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Description

The present invention relates to an apparatus for treatment of textile materials with a treatment liquor, in particular for dyeing, washing and bleaching, comprising an autoclave in the form of a cylindrical vessel with a horizontal axis provided with a material treatment compartment and designed in such a way that at least one mobile material holder carrying the material to be treated can be introduced into said autoclave and guided by means of a guidance path provided within said autoclave, said autoclave being so designed that it is suitable for treatment of these materials in a treatment liquor under the influence of heat and/or pressure, further comprising a heat exchanger for heating or cooling the treatment liquor circulated by a pump and a balancing compartment which communicates with the material treatment compartment receiving an excess liquor resulting from thermal expansion or chemical reactions during the treatment.

An apparatus of this type is disclosed in GB—A—2 072 724, having an elongated horizontal vessel of circular cross-section, receiving a plurality of beams therein, i.e. mobile perforated cylindrical tubes around which textile materials, such as yarns, tapes and other fabrics are wound to be treated in the interior of the vessel. Lower outlets of the vessel enable the treatment liquids introduced into the vessel to be partly recirculated to the inlet thereof by a connector pipe running outside the vessel and incorporating a heat exchanger as well as a pump means. Upper outlets connect the treatment compartment i.e. the interior of the vessel with an upper pressure control tank receiving pressurised air as well as excessive treatment liquid resulting from thermal expansion of chemical reactions thereof during the treatment within the vessel. Excess liquid within said pressure control tank is also returned to the interior of the vessel for further use, while the upper pressure tank assists the treatment process within the interior of the vessel by exerting a predetermined air pressure, thereto.

However, a number of drawbacks have been encountered in application of such a complicated system which, due to its plurality of branching pipes, valves and connection ducts causes high manufacturing and installation costs as well as increased maintenance costs. Moreover, in many cases a more space saving and less complicated structure of such a treatment apparatus is desirable.

A further weak point of the known system was found to be the pre-determined circular shape of the material supporting carriage means, delimiting the type of textile material treatable to fabrics which can be wound around the tubular supports.

Therefore it is an object of the present invention to provide an improved apparatus according to the preamble of claim 1, having a considerably simplified structure while enabling a variety of materials designed and packaged differently, such as yarn cheeses of different diameter, to be treated effectively.

To achieve the above mentioned object, the apparatus incorporates the features according to the characterising portion of claim 1.

Thus, the invention comprises a material treatment compartment formed substantially by two partitioned walls which are provided within the autoclave side of the material holder, the partition walls define a space outside the treatment compartment within said autoclave, constituting the balancing compartment, and that the heat exchanger is positioned in the interior of the autoclave.

Preferred embodiments of the invention are claimed in the subclaims.

The advantages of the new apparatus are basically the remarkably simplified structure thereof, enabling the horizontally oriented autoclave to simply rest on the floor, resulting in facilitated loading and removal operation of the autoclave. Due to the separation of the treatment compartment from a balancing compartment inside the autoclave vessel, no need arises to provide separate tanks for establishing an excess liquor collecting space, avoiding extended pipe and valve systems.

Moreover, the new design of the treatment compartment ensures application of material carriage means having reception devices of different structure adapted to the particularities of the goods to be treated. For example, vertical rods extending from a rectangular base portion may be applied as a support means to hold yarn cheeses or similar carrier means thereon.

Further features and advantages of the present invention will become more clearly apparent from the following description taken in conjunction with the accompanying drawings in which

Figures 1 to 4 disclose further embodiments of conventional apparatus for the treatment of textile materials,

Figure 5a is a schematic cross-sectional view of an apparatus according to an embodiment of the present invention,

Figure 5b is a longitudinal sectional view according to Figure 5a, and

Figure 5c is a sectional plan view according to Figure 5a.

In Figures 1 and 4, conventional apparatuses for treatment of textile materials are shown, their expansion or balance compartment 5 is located separated from one or a number of autoclaves 1 of the apparatus. Thus, not only a complicated pipeline system has to be applied, but also a pair of heat exchangers 6 for recovery of latent heat of the overflowing treatment liquor as well as for general heating of the process liquid. Additionally, a pair of motor driven pumps 3, 7 were proved to be necessary for recirculating the process or treatment liquid to the autoclave inlet.

Thus, considerable operating expenses are encountered, due to the considerable consumption

of energy by this equipment. Furthermore, the bath ratio is high, i.e. the ratio between weight of the liquor and the weight of the material to be treated is disadvantageously increased, resulting from the necessary complete filling of each autoclave with the treatment liquor.

Reference numeral 2 indicates a plurality of horizontally oriented material holders.

A vertically installed autoclave 1 of the afore indicated type, employing specifically adapted material holders 2 is shown in Figure 2. However, such a vertical vessel is limited to certain material holders 2 to be applied and requires application of elevating means for feeding and removing the material to be treated to the vessel, thus it cannot be operated with a desirable high efficiency. Moreover, particular support equipment for stabilising the vessel has to be used, resulting in considerably increased installation costs for such systems.

