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(54) **LEATHER SPLITTING MACHINE PROVIDED WITH A COOLING DEVICE**

LEDERSPALTMASCHINE MIT KÜHLVORRICHTUNG

MACHINE À AMINCIR LE CUIR DOTÉE D'UN DISPOSITIF DE REFROIDISSEMENT

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Description

[0001] The present invention relates to a splitting machine provided with a cooling device.

[0002] It is known that the so-called splitting machines operate in such a manner as to obtain semifinished products of leather, hide and similar material, and more particularly operate by equalising or dividing a given "raw" piece of hide into two semifinished pieces of smaller thickness (or into two pieces one of which will be a "finished piece" and the other "waste material").

[0003] It is known from US4991482 a cutting apparatus for cutting a layer from a substrate length of rubber material, which uses a knife to cut the material and extending transversely with respect to the direction of passage of the material through the knife itself. The knife is sprayed with a flow of oil for lubrication and temperature control, but this oil is then spread all over the working area and affects the rubber material as well.

[0004] It is also known from FR2025694 a leather cutting/splitting machine in which a flow of air is directed into the cutting slot: however, this airflow causes turbulent recirculation in the space surrounding the blade, and thus renders the area of permanence and work of the operator uncomfortable, due to the generation of noise and heated air.

[0005] Finally, is it known from US1714243 a leather-glazing machine, which performs a very peculiar operation of surface finishing on leather pieces essentially consisting in repeated passages, exerted under a certain mechanical pressure, of a glass cylinder on the leather surface so as to obtain compactness and even optical/visual appearance. In this prior art reference, the leather piece is held in position by a containment bed, and a layer of water underlying the containment bed of the leather piece: therefore, in this known device no cooling of the glass cylinder is provided, but only the leather piece is affected by the cooling action of the containment bed.

[0006] In operation, separation of the hide piece (in the thickness direction) is carried out by making the hide piece move forward towards a cutting station consisting of a belt blade, driven in transverse motion relative to the hide advancing direction, and operating in co-operation with a counter-blade (also known in the particular technical field as "thickness ruler") of a wedge-shaped or cylindrical section.

[0007] The splitting machine blade must always be perfectly aligned and must not suffer from oscillations and/or movements out of the cutting plane; to this end, the blade is usually caused to slide through two guides (currently referred to as "blade guides") usually retained by steel or cast iron plates which in turn rest on the blade itself, almost always by gravity.

[0008] The movable blade is then submitted, during the machine operation, to a continuous slight rubbing on the flywheels that drive it in motion, and it also continuously carries out a slight-rubbing motion in the blade guide (and in conclusion it is submitted to important sliding-friction stresses).

[0009] In addition, in the same region where guiding of the movable blade occurs, there is also a contact with the piece of hide to be split; therefore a further region exists where a sliding friction is created between the cutting edge of the movable blade and the hide piece being worked; this friction is generated both in the transverse direction and in the longitudinal direction (due to the fact that the split hide goes on sliding on the two faces of the blade while keeping some pressure thereon).

[0010] Generally, the weight intensity of the blade guides resting on the movable blade, the type of material to be split (leather, thin hide, crocodile and so on) and the climatic conditions, give rise to heating of the movable blade and the blade-guide plate assembly to such an extent that temperatures as high as more than 50°C can be reached.

[0011] While the just described known art is relatively simple and has been tried out for long, it however has some drawbacks.

[0012] In fact, the driving speed of the movable blade and the above described friction/pressure values of the hide piece under working generate an important amount of heat that spreads within the movable blade and the blade guide, causing thermal expansions that are detrimental to the cut accuracy/precision.

[0013] In particular, it is to be pointed out that a (fixed or movable) blade, when heated to such a high degree, easily loses its cutting capacity and is subjected to triggering of structural cracks that can cause breaking of the blade itself.

[0014] An increase in the operating temperature of the blade and the thickness ruler results in a decay of the mechanical properties of the last-mentioned elements that in conclusion will have a reduced duration (and at the same time this involves an increase in the operating costs of the machinery).

[0015] The high temperatures can also damage the blade guides worsening the relative smoothness of same and therefore producing a quicker wear of the movable blade sliding therethrough. In addition, the more the blade guides are subjected to high operating temperatures, the quicker they are worn out (and also the higher their cost is).

