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(54) **APPARATUS FOR CONDENSING A DRAFTED FIBRE SLIVER**

VORRICHTUNG ZUM KONDENSIEREN EINES VERSTRECKTEN FASERBANDS

APPAREIL DESTINE A CONDENSER UN RUBAN DE FIBRES ETIRE

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Description

[0001] The invention is concerned with apparatus for condensing a drafted fibre sliver in a condensation zone after the front roller pair on a drafting unit, where the condensation zone contains a suction element with a sliding surface with at least one suction slit essentially running in the direction of movement of the fibre sliver and a transport belt, which transports the fibre sliver over the sliding surface and is at least air-permeable over parts of its surface.

[0002] Apparatus of this kind is well-known, e.g. in file no. DE 199 03 531 A1. The suction element has a sliding surface on the same side as the travel of the fibre sliver, cambered in the direction in which the fibre travels and is provided with a suction slit. An air-permeable transport belt is moved over this sliding surface, so transporting the fibre sliver. Beneath the suction element the transport belt loops round a transfer roller, which for its part is driven over a pair of gearwheels by a drive roller. A nipping roller presses from the top against the transport belt lying on the sliding surface to limit the condensation zone on the sliding surface. The disadvantage of this process is that the transport belt would have to have completely contradictory characteristics in order for the apparatus to function satisfactorily. On the one hand, it has to provide the highest possible degree of non-clinging qualities on the side touching the sliding surface, i.e. a low coefficient of friction. On the other hand, the same side of the transport belt has to provide the highest possible coefficient of friction and a low tendency to stick, in order to permit an adequate transfer of force through the transfer roller. If the coefficient of friction is not ideally set with the other parameters, which could be difficult to achieve, the result will either be insufficient drive movement with a high degree of slippage between the transfer roller and the transport belt, or the transport belt will move jerkily on the sliding surface as a result of too much friction. In both cases undesirable irregularities in the quality of the yarn are unavoidable. Regardless of this, a satisfactory level of power transmission can only be achieved via the transfer roller if the transport belt is kept very tight. This, however, leads to unnecessary wear on the transport belt and the sliding surface and is also detrimental to the smooth sliding movement of the transport belt on the sliding surface.

[0003] An alternative to this is well-known, in file no. DE 199 24 527 A1. In this case the movement of the transport belt is created by friction drive created by the nipping roller limiting the condensation zone. The drive for the nipping roller is, for its part, derived from the upper roller of the front roller pair. The transport belt is subject to a high degree of wear in this embodiment. Among other things, this is due to the fact that the transport belt, which loops round the suction element under tension, has to be made to glide on the fixed suction element by the nipping roller, which requires a relatively high degree of contact pressure. Furthermore, the transport belt has to pass over a sharp corner before reaching the condensation zone equipped with the suction slit. The transport belt is therefore under a high degree of tensile stress in the condensation zone, which in the long term will lead to elongation. On the other hand, after passing over the nipping roller, the transport belt is under "thrust", so that there is a danger that excess length, which sets in with time, might extend to the condensation zone and there lead to defective support for the transport belt on the sliding surface. This, however, creates a situation where air can penetrate between the transport belt and the sliding surface laterally and can impair the condensation effect. A condensing apparatus according to the preamble of claim 1 is disclosed by DE 296 00 417 U1.

[0004] The underlying task of the invention is therefore to create apparatus for condensing a drafted fibre sliver, where the drive system for the transport belt is guaranteed to be safe, subject to little wear and independent of the tension on the transport belt.

[0005] This task is resolved by the invention according to the distinctive part of patent claim 1. Claims 2 to 12 contain further advantageous features.

[0006] The apparatus that has been invented has the advantage over the current state of technology that the drive for the transport belt occurs independently of its tension. The transport belt can therefore be kept at a level of tension, which is ideal for the remaining functions, without any detrimental effects on the transmission of the drive torque. In particular the sliding pairing between the transport belt and the sliding surface on the suction element is not adversely affected.

[0007] The apron always sits precisely on the sliding surface as a result of the defined tension for the apron and the convex shape of the sliding surface. This means that a constant partial vacuum is achieved and air cannot penetrate the system laterally.