Figure 3 refers to another conventional autoclave 1 having essentially a vertical rectangular cross section with an expansion device on the top. However, such an autoclave exhibits limits in view of the goods treatable therein, merely enabling hanks of yarn to be introduced for treatment. Moreover, the bath ratio of such an arrangement is considerably high.

Any drawbacks and inconveniences encountered in conventional autoclaves for textile treatment have been overcome by the newly designed autoclave 1 as disclosed in Figures 5a to 5c.

The autoclave 1, as indicated in Figures 5a and 5b, simply rests on the floor and is oriented horizontally, adapted to receive a plurality of trolleys forming material holders 2. The material holders 2 move along side bottom rails forming a guide path being integral with the autoclave extending in parallel to the longitudinal axis thereof.

Inside of the autoclave 1 at least partially including the trolley supporting guide rails, two partition walls 8 extend vertically upward, so as to form a material treatment compartment filled with treatment liquor and separating the treatment compartment from the rest of the interior of the autoclave 1.

The remaining part of the autoclave 1, normally not being occupied by the treatment process liquor generally constitutes the balancing compartment 5 containing a compressed air atmosphere, so as to accomplish static pressurisation inside the autoclave 1.

Since each partition wall 8 exhibits a free upper margin, the treatment compartment communicates with the balancing compartment 5, established next to the treatment compartment. The balancing compartment has been provided in order to receive excess process liquor from the treatment compartment expanding due to thermal or chemical reactions during the treatment. For this purpose, overflow fittings (not shown) are provided at the upper portion of the partition walls 8 accordingly.

As shown in Figures 5a and 5c, one of the partition walls 8 is profiled to form a sideward projecting piece, adapted to receive a heat exchanger 4 therein, which serves for heating or cooling of the treatment liquor.

An outlet of the pocket containing the heat exchanger 4 communicates with an inlet of the autoclave 1, particularly with the treatment compartment thereof via a circulating tube. Hence, the treatment liquor can be recirculated by means of a motor-driven pump 3, assisted by a diverting valve 7 which permits flow of process liquor in both directions with respect to the autoclave inlet.

The material supporting trolleys 2 preferably comprise a rectangular base portion carrying the textile material to be treated by vertical rods 6 being arranged in straight rows. This arrangement results in yarn cheeses to be positioned as close as possible. However, also various other holding elements adapted to the material to be treated might be applied. Such material, for example, comprises tops, tows, beams, staple fibres, hanks of yarns, and others.

Moreover, provisions are made for automatically stacking or removing goods on the vertical rods 6 resulting in the set-up time being shortened. Thus, simultaneous loading or unloading operation, including all vertical rods is considerably simplified and maybe made quicker. Feeding and removing of the textile material by the trolleys 2 may be automated as well.

Treatment liquor does not normally occupy more than the treatment compartment, hence, bath ratio of this system is rather low, for example of about 6:1.

The remaining space next to the treatment compartment inside the autoclave 1 substantially defines the pressurised air atmosphere so as to effect treatment under desired static pressurisation of the autoclave 1.

The treatment liquor is allowed to expand, exceeding the treatment compartment or the upper liquid level marked by the overflow fittings disposed therein to assist the expansion of the treatment liquor due to thermal and/or chemical reactions, while the excess process liquor is collected in the "empty" side zones of the autoclave 1.

The particular design of the material holders 2 comprising rectangular base portions with vertically directed cheese holder rods 6 arranged in straight rows thereon results in minimum dead space with respect to the arrangement or distribution of the material to be treated on the receiving section of the material holders 2.

Another advantage of the new autoclave was found in its universal application, suitable for dyeing yarn cheeses, tops, tows, beams, staples or other textile materials of different size and varied diameters and cheeses.

The reduced bath ratio results in savings in heating and electrical power costs, as well as in lowered purification costs of the autoclave, thus, not only installation and equipment costs, but also maintenance costs, are considerably reduced.

Claims

1. An apparatus for treatment of textile materials with a treatment liquor, in particular for dyeing, washing and bleaching, comprising an autoclave (1) in the form of a cylindrical vessel with a horizontal axis provided with a material treatment compartment and designed in such a way that at least one mobile material holder (2) carrying the material to be treated can be introduced into said autoclave (1) and guided by means of a guidance path provided within said autoclave (1), said autoclave (1) being designed so that it is suitable for the treatment/of these materials in a treatment liquor under the influence of heat and/or pressure, further comprising a heat exchanger (4) for heating or cooling said treatment liquor circulated by a pump (3) and a balancing compartment (5) which communicates with the material treatment compartment receiving excess liquor resulting from thermal expansion or chemical reactions during the treatment, characterised in that the treatment compartment is formed by substantially two partition walls (8) which are provided within the autoclave (1) next to the material holder (2), the partition walls (8) define a space outside the treatment compartment within said autoclave (1) constituting the balancing compartment (5), and that the heat exchanger (4) is positioned in the interior of the autoclave (1).

2. An apparatus according to claim 1, wherein said partition walls (8) extend in parallel to the longitudinal axis of the autoclave (1) having upper free portions including overflow fittings, enabling an excess treatment liquor to leave the treatment compartment.

