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(54) METHOD FOR TREATING FLEXIBLE LAMINAR SURFACES

VERFAHREN ZUR BEHANDLUNG BIEGSAMER LAMINARER OBERFLÄCHEN

PROCÉDÉ DE TRAITEMENT DE SURFACES LAMINAIRES FLEXIBLES

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Description

[0001] The present invention concerns a method for treating flexible laminar surfaces such as leathers, hides and the like in tannery circle, implemented in drums of tanning, re-tanning, dyeing or milling.

[0002] It is known that, in tannery industry circle the plants for treating flexible laminar surfaces, such as leathers, including, according to a prevalent constructive scheme, a tanning, dyeing or milling drum within which the flexible laminar surfaces are subjected to working (see GB-A-2 241 343)

[0003] The rotation of the drum around a central axis causes the mechanical working of the flexible laminar surfaces, with the lift and subsequent fall by gravity, in a continuative manner during a treatment cycle, of the laminar surfaces themselves within the volume bounded by the drum.

[0004] Generally, the plant also comprises circuits for the circulation from and to the drum of chemical products, dyeing and tanning agents, air and water which, while the drum rotates, carry out the so-called chemical working of the laminar surfaces.

[0005] For example, milling or flying working into drum dry-occurs with the aim to soften leathers and give a particular grain to the grain side thereof.

[0006] The operating parameters of the drum during the provided leathers treatment, such as working time, rotation speed of the drum, quantity of leathers introduced into the drum, type and quantity of the treatment products inserted into the drum, are decided and set by the operator on the basis of experience and historical data related to previous similar treatments, considering the type of leather to be treated.

[0007] In particular, the time of working leathers into the drum is determined by the operator in empirical way, by simply considering the production history, with the problems of inaccuracy and reliability of the set data that this entails, despite the proven experience of the operator.

[0008] Let's not overlook the fact that, sometimes, the operator, in order to avoid incomplete workings of the leathers, sets operating times of the drum which exceed even to a great extent those ones necessary for suitable and appropriate treatment.

[0009] This inevitably leads to not fully optimized working times, unjustified increase in energy consumptions and loss of productivity by the drum.

[0010] The present invention seeks to overcome the technical problems of the prior art just complained.

[0011] In particular, main purpose of the invention is to develop a method for treating flexible laminar surfaces which involves an optimization of implementation times or at least a precision greater than similar known methods.

[0012] In other words, the invention intends to propose a method for treating flexible laminar surfaces whose application depends less and less on the experience of the

involved operators thus resulting more reliable than the known art.

[0013] Within such a purpose, it is task of the invention to provide a method for treating flexible laminar surfaces which determines an increase of the productivity of a tanning, re-tanning, dyeing and/or milling drum with respect to equivalent methods of the known type.

[0014] It is another task of the present invention to limit with respect to the prior art the energy consumptions associated with the normal functioning of a flexible laminar surfaces treatment drum.

[0015] Said purposes are achieved through a method for treating flexible laminar surfaces such as leathers or hides in a plant comprising in a rotating tanning, re-tanning, dyeing and/or milling drum according to the appended claim 1. Further detail features of the treating method of the invention are reported in the corresponding dependent claims.

[0016] A plant for treating flexible laminar surfaces such as leathers or hides as defined claim 11 also constitutes integral part of the invention.

[0017] Other construction features of the plant of the invention are highlighted in the relative dependent claims.

[0018] Advantageously, the method for treating flexible laminar surfaces of the invention is able to establish the moment in which the working is actually completed and the processed material is ready, without the need to set any maximum time limit of the drum operation.

[0019] It is known, indeed, that a working in a drum, whatever it is but in particular the milling, in any case involves a progressive increase in the volume of leathers inside the drum and the change of the position of the barycentre of the overall mass occupied by the leather themselves.

[0020] Such issues affect in turn the movement of the drum, causing with the prosecution of the working an always stronger imbalance of the rotating drum and a more significant increase in the power absorption by the motorization means which drive the drum.

[0021] In tannery circle, it is agreed by a long time that the presence of these operative conditions is synonymous of the fact that the working of hides inside the drum is completed.

