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(54) **Machine for treating a fabric under pressure and/or depression**

Maschine zur Behandlung eines Stoffes unter Druck und/oder Unterdruck

Machine pour le traitement de tissus sous pression et/ou vide

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EP 2 065 501 B1

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a machine for treating a fabric, or other material to be subjected to similar treatments, for example hides or suchlike, under pressure and/or depression. The invention is advantageously used in finishing operations for a fabric, to perform one or more treatments in at least a relative chamber having a desired condition of pressure and/or depression with respect to the external environment, or with respect to one or more adjacent treatment chambers working at different pressures.

BACKGROUND OF THE INVENTION

[0002] It is known that in the field of textile finishing there are numerous and various treatments that require particular and specific conditions of pressure/depression in order to optimize the result obtained. Among these, in particular, the treatments of drying, impregnation, in particular with toxic and/or dangerous substances, décatissage under pressure, etc., are known.

[0003] In the state of the art various types of machine are known for the treatment under pressure and/or depression of a fabric, comprising one or more containing structures which define relative internal chambers maintained at the desired working pressure or depression.

[0004] The fabric is inserted into/removed from the internal chamber normally by means of one or more "soft" drawing cylinders, that is, covered with an elastomer material, and two hard rollers.

[0005] The two hard rollers are disposed in tangential contact with the "soft" cylinder in order to guarantee the longitudinal seal between the cylinder and each roller, and are disposed between the "soft" cylinder and the containing structure in order to guarantee the longitudinal seal with the structure.

[0006] These known machines also comprise two lateral flanges, which are kept thrust against the heads of the cylinders and rollers so as to guarantee the lateral seal in the step of insertion/removal of the fabric into/from the chamber.

[0007] A solution is known (see EP-A-943 719) which provides that the hard rollers are longer than the "soft" drawing cylinders and protrude laterally from the respective flanges through suitable seatings made on the flanges, which partly or totally occupy the circumferential development of the rollers.

[0008] The lateral seal of the flange and each hard roller is obtained thanks to the contact between one portion of the lateral surface of the hard roller and the internal surface of the corresponding seating.

[0009] This solution, however, has the disadvantage that it does not guarantee, in every circumstance, an adequate lateral seal and that, due to the continuous rubbing against the lateral surface of the rollers, the internal surface of the seatings is easily and quickly worn, reducing the sealing characteristics and requiring that, within a short time, the lateral plate be replaced, and sometimes also the whole hard roller.

[0010] Similar machines with sealing lateral plates are shown in EP-A-1 524 354 (closest prior art), DE-B-1 127 314 and US-A-3 920 287.

[0011] One purpose of the present invention is to achieve a machine for treating a fabric under pressure and/or depression, which allows to guarantee an extremely effective seal, both lateral and longitudinal, in all operating situations of the machine.

[0012] Another purpose of the present invention is to achieve a machine for treating a fabric under pressure and/or depression, which allows to maintain the seal substantially constant over time and while the machine is functioning, without needing to completely replace the lateral plates and/or the hard rollers in the event of wear, as happens in the state of the art, and which also allows easy and rapid operations to restore worn parts so as to guarantee over time that optimum and constant sealing conditions are maintained.

[0013] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0014] The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0015] In accordance with the above purposes, a machine for treating a fabric under pressure and/or depression comprises a containing structure, defining at least an internal chamber able to be kept in a condition of pressure or depression, in which the fabric is inserted into/removed from the internal chamber by means of at least a cylinder covered with "soft" elastomer material, and two hard rollers located in tangential contact with the "soft" cylinder and disposed between the "soft" cylinder and the containing structure. The machine also comprises two plate elements, disposed in cooperation with the heads of the cylinders and suitable for the head-wise sealing of at least part of the "soft" cylinder.

[0016] According to a characteristic feature of the present invention, said plate elements are associated with the heads of both the "soft" cylinder and also the hard rollers, which are exactly the same length and are disposed perfectly aligned with each other; furthermore, wear elements are interposed between each lateral head of the "soft" cylinder and the respective plate element.

[0017] According to an advantageous feature of the present invention, the wear elements of the "soft" cylinder are removable and replaceable.

[0018] According to another advantageous feature of the present invention, compensation elements are inter-

posed between each lateral head of the "soft" cylinder and the wear elements.

[0019] According to another advantageous feature of the present invention, the compensation elements are removable and replaceable.

[0020] According to another advantageous feature of the present invention, the lateral plate elements are kept elastically thrust against the wear elements in order to achieve the lateral seal of the "soft" cylinder, and against the heads of the hard rollers.

[0021] In a preferential solution, the machine according to the present invention also comprises intermediate longitudinal sealing elements interposed between the hard rollers and the containing structure, and contained longitudinally between the plate elements so that the heads of the intermediate sealing elements are also in contact with the plate elements, also thrust elastically against said heads.

[0022] According to another advantageous feature of the present invention, the machine comprises packing elements disposed between the intermediate sealing elements and the containing structure, and between the plate elements and the containing structure.