3. An apparatus according to claim 1, wherein the space within said autoclave (1) not being normally occupied by either the treatment liquor or another component of the apparatus, is filled with pressurised air.

4. An apparatus according to claim 1, wherein the heat exchanger (4) is arranged in a chamber adjacent to the treatment compartment and communicating therewith, whereas a treatment circulating pipe connects an outlet of said chamber with an inlet of the treatment compartment via the pump (3) and a valve means (7), said pipe essentially runs outside the autoclave (1).

5. An apparatus according to claim 1, wherein the material holder (2) is a trolley having a rectangular base portion provided with a plurality of rods (6) extending vertically upwards from said base portion in straight rows.

6. An apparatus according to claim 1, wherein a plurality of material holders (2) is introduced in the autoclave (1) so as to treat simultaneously material received thereon.

Patentansprüche

1. Vorrichtung zur Behandlung textilen Materials mit einer Behandlungsflüssigkeit, insbesondere zum Färben, Waschen und Bleichen mit einem Autoklav (1) in Form eines zylindrischen Behälters mit einer horizontalen Achse, welcher mit einem Materialbehandlungsraum versehen ist und derart konstruiert ist, daß wenigstens ein beweglicher Materialhalter (2), der das zu behandelnde Material trägt, in den Autoklav (1) eingeführt werden kann und mittels eines Führungsweges, welcher im Autoklav (1) angeordnet ist, geführt ist, wobei der Autoklav (1) derart ausgebildet ist, daß er zur Behandlung dieser Materialien in einer Behandlungsflüssigkeit unter dem Einfluß von Wärme und/oder Druck geeignet ist, und weiterhin mit einem Wärmetauscher (4) zum Erwärmen oder Abkühlen der Behandlungsflüssigkeit, die von einer Pumpe (3) umgewälzt wird, und mit einem Ausgleichsraum (5), welcher mit dem Materialbehandlungsraum in Verbindung steht und der Überschußflüssigkeit aufnimmt, welche von thermischer Ausdehnung oder chemischen Reaktionen während der Behandlung herrührt, dadurch gekennzeichnet, daß der Behandlungsraum im wesentlichen von zwei Trennwänden (8) gebildet ist, welche innerhalb des Autoklav (1) nahe dem Materialhalter (2) angeordnet sind, wobei die Trennwände (8) einen Raum außerhalb des Behandlungsraumes innerhalb des Autoklav (1) bestimmen, der den Ausgleichsraum (5) bildet und daß der Wärmetauscher (4) im Inneren des Autoklav (1) angeordnet ist.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Trennwände (8) sich parallel zur Längsachse des Autoklav (1) erstrecken und obere freie Bereiche mit Überlauf-Anschlußteilen aufweisen, die es einem Überschußanteil der Behandlungsflüssigkeit ermöglichen, den Behandlungsraum zu verlassen.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Raum innerhalb des Autoklav (1), der normalerweise nicht von der Behandlungsflüssigkeit oder einem anderen Bestandteil der Vorrichtung besetzt ist, mit unter Druck stehender Luft gefüllt ist.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Wärmetauscher (4) in einem Raum benachbart zum Behandlungsraum angeordnet ist und mit diesem in Verbindung steht, während ein Behandlungsumlaufrohr einen Auslaß dieses Raumes mit dem Einlaß des Behandlungsraumes über die Pumpe (3) und eine Absperrorganeinrichtung (7) verbindet, wobei das Rohr im wesentlichen außerhalb des Autoklav (1) verläuft.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Materialhalter (2) ein Transportkarren ist, der einen rechteckförmigen Basisbereich mit einer Mehrzahl von Stangen (6) aufweist, die sich vertikal aufwärts vom Basisbereich in geraden Reihen erstrecken.

6. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß eine Mehrzahl von Materialhaltern (2) in den Autoklav (1) eingeführt ist, um gleichzeitig darauf angeordnetes Material zu behandeln.

Revendications

1. Appareil pour le traitement des matières textiles au moyen d'un bain de traitement, en particulier, pour la teinture, le lavage et le blanchiment, comprenant un autoclave (1) présentant la forme d'une cuve cylindrique à axe horizontal, muni d'un compartiment de traitement de la matière et conçu de manière qu'au moins un support de matière mobile (2), qui porte la matière à traiter, puisse être introduit dans ledit autoclave (1) et guidé, au moyen d'un trajet de guidage prévu dans ledit autoclave (1), ledit autoclave (1) étant conçu de manière à être approprié pour traiter ces matières dans un bain de traitement sous l'influence de la chaleur et/ou de la pression, cet appareil comprenant en outre un échangeur de chaleur (4) servant à chauffer ou refroidir le bain de traitement mis en circulation par une pompe (3), et un compartiment d'équilibrage (5), qui communique avec le compartiment de traitement de la matière et qui reçoit le bain en excès résultant de la dilatation thermique ou des réactions chimiques qui se produisent pendant le traitement, caractérisé en ce que le compartiment de traitement est formé essentiellement par deux parois de séparation (8) qui sont prévues dans l'autoclave (1) à proximité du support de matière (2), les parois de séparation (8) délimitent un espace situé à l'extérieur du compartiment de traitement, mais à l'intérieur de l'autoclave (1) et qui constitue le compartiment d'équilibrage (5), et en ce que l'échangeur de chaleur (4) est positionné à l'intérieur de l'autoclave (1).

