(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 922 974 B9**

(12) **CORRECTED EUROPEAN PATENT SPECIFICATION**

(15) Correction information:
Corrected version no 1 (W1 B1)
Corrections, see
Description Paragraph(s) 24, 35, 48

(48) Corrigendum issued on:
06.09.2017 Bulletin 2017/36

(45) Date of publication and mention of the grant of the patent:
08.03.2017 Bulletin 2017/10

(21) Application number: **13762564.6**

(22) Date of filing: **28.06.2013**

(51) Int Cl.:
C14B 1/58 *(2006.01)*

(86) International application number:
PCT/IB2013/055338

(87) International publication number:
WO 2014/184621 (20.11.2014 Gazette 2014/47)

(54) **IMPROVED VACUUM DRIER FOR INDUSTRIAL HIDES**

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(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **17.05.2013 IT VI20130138**

(43) Date of publication of application:
30.09.2015 Bulletin 2015/40

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Description

Field of the invention

[0001] The present invention generally finds application in the field of tannery, and namely relates to a vacuum drier for drying wet industrial hides, as defined in the preamble of claim 1.

Background art

[0002] Vacuum driers for industrial hides are known, which generally comprise a body consisting of a frame or bearing structure that supports one or more mutually superimposed and substantially horizontal tables, upon which hides lie during drying.

[0003] The bearing structure is typically composed of at least two vertical columns at the ends of the tables, having vertical guides and mutually joined by a lower base and an upper cover.

[0004] Each table may be vertically driven by appropriate hydraulic actuators or the like, to be moved toward the overlying table and form a hermetically sealed suction chamber therewith, in which the hides to be dried are enclosed.

[0005] In order to facilitate evaporation of moisture from the hides, the tables are heated by appropriate heating means.

[0006] Furthermore, the suction chambers formed by the tables are connected to vacuum sources, comprising one or more vacuum pumps, that are used to quickly draw vapors through a circuit comprising at least one manifold connected to the tables via appropriate connection tubing.

[0007] Generally, the manifold, the vacuum pumps, the hydraulic and pneumatic stations and the switchboard form a distinct assembly, separate from the body and connected thereto by series of flexible or rigid tubes or power lines.

[0008] Thus, as a whole the machine covers a larger plan area than the body, thereby also adding complexity to the plant layout.

[0009] Furthermore, in this prior art arrangement, as disclosed for instance in EP384196 and GB2152530 by the Applicant hereof, the flexible tubes that connect the tables to the manifold and the latter to the pumps shall minimize mutual rubbing to extend their average life, whereby they are poorly bent and have a considerable length, which will increase the volume of the inner circuit to be emptied, as well as pressure losses along the circuit.

[0010] A further drawback of this kind of plants is the presence of one or more external condensers downstream from the tables, which are generally mounted to the vacuum pump unit and are associated to condensate separators, that require chilled water supplied by a chiller or cooling towers, thereby involving high maintenance costs, and frequent replacements due to oxidation and contacts with highly aggressive vapors and condensates.

[0011] Furthermore, the presence of these components along the circuit, with inevitable safety valves and by-passes, increases pressure losses and involves a higher power consumption by the pumps, while requiring longer times for cyclic evacuation of the tables and hence longer times for drying the hides lying thereon, which may be of the order of one minute.

[0012] Another drawback of prior art traditional driers is that, once the plant has been fabricated, it must be disassembled into partial assemblies for shipment and installation at the tannery or working site, to separate the body with the tables from the assembly that comprises the vapor manifold, one or more condensers and condensate separators, the pump unit and the various connection tubing, as well as the flexible tubes for connection of the tables to the vapor manifold.

[0013] Therefore, after such partial disassembly, the body with the tables must be packaged in a case, whereas the assembly comprising the pumps, the hydraulic and oleodynamic stations and the flexible tubes must be placed in a separate container. Upon transportation to the installation site, the frame with its columns must be reassembled and all the parts of the pump unit must be connected via the flexible tubes, which is a time-consuming process, requiring adjustments and regulations.

[0014] WO87/05944 discloses a vacuum drier for industrial hides having all the features mentioned in the preamble of the claim 1. However also this prior drier have hydraulic lines ad vapor collection lines which are installed in a unit detached from the vacuum drier body thereby occupying a bigger plan space and having and increased power consumption for the longer connection lines with the drier.

Disclosure of the invention

[0015] A general object of the present invention is to eliminate or at least reduce the above drawbacks, by providing a vacuum drier for industrial hides that is highly efficient and relatively cost-effective.

[0016] A particular object is to provide a drier for industrial hides that is highly compact and occupies a smaller space than conventional apparatus.

[0017] A further particular object of the invention is to provide a drier that has lower pressure losses along the connection circuit, thereby increasing the useful rate and efficiency of the vacuum means, as well as reducing consumption and circuit evacuation and hide drying times.

[0018] Yet another object is to reduce the number of parts to be dismantled for shipment, thereby reducing both times for disassembly at the factory and for assembly on site, and achieving savings on machine operation.

[0019] These and other objects, as better explained hereinafter, are fulfilled by a vacuum drier for drying industrial hides as defined in claim 1, which comprises a bearing structure having at least one pair of end uprights with substantially vertical guide means, a lower base and

an upper cover, a plurality of mutually superimposed and substantially horizontal tables for supporting the hides during drying, said tables being adapted to be peripherally and sealingly coupled to define respective vacuum chambers for drawing in vapors from the hides, drive means for vertically moving said tables along said guide means, which are connected to a power unit, heating means associated with the tables for heating the hides, connected to a hydraulic station, vacuum means adapted for selective connection to said tables for drawing vapors released from the hides from said vacuum chambers, control means for electrically controlling said drive means, said heating means and said vacuum means, a suction line for connecting said vacuum chambers with said vacuum means, comprising at least one vapor manifold connected to said vacuum chambers of all the tables via connection tubing. The drier is characterized in that said vacuum means, said power unit, said hydraulic station and said electric control means are integral with said bearing structure and are placed within the ground projection of the machine body and not in a separate assembly, said at least one vapor manifold being directly attached to at least one of said uprights near said tables thereby minimizing the length of said connection tubing, the length of said circuit, the volume of the vapor to be drawn and the time for evacuation of said vacuum chambers.

[0020] This arrangement results in a very compact and condensed drier structure, which will reduce the overall plan dimensions of the drier.

[0021] Furthermore, the smaller length of the circuit and the smaller volume of vapor to be drawn reduces pressure losses, increases suction capacity and reliability of the plant, reduces power consumption and suction chamber evacuation times.

[0022] Finally, the structure simplfies disassembly at the factory, shipment and reassembly at the installation site and affords savings in terms of installation costs and times.

[0023] Advantageous embodiments of the invention are defined in accordance with the dependent claims.

Brief description of the drawings

[0024] Further features and advantages of the invention will be more apparent from the detailed description of a preferred, non-exclusive embodiment of a vacuum drier for industrial hides according to the invention, which is described as a non-limiting example with the help of the annexed drawings, in which:

FIG. 1 is a general perspective view of a drier of the invention in a fully assembled state and with a protective guard;

FIG. 2 is a general perspective view of the drier of FIG. 1 without the guard;

FIG. 3 is a general perspective exploded view of the drier of FIG, 1;

FIG. 4 is a side view of the drier of FIG. 1;

FIG. 5 is a front view of the drier of FIG. 1 from a longitudinal end;

FIG. 6 is a front view of the drier of FIG. 1 from the longitudinal end opposite to that of FIG. 5;

FIG. 7 is a top view of the drier of FIG. 1;

FIG. 8 is the view of FIG. 5 with certain parts partially removed for clarity;

FIG. 9 is the view of FIG. 5 with other parts partially removed for clarity;

FIG. 10 is a perspective view of a detail of FIG. 1;

FIG. 11 is a perspective view of a detail of FIG. 10;

FIG. 12 is an enlarged perspective view of the pump unit of the drier as shown in FIG. 1;

FIG. 13 is a schematic view of a pump as shown in FIG. 12;

FIG. 14 is a diagram of the circuit of the drier of the invention;

FIG. 15 is a side view of a body ready to be packaged in a case.

Detailed description of a preferred embodiment

[0025] Referring to the above figures, a drier of the invention, generally designated by numeral 1, is particularly designed for drying flat products such as industrial hides P that have undergone tanning treatments and retain a high moisture content.

[0026] The drier 1 comprises a body consisting of a bearing structure 2 which defines a longitudinal axis L and is entirely covered by a removable guard 3.

[0027] In the embodiment of the figures, the guard 3 has two shutters 3' at its longitudinal ends, that may be lifted for easy access to the interior of the machine without dismantling the whole guard.

[0028] The bearing structure 2 is essentially composed of a pair of longitudinally offset end uprights 4, 5, a base 6 interposed between the uprights 4, 5 and a flat cover 7.

[0029] Preferably, the uprights 4, 5, the base 6 and the cover 7 are rigidly connected together, as better shown in FIG. 4, such that a rigid and monolithic bearing structure 2 is obtained, to form the body. Preferably, the base 6 has feet 6' for ground mounting.

[0030] Preferably, each upright 4, 5 is composed of a pair of columns 8, 9 having a polygonal or the like section, which are symmetrically arranged with respect to a vertical plane V passing through the longitudinal axis L and mutually joined by tables or ribs located at various heights.

[0031] The cover 7 may be anchored to the uprights 4, 5 and is integral with a lattice truss 7' composed of a pair of longitudinal stringers 10, 10' symmetrically arranged with respect to the vertical plane V and joined by crossbeams, also attached to the uprights 4, 5.

[0032] The columns 8, 9 have vertical guide means fixed thereto, which consist, for instance, of high-strength steel guides 11.

[0033] The bearing structure 2 supports one or more

substantially horizontal and mutually superimposed identical tables 12 above the base 6.