[0008] There is a further advantage to the invention in that no changes have to be made to the pressure arm or pendulum carrier normally found on ring spinning machines in order to apply the solution provided by this invention. The additional nipping roller required above the sliding surface is housed in a special upper roller retainer, which is supported on the axis of the front upper roller on the pressure arm. This upper roller retainer can be attached or removed in a very simple way without the need for any auxiliary assembly equipment. This means that ring spinning machines can be used both as standard machines and also as condensation machines with a minimum of effort required to retool them.

[0009] Hereinafter the invention is described in more detail using an embodiment example.

[0010] The accompanying illustrations show in

fig. 1 a side view of the invented apparatus and in
fig. 2 a suction element on the invented apparatus.

[0011] Fig. 1 shows the outlet area of a drafting unit **1,** as found on ring spinning machines. Three driven bottom

rollers, **2, 3** and **4** are arranged on shafts that are not illustrated, by which three upper rollers, **6, 7** and **8** housed in a pressure arm **5** are driven. The bottom roller **4** and the upper roller **8** jointly form the front pair of rollers **9** on the drafting unit **1.** The drafting of the fibre sliver **10,** which has been fed in, takes place in the drafting unit **1** up to this pair of front rollers **9** and this is a widely known process.

[0012] A condensation zone with a suction element **11,** which will be described in greater detail later, is attached to the pair of front rollers **9.** This suction element **11,** as well as a guide roller **13,** are both partly looped by an air-permeable transport belt 12. In the section covered by the transport belt **12,** a guide roller **13** presses against a drive roller **14,** which is linked to a motor drive unit, which is not illustrated. This drive roller **14** and the bottom rollers **2, 3** and **4** are preferably part of a drive shaft extending over several spinning positions or the complete machine length. The guide roller's **13** pressure on the drive roller 1**4** is created using a spring **15,** which is attached at a retaining element **16,** which is linked to the spinning machine frame. The spring **15** presses against the shaft **19,** which - as is normal on spinning machines - carries the guide rollers **13** for two adjacent spinning points, and is locked in place temporarily at the retaining element **16** using a catch **20** which overlaps the retaining element's edge **17.** The shaft itself **19** is not secured in a bearing, but simply rests on a catch **18** on the retaining element **16.** This means that the guide roller **13** floats at right angles to the shaft **19.** The spring **15,** engaged between each two of the guide rollers **13,** which are seated on the shaft **19,** is so wide that it limits the axial mobility of the guide rollers **13.**

[0013] A further spring **21** attached to the retaining element **16** presses against the transport belt **12** to provide it with the required tension.

[0014] A nipping roller **22,** which is housed in the upper roller mounting **23,** presses against the transport belt **12** moving over the suction element **11.** This upper roller mounting **23** is once again secured in the shaft **24** of the upper roller **4** of the front roller pair **9** held in the pressure arm **5** and can be removed. A spring **25** supported on the pressure arm **5** provides the required contact pressure for the nipping roller **22** on the suction element **11.**

[0015] The invention caters for a situation where the nipping roller **22** rests on the transport belt **12** with a low degree of active pressure amounting to roughly 1 to 2 daN. This means that it is possible to limit the condensation zone; the movement of the transport belt **12** on the suction element is not hindered, however. The nipping roller is also provided with a soft coating with a hardness in the 53° to 63° range on the Shore A hardness scale.

[0016] The suction element **11** consists of a hollow section, preferably a drawn steel section, which extends over several, or preferably two spinning points and is sealed off on the front side in an advantageous manner by two sealing caps **27** made of plastic. A common source of partial vacuum, which is not, however, illustrated, is assigned to all these spinning points via an extraction opening **26** on the suction element **11.** The link with the partial vacuum source is created via a suction channel, which is linked to the suction element **11** by means of a detachable rubber gasket. A suction slit **28** is arranged for each fibre sliver **10** in the area covered by the transport belt **12** (sliding surface). The surface of the suction element **11** is given additional treatment, at least in the area around the sliding surface, in order to achieve a low coefficient of friction. In an embodiment made of a drawn steel section, this can take place using e.g. shot peening or by modifying the surface. If alternatively an extrusion press section made of aluminium is used, the surface is coated to guarantee both the required slide performance and the necessary hardness of the surface.