2. Appareil selon la revendication 1, dans lequel les parois de séparation (8) s'étendent parallèlement à l'axe longitudinal de l'autoclave (1), et présentent des parties libres supérieures qui comprennent des déversoirs de trop-plein servant à permettre au bain de traitement en excès de s'échapper du compartiment de traitement.

3. Appareil selon la revendication 1, dans lequel l'espace compris à l'intérieur de l'autoclave (1) et qui n'est pas normalement occupé, ni par le bain de traitement, ni par un autre organe de l'appareil, est rempli d'air sous pression.

4. Appareil selon la revendication 1, dans lequel l'échangeur de chaleur (4) est agencé dans une chambre adjacente au compartiment de traitement et qui communique avec ce compartiment, tandis qu'un tuyau de circulation de traitement relie une sortie de cette chambre à une entrée du compartiment de traitement avec interposition de la pompe (3) et d'une vanne (7), le tuyau s'étendant essentiellement à l'extérieur de l'autoclave (1).

5. Appareil selon la revendication 1, dans lequel le support de matière (2) est un chariot qui présente une partie de base rectangulaire munie d'une série de tiges (6) qui s'élèvent verticalement sur la partie de base et sont disposées en rangées rectilignes.

6. Appareil selon la revendication 1, dans lequel on peut introduire une pluralité de supports de matière (2) dans l'autoclave (1) pour traiter simultanément la matière portée par ces supports.