[0034] Slides, not shown, are mounted at the transverse end edges of the tables 12, and slide along the guides 11 for vertically transferring the tables 12 parallel to themselves, and moving them one at a time to the working height H from the ground, for operators to lay the hides P to be dried on their upper surfaces 13.

[0035] The bottom surfaces of the tables 12 and the cover 7 have peripheral seals 14 which are adapted to cooperate with the top surfaces 13 of the underlying tables to form respective vacuum chambers 15, that may be cyclically opened and sealed. The negative pressure created in the vacuum chambers 15 is useful for drawing the vapors released from the hides P but also provides the benefit of decreasing the pressure and hence the temperature of evaporation of water in the hides P, thereby reducing thermal stress thereon.

[0036] Drive means are provided, which preferably consist of hydraulic cylinders, not shown, for controlled upward or downward movement of the tables 12. As is known per se, the actuators are powered by a power unit 16 comprising a pump and a valve-operated control unit.

[0037] Heating means are also provided for heating the tables 12 and accelerate evaporation of the moisture in the hides P. Particularly, the heating means may essentially consist of serpentines or labyrinths formed in the tables, not shown, and fed with a fluid, preferably hot water supplied by a circuit connected to a hydraulic station 17.

[0038] The hydraulic heating circuit, more clearly shown in FIG. 6, comprises a heat exchanger 17' with a primary circuit that receives steam or another high-temperature fluid from a tube 18 and a secondary circuit that receives cold water from a tube 19, pumped by a pump 20.

[0039] The hot water that flows out of the exchanger 17' is conveyed to a supply manifold 21 and then to the tables 12 through flexible inlet tubes 22, flows through the serpentines and then out of the tables 12 through flexible outlet tubes 23 and is conveyed to a discharge manifold 24 from which it flows back into the exchanger 17' via a return tube 25. Alternatively, the heat exchanger 17' may be replaced by a direct hot water supply line, for water that comes from an external system, not shown.

[0040] It shall be noted that the heating circuit, including the supply and discharge manifolds 21, 24 are stably mounted to the upright 5.

[0041] The vapors released from the hides P are drawn by the vacuum chambers 15 by vacuum means, generally referenced 26.

[0042] In a preferred, non-limiting embodiment, the vacuum means 26 include a pump unit composed of two tandem pumps, i.e. a high-performance lobe or Roots pump 27 connected in series to a dry screw pump 28.

[0043] The Roots pump 27 may be of the type that has an internal bypass and an integrated inverter, with automatic elastic balancing of the bypass valve 27', allowing the opening to be adapted to the differential pressure Δp between upstream and downstream from maximum performance pumps, according to the suction pressure.

[0044] The operation of all the pumps, the valves, the hydraulic and pneumatic stations of the machine is controlled by a switchboard 29, possibly connected by wifi to a contact screen that can be integrated in the guard 3 of the body.

[0045] The suction chambers 15 of the tables 12 are connected to the pump unit 26 via a suction line.

[0046] The suction line comprises at least one vapor manifold 30 connected to the suction chambers 15 of the tables via respective connection tubing 31.

[0047] Preferably, two vapor manifolds 30 are provided for connection to the connection tubing 31.

[0048] Suitably, the tubing 31 are connected to the suction chambers 15 by a pair of lateral compartments 15 formed near the longitudinal edges of each table 12, as more clearly shown in FIGS, 10 and 11.

[0049] The lateral compartments 32 of each table 12 have a series of aligned and evenly arranged holes 33 on their top wall, to ensure fluid communication between said compartments 32 and the suction chamber 15 formed between the top surface 13 and the bottom surface of the overlying table.

[0050] Each compartment 32 has a connection 34 at its longitudinal end for connection to a corresponding tube 31. Furthermore, the vapor manifold 30 is connected to the pump unit 26 via a suction pipe 35. Thus, the vapors released from the hides P and collected in the vacuum chambers 15 are drawn through the holes 33 and flow into the lateral compartments 32, from which they are extracted by the tubing 31 and conveyed to the vapor manifold 30; the latter is connected to the pump unit 26 via the suction tube 35.

[0051] Advantageously, each compartment 32 houses a condenser 36 with a longitudinal tube-bundle 37 for cold water circulation. Thus, the vapors generated in the vacuum chambers are drawn through the holes 33 into the compartments 32 where they flow on the tube-bundles 37 of the condensers 36, thereby condensing and depositing in the compartments.

[0052] Suitably, in addition to inlet and outlet connections for the cooling water, each compartment 32 has respective discharge tubes 38 at the end close to the connections 34, with free ends equipped with automatic valves 39 The valves 39 are normally closed during the suction operation and automatically open when each vacuum chamber 15 is opened and vacuum is released, for the hides P to be laid on the surface 13.

[0053] Conveniently, as clearly shown in FIG. 9. the condensate discharging tubes 38 and their respective automatic valves 38 are slidingly accommodated in two substantially vertical downpipes are arranged at the sides or the table 12 to prevent reevaporation of the separated condensate.

[0054] A peculiar feature of the invention is that each vapor manifold 30 is directly mounted to one of the up-

rights of the bearing structure 2, particularly to the upright 4, and near the tables 12, to minimize the length of the connection tubing 31.

[0055] For this purpose, the connection tubing 31 may be low-rigidity flexible tubes formed with wear-resistant materials, to allow bending with a small bending radius and reduction of the distance between the inlet and outlet connections, to limit the length of the suction circuit, the volume of the vapor to be drawn and the time required for evacuation of the suction chambers 15, with a consequent higher suction capacity and higher efficiency of the plant.

[0056] Alternatively, the connection tubing may be rigid or semirigid, and have, for example sleeve-type bellow expansion joints, for selective alignment with connections or apertures formed in the tables at the compartments, not shown.

[0057] Furthermore, the vacuum means 26, the vapor manifolds 30, the suction circuit, the oleodynamic and hydraulic stations 16 and 17 are all stably mounted to the bearing structure 2 within the ground projection of the body, to reduce the overall plan dimensions of the drier.

[0058] Particularly, the pumps 27, 28, the oleodynamic and hydraulic stations 16, 17, as well as the control switchboard 29 are mounted to the lattice truss 7' above the cover 7, whose top surface defines a walking surface for any required maintenance of all the stations and control means.

[0059] Conveniently, the pump unit 27, 28 is connected to the vapor manifold 30 via suction pipes 35 integral with the upright 4. Each vapor manifold 30 is substantially vertical and has a plurality of connections 41 evenly arranged along its vertical extent, for the connection tubing 31.

[0060] Furthermore, each suction tube 35 is also substantially vertical and has a cyclone condensate separator 42 at its bottom and, which is connected to a condensate collection vessel 43

[0061] Finally, vertical suction tubes 35 are connected to the pump unit 26 by a horizontal tubes 44, 45 (see Figure 7).

[0062] Due to the vertical arrangement of the suction tubes 35, vapors naturally tend to rise upwards toward the pump unit, thereby increasing the flow rate in the circuit, whereas condensates tend to deposit downwards thereby facilitating separation of the moisture contained in vapors.

[0063] Also, since connections are made using a very small number of valves, connections and throttles, pressure losses along the vacuum circuit have been considerably reduced.

[0064] The improved efficiency of the circuit, in combination with a smaller evacuation volume in the circuit, allowed to afford shorter suction times, reduced power consumption, reduced noise and improved throughput of the drier.

[0065] Thanks to, this configuration the following benefits have been obtained:

- higher suction capacity, i.e. about 2500 m^3/h against the normal 900 m^3/h;
- about 20% lower power consumption of the whole drier;
- about 37% lower power consumption of the pump unit;
- about 60% reduced table evacuation time;
- longer life of wear-resistant flexible tubes, both for vacuum and for hot and cold water;
- elimination of the liquid ring pump and the working oil;
- lower noise;
- simplification of the circuits for vacuum, heating liquid and cooling liquid, involving a considerable reduction;
- about 37% increased drying capacity.

[0066] In a preferred embodiment, the columns 8, 9 are made up of two parts, an upper part 8', 9' and a lower part 8", 9", which are joined by connections 46, the upper part 8', 9' being removable and the lower part 8", 9" being integral with the base 66.

[0067] Thus, the drier may be prepared for transportation by dismantling the upper part 8', 9' of the columns, packing all the tables 12 on the base 6, placing thereon the cover 7 and monolithic lattice truss 7', with the pump units and the various stations and control means, while keeping all the circuits and tubes connected and avoiding any disassembly and later assembly operations.

[0068] In case of maritime transport, this assembly will be generally placed in a case, whereas the upper part of the columns, the guard and all the accessories may be placed in a separate container. In case of transport by land, the assembly composed of the base, the table pack, the cover and the truss with the various auxiliary and control units, stations and circuits will be protected by a plastic package in turn covered by the sheet, whereas the upper part of the columns, the guard and other accessories will be arranged to in a special transport vehicle.

[0069] On-site assembly will only consist in assembling the columns, restoring the guides and mounting the external guard, which will afford about 35% shorter installation times.

[0070] The drier of the invention is susceptible of a number of changes and variants, within the inventive principle disclosed in the appended claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention.

[0071] While the drier has been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.