[0022] The method of the invention takes advantage right of these issues and, by detecting some operating parameters of the drum, among which exactly the power consumption and/or displacements of the central axis of rotation during operation, stops the movement of the drum as soon as it detects values excessively abnormal with respect to the nominal operating ones. This involves optimization of the working times of flexible laminar surfaces, less energy wastes compared to the known art and a greater productivity by the machine.

[0023] Still advantageously, the worked flexible laminar surfaces are qualitative better than those ones obtained through known type methods, other factors involved being equal.

[0024] Said purposes and advantages will result better from the description that follows relating to a preferred embodiment of the drum of the invention and a preferred application of the method of the invention which can be implemented with it, given by illustrative but not limiting way with reference to the attached drawings where:

- figures 1 and 2 are two perspective views of the plant of the invention;
- figures 3-5 are enlargements of three distinct details of the plant of figure 1 and 2.

[0025] The plant for treating flexible laminar surfaces, not represented, is illustrated from two different angles in figures 1 and 2, where it is globally indicated with 1.

[0026] As it is observed, the plant 1, according to a traditional constructive form in the tannery circle, comprises a support frame 2, which stands on a reference surface, such as for example the paving of an industrial factory, and a rotating milling drum 3, suitable to contain the flexible laminar surfaces, such as animal leathers, in order to carry out their milling.

[0027] The rotating drum 3 defines a central axis of symmetry Z and is coupled with the support frame 2. The plant 1 also includes motorization means, not visible; contained in the box body 4, suitable to put in rotation around the central axis Z the rotating drum 3.

[0028] According to the invention, the plant 1 comprises detection means, as a whole numbered with 5, operatively connected with the rotating drum 3 and/or the motorization means, which detect a pair of operating parameters of the plant 1 in order to allow the comparison of the detected value with a predetermined nominal value and the stopping of the moving of the drum 3 if the difference between the detected value of the operating parameters and the nominal value is greater than 0.

[0029] Preferably but not necessarily, the detection means 5 comprise two weighing instruments 6, 7, for example load cells, one visible in figure 3 and the other in figure 4, supported by the support frame 2.

[0030] The weighing instruments 6, 7 are reciprocally opposed, in the sense that the first is positioned at the front of the side wall 3a of the rotating drum 3 and the second is arranged at the front of the side wall 3b of the rotating drum 3.

[0031] Each weighing instrument 6, 7 is placed below a connection hub 8, 9, protruding from the rotating drum 3 in correspondence of the central axis of symmetry Z and coupled with a rotating shaft, not visible, positioned inside the rotating drum 3 and connected with the motorization means through transmission means, not shown.

[0032] More in detail, each of the weighing instruments 6, 7 is arranged in a hollowed section 10, 11 of the support frame 2.

[0033] In the case at issue, the detection means 5 include, in addition, a plurality of toroidal ammeters 12, better visible in figure 5, cooperating with the motorization means with which they are connected. In general, the

detection means 5 are electrically connected with a central processing and control unit, not represented and constituted for example by a PLC, at operator's disposal.

[0034] The method for treating the flexible laminar surfaces in the plant 1 for tanning, re-tanning, dyeing and/or milling comprises the following operations:

- introducing into the drum 3 a plurality of flexible laminar surfaces, such as animal leathers, as already mentioned;
- rotating the drum 3 in order to carry out the working of the flexible laminar surfaces.

[0035] According to the invention, the method also comprises the following operations:

- detecting some operating parameters of the plant 1;
- comparing the detected value of the operating parameters with a predetermined nominal value;
- stopping the movement of the drum 3 if the difference between the detected value of the operating parameters and the nominal value is greater than 0.

[0036] In this case, at purely example way, the operating parameters include the power absorbed by the motorization means which drive the drum 3 and the forces applied by the rotating drum 3 on two weighing instruments 6, 7, for example load cells, associate from opposite sides with the rotating drum 3.

[0037] Other solutions of the invention may include that the operating parameter is any of the quantities selected from the group consisting of:

- lateral displacement of the axis of rotation of the rotating drum;
- barycentre of the flexible laminar surfaces inside the rotating drum or even more.

[0038] Moreover, in alternative applications, the method of the invention may comprise the detection of a number of operating parameters of the plant different from that one here considered and referred to the attached drawings.

[0039] For example, other applicative variants of the method may include only one of aforesaid operating parameters or any combination thereof.