Fig.1

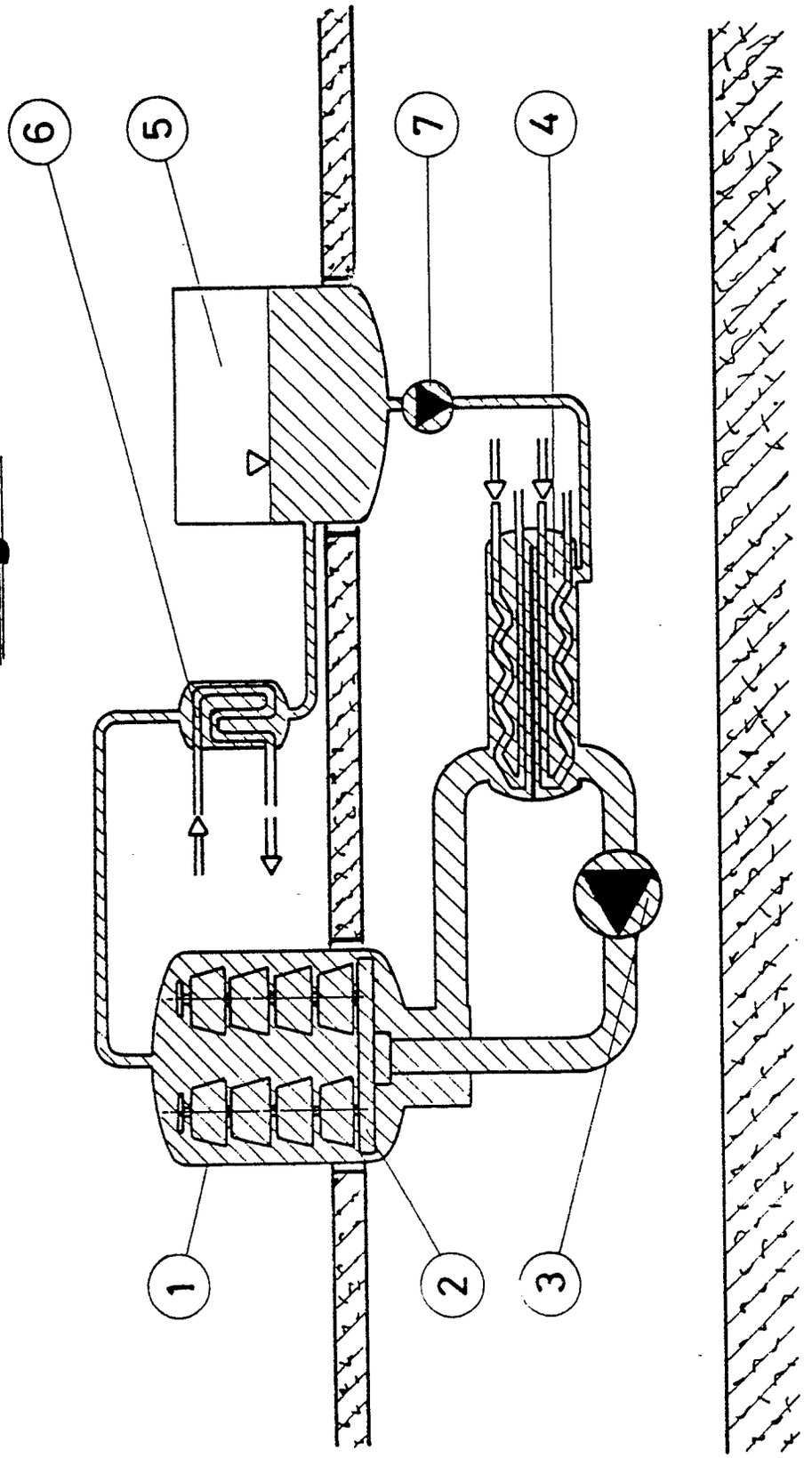
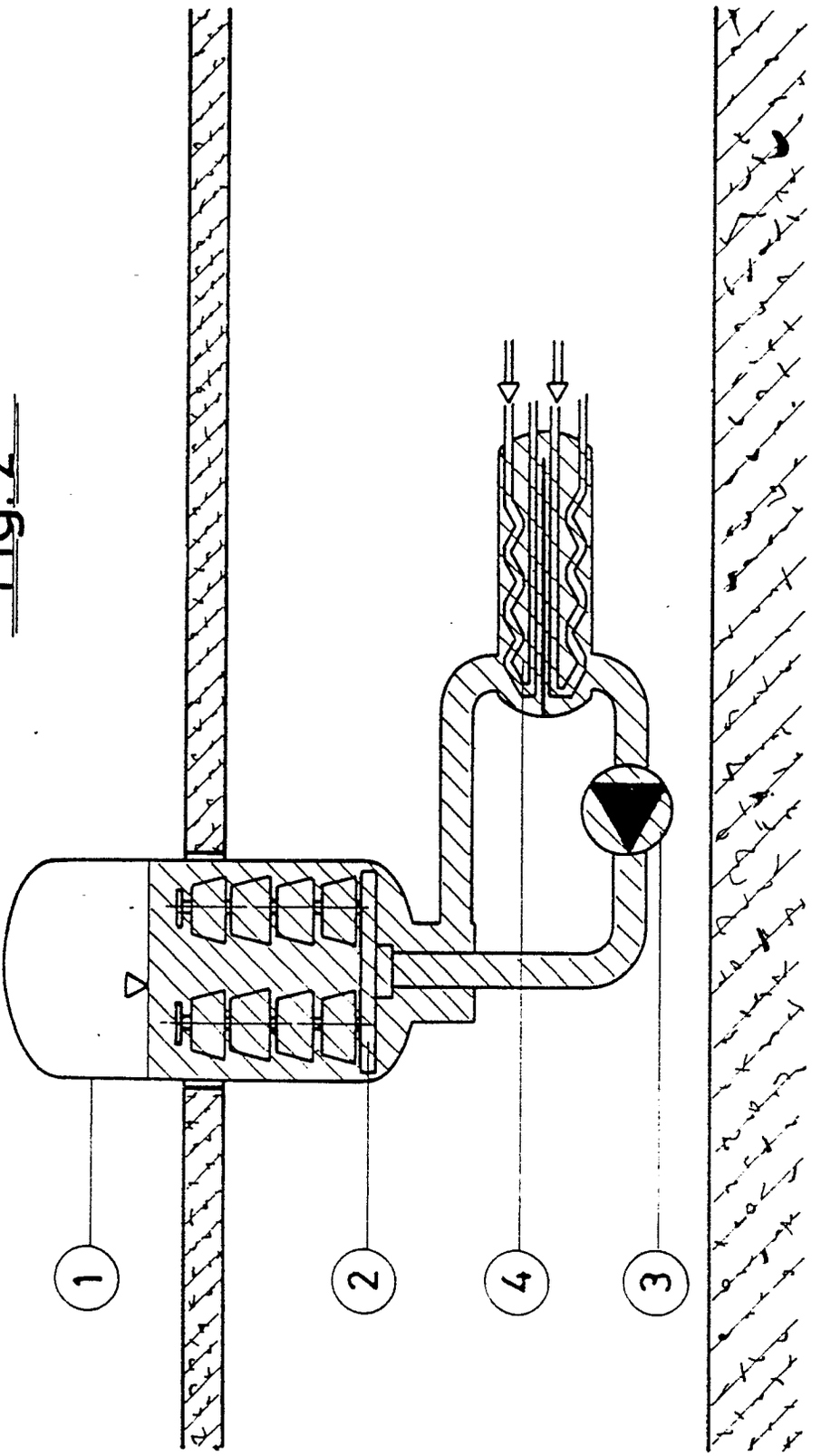