Claims

1. A vacuum drier (1) for drying industrial hides (P), comprising:

   - a body including a bearing structure (2) with at least one pair of end uprights (4, 5) having substantially vertical guide means (11), a lower base (6) and an upper cover (7);
   - a plurality of reciprocally superimposed and substantially horizontal tables (12) designed to support the hides (P) during drying thereof, and to be peripherally sealingly coupled with each other and with said cover (7) to define corresponding vacuum chambers (15) for sucking vapors issued from the hides (P);
   - means for vertically moving said tables (12) along said guide means (11) powered by a power supply unit (16);
   - heating means associated to said tables (12) for heating the hides (P) and connected to a heating unit (17);
   - vacuum means (26) designed to be selectively connected to said tables (12) for sucking from said chambers (15) the vapors issued from the hides (P);
   - control means (29) for controlling said movement means, said heating means and said vacuum means (26)
   - a suction line for connecting said vacuum chambers (15) to said vacuum means (26), which line having at least one vapor manifold (30) connected to said vacuum chambers (15) of said tables (12) by means of connection tubing (31);

   characterized in that said vacuum means (26), said power unit (16), said heating unit (17) and said control means (29) are mounted to said bearing structure (2) within the ground projection of the machine body and not in a separate assembly, said at least one vapor manifold (30) being directly attached to at least one of said uprights (4) close to said tables (12) thereby minimizing the length of said connection tubing (31), the length of said circuit, the volume of the vapor to be sucked and the evacuation time of said vacuum chambers (15).

2. Drier as claimed in claim 1, wherein said vacuum means (26) are connected to said at least one vapor manifold (30) with at least one connection duct (35) unitary with said at least one upright (4).

3. Drier as claimed in claim 1, wherein said suction line comprises, for each table (12) close to its longitudinal edges, a pair of side seats (32) provided with a plurality of holes (33) for suction of the vapors from the vacuum chambers (15) and having at one longitudinal end thereof a connector (34) for a connection tubing (31).

4. Drier as claimed in claim 1, wherein said at least one vapor manifold (30) is substantially vertical and has a plurality of joints (41) for said connection tubing (31), evenly distributed along Its vertical extension.

5. Drier as claimed in claim 2, wherein said at least one suction duct (35) has a substantially vertical portion joint to said at least one vapor manifold (30) and a condensate separator (42).

6. Drier as claimed in claim 1, wherein a pair of vapor manifolds (30) is arranged in substantially symmetrical positions with respect to a middle vertical plane (V) passing through said longitudinal axis (L) for conveying the vapors collected in said longitudinal side seats (32) of said tables (12), said pair of vapor manifolds (30) being in turn joint to a pair of feeding ducts (35) similarly mounted on the same upright (4) in substantially symmetrical relationship with respect to said vertical middle plane (V).

7. Drier as claimed in claim 3, wherein each of said side seats (32) has at one longitudinal end an outlet hose (38) for evacuating the condensate produced by a respective condenser (36), said outlet hose (38) having ad end provided with an automatic valve (39) for draining the condensate collected in said seats (32) and conveyed in a substantially vertical collection gutter (40).

8. Drier as claimed in claim 1, wherein said connection tubing (31) are flexible and made of a low-wear material suitable to allow a high multidirectional bending of the tubing to reduce their connection length upon connection of each seat (32) with a corresponding vapor manifold (30).

9. Drier as claimed in claim 1, wherein said heating means comprise a serpentine arranged within each table (12) wherein a heating fluid is supplied through flexible tubing connected to an appropriate heat exchanger (17')

10. Drier as claimed in claim 1, wherein said movement means of said tables (12) comprise at least one plurality of hydraulic cylinders supplied by said power unit (16).

11. Drier as claimed in claim 1, wherein said power unit (16) and said control means (29) are mounted to the upper surface (7') of said cover (7) which defines a pacing surface for maintenance and control personnel, said heating unit (17) being mounted to said at least one uprights (4).

12. Drier as claimed in claim 1, wherein each of said uprights (4, 5) is formed by at least one pair of columns (8, 9), each of which made of two parts (8', 8"; 9', 9"), respectively an upper part (8', 9') separable from a lower part (8", 9") and from said cover (7), said lower part (8", 9") being unitary with said base (6), said upper parts (8', 9') being designed to be removed while said tables (12) and said cover (7) being designed to be compacted to provide a unitary body for transportation, leaving unchanged all the other connections to minimize the installation time.

Patentansprüche

1. Ein Vakuum-Trockner (1) zum Trocknen industrieller Häute (P) mit

- einem Gehäuse, das eine Tragstruktur (2) umfasst mit mindestens einem Paar von Abschlussstützen (4, 5) mit im Wesentlichen senkrechten Führungseinrichtungen (11), einem unteren Boden (6) und einem oberen Deckel (7),
- einer Vielzahl von wechselseitig gestapelten und im Wesentlichen horizontalen Tischen (12), die ausgelegt sind für die Unterstützung der Häute (P) während deren Trocknung und für den dichtenden Anschluss am Umfang mit einander und mit dem Deckel (7), um entsprechende Vakuumkammern (15) zu bilden zum Absaugen von Dämpfen, die von den Häuten (P) abgegeben werden,
- Einrichtungen um die Tische (12) senkrecht zu bewegen entlang den Führungseinrichtungen (11), die betrieben werden von einem Motor (16),
- Heizeinrichtungen, die den Tischen (12) zugeordnet sind zum Heizen der Häute (P) und verbunden sind mit einer Heizung (17),
- Vakuumeinrichtungen (26), die ausgelegt sind, wahlweise mit den Tischen (12) verbunden zu werden, um aus den Kammern (15) die Dämpfe abzusaugen, die von den Häuten (P) abgegeben werden,
- Steuereinrichtungen (29) zum Steuern der Bewegungseinrichtungen, der Heizeinrichtungen und der Vakuumeinrichtungen (26),
- einer Saugleitung zum Verbinden der Vakuumkammern (15) mit den Vakuumeinrichtungen (26), wobei die Leitung mindestens einen Ansaugstutzen (30) für den Dampf aufweist, der verbunden ist mit den Vakuumkammern (15) der Tische (12) mittels verbindender Rohre (31), **dadurch gekennzeichnet, dass** die Vakuumeinrichtungen (26), der Motor (16), die Heizung (17) und die Steuereinrichtungen (29) an die Tragstruktur (2) montiert sind innerhalb der Basisprojektion des Maschinengehäuses und nicht in einem getrennten Aufbau, wobei der mindestens eine Ansaugstutzen (30) direkt angebracht ist an mindestens einer der Stützen (4) nahe bei den Tischen (12), so dass die Länge der verbindenden Rohre (31), die Länge des Kreislaufs, das Volumen der Dämpfe, die angesaugt werden sollen, und die Zeit zum Evakuieren der Vakuumkammern (15) minimiert ist.

2. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Vakuumeinrichtungen (26) verbunden sind mit dem mindestens einen Ansaugstutzen (30) für den Dampf mit mindestens einem Verbindungskanal (35), der einheitlich ist mit der mindestens einen Stütze (4).

3. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Saugleitung für jeden Tisch (12) nahe bei dessen longitudinalen Kanten ein Paar seitliche Auflagen (32) aufweist, die mit einer Vielzahl von Öffnungen (33) versehen sind zum Absaugen der Dämpfe aus den Vakuumkammern (15) und an einem longitudinalen Ende davon eine Verbindung (34) aufweist für verbindende Rohre (31).

4. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der mindestens eine Ansaugstutzen (30) für den Dampf im Wesentlichen senkrecht ist und eine Vielzahl von Anschlüssen (41) aufweist für die verbindenden Rohre (31), die gleichmäßig verteilt sind entlang seiner senkrechten Erstreckung.

5. Trockner gemäß Anspruch 2, **dadurch gekennzeichnet, dass** der mindestens eine Verbindungskanal (35) einen im Wesentlichen senkrechten Bereichsanschluss mit dem mindestens einen Ansaugstutzen (30) für den Dampf und einem Abscheider für Kondensat (42) aufweist.

6. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** ein Paar Ansaugstutzen (30) für den Dampf mit im Wesentlichen symmetrischen Positionen mit Bezug auf eine mittlere senkrechte Ebene (V) angeordnet ist, das durch die longitudinale Achse (L) geht zur Förderung der in den longitudinalen, seitliche Auflagen (32) der Tische (12) gesammelten Dämpfe, wobei das Paar Ansaugstutzen (30) für den Dampf seinerseits angeschlossen ist an ein Paar Zufuhrkanäle (35), die ähnlich montiert sind an der selben Stütze (4) in im Wesentlichen symmetrischer Beziehung mit Bezug auf die senkrechte mittlere Ebene (V).

7. Trockner gemäß Anspruch 3, **dadurch gekennzeichnet, dass** jede der seitlichen Auflagen (32) an einem longitudinalen Ende einen Auslassschlauch (38) aufweist zum Ablassen des Kondensats, das durch einen jeweiligen Kondensator (36) erzeugt

wurde, wobei der Auslassschlauch (38) ein Ende aufweist, das mit einem automatischen Ventil (39) versehen ist zum Ablassen des Kondensats, das in den Auflagen (32) gesammelt und in einer im Wesentlichen senkrechten Sammelrinne (40) gefördert wurde.

8. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die verbindenden Rohre (31) biegsam sind und aus einem verschleissfesten Material hergestellt sind, das geeignet ist hohe Biegung in viele Richtungen der Rohre zu ermöglichen, um deren Verbindungslänge nach Verbindung von jeder Auflage (32) mit einem entsprechenden Ansaugstutzen (30) für den Dampf zu reduzieren.

9. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Heizeinrichtungen eine Schlange aufweisen, die in jedem Tisch (12) angeordnet ist, in die ein Heizfluid zugeführt wird durch biegsame Rohre, die verbunden sind mit einem geeigneten Wärmetauscher (17').

10. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Bewegungseinrichtungen für die Tische (12) mindestens eine Vielzahl von hydraulischen Zylindern aufweisen, die von dem Motor (16) versorgt werden.

11. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Motor (16) und die Steuereinrichtungen (29) an die obere Fläche (7') des Deckels (7) montiert sind, die eine taktgebende Oberfläche bildet für Wartung und Bedienpersonal, wobei die Heizung (17) montiert ist an der mindestens einen Stütze (4).