[0016] Furthermore, overheating of the cutting station may constitute a hinder also from the point of view of safety and comfort for the operator of the splitting machine, who must manually move the hide piece being worked close to the cutting station and can therefore suffer from the high heat (or can even get burnt, coming into contact with the blade, guide blade and thickness ruler):

[0017] On the other hand, it is to be noted that the plate region (and more particularly the upper plate region) is the one also acted upon by the operator; the high temperatures obviously do not facilitate the operator's manoeuvring and make the workplace conditions and microclimate worse.

[0018] It is apparent that the operator must in any case manipulate leather and hides (that are sometimes very valuable) which can be easily damaged due to the high perspiration of the operator's hands; in other words, the generated heat can adversely affect the quality of the semifinished products.

[0019] It is an object of the present invention to provide a splitting machine equipped with a cooling device that is able to overcome the mentioned drawbacks and that can be used for example in the shoe sector, the leather manufacturing sector, the tan sector and so on.

[0020] In particular, the present invention aims at conceiving a cooling device enabling the temperature of the blade guide and/or the movable blade to be lowered without the accuracy of the cutting action and the operation of the assembly for actuation of the movable blade being impaired.

[0021] The present invention also aims at conceiving a device enabling an operator to move close to the machine more safely, without suffering from the effects of heat generated during leather working and without running the risk of being accidentally burnt.

[0022] The foregoing and further aims are achieved by a splitting machine in accordance with the present invention, which has the features recited in the appended claims and hereinafter illustrated in an embodiment thereof given by way of non-limiting example with reference to the accompanying drawings, in which Figs. 1 and 2 show diagrammatic views of two possible embodiments of splitting machines including the device being the object of the invention.

[0023] With reference to the drawings, the splitting machine in accordance with the invention is generally identified with reference numeral 1 and substantially comprises a cutting station conveniently dedicated to receiving a hide piece to be worked and to division of same into thinner semifinished products.

[0024] According to the invention, a cooling device for splitting machines is present, which in turn comprises heat removing means operatively associable with at least said cutting station; within the scope of the invention, the heat removing means operates by conduction. In other words, a cutting station of a splitting machine can be advantageously provided with a device enabling the heat generated during use of the machine to be "picked up" and dispersed in the surrounding environment, preferably where it has no influence on the operator.

[0025] The heat-removal modalities are based on heat transportation by conduction, because the heat generated during movement of the blade and cutting of the hide is transmitted to solid elements that usually consist of materials promoting conduction; therefore, it will be possible to remove heat in a "direct" or "indirect" manner from the operating blade since the latter absorbs the generated heat and in turn transmits it to the pieces or parts on which it is mounted or which it contacts.

[0026] Within the scope of the invention, by "direct removal" of heat it is intended a thermal flux directly moving away from the objects to be cooled (first from the blade but also from the blade guide and/or the support means, as detailed below), which thermal flux takes place directly from the blade to the cooling device (i.e. without intermediate thermal masses through which the thermal energy is caused to flow).

[0027] On the other hand, still within the scope of the present invention by "indirect removal" of heat from the blade it is intended a thermal flux moving away from pieces or parts, which flux however passes through other pieces or parts located at an intermediate position.

[0028] Depending on current requirements, the heat removing means can therefore either "directly" cool the blade (picking up heat and dissipating it without conduction paths concerning other pieces or parts of the machine) or "indirectly" cool the blade and/or the blade guide and/or the supports (picking up heat from a piece that is not directly the blade, but is in contact with the blade or in turn is in contact with one or more other pieces interposed between the blade and the heat removing means).

[0029] In detail, it is possible to see that the heat removing means comprises a thermal-energy carrier in a liquid state and a movement circuit adapted to contain this thermal-energy carrier.

[0030] The thermal-energy carrier is caused to flow through suitable driving means (a pump for example) and the parameters of this circulation (such as pressure, flow rate, residence time in suitable circuit areas, thermal features of the carrier itself) are established based on current requirements; from an operating point of view, the driving means is therefore interlocked with the movement circuit to move the thermal-energy carrier in a reversible manner between a thermal-energy picking-up station 2 and a dissipation station 3.

[0031] Conveniently, the movement circuit is formally divided into a thermal-energy picking-up station 2 (that in accordance with the present invention can be positioned near and/or in close proximity with pieces or parts of the splitting machine) and a dissipation station 3 connected in circuit to the thermal-energy picking-up station 2 and adapted to eliminate the heat stored by the thermal-energy carrier.