[0023] In this way the use of the plate elements for the head-wise sealing of the hard rollers too prevents the lateral surface of each of them from wearing, therefore avoiding the need to replace them. Furthermore, the presence of the compensation elements and the wear elements associated with the heads of the "soft" cylinder allows to ensure that optimum sealing conditions are maintained, by replacing and restoring one or more of the compensation elements and/or wear elements as soon as it becomes necessary. The machine according to the present invention therefore guarantees optimum seal, both lateral and longitudinal, substantially constant over time and while the machine is functioning.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a first three-dimensional view of a machine for treating a fabric under pressure and/or depression according to the present invention;
- fig. 2 is a front view of the machine in fig. 1;
- fig. 3 is a section from III to III of fig. 2; and
- fig. 4 is a second three-dimensional view of the machine in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0025] With reference to the attached drawings, a machine 10 according to the present invention for treating a fabric 11 under pressure and/or depression comprises a containing structure 12, only partly shown in the attached drawings, which defines inside it a treatment chamber 13. The containing structure 12 comprises, disposed on its upper surface, a supporting structure 14, shaped so as to define a substantially L-shaped profile. The containing structure 12 and the supporting structure 14 are also shaped so as to define, together, a single longitudinal aperture 15, made substantially in the central part of both structures 12, 14, in which the fabric 11 is able to pass, entering or exiting the treatment chamber 13.

[0026] The fabric 11 is inserted into/removed from the treatment chamber 13 by means of a "soft" cylinder 16 covered with elastomer material, in this case idle, and two hard drawing rollers 17, 18, hollow, located in tangential contact with the "soft" cylinder 16. The hard rollers 17, 18 advantageously have a degree of hardness comprised between 1000 Vickers and 1500 Vickers.

[0027] The "soft" cylinder 16 and each hard roller 17, 18 are substantially the same length and are disposed aligned with each other, so that their heads lie substantially on the same plane.

[0028] The two hard rollers 17, 18 are disposed between the "soft" cylinder 16 and two intermediate blocks 19, 20. The intermediate blocks, lying longitudinally and advantageously made of loaded Teflon® (VALFLON®), having high resistance to wear and low friction coefficient, are attached to the supporting structure 14, and on each of them the lateral surface of each hard roller 17, 18 is slidingly rested. In particular, each intermediate block 19, 20 is made in a single piece and has a predefined length so that its heads are aligned substantially with the heads of the hard rollers 17, 18 and the "soft" cylinder 16. Furthermore, each intermediate block 19, 20 is shaped so as to define an upper surface having a curved shape, in this case concave, so as to allow a perfect adherence with the lateral surface of the respective hard roller 17, 18, but at the same time does not impede the rotation thereof. Furthermore, between the supporting structure 14 and the intermediate blocks 19, 20 a packing 21 is interposed, advantageously made of elastomer material, to ensure the seal between the intermediate blocks 19, 20 and the supporting structure 14.

[0029] The cooperation between the lateral surface of the hard rollers 17, 18 and the intermediate blocks 19, 20 also guarantees the longitudinal seal between the rollers 17, 18 and the supporting structure 14 and the containing structure 12.

[0030] The machine 10 also comprises two lateral sealing elements, with a closing function, precisely in order to effect the lateral seal.

[0031] Each of the lateral sealing elements consists of a metal plate 22a, associated with a relative counter-plate 22, attached to each other by means of screws or gluing. Each counter-plate 22 is advantageously made of loaded Teflon® (VALFLON®), having high resistance to wear and low friction coefficient. The counter-plates 22 are dis-

posed in sliding contact with the heads of each hard roller 17 and 18, and with at least part of each head of the "soft" cylinder 16, and function as an anti-wear friction block.

[0032] The packing 21 is also interposed between each counter-plate 22 and the supporting structure 14, to ensure the seal between each counter-plate 22 and the supporting structure 14.

[0033] The metal plates 22a and the relative counter-plates 22 are mobile with respect to the containing structure 12, so as to be thrust by a first pressure member 24, of a known type, and are disposed resting on the packing 21, which ensures the seal between each counter-plate 22 and the supporting structure 14 and also facilitates the movement of the counter-plates 22 towards the head of the hard rollers 17, 18 and the "soft" cylinder 16. The counter-plates 22 are therefore suitable for the lateral seal of the "soft" cylinder 16 and each hard roller 17, 18.

[0034] The counter-plates 22 are also disposed in contact with the ends of the intermediate blocks 19, 20, which are therefore contained longitudinally between the counter-plates 22.

[0035] The machine 10 also comprises seal and wear elements, advantageously made of loaded Teflon® (VALFLON®), or a material having similar characteristics of resistance to wear and slidability, and substantially ring-shaped, associated with each lateral head of the "soft" cylinder 16. The wear elements 23, with a thickness comprised between about 1 mm and about 20 mm, are interposed between each lateral head of the "soft" cylinder 16 and the respective counter-plates 22 so as to achieve the lateral seal of the "soft" cylinder 16. In particular, between each lateral head of the "soft" cylinder 16 and the wear elements 23, a plurality of compensation rings 31 are disposed, with a thickness comprised between 0.1 mm and 0.5 mm, advantageous between 1 and 5 in number, preferably made of Teflon® and/or similar material, for example glass fiber covered with Teflon®. The compensation rings thicken the head zone of the "soft" cylinder 16, so as to have a substantial and controlled equal measurement in length of the "soft" cylinder 16, the two hard rollers 17, 18 and the intermediate blocks 19, 20.