12. Trockner gemäß Anspruch 1, **dadurch gekennzeichnet, dass** jede der Stützen (4, 5) gebildet ist aus mindestens einem Paar Säulen (8, 9), von denen jede aus zwei Teilen (8', 8", 9', 9") gefertigt ist, jeweils einem oberen Teil (8', 9'), das trennbar ist von einem unteren Teil (8", 9") und von dem Deckel (7), wobei der untere Teil (8", 9") einheitlich ist mit dem Boden (6) und die oberen Teile (8', 9') ausgelegt sind, entfernt zu werden, während die Tische (12) und der Deckel (7) ausgelegt sind, zusammen gelegt zu werden, um einen einheitlichen Körper für den Transport bereit zu stellen, wobei alle anderen Verbindungen unverändert bleiben, um die Zeit für den Zusammenbau zu minimieren.

Revendications

1. Sécheur sous vide (1) destiné à sécher des peaux industrielles (P) comprenant :

- un corps ayant une porteuse (2), avec une paire de montants verticaux d'extrémité (4, 5) comportant des moyens de guidage sensiblement verticaux (11), un socle inférieur (6) et un couvercle supérieur (7) ;
- une pluralité de tables (12) sensiblement horizontales et superposées les unes sur les autres, destinées à supporter les peaux (P) pendant le séchage de celles-ci, et à être couplées hermétiquement sur leur périphérie les unes aux autres et audit couvercle (7) de manière à définir des chambres à vide (15) correspondantes (15) pour l'aspiration des vapeurs dégagées par les peaux (P) ;
- des moyens pour déplacer verticalement lesdites tables (12) le long desdits moyens de guidage (11) alimentés par une unité d'alimentation (16) ;
- des moyens de chauffage associés auxdites tables (12) afin de chauffer les peaux (P), et reliés à une unité de chauffage (17) ;
- des moyens de vide (26) conçus pour être sélectivement reliés auxdites tables (12) afin d'aspirer les vapeurs dégagées par les peaux (P) desdites chambres (15) ;
- des moyens de commande (29) afin de commander lesdits moyen d'entraînement, lesdits moyens de chauffage et lesdits moyen de vide (26) ;
- un circuit d'aspiration destiné à relier lesdites chambres à vide (15) auxdits moyens de vide (26), ledit circuit ayant au moins un collecteur de vapeur (30) relié auxdites chambres à vide (15) desdites tables (12) au moyen d'un tuyau de liaison (31) ;

caractérisé en ce que lesdits moyens de vide (26), ladite unité d'alimentation (16), ladite unité de chauffage (17) et lesdits moyens de commande (29) sont montés sur ladite structure porteuse (2) dans la projection plane du corps de la machine et ne forment pas un ensemble séparé, ledit collecteur de vapeur (30) étant monté directement sur au moins un desdits montants verticaux (4) à proximité desdites tables (12), ce qui permet de minimiser la longueur dudit tuyau de liaison (31), la longueur dudit circuit, le volume de la vapeur à aspirer et le temps d'évacuation desdites chambres à vide (15).

2. Sécheur selon la revendication 1, dans lequel lesdits moyens de vide (26) sont reliés audit au moins un collecteur de vapeur (30) au moyen d'au moins un conduit de liaison (35), formé d'un seul tenant avec ledit au moins un montant (4).

3. Sécheur selon la revendication 1, dans lequel ledit circuit d'aspiration comprend, pour chaque table (12), à proximité de ses bords longitudinaux, une

paire de sièges latéraux (32) pourvus d'une pluralité de trous (33) pour l'aspiration des vapeurs des chambres à vide (15) et présentant, à une extrémité longitudinale de ceux-ci, un raccord (34) pour un tuyau de liaison (31).

4. Sécheur selon la revendication 1, dans lequel ledit au moins un collecteur de vapeur (30) est sensiblement vertical et comporte une pluralité de joints (41) pour lesdits tuyaux de liaison (31), distribués uniformément le long de son étendue verticale.

5. Sécheur selon la revendication 2, dans lequel ledit au moins un conduit d'aspiration (35) comporte une partie sensiblement verticale raccordée audit au moins un collecteur de vapeur (30) ed un séparateur de buée (42).

6. Sécheur selon la revendication 1, dans lequel une paire de collecteurs de vapeur (30) sont disposés en positions sensiblement symétriques par rapport à un plan médian vertical (V) passant par ledit axe longitudinal (L) pour transporter les vapeurs recueillies dans lesdits sièges latéraux longitudinaux (32) desdites tables (12), ladite paire de collecteurs de vapeur (30) étant à son tour raccordé à une paire de conduits d'alimentation (35), eux aussi montés sur le même montant (4) en positions sensiblement symétriques par rapport audit plan médian vertical (V).

7. Sécheur selon la revendication 3, dans lequel chacun desdits sièges latéraux (32) comporte, à une extrémité longitudinale, un flexible de sortie (38) pour l'évacuation de la buée produite par un condenseur respectif (36), ledit flexible de sortie (38) ayant une extrémité pourvue d'une soupape automatique (39) de vidange de la buée recueillie dans lesdits sièges (32) et transportée dans une gouttière réceptrice sensiblement verticale (40).

8. Sécheur selon la revendication 1, dans lequel ledit tuyau de liaison (31) est flexible et constitué d'un matériau à faible usure, conçu pour conférer une grande capacité de flexion multidirectionnelle aux tuyaux afin d'en réduire la longueur de liaison suite à la liaison de chaque siège (32) avec un collecteur de vapeur correspondant (30).

9. Sécheur selon la revendication 1, dans lequel lesdits moyens de chauffage comprennent une serpentine mise en place dans chaque table (12), dans laquelle un fluide de chauffage est alimenté à travers les tuyaux flexibles reliés à un échangeur de chaleur (17') approprié.

10. Sécheur selon la revendication 1, dans lequel lesdits moyens d'entraînement desdites tables (12) comprennent au moins une pluralité de cylindres hydrauliques alimentés par ladite unité d'alimentation (16).

11. Sécheur selon la revendication 1, dans lequel ladite unité d'alimentation (16) et lesdits moyens de commande (29) sont montés sur la surface supérieure (7') dudit couvercle (7), qui définit une surface de piétinement pour le personnel d'entretien et de contrôle, ladite unité de chauffage (17) étant monté sur ledit au moins un montant (4).

12. Sécheur selon la revendication 1, dans lequel chacun desdits montants (4, 5) est constitué d'au moins une paire de colonnes (8, 9), chacune desquelles est composée de deux parties (8', 8"; 9', 9"), respectivement une partie supérieure (8', 9') séparable d'une partie inférieure (8", 9") et dudit couvercle (7), ladite partie inférieure (8", 9") étant formée d'un seul tenant avec ladite base (6), lesdites parties supérieures (8", 9") étant destinées à être retirées alors que lesdites tables (12) et ledit couvercle (7) sont destinés à être compactés pour réaliser un corps monobloc à transporter, tout en laissant toutes les autres liaisons inchangées pour minimiser le temps d'installation.