Fig.2



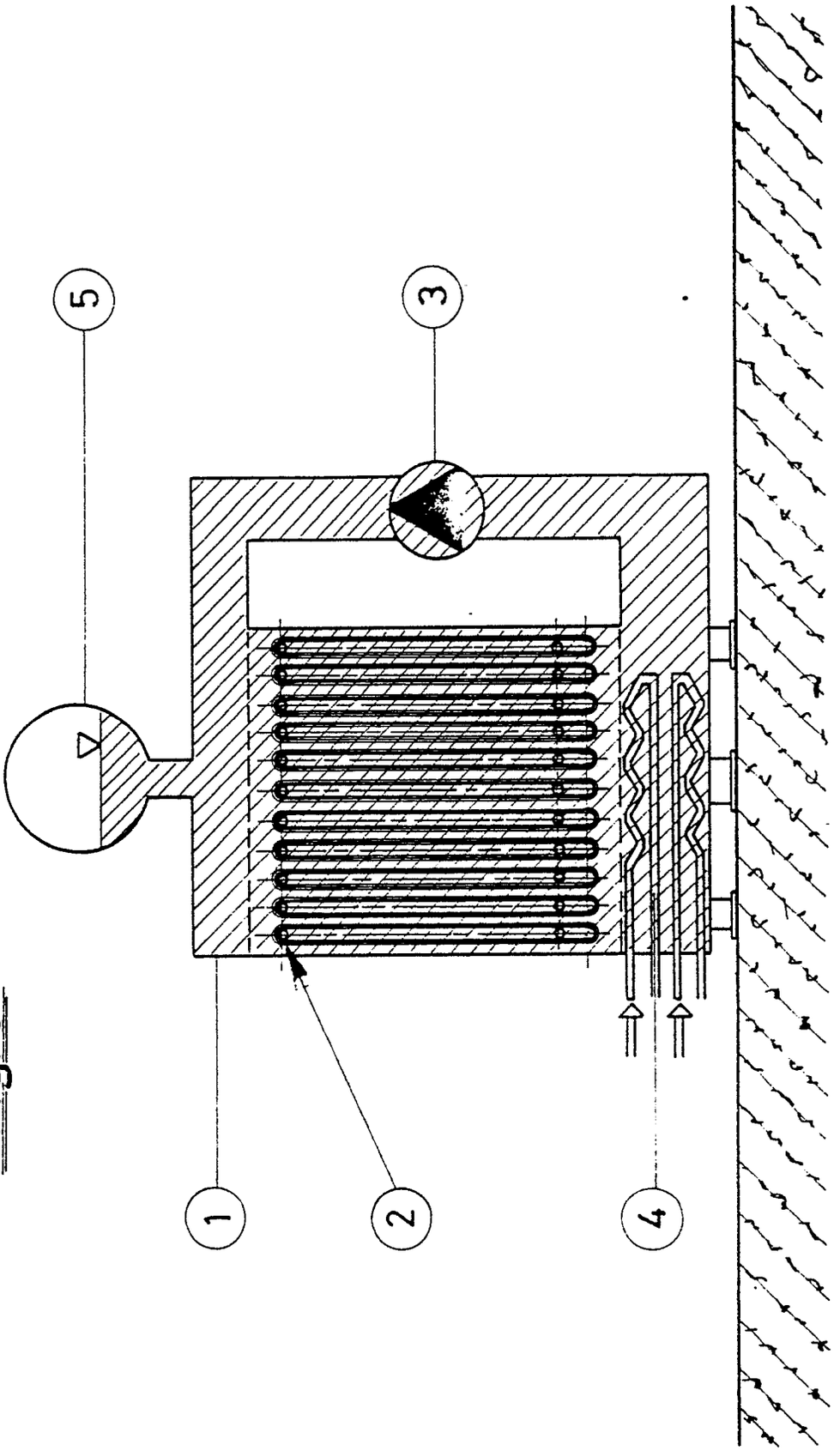


Fig.3

Fig.4