[0032] In more detail, the pieces or parts close to which the thermal-energy picking-up station 2 can be positioned/mounted can advantageously consist of a thickness ruler and/or a movable blade (that typically is adapted to co-operate with the just mentioned thickness ruler to split at least one hide piece), and/or of one or more blade guides operatively active at least on the movable blade, and/or of suitable support means (flywheels, plates, blocks, kinematic mechanisms, linkages or others) for the thickness ruler, blade guides and movable blade.

[0033] In other words, the thermal-energy picking-up station 2 can be positioned near and/or in close proximity with the pieces or parts of the splitting machine from which the heat generated during sliding/rubbing of the movable blade on the different blade guides (and/or dur-

ing splitting of the hide pieces) will be eliminated (through heat exchange by conduction), said parts or pieces in turn having received said heat by conduction.

[0034] Referring to the drawings it is possible to see two thermal-energy picking-up stations 2, one of which is such positioned that it removes heat from the movable blade and/or the lower guide of the movable blade (lower blade guide), and the other is such positioned that it removes heat from the upper guide of the movable blade (upper blade guide), and both stations 2 can also pick up thermal energy from the supports of said pieces.

[0035] Incidentally, it is to be noted that a heat exchange by conduction has been selected as the prominent embodiment of the present invention but in case of need, the thermal-energy removing means could also utilise natural or forced convection and/or radiation to remove heat from the surfaces of the pieces or parts that are intended to be cooled.

[0036] In order to ensure the suitable heat-elimination speed, and at the same time pick up heat in the most homogeneous manner, at least the thermal-energy picking-up station 2 can be at least partly formed inside predetermined pieces or parts of the splitting machine; in particular the most appropriate "pieces or parts" to this end can preferably be the so-called upper or lower "plate assemblies" and/or one or more blade guides and/or the movable blade itself.

[0037] Structurally, the just described architecture can be obtained through suitable channels formed within the mentioned pieces or parts; therefore the thermal-energy carrier will be caused to flow within these pieces or parts and the required conductive thermal exchange will be carried out.

[0038] Conveniently, it is an object of the present invention a splitting machine comprising a cutting station (provided with a thickness ruler and a movable blade adapted to co-operate with the thickness ruler to split at least one hide piece), a predetermined number of blade guides suitably active at least on the movable blade, and support means for said thickness ruler, blade guide and movable blade; advantageously, this splitting machine 1 further comprises cooling means acting by heat conduction and operatively associated with the thickness ruler and/or one or more blade guides and/or the movable blade and/or the support means.

[0039] In accordance with the present invention, this cooling means acting by heat conduction defines a cooling device in accordance with the above description and/or with the following claims; in particular, the cooling means and/or the thermal-energy picking-up station 2 can be formed within at least one thickness ruler and/or one or more blade guides and/or the support means.

[0040] Depending on current requirements, the dissipation station 3 is positioned internally of a machine body of the splitting machine 1; this can be the case when a machine is made expressly and a suitable inner space for the dissipation station 3 has been provided which can consist of a refrigerating unit and/or a heat exchanger or equivalent means.

[0041] The dissipation station 3 may also be positioned externally of said machine body of the splitting machine 1; this may occur for example when the cooling device is mounted on an already existing machine that therefore is not provided with appropriate inner spaces. In this case it will be obviously also necessary to take into account the suitable positioning of the thermal-energy picking-up station 2 that can for example consist of suitable pipe coils inside which the thermal-energy carrier flows and which are put into contact with the pieces or parts to be cooled, and also provided must be the suitable circuit for the carrier that through appropriate piping must reach the dissipation station 3.

[0042] The invention enables achievement of important advantages.

[0043] First of all, it will be recognised that the particular construction architecture of the cooling device enables efficient removal, through conduction, of the excess heat both from the blade and from the machine pieces co-operating with the blade (such as blade guides and/or supports for the blade guides).

[0044] Heat removal by conduction further enables the cooling device to be easily integrated into a splitting machine, even in the case of an already existing machine, of which it improves the performance both in terms of quality of the cutting operation and in terms of duration of the different pieces submitted to wear.