[0040] The operations of detection and comparison occur automatically by means of the aforesaid central processing and control unit.

[0041] In convenient way, the method comprises the operation of displaying on a screen accessible to the operator the detected value of the chosen operating parameters.

[0042] Preferably but not necessarily, the method of invention includes the operation of setting up the predetermined nominal value in the central processing and control unit.

[0043] Such a nominal value of the operating param-

eter depends at least on the physical and morphological characteristics, weight and/or amount of the flexible laminar surfaces introduced into the rotating drum 3. According to the preferred application form here described of the invention, the method comprises the operation of signalling the operative condition of the plant 1 for which the difference between the detected value and the nominal value is greater than 0.

[0044] The signalling operation is performed before the stopping operation and could consist in a signal or visual message on the screen accessible to the operator or, alternatively, in a sound signal.

[0045] The stopping operation occurs automatically or as a result of operator's intervention after the signalling operation.

[0046] In case it is necessary to perform treatment of tanning, re-tanning or dyeing, the method of the invention comprises, according to a custom for the tannery industry, the operation of introducing into the rotating drums products such as dyes, enriching oils, water or air, suitable for the chemical working of the flexible laminar surfaces.

[0047] Such an operation of introducing the chemical products is performed before or during the operation of moving the rotating drum.

[0048] The method of the invention includes, therefore, the operation of extracting the flexible laminar surfaces from the rotating drum 3, performed after the operation of stopping the drum 3 itself.

[0049] On the basis of what just stated, it is understood, therefore, that the method for treating flexible laminar surfaces in tanning, re-tanning, dyeing and/or milling plant of the invention reaches the purposes and achieves the advantages mentioned above. In execution, changes may be made to the plant for treating flexible laminar surfaces of the invention consisting, for example, in detection means different from those ones described above.

[0050] It is stressed that the number, quantity, weight and sizes of the flexible laminar surfaces treated within the rotating drum can be any, depending on the productive choices and needs.

Claims

1. Method for treating flexible laminar surfaces such as leathers or hides in a plant (1) comprising a rotating tanning, re-tanning, dyeing and/or milling drum (3) comprising the following steps:

- introducing into said rotating drum (3) one or more of said flexible laminar surfaces;
- moving said drum (3) in order to carry out the working of said flexible laminar surfaces,
- characterized in that** it comprises the following operations:
- detecting at least one operating parameter of

said plant (1) ;

- comparing the detected value of said operating parameter with a predetermined nominal value;
- stopping the movement of the drum (3) if the difference between said detected value of said operating parameter and said nominal value is greater than 0.

2. Method as claim 1 **characterized in that** said operating parameter includes any of the variables selected from the group consisting of absorbed power by the motorization means carrying out the moving of said drum (3), lateral displacement of the axis of rotation of said drum (3), barycentre of said flexible laminar surfaces within said drum (3), and forces applied by said drum (3) on one or more weighing instruments (6, 7) associated with it.

3. Method as any of the previous claims **characterized in that** it comprises the operation of displaying said detected value of said operating parameter.

4. Method as any of the previous claims **characterized in that** it includes the operation of setting up said predetermined nominal value in a central processing and control unit.

5. Method as claim 4 **characterized in that** said detecting and comparing operations occur automatically by means of said central processing and control unit.

6. Method as any of the previous claims **characterized in that** said nominal value depends at least on the physical and morphological characteristics, weight and/or amount of said flexible laminar surfaces introduced into said rotating drum (3).

7. Method as any of the previous claims **characterized in that** it comprises the operation of signalling the operative condition for which said difference between said detected value and said nominal value is greater than 0, performed before said stopping operation.

8. Method as claim 7 **characterized in that** said stopping operation occurs automatically or as a result of operator's intervention after said signalling operation.

9. Method as any of the previous claims **characterized in that** it comprises the operation of introducing into said rotating drum products for the chemical treatment of said flexible laminar surfaces, performed before or during said operation of moving said rotating drum.

10. Method as claim 1 **characterized in that** it includes

the operation of extracting said flexible laminar surfaces from said rotating drum (3), performed after said operation of stopping said drum (3).