[0036] The compensation rings 31 are removable and easily replaced. In particular they can also be added to compensate the wear of the wear elements 23, or to compensate initial differences in length of the cooperating elements due to inaccuracies in the working.

[0037] The wear elements 23 are also removable and therefore easily replaceable every time they show signs of accentuated wear, no longer recoverable by means of the compensation rings 31, so as to prevent sealing problems. In particular, when one or more of the annular wear elements 23 begins to wear due to the effect of continuous sliding against the counter-plates 22, it is sufficient to remove the "soft" cylinder 16 and remove from its heads the wear element or elements 23 to be replaced, and then apply new wear elements 23. This operation substantially does not involve other parts of the machine, except for the compensation rings 31, and can be carried out quickly and with relative ease.

[0038] The two plates 22a and the relative counter-plates 22 are kept elastically thrust against the heads of the hard rollers 17, 18 and against the wear elements 23 of the "soft" cylinder 16 by means of the first pressure member 24 in order to achieve the lateral seal of the hard rollers 17, 18 and the "soft" cylinder 16. Furthermore, the "soft" cylinder 16 is kept elastically thrust against the hard rollers 17, 18 by means of a second pressure member 25, of a known type, to guarantee the seal between the "soft" cylinder 16 and the hard rollers 17, 18.

[0039] The machine 10 also comprises, on one side, a chain kinematism 26, of a known type, able to transmit motion to each hard roller 17, 18 so as to allow the rotation of the hard rollers 17, 18 and consequently, through drawing, of the idle "soft" cylinder 16. In particular, the chain kinematism 26 is associated with each hard roller 17, 18 by means of hollow transmission shafts 27 passing in holes 28 made in the plates 22a, the counter-plates 22 and the structure 14. The hollow transmission shafts 27 are also supported by bearings disposed in supports 30 fixed to the structure 14.

[0040] The position of the supports 30 is adjustable in height, so as to compress to the correct extent the hard rollers 17, 18 against the longitudinal wear elements 23, to ensure a perfect adherence and hence perfect seal.

[0041] The machine 10 is also associated with a hydraulic circuit, not shown in the drawings, by means of rotary hydraulic joints 29, of the known type, associated at one end with the hollow transmission shafts 27, and at the opposite end with the pipes of said hydraulic circuit. This allows the water, or other cooling fluid, to flow in and out through the hollow transmission shafts 27 and the hard rollers 17, 18, even when they are rotating, so as to cool them and thus avoid phenomena of thermal dilatation which could cause problems of sealing or functioning of the machine 10.

[0042] According to a variant of the present invention, the water or other cooling fluid is also made to flow inside at least one intermediate block 19, 20.

[0043] It is clear that modifications and/or additions of parts may be made to the machine 10 as described heretofore, without departing from the field and scope of the present invention.

[0044] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of machine for treating a fabric under pressure and/or depression, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Machine for treating a fabric (11) under pressure

and/or depression, comprising a containing structure (12) defining at least an internal chamber (13) able to be kept under pressure or depression, wherein said fabric (11) is inserted into/removed from said internal chamber (13) by means of at least a "soft" cylinder (16) covered with elastomer material, and two hard rollers (17, 18) located in tangential contact with said "soft" cylinder (16) and disposed between said "soft" cylinder (16) and said containing structure (12), said machine also comprising two plate elements (22) associated with the heads of said "soft" cylinder (16), **wherein** said plate elements (22) are also associated with the heads of each of said hard rollers (17, 18), which have the same length as said "soft" cylinder (16) and are, in use, substantially aligned therewith, and also compris**ing** wear elements (23), selectively removable and replaceable, interposed between each lateral head of said "soft" cylinder (16) and the respective plate element (22), **characterized in that** between the lateral head of each of the "soft" cylinders (16) and the wear elements (23) a plurality of compensation rings (31) are disposed, with a thickness comprised between 0,1 and 0,5 mm.

2. Machine as in claim 1, **characterized in that** said compensation rings (31) are made of Teflon® or similar material, for example glass fiber covered with Teflon®.

3. Machine as in claim 1, **characterized in that** the heads of said "soft" cylinder (16) and of said hard rollers (17, 18), in use, lie substantially on the same plane.

4. Machine as in claim 1, **characterized in that** said plate elements (22) are disposed on said containing structure (12) and are elastically thrust against said wear elements (23) and against each head of said hard rollers (17, 18) by thrust means (24).

5. Machine as in any claim hereinbefore, **characterized in that** said "soft" cylinder (16) is kept elastically thrust by thrust means (25) against said hard rollers (17, 18) in order to achieve the lateral seal of said hard rollers (17, 18).