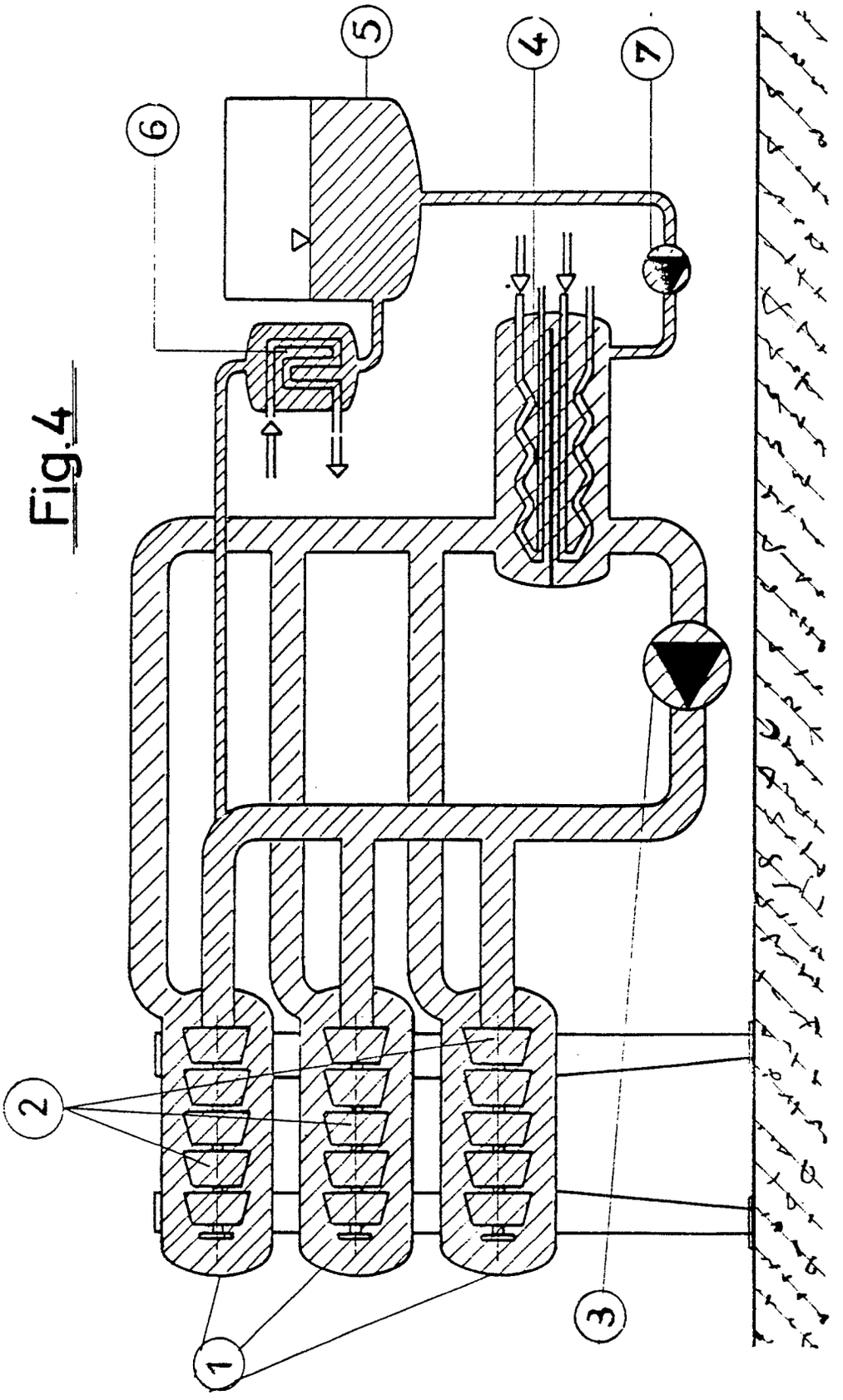
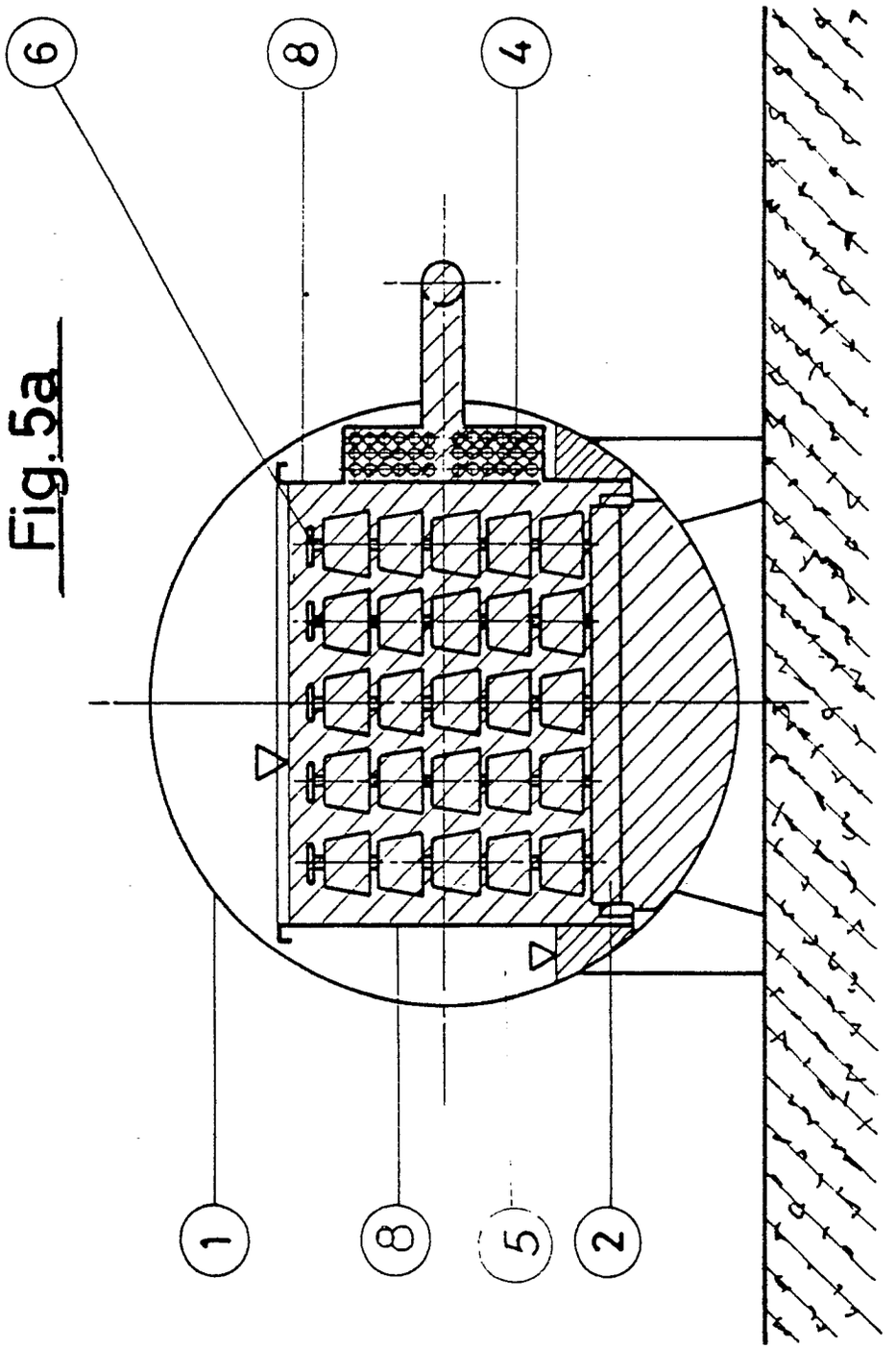