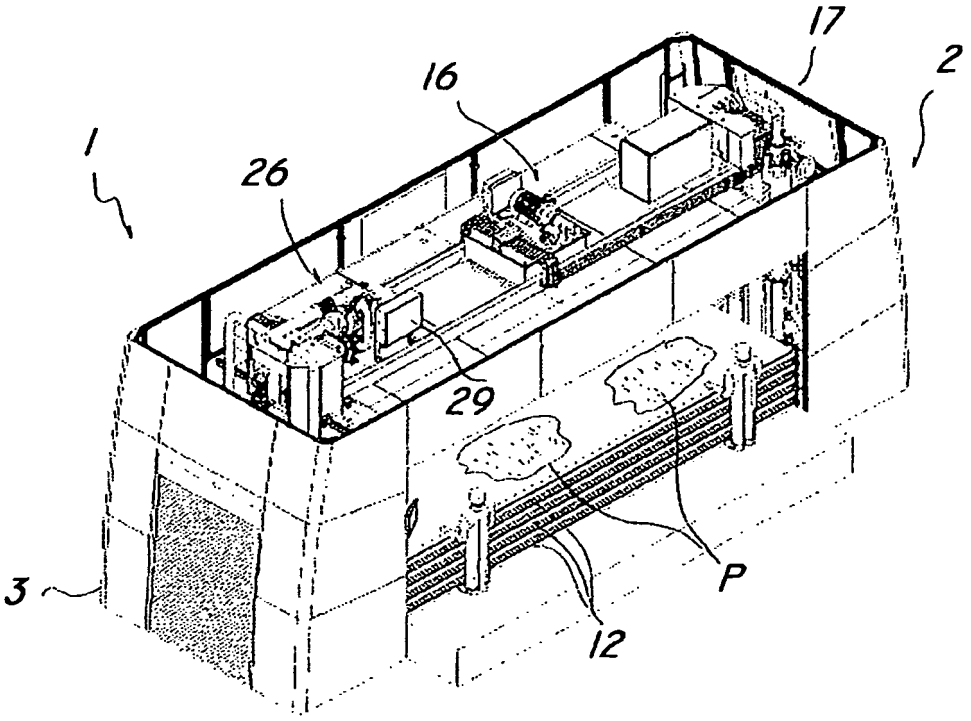
17
2
16
1
26
29
3
P
12

FIG. 1

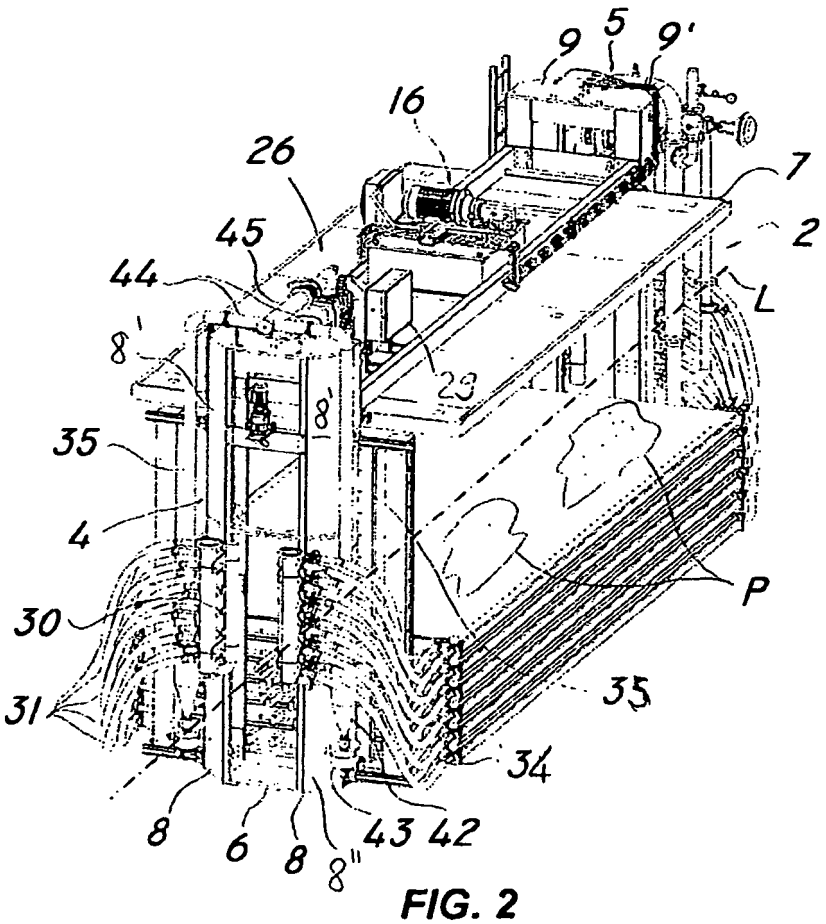
9
5
9'
16
26
7
45
2
44
L
8'
23
35
4
P
30
35
31
34
8
6
8
43
42
8"