[0017] As part of the invention, the transport belt **12** has a coating with a low coefficient of friction on the side touching the sliding surface and a coating with a high coefficient of friction on the side not touching the sliding surface. When linked to the other features of this new invention, the movement of the transport belt **12** can be greatly enhanced. Disadvantages, as found on familiar apparatus of this kind, are avoided. The inner side of the transport belt **12** is not used to transmit power and can therefore be fitted with good sliding characteristics. The drive movement is fed into the transport belt **12,** by pressing the guide roller **13** against the drive roller **14** by means of the perpendicular force exerted by the spring **15.**

[0018] By providing the spring **15** with the correct dimensions, the normal force for the transmission of power is sufficiently large, but not too large. This feature prevents premature wear on the transport belt **12.**

[0019] The apparatus in the invention is designed in such a way that all the elements, which are used to condense the fibre sliver **10,** can be assembled or removed at the spinning point without any great effort. This means that it is possible to use the spinning point both in the conventional sense and also for condensation spinning. In order to create a conventional drafting unit **1,** the upper roller mounting **23** with the nipping roller **22** is detached from the pressure arm **5,** and the guide roller **13** is released by freeing the spring **15,** so that the suction element **11,** the transport belt **12** and the guide roller **13** can be simply removed from the spinning point.

Table of Reference Terms

[0020]

1	drafting unit
2	lower roller
3	lower roller
4	lower roller
5	pressure arm
6	upper roller
7	upper roller
8	upper roller

9 front roller pair
10 fibre sliver
11 suction element
12. transport belt
13 guide roller
14 drive roller
15 spring
16 retaining element
17 edge
18. catch
19 shaft
20 catch
21 spring
22 nipping roller
23 upper roller mounting
24 shaft
25 spring
26 extraction opening
27 sealing cap
28 suction slit

Claims

1. Apparatus for condensing a drafted fibre sliver in a condensation area after the front roller pair on a drafting unit, where the condensation zone contains a suction element with a sliding surface with at least one suction slit essentially running in the direction of movement of the fibre sliver and a transport belt, which transports the fibre sliver over the sliding surface and which is at least air-permeable over parts of its surface, **characterized by** the following features:

- the transport belt (12), apart from the suction element (11), partially loops round a guide roller (13) placed at a distance from the suction element and flexibly arranged transversely on its axis of rotation,
- the guide roller (13) in the looping area and the transport belt (12) bear against a drive roller (14) and
- these are provided with the means to create a defined contact pressure between the guide roller (13) and the drive roller (14).

2. Apparatus according to claim 1, **characterized by** the fact that the guide roller (13) is routed transversely in a retaining element (16) and is pressed against the drive roller (14) by means of a spring element (15), which can be fixed in the retaining element (16).

3. Apparatus according to claim 2, **characterized by** the fact that the spring element (15) limits the mobility of the guide roller (13) in the direction of its axis.

4. Apparatus according to claim 1, **characterized by** the fact that the transport belt (12) has a coating with a low coefficient of friction on the side touching the sliding surface and a coating with a high coefficient of friction on the side not touching the sliding surface.

5. Apparatus according to claim 1, **characterized by** the fact that the suction element (11) consists of a drawn steel section.

6. Apparatus according to claim 5, **characterized by** the fact that the surface of the suction element (11), at least in the area of the sliding surface, is treated subsequently to achieve a low coefficient of friction.

7. Apparatus according to claim 1, **characterized by** the fact that the suction element (11) consists of an aluminium extrusion press section.

8. Apparatus according to claim 7, **characterized by** the fact that the surface of the suction element (11), at least in the area of the sliding surface, is treated subsequently to achieve a low coefficient of friction, a high degree of hardness and a high degree of resistance to wear.

9. Apparatus according to one or several of claims 1 to 8, **characterized by** the fact that the suction element (11) is shaped as a section, which is open on both sides and which is sealed laterally by sealing caps (27) made of plastic.