6. Machine as in any claim hereinbefore, **characterized in that** it also comprises intermediate sealing elements (19, 20) interposed between said hard rollers (17, 18) and said containing structure (12), said intermediate sealing elements (19, 20) being contained longitudinally between said plate elements (22) so that the heads of said intermediate sealing elements (19, 20) are in contact with said plate elements (22).

7. Machine as in claim 6, **characterized in that** said intermediate sealing elements (19, 20) comprise a concave surface which couples through sliding with the lateral surface of a relative hard roller (17, 18).

8. Machine as in claim 6, **characterized in that** it comprises packings (21) disposed between said intermediate sealing elements (19, 20) and said containing structure (12) and between said plate elements (22) and said containing structure (12).

9. Machine as in claim 6, **characterized in that** each of said intermediate sealing elements (19, 20) is made in a single piece.

10. Machine as in any claim hereinbefore, **characterized in that** a cooling fluid flows through at least one of said hard rollers (17, 18).

11. Machine as in any claim hereinbefore, **characterized in that** a cooling fluid flows through at least one of said intermediate sealing elements (19, 20).

12. Machine as in any claim hereinbefore, **characterized in that** said hard rollers (17, 18) have a degree of hardness comprised between 1000 Vickers and 1500 Vickers.

Patentansprüche

1. Maschine zum Behandeln eines Stoffes (11) unter Druck und/oder Unterdruck mit einer Aufnahmestruktur (12), die wenigstens eine innere Kammer (13) bildet, die dazu eingerichtet ist, unter Druck oder Unterdruck gehalten zu werden, wobei der Stoff (11) durch wenigstens einen mit einem Elastomermaterial beschichteten "weichen" Zylinder (16) und durch zwei harte Walzen (17, 18), die sich im tangentialen Kontakt mit dem "weichen" Zylinder (16) befinden und zwischen dem "weichen" Zylinder (16) sowie der Aufnahmestruktur (12) angeordnet sind, in die innere Kammer (13) eingeführt beziehungsweise aus dieser entfernt wird, wobei die Maschine weiterhin zwei Plattenteile (22), die mit den Kopfenden des "weichen" Zylinders (16) verbunden sind, wobei die Plattenteile (22) auch mit den Kopfenden jeder der harten Walzen (17, 18) verbunden sind, die die gleiche Länge wie der "weiche" Zylinder (16) aufweisen und im Betrieb im Wesentlichen mit diesem fluchten, sowie weiterhin Verschleißteile (23) aufweist, die wahlweise entfernbar und ersetzbar sowie zwischen jedem seitlichen Kopfende des "weichen" Zylinders (16) und dem jeweiligen Plattenteil (22) angeordnet sind, **dadurch gekennzeichnet, dass** zwischen dem seitlichen Kopfende jedes "weichen" Zylinders (16) und den Verschleißteilen (23) eine Anzahl von Ausgleichsringen (31) angeordnet ist, die eine Dicke zwischen 0,1 und 0,5 mm aufweisen.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Ausgleichsringe (31) aus Teflon® oder einem ähnlichen Material wie zum Beispiel mit Teflon® beschichteter Glasfaser hergestellt sind.

3. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kopfenden des "weichen" Zylinders (16) und der harten Walzen (17, 18) im Betrieb im Wesentlichen auf der gleichen Ebene liegen.

4. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Plattenteile (22) auf der Aufnahmestruktur (12) angeordnet sind und durch Schubmittel (24) federnd gegen die Verschleißteile (23) sowie gegen jedes Kopfende der harten Walzen (17, 18) gedrückt werden.

5. Maschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der "weiche" Zylinder (16) durch Schubmittel (25) federnd gegen die harten Walzen (17, 18) angedrückt wird, um eine seitliche Abdichtung der harten Walzen (17, 18) zu erreichen.

6. Maschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie weiterhin zwischenliegende Abdichtelemente (19, 20) aufweist, die zwischen den harten Walzen (17, 18) und der Aufnahmestruktur (12) angeordnet sind, wobei die zwischenliegenden Abdichtelemente (19, 20) in Längsrichtung zwischen den Plattenteilen (22) gehalten werden, so dass die Kopfenden der zwischenliegenden Abdichtelemente (19, 20) mit den Plattenteilen (22) in Kontakt sind.

7. Maschine nach Anspruch 6, **dadurch gekennzeichnet, dass** die zwischenliegenden Abdichtelemente (19, 20) eine konkave Oberfläche aufweisen, die durch Verschieben mit der seitlichen Oberfläche einer zugeordneten harten Walze (17, 18) gekuppelt wird.

8. Maschine nach Anspruch 6, **dadurch gekennzeichnet, dass** sie Dichtlagen (21) aufweist, die zwischen den zwischenliegenden Abdichtelementen (19, 20) und der Aufnahmestruktur (12) sowie zwischen den Plattenteilen (22) und der Aufnahmestruktur (12) angeordnet sind.

9. Maschine nach Anspruch 6, **dadurch gekennzeichnet, dass** jedes der zwischenliegenden Abdichtelemente (19, 20) aus einem Stück hergestellt ist.

10. Maschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** durch wenigstens eine der harten Walzen (17, 18) ein Kühlfluid strömt.

11. Maschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** durch wenigstens eines der zwischenliegenden Abdichtelemente (19, 20) ein Kühlfluid strömt.

12. Maschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die harten Walzen (17, 18) einen Härtegrad zwischen 1000 Vikkers und 1500 Vickers aufweisen.

Revendications

1. Machine pour le traitement d'un tissu (11) sous pression et/ou vide, comprenant une structure de réception (12) définissant au moins une chambre interne (13) capable d'être maintenue sous pression ou sous vide, dans laquelle ledit tissu (11) est inséré dans/enlevé de ladite chambre interne (13) au moyen d'au moins un cylindre « souple » (16) recouvert d'un matériau élastomère, et de deux rouleaux durs (17, 18) situés en contact tangentiel avec ledit cylindre « souple » (16) et disposés entre ledit cylindre « souple » (16) et ladite structure de réception (12), ladite machine comprenant également deux éléments de plaques (22) associés aux têtes dudit cylindre « souple » (16), dans laquelle lesdits éléments de plaques (22) sont également associés aux têtes de chacun desdits rouleaux durs (17, 18), qui ont la même longueur que ledit cylindre « souple » (16) et sont, en utilisation, sensiblement alignés avec celui-ci, et comprenant également des éléments d'usure (23), sélectivement amovibles et remplaçables, interposés entre chaque tête latérale dudit cylindre « souple » (16) et l'élément de plaque respectif (22), **caractérisée en ce que**, entre la tête latérale de chacun des cylindres « souples » (16) et les éléments d'usure (23), il est disposé une pluralité d'anneaux de compensation (31) d'une épaisseur comprise entre 0,1 et 0,5 mm.

2. Machine selon la revendication 1, **caractérisée en ce que** lesdits anneaux de compensation (31) sont en Téflon® ou dans un matériau similaire, par exemple de la fibre de verre recouverte de Téflon®.

3. Machine selon la revendication 1, **caractérisée en ce que** les têtes dudit cylindre « souple » (16) et desdits rouleaux durs (17, 18), en utilisation, se trouvent sensiblement sur le même plan.

4. Machine selon la revendication 1, **caractérisée en ce que** lesdits éléments de plaques (22) sont disposés sur ladite structure de réception (12) et sont élastiquement poussés contre lesdits éléments d'usure (23) et contre chaque tête desdits rouleaux durs (17, 18) par des moyens de poussée (24).

5. Machine selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit cylindre « souple » (16) est maintenu élastiquement poussé par des moyens de poussée (25) contre lesdits rouleaux durs (17, 18) pour assurer l'étanchéité latérale desdits rouleaux durs (17, 18).

6. Machine selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend également des éléments d'étanchéité intermédiaires (19, 20) interposés entre lesdits rouleaux durs (17, 18) et ladite structure de réception (12), lesdits éléments d'étanchéité intermédiaires (19, 20) étant contenus longitudinalement entre lesdits éléments de plaques (22) de sorte que les têtes desdits éléments d'étanchéité intermédiaires (19, 20) soient en contact avec lesdits éléments de plaques (22).

7. Machine selon la revendication 6, **caractérisée en ce que** lesdits éléments d'étanchéité intermédiaires (19, 20) comprennent une surface concave qui se couple par coulissement avec la surface latérale d'un rouleau dur relatif (17, 18).

8. Machine selon la revendication 6, **caractérisée en ce qu'**elle comprend des garnitures (21) disposées entre lesdits éléments d'étanchéité intermédiaires (19, 20) et ladite structure de réception (12) et entre lesdits éléments de plaques (22) et ladite structure de réception (12).

9. Machine selon la revendication 6, **caractérisée en ce que** chacun desdits éléments d'étanchéité intermédiaires (19, 20) est constitué d'une seule pièce.

10. Machine selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**un fluide de refroidissement s'écoule à travers au moins l'un desdits rouleaux durs (17, 18).

11. Machine selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**un fluide de refroidissement s'écoule à travers au moins l'un desdits éléments d'étanchéité intermédiaires (19, 20).

12. Machine selon l'une quelconque des revendications précédentes, **caractérisée en ce que** lesdits rouleaux durs (17, 18) ont un degré de dureté compris entre 1000 Vickers et 1500 Vickers.