[0045] Secondly, it will be recognised that the reduction in temperature of the pieces appearing in the cutting station not only enables improvement of the machinery performance, but also the operators' work conditions are improved; in particular, the likelihood of burns on the operators are reduced and the microclimate around the machinery is improved, so that the operators' life becomes more comfortable and they are no longer subjected to too much perspiration.

[0046] Furthermore, the present invention enables semifinished products of better quality to be obtained both as regards accuracy in cutting and absence of contamination by the operator's sweat.

[0047] It will be also appreciated that the longer useful life of the different pieces of the splitting machine (as well as duration of the optimal mechanical and cutting performance of the blade and blade guides) enables the intervals for servicing/replacement of parts to be extended, which is advantageous in terms of low management costs.

[0048] Finally, the present invention can be advantageously employed in different production fields in which operation of a splitting machine is required, such as the shoe sector, leather and hide sector, tan sector, and also in the furniture manufacturing field (sofas, chairs, armchairs and the like made of leather), and so on.

Claims

1. A leather splitting machine, comprising:

   - a cutting station equipped with a thickness ruler and a movable blade adapted to co-operate with said thickness ruler to split at least one hide piece;
   - a predetermined number of blade guides operatively active at least on said movable blade; and
   - support means for said thickness ruler, blade guides and movable blade; and
   - a cooling device operatively associated with the thickness ruler and/or the movable blade and/or the blade guides and/or said support means and comprising heat removing means operatively associable at least with said cutting station, said heat-removing means operating by conduction,

   characterized in that said heat-removing means comprises:

   - a thermal-energy carrier in a liquid state; and
   - a movement circuit adapted to contain said thermal-energy carrier and comprising:

     - a thermal-energy picking-up station (2) to be positioned near and/or in close proximity with said thickness ruler and/or said movable blade and/or at least one of said blade guides and/or said support; and
     - a dissipation station (3) connected in circuit to said thermal-energy picking-up station (2) and adapted to eliminate the heat stored by said thermal-energy carrier.

2. A machine as claimed in claim 1, **characterized in that** said cooling device further comprises driving means interlocked with the movement circuit to move the thermal-energy carrier in a reversible manner between the thermal-energy picking-up station (2) and the dissipation station (3).

3. A machine as claimed in anyone of the preceding claims, **characterized in that** the cooling means and/or the thermal-energy picking-up station (2) are formed inside at least the thickness ruler and/or one or more guide blades and/or the support means.

4. A machine as claimed in anyone of the preceding claims, **characterized in that** the dissipation station (3) is located internally of a machine body of the splitting machine (1).

5. A machine as claimed in anyone of the claims 1-3, **characterized in that** the dissipation station (3) is positioned externally of said machine body of the splitting machine (1).

Patentansprüche

1. Lederspaltmaschine, umfassend:

   - eine Schneidestation, die mit einem Dickenmesser und einer beweglichen Klinge, die dazu geeignet ist, mit dem Dickenmesser zusammenzuarbeiten, um mindestens ein Hautstück zu spalten, ausgestattet ist;
   - eine festgelegte Anzahl von Klingenführungen, die mindestens auf die bewegliche Klinge betriebswirksam einwirken; und
   - Mittel zum Halten des Dickenmessers, der Klingenführungen und der beweglichen Klinge; und
   - eine Kühlvorrichtung, die betriebswirksam mit dem Dickenmesser und/oder der beweglichen Klinge und/oder den Klingenführungen und/oder den Haltemitteln verbunden ist und umfassend Wärmeabführmittel, die mindestens mit der Schneidestation betriebswirksam verbindbar sind, wobei die Wärmeabführmittel durch Konduktion wirken,

   dadurch gekennzeichnet, dass die Wärmeabführmittel Folgendes umfassen:

   - einen Träger von thermischer Energie in einem flüssigen Zustand; und
   - einen Bewegungskreis, der dazu geeignet ist, den Träger von thermischer Energie zu enthalten und umfassend:

     - eine Aufnahmestation von thermischer Energie (2), die in der nahe und/oder in nächster Nähe zum Dikkenmesser und/oder zur beweglichen Klinge und/oder zumindest einer der Klingenführungen und/oder der Halterung positioniert wird; und
     - eine Dissipationsstation (3), die in einem Schaltkreis mit der Aufnahmestation von thermischer Energie (2) verbunden ist und dazu geeignet ist, die vom Träger von thermischer Energie gespeicherte Wärme abzuführen.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kühlvorrichtung ferner Antriebsmittel umfasst, die mit dem Bewegungsschaltkreis verriegelt sind, um den Träger von thermischer Energie rückkehrbar zwischen der Aufnahmestation von thermischer Energie (2) und der Dissipationsstation (3) zu bewegen.