10. Apparatus according to one or several of claims 1 to 9, **characterized by** the fact that one nipping roller (22), which limits the condensation zone, rests on the transport belt (12) guided over the sliding surface with a low degree of active pressure amounting to approximately 1 to 2 daN.

11. Apparatus according to claim 10, **characterized by** the fact that the nipping roller (22) is provided with a soft coating with a degree of hardness in the 53° to 63° range on the Shore A hardness scale.

12. Apparatus according to claims 1 to 11, **characterized by** the fact that all the components related to condensing the fibre sliver (10) are arranged on the drafting unit in such a way that they can be removed, so that the drafting unit (1) can be used in a traditional manner.

Patentansprüche

1. Vorrichtung zum Kondensieren eines verstreckten Faserbandes in einem Kondensationsbereich hinter dem vorderen Walzenpaar einer Verstreckeinheit, wobei die Kondensationszone ein Saugelement mit einer Gleitfläche beinhaltet, mit wenigstens einem

Saugschlitz, der im Wesentlichen in der Richtung der Bewegung des Faserbandes und eines Transportbandes läuft, das das Faserband über die Gleitfläche transportiert und das wenigstens über Teile seiner Fläche luftdurchlässig ist, **gekennzeichnet durch** die folgenden Merkmale:

- das Transportband (12) ist teilweise weg von dem Saugelement (12) um eine Führungswalze (13) geschlungen, der mit einem Abstand von dem Saugelement und flexibel quer zu seiner Drehachse angeordnet ist,
- die Führungswalze (13) in dem umschlungenen Bereich und der Transportgurt (12) wirken gegen eine Antriebswalze (14), und
- diese sind mit Mitteln zum Erzeugen eines definierten Kontaktdruckes zwischen der Führungswalze (13) und der Antriebswalze (14) versehen.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Führungswalze (13) quer in einem Rückhalteelement (16) geführt ist und gegen die Antriebsrolle (14) mittels eines Federelements (15) gedrückt wird, das in dem Rückhalteelement (16) fixiert werden kann.

3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** das Federelement (15) die Beweglichkeit der Führungswalze (13) in der Richtung seiner Achse begrenzt.

4. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Transportgurt (12) eine Beschichtung in einem niedrigen Reibungskoeffizienten auf der Seite, der die Gleitfläche berührt, und eine Beschichtung in einem hohen Reibungskoeffizienten auf der Seite die die Gleitfläche nicht berührt, hat.

5. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Saugelements (11) aus einem gezogenen Stahlabschnitt besteht.

6. Vorrichtung nach Anspruch 5, **dadurch gekennzeichnet, dass** die Fläche des Saugelements (11) wenigstens in dem Bereich der Gleitfläche nachträglich behandelt ist, um einen niedrigen Reibungskoeffizienten zu erreichen.

7. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Saugelements (11) aus einem Aluminiumextrusionsdruckabschnitt besteht.

8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet, dass** die Fläche des Saugelements (14) wenigstens in dem Bereich der Gleitfläche nachträglich zum Erreichen eines geringen Reibungskoeffizienten, eines hohen Grads von Härte und eines hohen Grad von Widerstandsfähigkeit gegenüber Abnutzung behandelt ist.

9. Vorrichtung nach einem oder mehreren Ansprüchen 1 - 8, **dadurch gekennzeichnet, dass** das Saugelement als ein Abschnitt geformt ist, der auf beiden Seiten offen ist und der lateral durch aus einem Kunststoff gefertigte Dichtungskappen (27) abgedichtet ist.

10. Vorrichtung nach einem oder mehreren der Ansprüche 1 - 8, **dadurch gekennzeichnet, dass** eine Kneifwalze (22), die die Kondensationszone begrenzt, auf dem Transportgurt (12), der über die Gleitfläche mit einem geringen aktiven Druck von etwa 1 - 2 daN geführt ist, ruht.

11. Vorrichtung nach Anspruch 10, **dadurch gekennzeichnet, dass** die Kneifwalze (22) mit einer weichen Beschichtung mit einer Härte von 53° bis 63° auf der Shore A Härteskala versehen ist.