FIG. 2

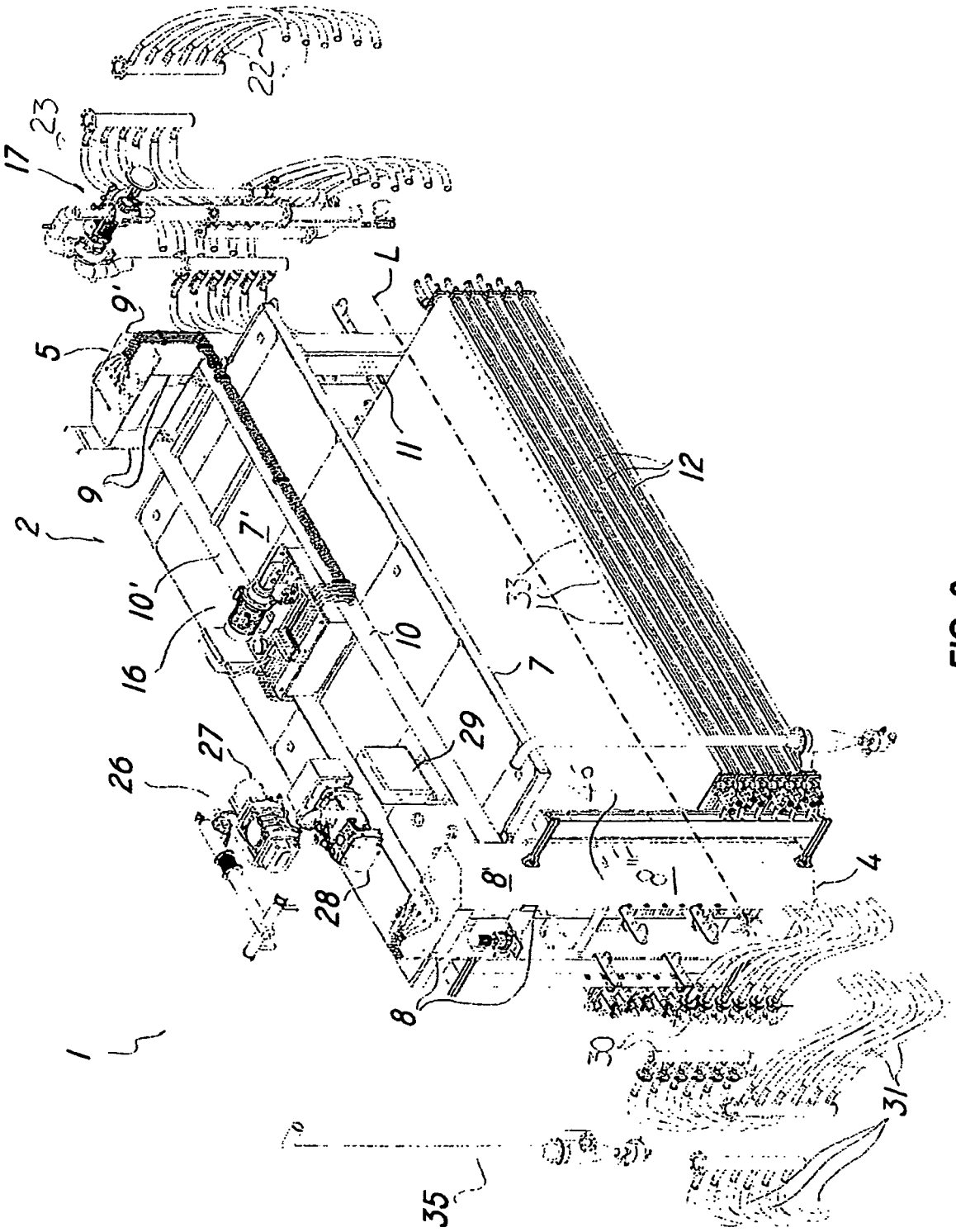

FIG. 3

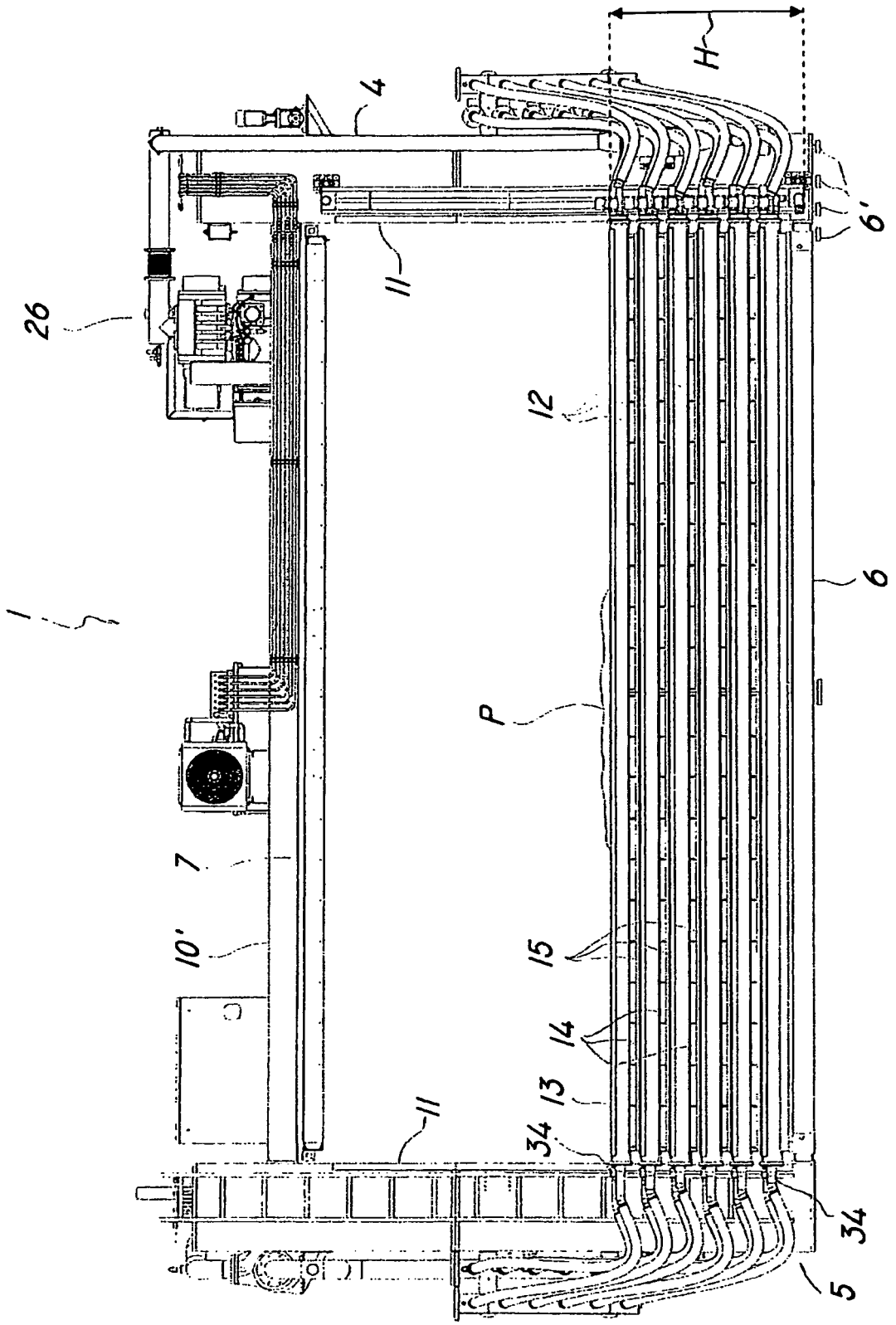

FIG. 4

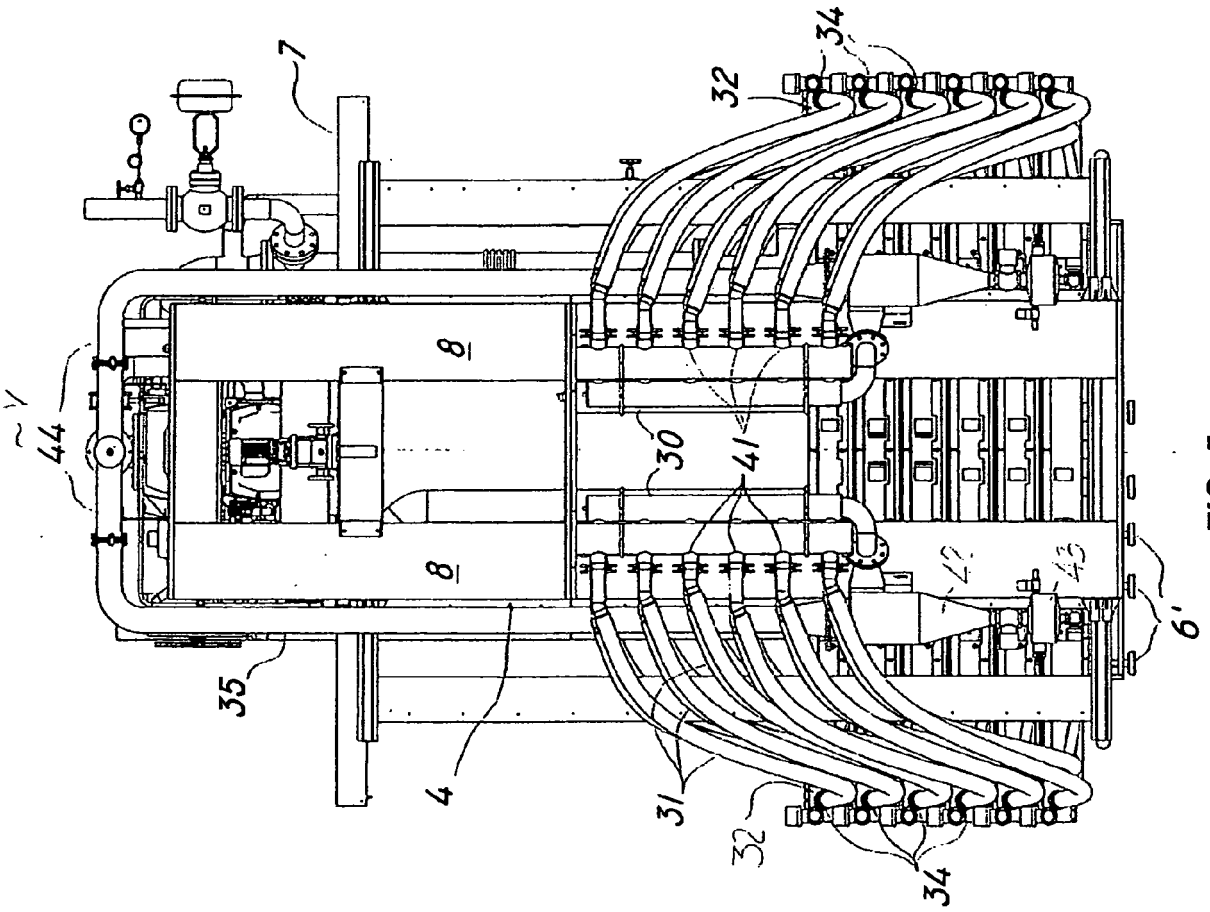

FIG. 5

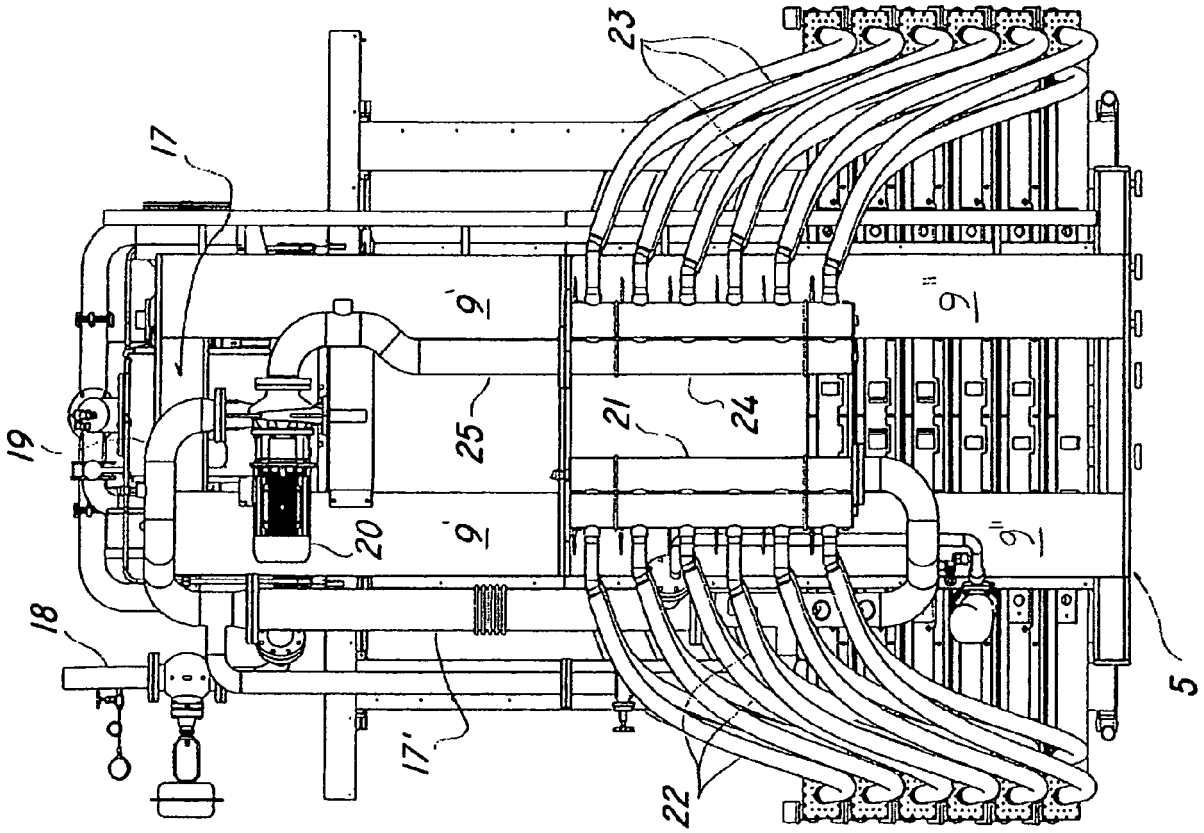

FIG. 6

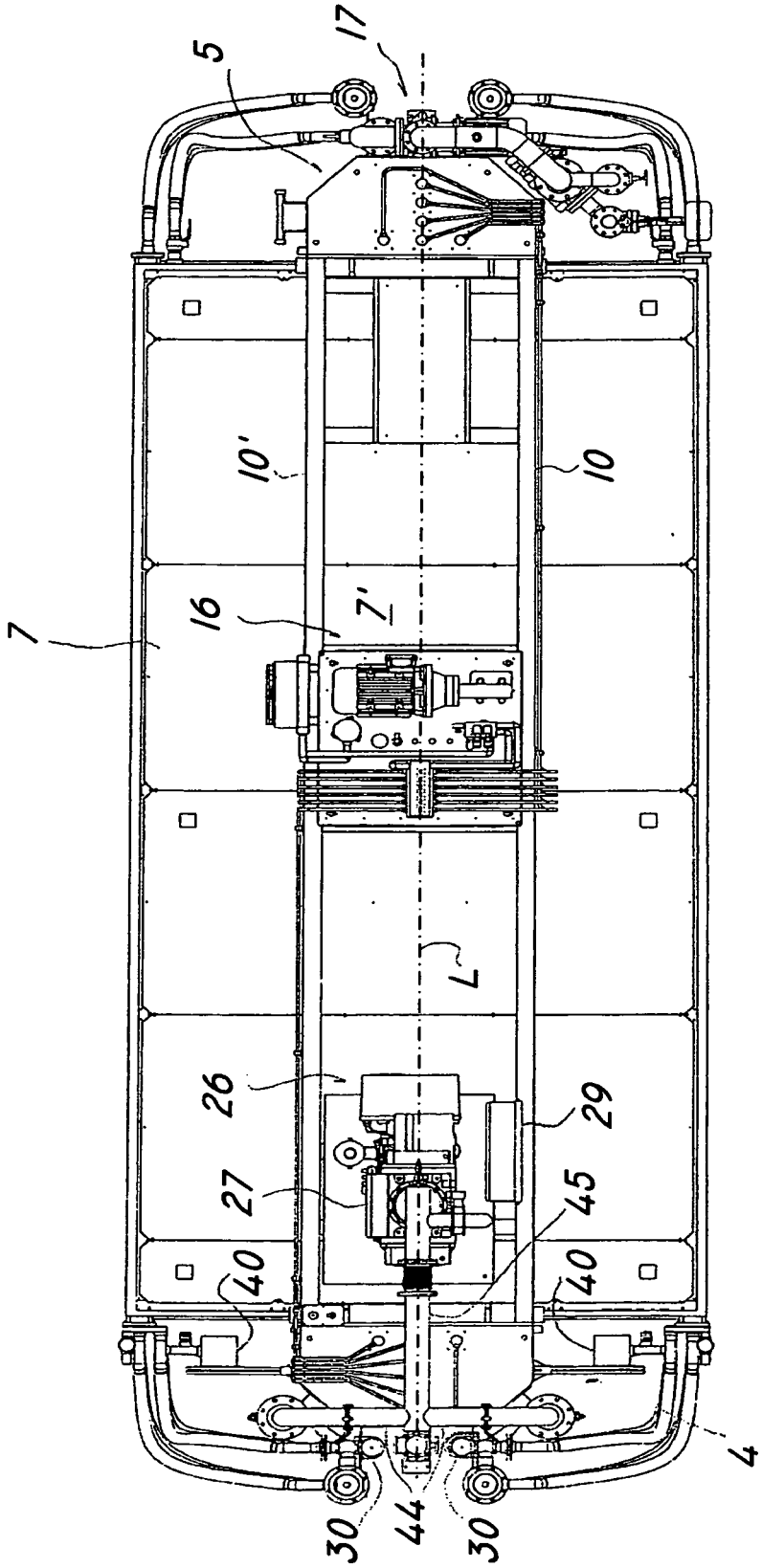