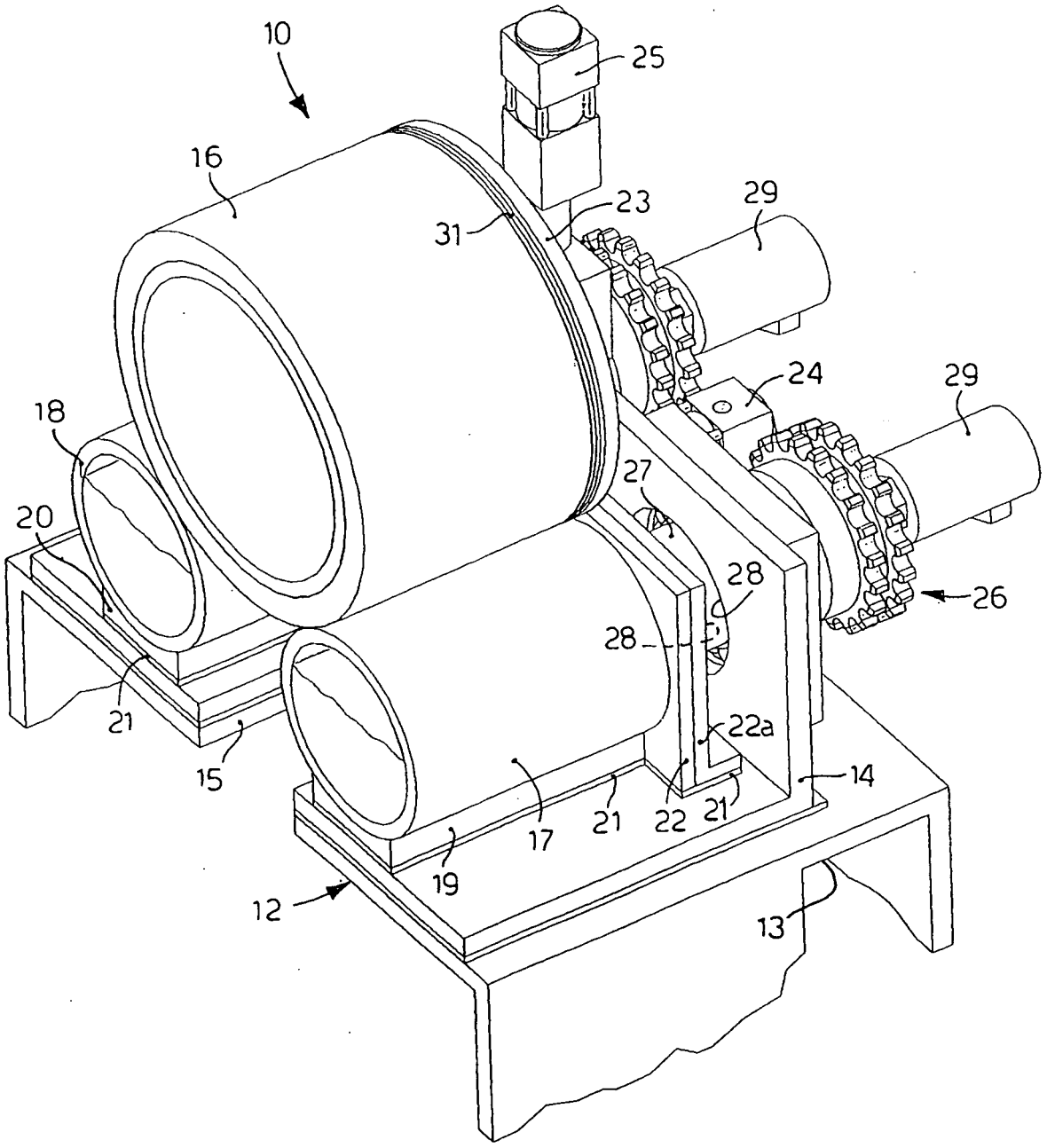

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fig.1

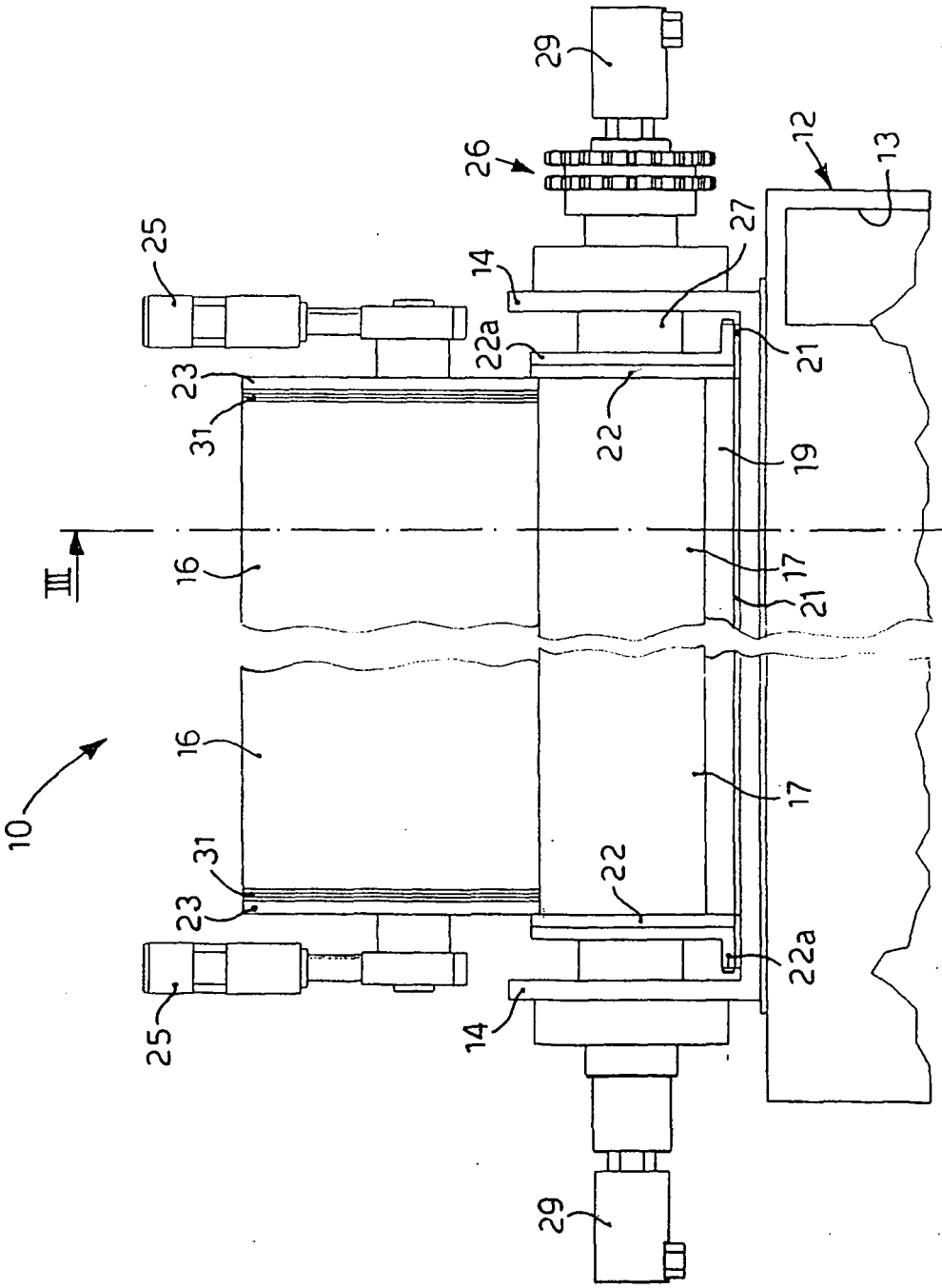