12. Vorrichtung nach Anspruch 1 bis 11, **dadurch gekennzeichnet, dass** alle Komponenten, die zum Kondensieren des Faserbandes (10) Bezug haben, auf der Verstreckeinheit derart angeordnet sind, dass sie entfernt werden können, so dass die Verstreckeinheit (11) in einer üblichen Weise verwendet werden kann.

Revendications

1. Appareil pour étirer avec frotteurs une fibre d'argent étirée dans une zone d'étirage à frotteurs après la paire de rouleaux avant sur un dispositif d'étirage, cette zone d'étirage à frotteurs contenant un élément d'aspiration avec une surface de glissement avec au moins une fente d'aspiration s'étendant essentiellement dans la direction du mouvement de la fibre d'argent, et une courroie transporteuse, qui transporte la fibre d'argent au-dessus de la surface de glissement et qui est au moins perméable à l'air sur des parties de sa surface, **caractérisé par** les aspects suivants :

- la courroie transporteuse (12), séparée de l'élément d'aspiration (11), forme une boucle partielle autour d'un rouleau de guidage (13) placé à distance de l'élément d'aspiration et disposé de manière flexible transversalement sur son axe de rotation,
- le rouleau de guidage (13) dans la zone de bouclage et la courroie transporteuse (12) s'appuient contre un rouleau d'entraînement (14) et
- ces éléments sont pourvus des moyens pour créer une pression de contact définie entre le

rouleau de guidage (13) et le rouleau d'entraînement (14).

2. Appareil selon la revendication 1, **caractérisé par le fait que** le rouleau de guidage (13) est placé transversalement dans un élément de retenue (16) et pressé contre le rouleau d'entraînement (14) au moyen d'un élément ressort (15), qui peut être fixé dans l'élément de retenue (16)

3. Appareil selon la revendication 2, **caractérisé par le fait que** l'élément ressort (15) limite la mobilité du rouleau de guidage (13) dans la direction de son axe.

4. Appareil selon la revendication 1, **caractérisé par le fait que** la courroie transporteuse (12) a un revêtement avec un faible coefficient de frottement sur le côté touchant la surface de glissement et un revêtement avec un coefficient de frottement élevé sur le côté ne touchant pas la surface de glissement.

5. Appareil selon la revendication 1, **caractérisé par le fait que** l'élément d'aspiration (11) consiste en un profilé en acier étiré.

6. Appareil selon la revendication 5, **caractérisé par le fait que** la surface de l'élément d'aspiration (11), au moins dans la zone de la surface de glissement, est traitée par la suite de façon à obtenir un faible coefficient de frottement.

7. Appareil selon la revendication 1, **caractérisé par le fait que** l'élément d'aspiration (11) consiste en un profilé en aluminium extrudé.

8. Appareil selon la revendication 7, **caractérisé par le fait que** la surface de l'élément d'aspiration (11), au moins dans la zone de la surface de glissement, est traitée par la suite de façon à obtenir un faible coefficient de frottement, un degré élevé de dureté et un degré élevé de résistance à l'usure.

9. Appareil selon l'une quelconque ou plusieurs des revendications 1 à 8, **caractérisé par le fait que** l'élément d'aspiration (11) est formé comme un profilé, qui est ouvert sur les deux côtés et qui est obturé latéralement par des chapeaux d'obturation (27) faits en plastique.

10. Appareil selon l'une quelconque ou plusieurs des revendications 1 à 9, **caractérisé par le fait qu'**un rouleau pinceur (22), qui limite la zone d'étirage à frotteurs, repose sur la courroie transporteuse (12) guidée au-dessus de la surface de glissement avec un faible degré de pression active se montant à environ 1 à 2 daN.

11. Appareil selon la revendication 10, **caractérisé par le fait que** le rouleau pinceur (22) est pourvu d'un revêtement tendre avec un degré de dureté situé dans la plage allant de 53° à 63° sur l'échelle de dureté Shore A.