FIG. 7

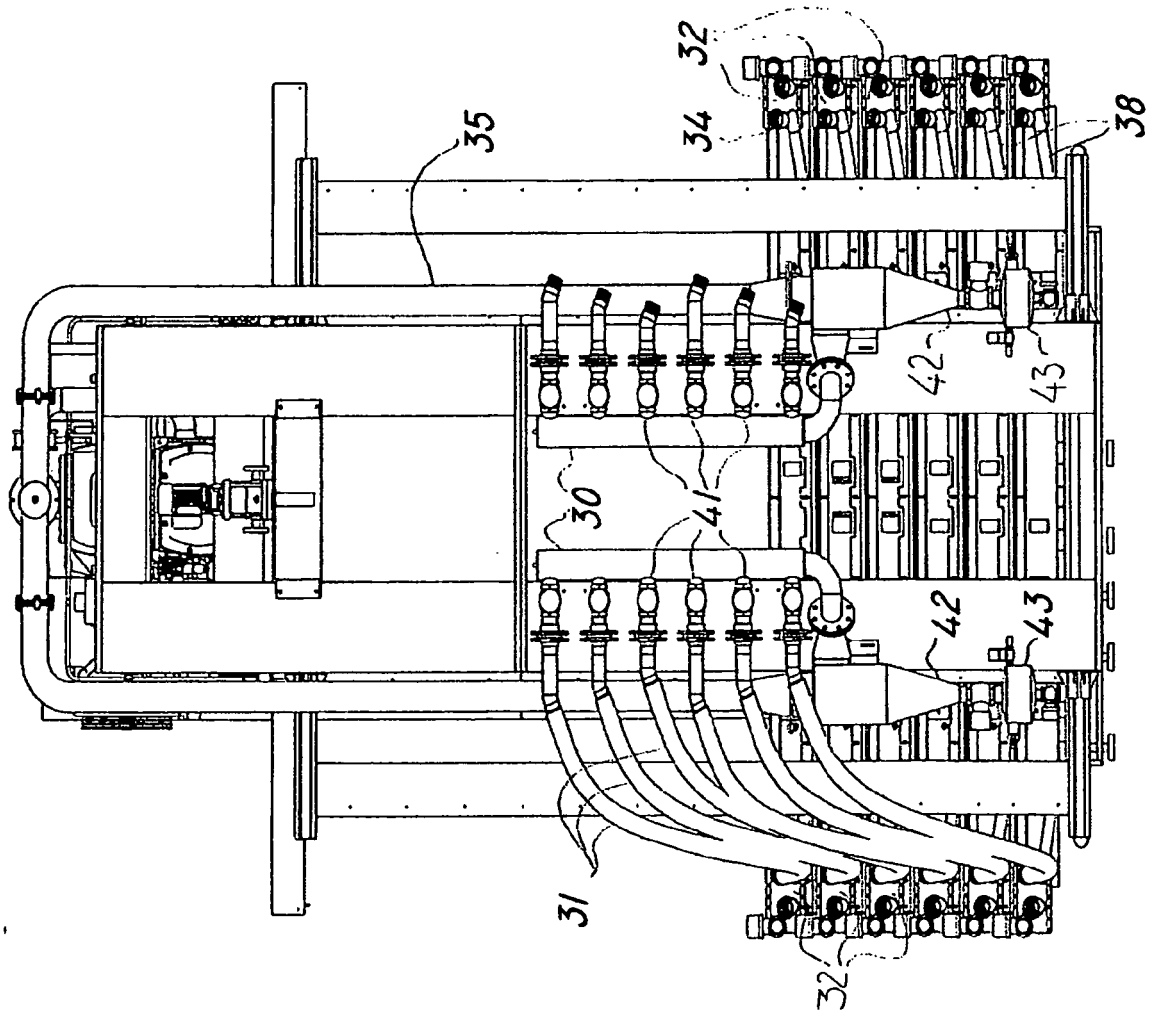

FIG. 8

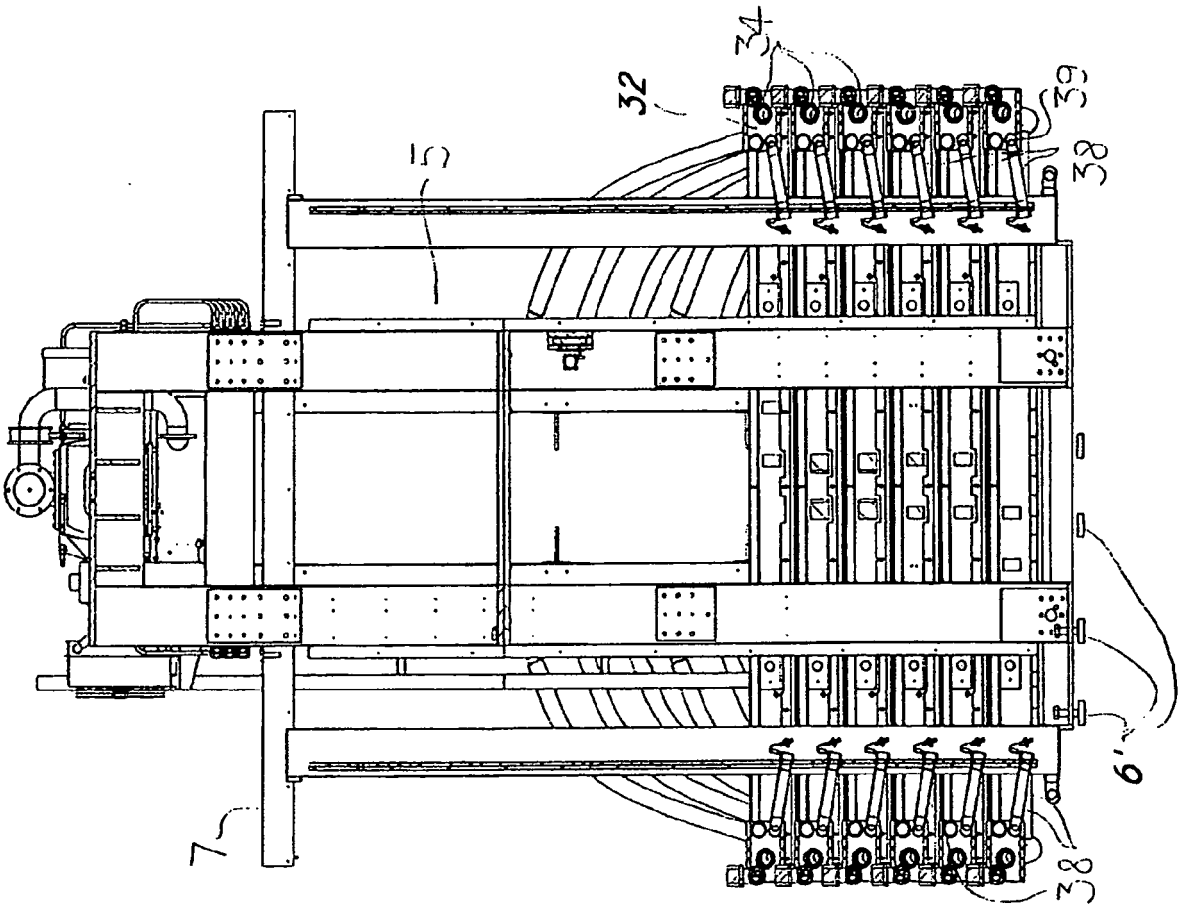

FIG. 9

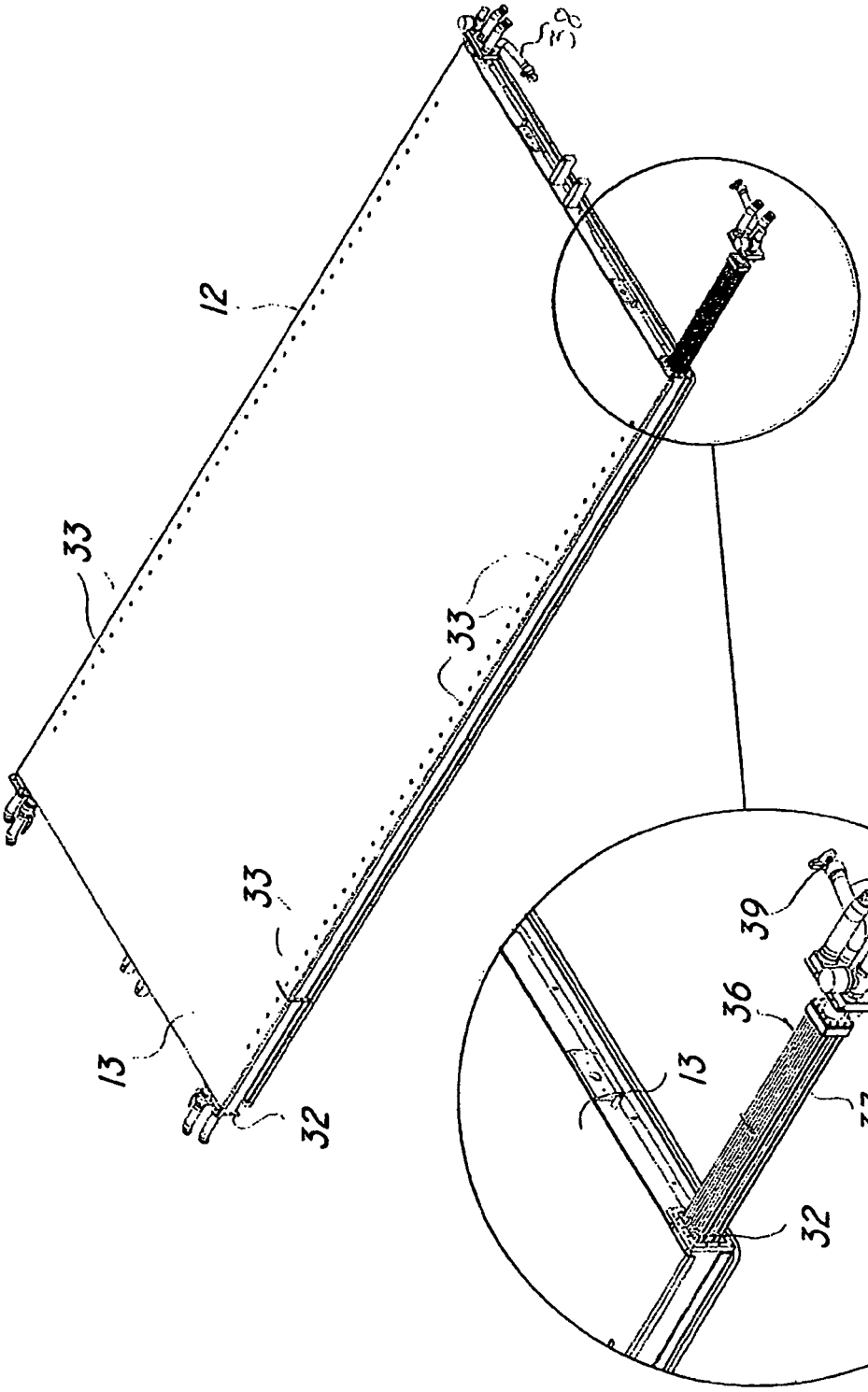

FIG. 11

FIG. 10

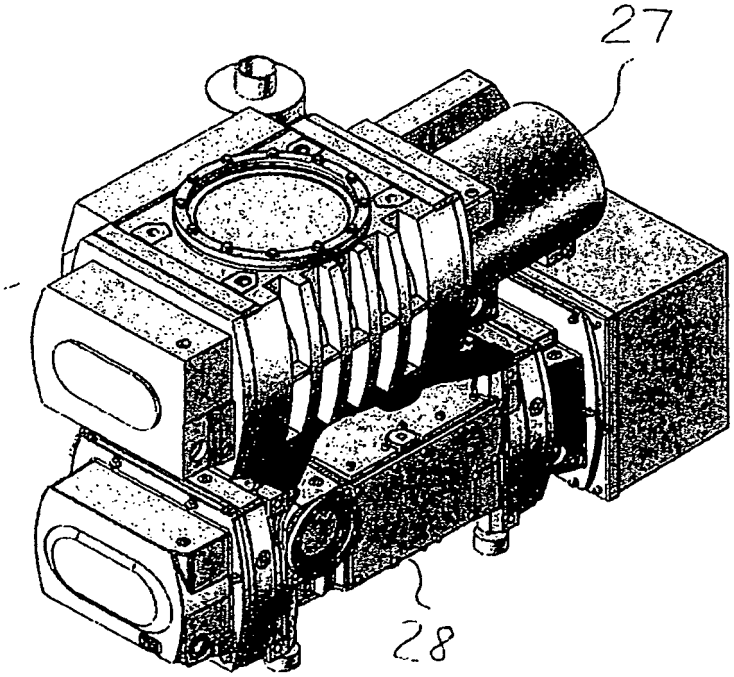

FIG. 12