3. Maschine nach einem der vorangehenden Ansprü-

che, **dadurch gekennzeichnet, dass** die Kühlmittel und/oder die Aufnahmestation (2) von thermischer Energie mindestens innerhalb des Dickenmessers und/oder eines oder mehrerer Führungsklingen und/oder von Haltemitteln ausgebildet sind.

4. Maschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Dissipationsstation (3) innerhalb eines Maschinenkörpers der Spaltmaschine (1) liegt.

5. Maschine nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Dissipationsstation (3) außerhalb des Maschinenkörpers der Spaltmaschine (1) liegt.

Revendications

1. Machine à amincir le cuir, comprenant :

- un poste de découpe doté d'une règle d'épaisseur et d'une lame mobile pouvant coopérer avec ladite règle d'épaisseur pour amincir au moins un morceau de peau ;
- un nombre prédéterminé de guides de lame fonctionnellement actifs au moins sur ladite lame mobile ; et
- des moyens de support pour ladite règle d'épaisseur, guides de lame et lame mobile ; et
- un dispositif de refroidissement fonctionnellement associé à la

règle d'épaisseur et/ou à la lame mobile et/ou aux guides de lame et/ou aux moyens de support et comprenant des moyens de suppression de la chaleur fonctionnellement associés au moins au dit poste de découpe, lesdits moyens de suppression de la chaleur fonctionnant par conduction,
caractérisée en ce que lesdits moyens de suppression de la chaleur comprennent :

- un transporteur d'énergie thermique dans un état liquide ; et
- un circuit de déplacement pouvant contenir ledit transporteur d'énergie thermique et comprenant :

  - un poste de collecte d'énergie thermique (2) étant positionné près et/ou à proximité de ladite règle d'épaisseur et/ou de ladite lame mobile et/ou desdits au moins l'un desdits guides de lame et/ou dudit support ; et
  - un poste de dissipation (3) relié en circuit au dit poste de collecte d'énergie thermique (2) et pouvant éliminer la chaleur stockée par ledit transporteur d'énergie thermique.

2. Machine selon la revendication 1, **caractérisée en ce que** ledit dispositif de refroidissement comprend de plus des moyens d'entraînement accouplés au circuit de déplacement pour déplacer le transporteur d'énergie thermique d'une manière réversible entre le poste de collecte d'énergie thermique (2) et le poste de dissipation (3).

3. Machine selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les moyens de refroidissement et/ou le poste de collecte d'énergie thermique (2) sont au moins formés à l'intérieur de la règle d'épaisseur et/ou d'un ou plusieurs guide-lames et/ou des moyens de support.

4. Machine selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le poste de dissipation (3) est situé à l'intérieur d'un corps de machine de la machine à amincir (1).

5. Machine selon l'une quelconque des revendications de 1 à 3, **caractérisée en ce que** le poste de dissipation (3) est situé à l'extérieur dudit corps de machine de la machine à amincir (1).