11. Plant (1) for treating flexible laminar surfaces such as leathers or hides comprising:

- a support frame (2), suitable to stand on a reference surface;
- a rotating tanning, re-tanning, dyeing and/or milling drum (3), suitable to contain said flexible laminar surfaces, defining a central axis of symmetry (Z) and coupled with said support frame (2);
- motorization means suitable to rotate said rotating drum (3) around said central axis (3), **characterized in that** it comprises detection means (5), operatively connected with said rotating drum (3) and/or said motorization means, suitable to measure at least one operating parameter of said plant (1) in order to allow the comparison of the detected value with a predetermined nominal value and the stopping of the movement of said drum (3) if the difference between said detected value of said operating parameter and said nominal value is greater than 0.

12. Plant (1) as claim 11 **characterized in that** said detection means (5) comprise at least one load cell (6, 7) supported by said support frame (2) and placed below a connecting hub (8, 9), protruding from said rotating drum (3) in correspondence of said central axis of symmetry (Z) and coupled with a rotating shaft positioned inside said rotating drum (3).

13. Plant (1) as claim 12 **characterized in that** said load cell (6, 7) is arranged in a hollowed section (10, 11) of said support frame (2).

14. Plant (1) as any of the claims from 11 to 13 **characterized in that** said detection means (5) include one or more toroidal ammeters (12) cooperating with said motorization means with which they are connected.

15. Plant (1) as any of the claims from 11 to 14 **characterized in that** said detection means (5) are electrically connected with a central processing and control unit available to the operator.

Patentansprüche

1. Verfahren zum Behandeln flexibler laminarer Flächen wie zum Beispiel Leder oder Tierhäute in einer Anlage (1) mit einer drehbaren Gerb-, Nachgerb-, Färb- und/oder Frästrommel (3), umfassend die folgenden Schritte:

- Einführen einer oder mehrerer der flexiblen laminaren Flächen in die drehbare Trommel (3);
- Bewegen der Trommel (3) zum Ausführen der Bearbeitung der flexiblen laminaren Flächen, **dadurch gekennzeichnet, dass** es die folgenden Operationen umfasst:
- Detektieren zumindest eines Betriebsparameters der Anlage (1);
- Vergleichen des detektierten Werts des Betriebsparameters mit einem vorbestimmten nominalen Wert;
- Stoppen der Bewegung der Trommel (3), wenn der Unterschied zwischen dem detektierten Wert des Betriebsparameters und dem nominalen Wert größer ist als 0.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Betriebsparameter eine Variable umfasst, ausgewählt aus der Gruppe umfassend absorbierte Energie durch die Motorisierungsmittel, die das Bewegen der Trommel (3) ausführen, Lateralversatz der Drehachse der Trommel (3), Baryzentrum der flexiblen laminaren Flächen in der Trommel (3) und Kräfte, aufgebracht durch die Trommel (3) auf eine oder mehrere Wieginstrumente (6, 7), zugeordnet damit.

3. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es die Operation des Anzeigens des detektierten Werts des Betriebsparameters umfasst.

4. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es die Operation des Anlegens des vorbestimmten nominalen Werts in einer Zentralrechen- und Steuereinheit umfasst.

5. Verfahren gemäß Anspruch 4, **dadurch gekennzeichnet, dass** die Detektier- und Vergleichsoperationen automatisch erfolgen mittels der Zentralrechen- und Steuereinheit.

6. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der nominale Wert abhängt von zumindest physikalischen und morphologischen Eigenschaften, Gewicht und/oder Menge der flexiblen laminaren Flächen, die in die drehbare Trommel (3) eingeführt sind.

7. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es die Operation des Signalisierens der Betriebsbedingung umfasst, für die der Unterschied zwischen dem detektierten Wert und dem nominalen Wert größer ist als 0, ausgeführt vor der Stopoperation.

8. Verfahren gemäß Anspruch 7, **dadurch gekennzeichnet,**

zeichnet, dass die Stopoperation automatisch ausgeführt wird oder als Ergebnis einer Intervention einer Bedienperson nach der Signalisieroperation.

9. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es die Operation des Einführens von Produkten in die drehbare Trommel umfasst, die zur chemischen Behandlung der flexiblen laminaren Flächen geeignet sind, ausgeführt vor oder während der Operation des Bewegens der drehbaren Trommel. 5
10. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** es die Operation des Entnehmens der flexiblen laminaren Flächen aus der drehbaren Trommel (3) umfasst, ausgeführt nach der Stopoperation der Trommel (3). 10
11. Anlage (1) zum Behandeln flexibler laminarer Flächen wie beispielsweise Leder oder Tierhäute, umfassend: 20
 - einen Halterahmen (2), geeignet, um auf einer Referenzfläche zu stehen;
 - eine drehbare Gerb-, Nachgerb-, Färb- und/oder Frästrommel (3), geeignet, die flexiblen laminaren Flächen aufzunehmen, definierend eine zentrale Symmetrieachse (Z) und gekoppelt mit dem Halterahmen (2); 25
 - Motorisierungsmittel, geeignet, um die drehbare Trommel (3) um die zentrale Achse (3) zu drehen, 30

dadurch gekennzeichnet, dass sie Detektiermittel (5) aufweist, wirkverbunden mit der drehbaren Trommel (3) und/oder den Motorisierungsmitteln, geeignet, um zumindest einen Betriebsparameter der Anlage (1) zu messen, zum Ermöglichen des Vergleichs des detektierten Werts mit einem vorbestimmten nominalen Wert und des Stoppens der Bewegung der Trommel (3), wenn der Unterschied zwischen dem detektierten Wert des Betriebsparameters und dem nominalen Wert größer ist als 0. 35

- 12. Anlage (1) gemäß Anspruch 11, **dadurch gekennzeichnet, dass** die Detektiermittel (5) zumindest eine Lastzelle (6, 7) umfassen, gehalten durch den Halterahmen (2) und platziert unter einer Verbindungsnabe (8, 9), vorragend von der drehbaren Trommel (3) in Übereinstimmung mit der zentralen Symmetrieachse (Z) und gekoppelt mit einer Drehschaft, positioniert in der drehbaren Trommel (3). 40
- 13. Anlage (1) gemäß Anspruch 12, **dadurch gekennzeichnet, dass** die Lastzelle (6, 7) angeordnet ist in einer Hohlsektion (10, 11) des Halterahmens (2). 45
- 14. Anlage (1) gemäß einem der vorhergehenden An-

sprüche 11 bis 13, **dadurch gekennzeichnet, dass** die Detektiermittel (5) einen oder mehrere Ampere-meter (12) umfassen, kooperierend mit den Motorisierungsmitteln, mit denen sie verbunden sind.

15. Anlage (1) gemäß einem der Ansprüche 11 bis 14, **dadurch gekennzeichnet, dass** die Detektiermittel (5) elektrisch verbunden sind mit einer Zentralrechen- und Steuereinheit, die der Bedienperson zur Verfügung steht.

Revendications

1. Procédé de traitement de surfaces laminaires flexibles telles que des cuirs ou peaux dans une installation (1) comprenant un tonneau rotatif (3) de tannage, re-tannage, teinture et/ou foulonnage, comprenant les étapes suivantes :
 - introduire dans ledit tonneau rotatif (3) une ou plusieurs desdites surfaces laminaires flexibles;
 - mettre en mouvement ledit tonneau (3) afin d'exécuter le traitement desdites surfaces laminaires flexibles,

caractérisé en ce qu'il comprend les opérations suivantes :

 - détecter au moins un paramètre de fonctionnement de ladite installation (1);
 - comparer la valeur détectée dudit paramètre de fonctionnement avec une valeur nominale prédéterminée;
 - arrêter le mouvement du tonneau (3) si la différence entre ladite valeur détectée dudit paramètre de fonctionnement et ladite valeur nominale est supérieure à 0.
2. Procédé selon la revendication 1, **caractérisé en ce que** ledit paramètre de fonctionnement comprend l'une quelconque des variables sélectionnées dans le groupe comprenant la puissance absorbée par les moyens de motorisation assurant le mouvement dudit tonneau (3), le déplacement latéral de l'axe de rotation dudit tonneau (3), le barycentre desdites surfaces laminaires flexibles à l'intérieur dudit tonneau (3), et les forces appliquées par ledit tonneau (3) sur un ou plusieurs instruments de pesage (6, 7) qui y sont associés.
3. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce qu'il** comprend l'opération d'affichage de ladite valeur détectée dudit paramètre de fonctionnement.
4. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce qu'il** comprend l'opération de réglage de ladite valeur nominale prédéterminée dans une unité centrale de traitement et

de commande.