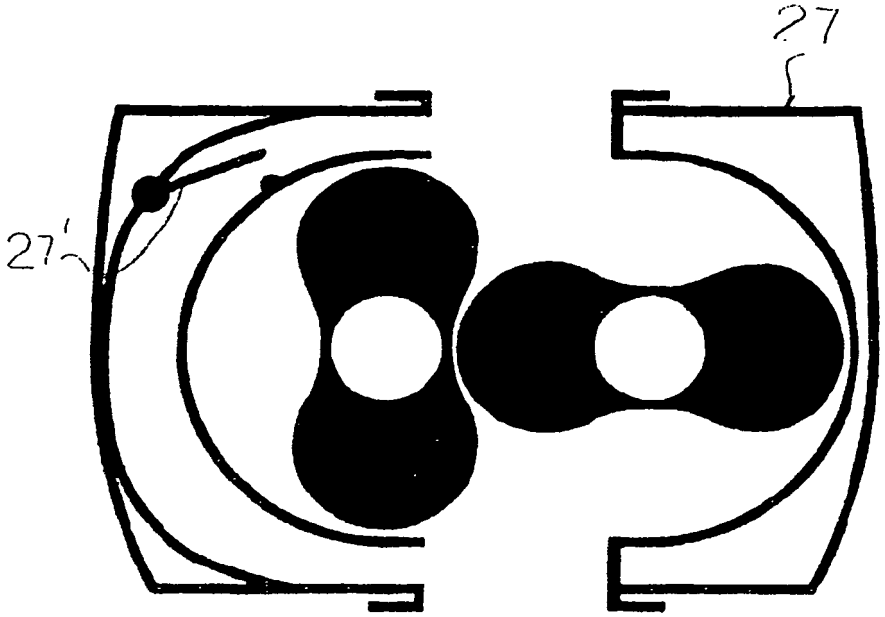

FIG. 13

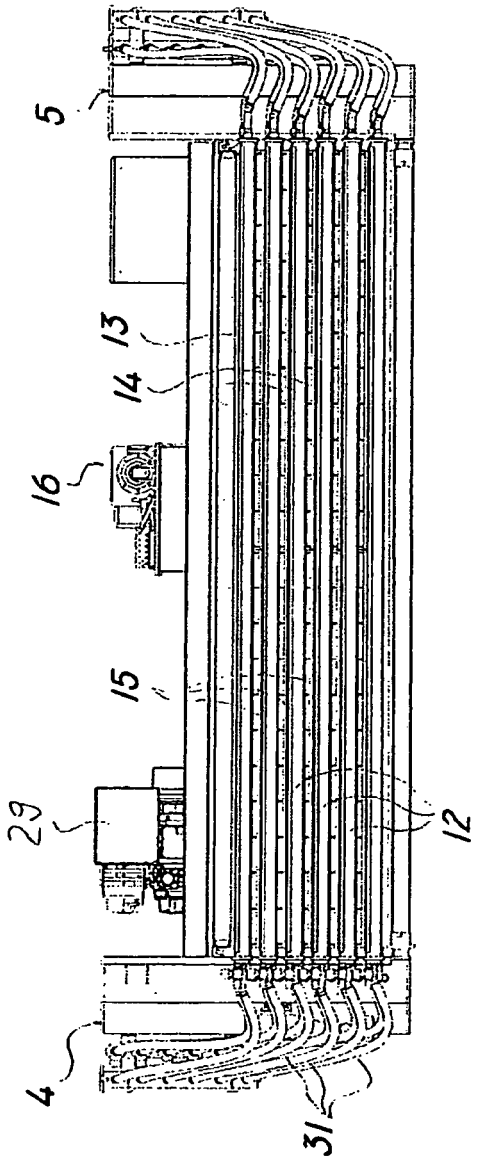

FIG. 15

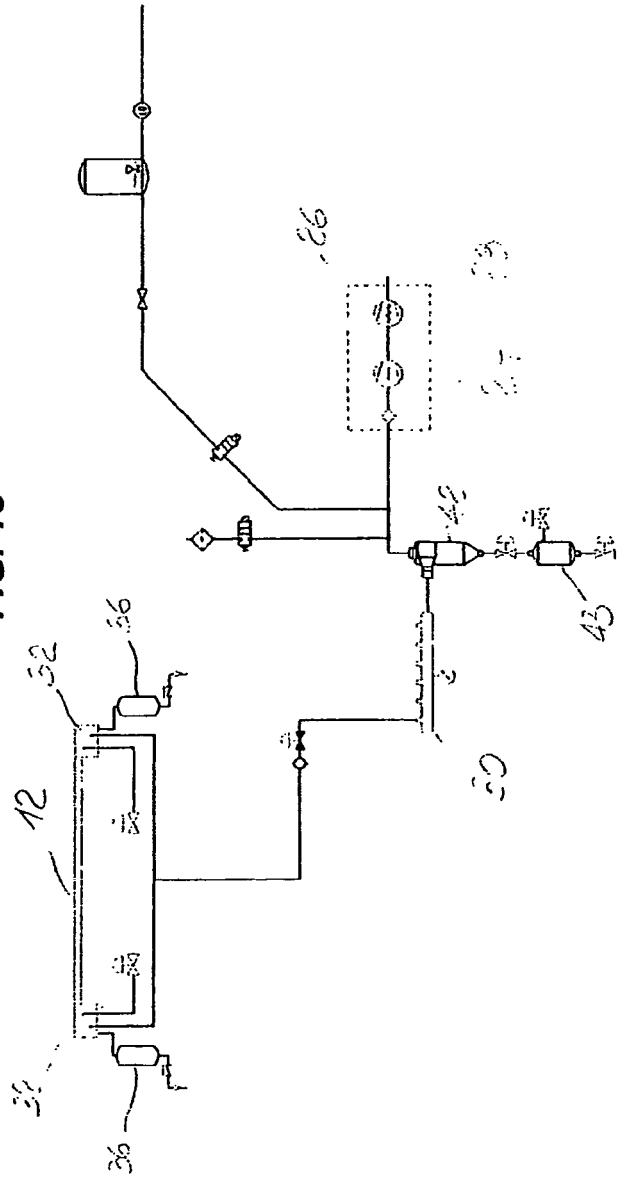

FIG. 14

REFERENCES CITED IN THE DESCRIPTION

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