12. Appareil selon les revendications 1 à 11, **caractérisé par le fait que** tous les éléments associés à l'étirage par frotteurs de la fibre d'argent (10) sont disposés sur le dispositif d'étirage de manière à pouvoir être enlevés, de façon à ce que le dispositif d'étirage (1) puisse être utilisé d'une manière traditionnelle.

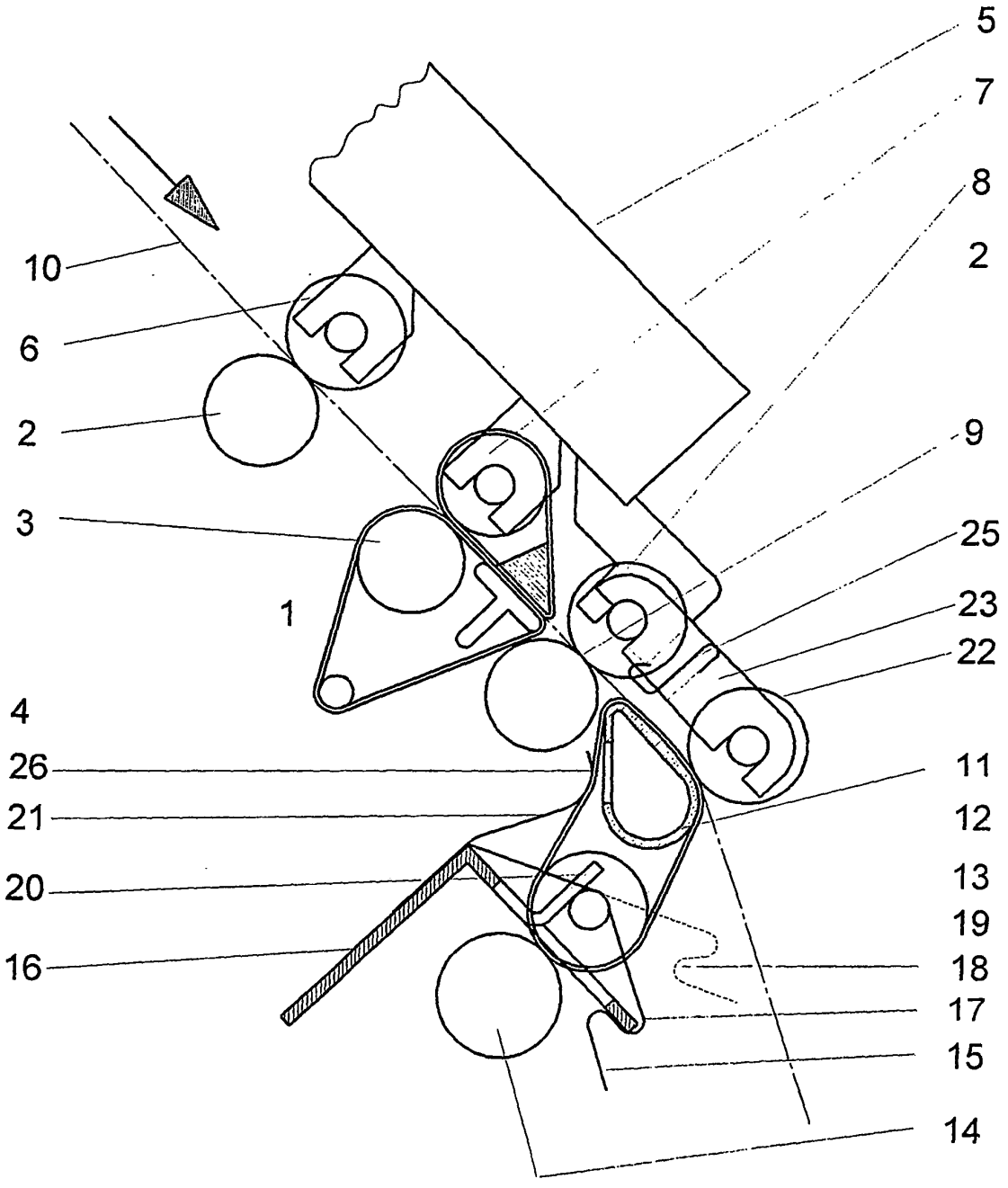

Fig. 1

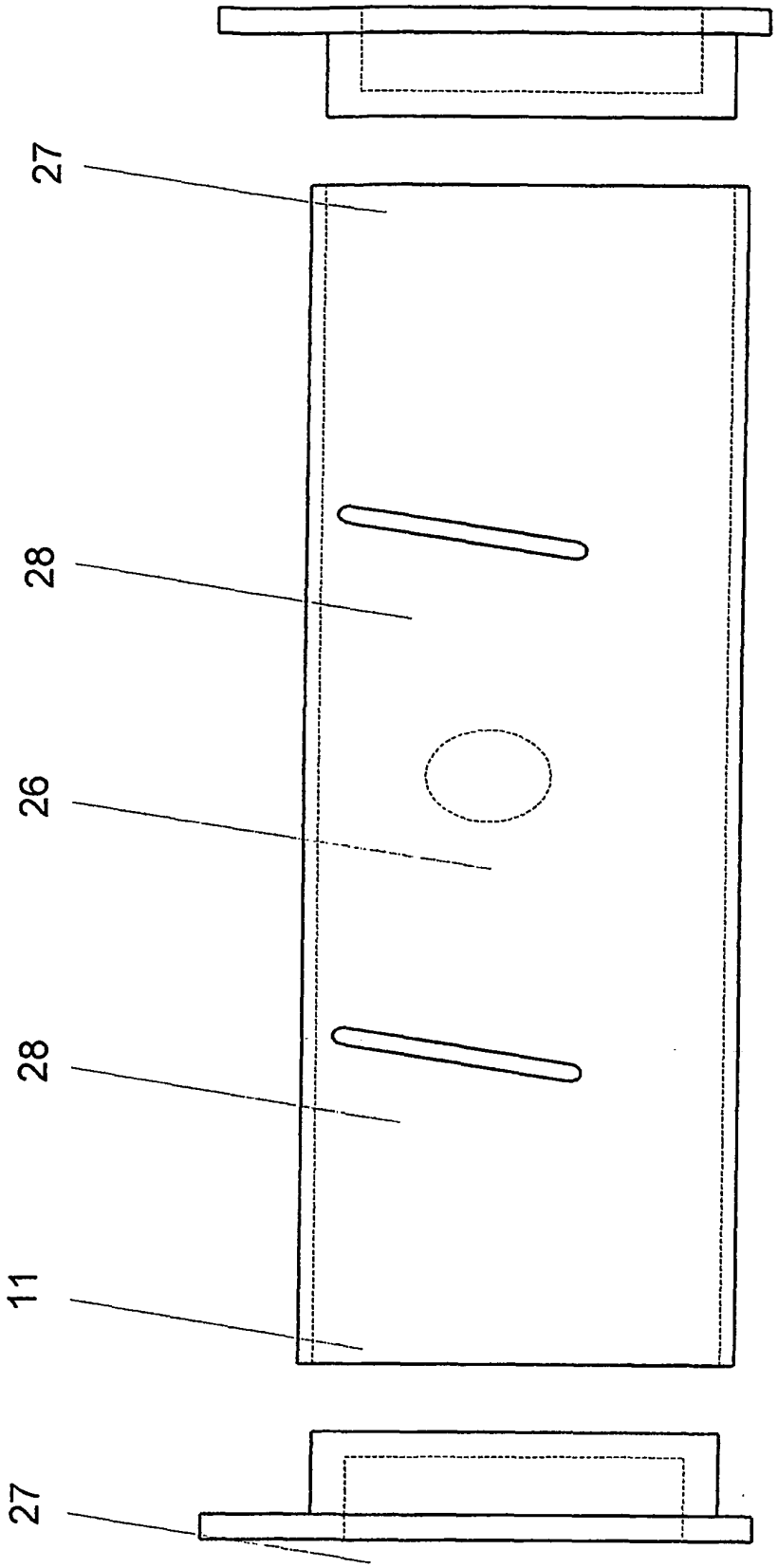

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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