5. Procédé selon la revendication 4, **caractérisé en ce que** lesdites opérations de détection et comparaison s'effectuent automatiquement au moyen de ladite unité centrale de traitement et de commande. 5
6. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite valeur nominale dépend au moins des caractéristiques physiques et morphologiques, du poids et/ou de la quantité desdites surfaces laminaires flexibles introduites dans ledit tonneau rotatif (3). 10
7. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce qu'il** comprend l'opération de signalisation de l'état opérationnel pour lequel ladite différence entre ladite valeur détectée et ladite valeur nominale est supérieure à 0, opération exécutée avant ladite opération d'arrêt. 15 20
8. Procédé selon la revendication 7, **caractérisé en ce que** ladite opération d'arrêt s'effectue automatiquement ou résulte de l'intervention d'un opérateur après ladite opération de signalisation. 25
9. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend l'opération consistant à introduire dans ledit tonneau rotatif des produits pour le traitement chimique desdites surfaces laminaires flexibles, opération exécutée avant ou pendant ladite opération de mise en mouvement dudit tonneau rotatif. 30
10. Procédé selon la revendication 1, **caractérisé en ce qu'il** comprend l'opération d'extraction desdites surfaces laminaires flexibles dudit tonneau rotatif (3), exécutée après ladite opération d'arrêt dudit tonneau (3). 35 40
11. Installation (1) de traitement de surfaces laminaires flexibles telles que cuirs ou peaux, comprenant :
 - un châssis support (2), apte à reposer sur une surface de référence; 45
 - un tonneau rotatif (3) de tannage, re-tannage, teinture et/ou foulonnage, apte à contenir lesdites surfaces laminaires flexibles, définissant un axe central de symétrie (Z) et accouplé audit châssis support (2); 50
 - des moyens de motorisation aptes à faire tourner ledit tonneau rotatif (3) autour dudit axe central (Z),**caractérisée en ce qu'elle** comprend des moyens de détection (5), reliés fonctionnellement audit tonneau rotatif (3) et/ou auxdits moyens de motorisation, propres à mesurer au moins un paramètre de fonctionnement de ladite 55

installation (1) afin de permettre la comparaison de la valeur détectée avec une valeur nominale prédéterminée et l'arrêt du mouvement dudit tonneau (3) si la différence entre ladite valeur détectée dudit paramètre de fonctionnement et ladite valeur nominale est supérieure à zéro.

12. Installation (1) selon la revendication 11, **caractérisée en ce que** ledit moyen de détection (5) comprend au moins une cellule de charge (6, 7) supportée par ledit châssis support (2) et placée au-dessous d'un moyeu de liaison (8, 9), faisant saillie dudit tonneau rotatif (3) en correspondance avec ledit axe central de symétrie (Z) et couplé à un arbre rotatif positionné à l'intérieur dudit tonneau rotatif (3).
13. Installation (1) selon la revendication 12, **caractérisée en ce que** ladite cellule de charge (6, 7) est disposée dans une section creuse (10, 11) dudit châssis support (2).
14. Installation (1) selon l'une quelconque des revendications 11 à 13, **caractérisée en ce que** lesdits moyens de détection (5) comprennent un ou plusieurs ampèremètres toroïdaux (12) coopérant avec lesdits moyens de motorisation auxquels ils sont reliés.
15. Installation (1) selon l'une quelconque des revendications 11 à 14, **caractérisée en ce que** lesdits moyens de détection (5) sont électriquement reliés à une unité centrale de traitement et de commande à la disposition de l'opérateur.