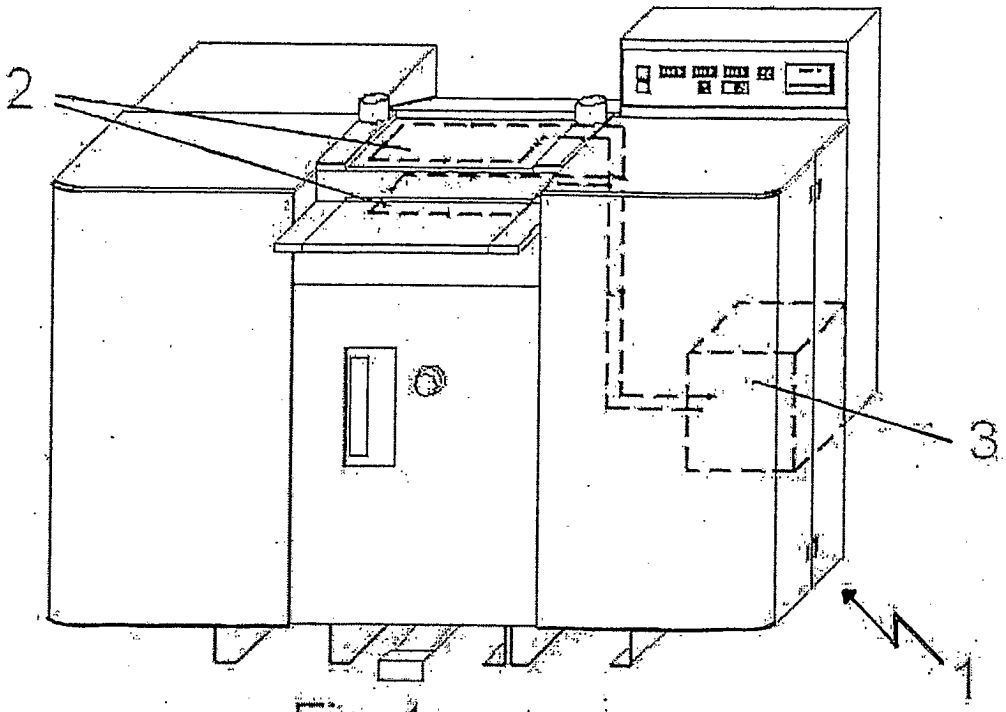

Fig. 1

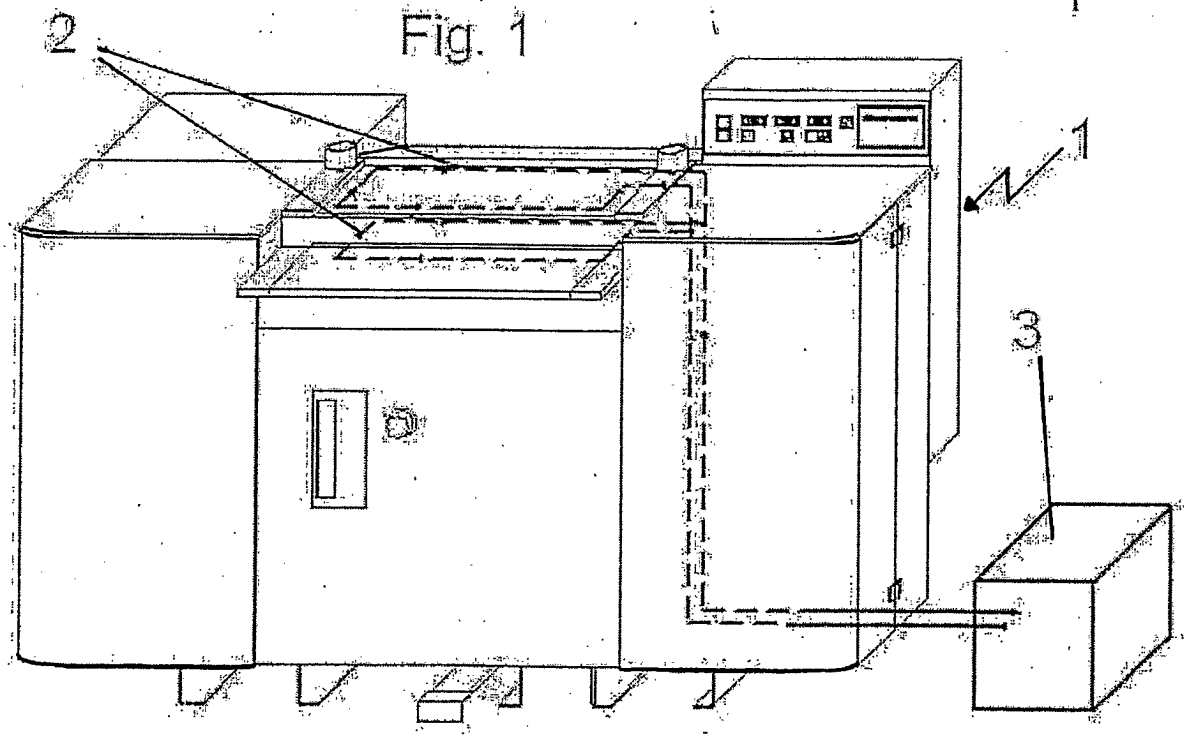

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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