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fig. 2

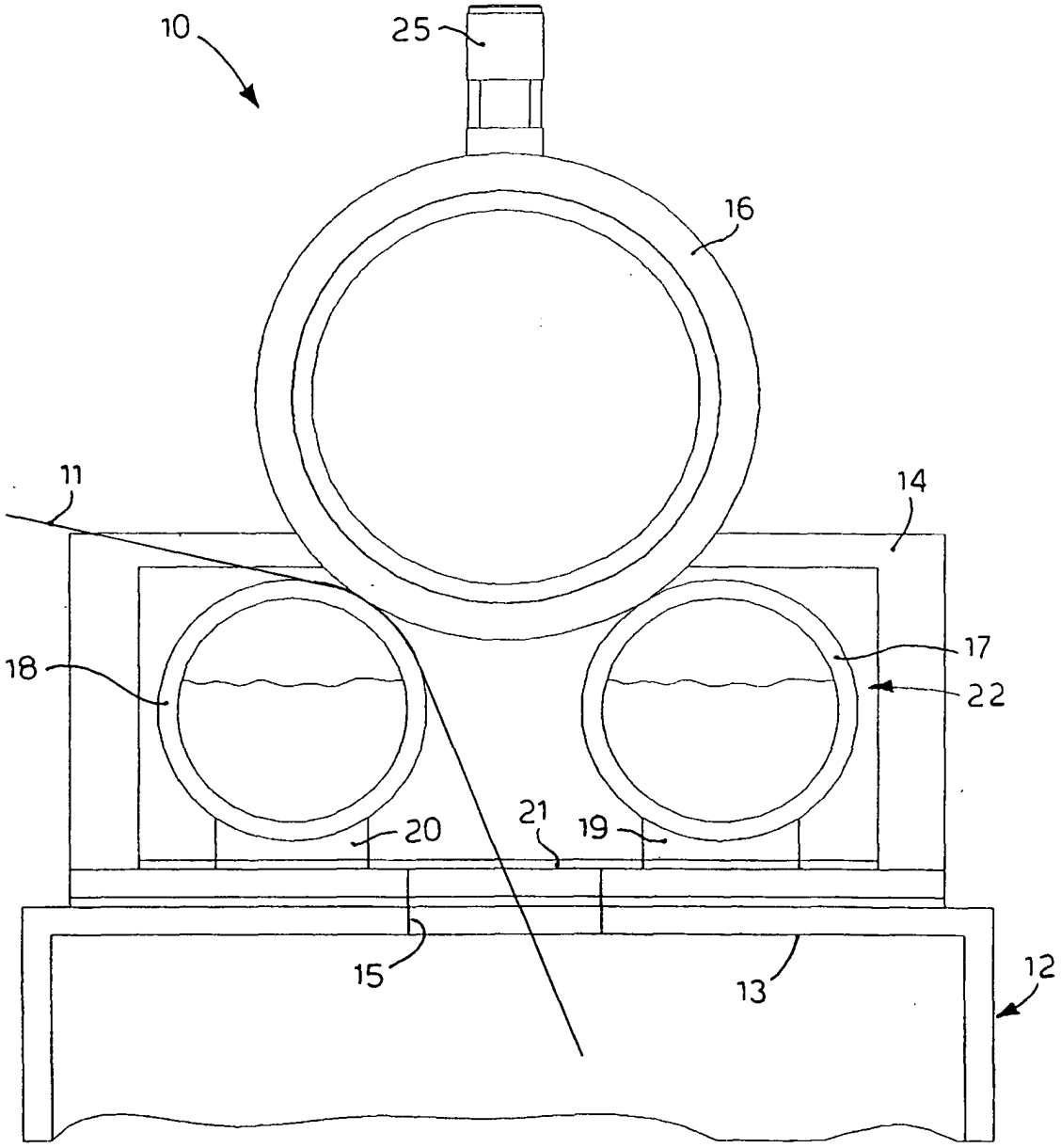


fig. 3