Fig.5a



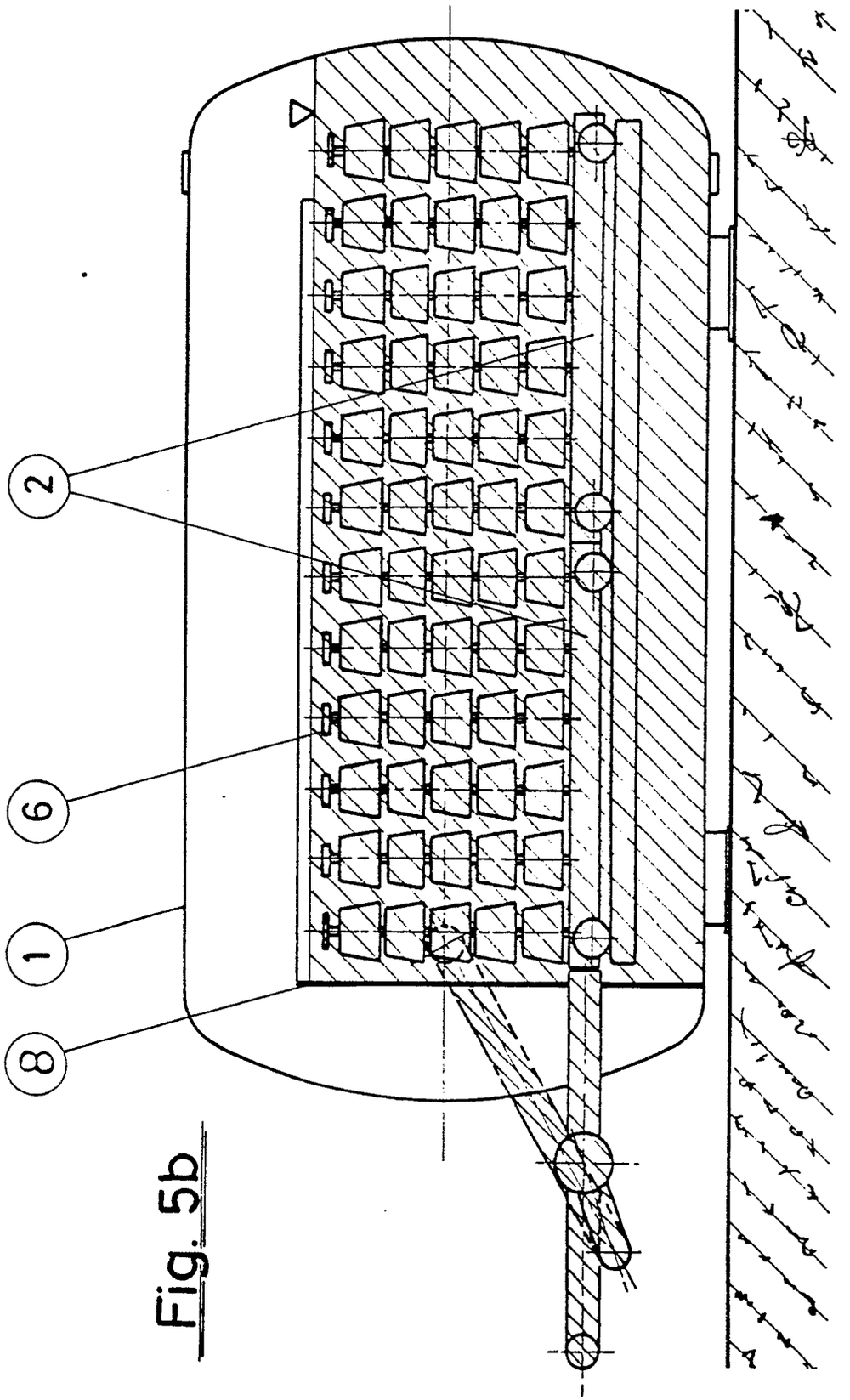


Fig. 5b

Fig. 5c

