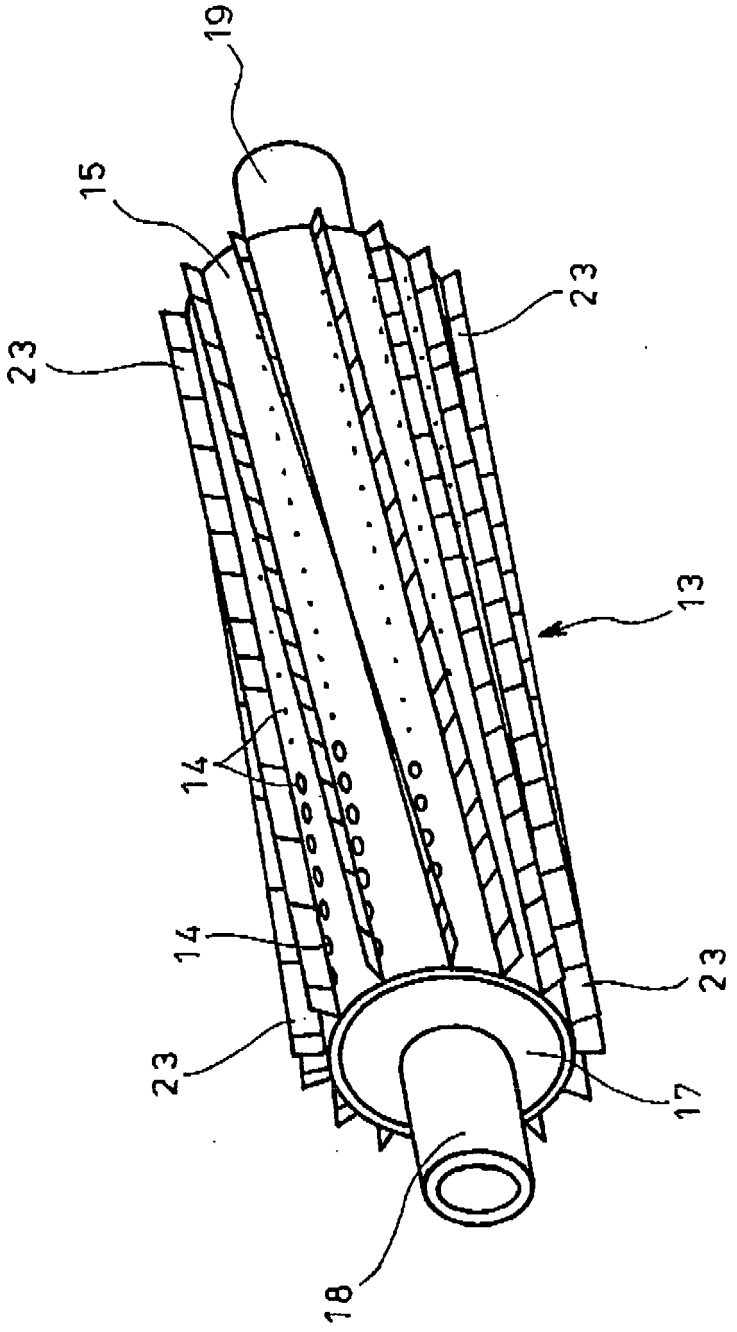


FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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