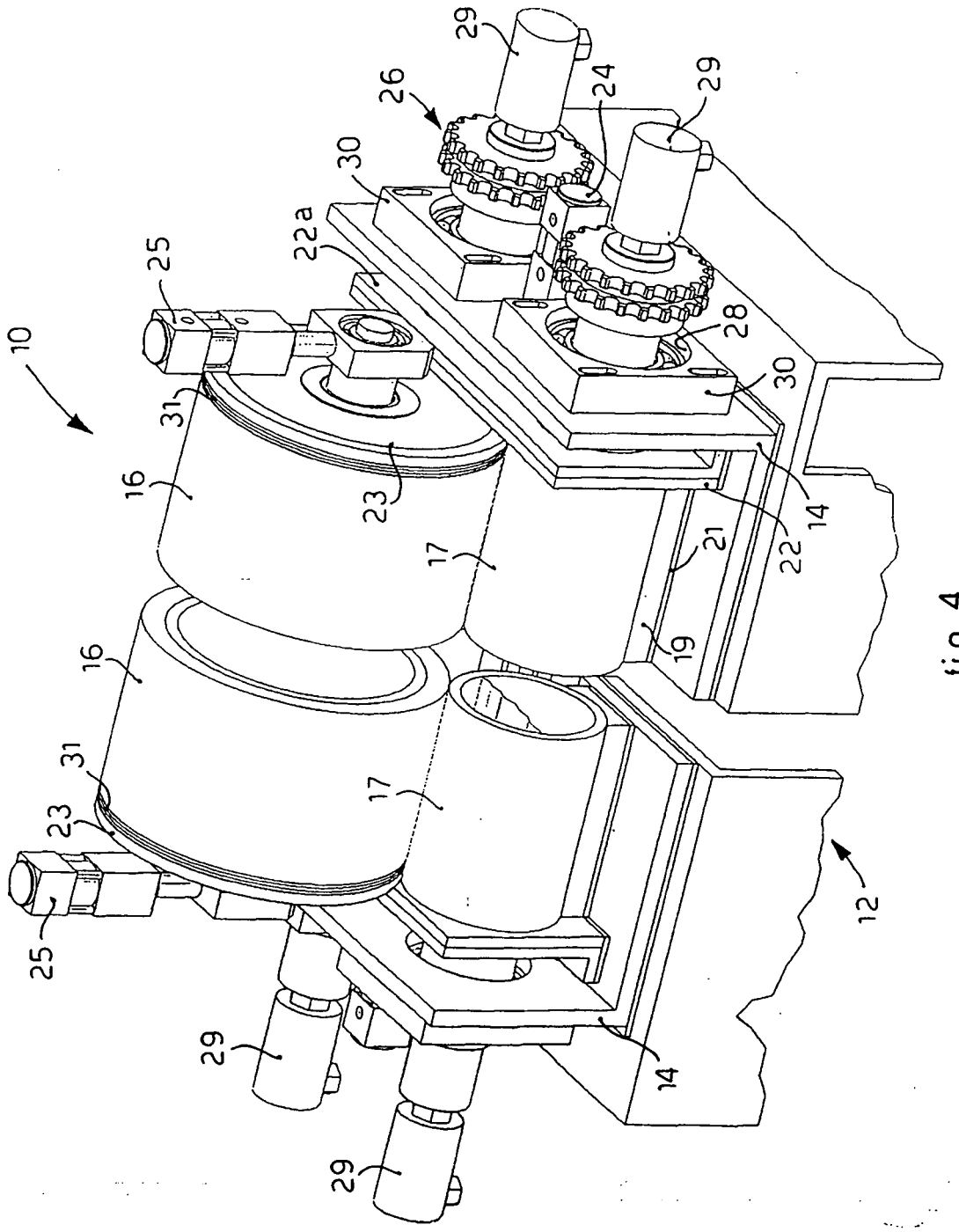


fig. 4

REFERENCES CITED IN THE DESCRIPTION

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