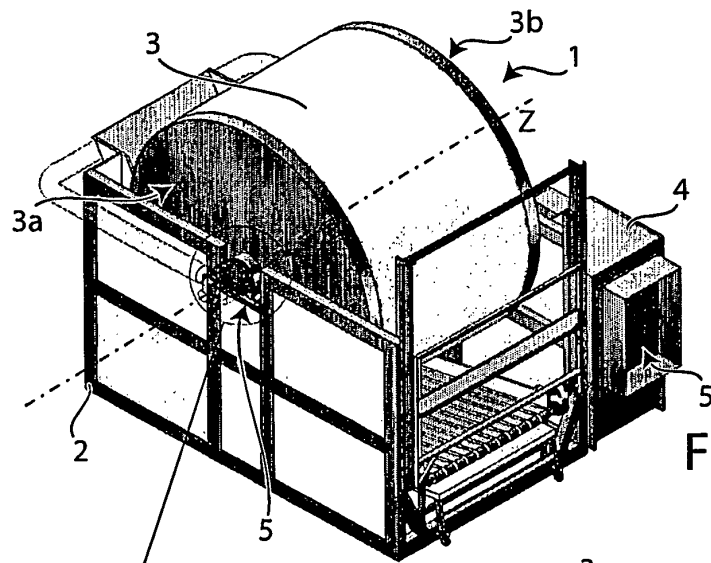


Fig. 1

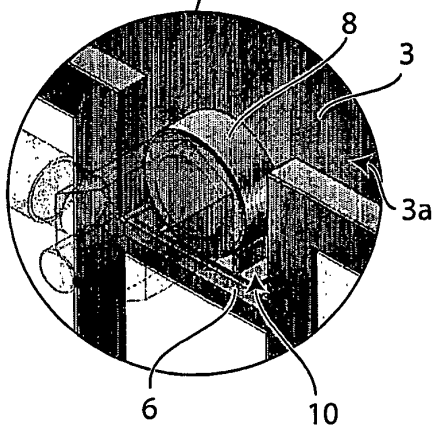


Fig. 3

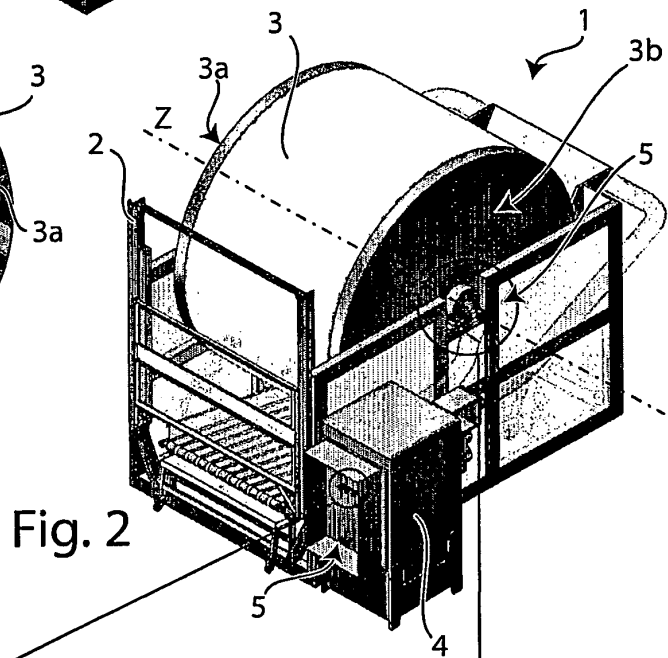


Fig. 2

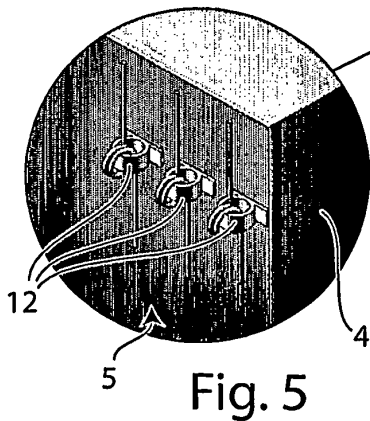


Fig. 5

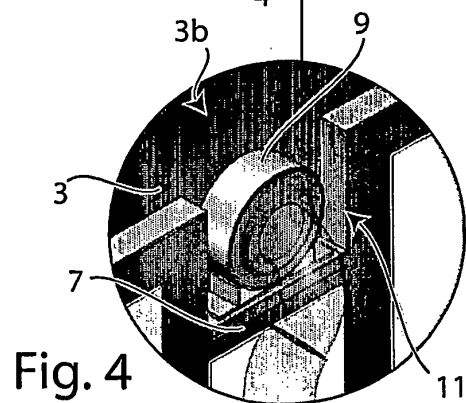


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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