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(54) Improvement to a dry cleaning plant.

(57) -A unit for generation of warm and of cool liquids contained in two separate columns (25,26), the liquids respectively warmed and cooled by a heat pump unit.

-Temperature of the liquids can be adjusted.

-The unit can be used in a dry cleaning plant in combination with the apparatus for handling and recovering solvent.

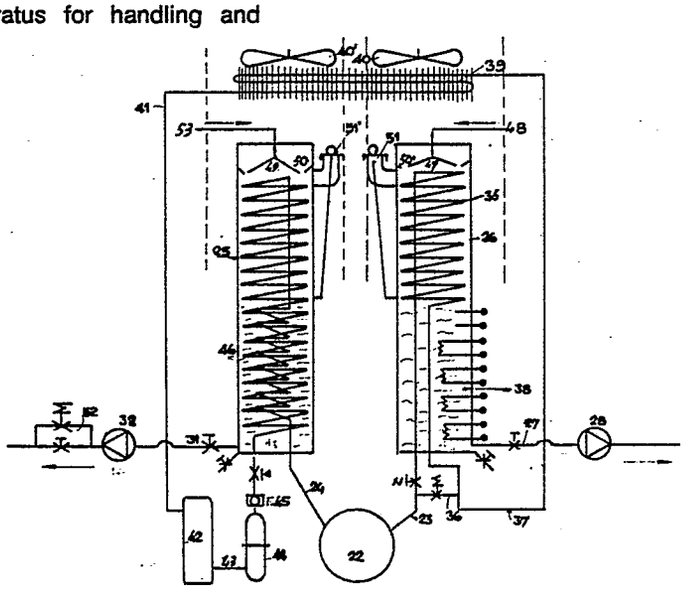

Fig.3

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IMPROVEMENT TO A DRY CLEANING PLANT

This invention relates to an improvement thought to obtain a better efficiency, to deodorize the environment and to have chlorine-ethylene regeneration in a dry cleaning machine for garments and various type fabrics of the type already known and introduced on the market, both in the open and closed circuit version.

The invention described hereunder and illustrated as per enclosed Figs. 1, 2, 3, 4 and 5 is mainly based on having introduced a cooling unit, of which both the hot and cold phases of its circuit are used, through a series of innovations that culminate in having conceived an original unit in which, inside two separate columns, is performed that energetic exchange allowing to recover, in a short time and in a high percent, that energy which, either at high or low temperature, is normally dispersed.

For a better understanding of the innovations brought in,Fig.1 dyagrammatically shows a known dry cleaning machine, wherein section 5' in dashes in essentially distinguishing the closed circuit type from the open circuit one.

The machine consists of a so called barrel 1, inside which are put the garments and linen to be cleaned. To it flows the chlorine-ethylene, regenerated inside the condenser 3, through the collecting tank 4 and the recycling duct 5.

The chlorine-ethylene to be distilled is collected into the tank 2 and from this, through a pump, it is conveyed to the tank 6 wherein it is warmed up through a series of resistors 8 during its regeneration phase.

The chlorine-ethylene vapor flows out from the tank 6 through the pipe 9 to reach the condenser 3. In this one is inserted a pipe coil 10, inside which the cooling water coming from a duct 11 is circulating, that comes out through a pipe 12 for discharge into a drain, without being recovered.

The chlorine-ethylene cooled inside the condenser 3 comes down through the duct 13 reaching the collecting tank 4; from here it will be recycled by means of a motor driven pump during the dry cleaning phase, so to enter into the barrel 1 through the recycling duct 5.

The chloryne-ethylene vapors come out from the barrel 1 being sucked by the electro-fan 14 through the recycling duct 5 conveying them by means of the radiator 15, which is cooled by a circulation of fresh water coming from a network pipe 16, discharging without recovery in the drain through the pipe 17. A flow deflecting valve 18 conveys a part of it downwards to an electrical heating element 19 heated by resistors, that warms up the air again before coming back to the barrel 1, while the residual is dispersed in the atmosphere through the outlet 20 if the circuit is open, or comes to the barrel 1 through the duct 5' if the circuit is closed. The valve 21 controls the inlet of ambient air.

In Fig.2 a dry cleaning plant is shown, as it looks after the modifications according to the invention as hereby described. From this figure and from the relevant specification detailed hereunder clearly appear the important innovations that have been made bearing to the results which the present invention aims to.

Fig. 3 shows in all details the original heat and cold gener ating unit, for recovery and regeneration of the chlorine-ethylene to be used for dry cleaning operation. Said Fig. 3 shows, under reference numeral 22, the refrigerating compressor unit from which branches off the pipe 23 of pressurized gas , which is so heated, an the pipe 24 through which the expanded gas enters again into the refrigerating compressor unit, after having removed warm from the liquid inside the column 25. The pipe 23 conveys the gas warmed up to the column 26, where it warms up the liquid contained therein.

The liquid acting as heat carrier is preferably dyathermic oil or other type having similar features that gathers, being warmed up, in the bottom of the column 26; from here it is sent to the electrical heating elements 29, 30 and 19" through the pipe 27 and a motor driven pump 28.

The liquid acting as cold carrier is preferably antifreeze, that gathers at the lowest temperature in the bottom of column 25; from here, through the pipeline 31 and by means of a motor-driven pump 32, it is sent to the cooling elements 33 and 34.

In Fig. 2 are dyagrammatically shown the circuits composing a dry cleaning machine with the improvements as claimed hereby. The unit generating warmed up and cool fluids, dyagrammatically shown in detail in Fig. 3, warms up the chlorine-ethylene to be distilled, which is contained inside the tank 6, through the electrical heating element 29 and, during dry cleaning phase, it warms up the electrical heating elements 30 and 19", this last having replaced the one numbered 19, which is no longer necessary in this case.

The coolant, after having been cooled inside the column 25, is put in circulation with the help of the motor driven pump 32 and sent to cool the heat exchanger 34 and the pipe coil 33. In this way the resistor 8 and the electrical heating element 19, as well as the water flows 16-17 and 11-12 have been eliminated without recovery.

Fig. 3 shows heating and cooling liquid generating unit. This original member of the new dry-cleaning machine consists of a refrigerating compressor unit 22 which, by compressing the gas, sends it in pressurized condition, and then in warm condition, through the delivery duct 23 to the finned pipe coil 35. In the delivery duct 23, before its entering into the column 26, a deviation 36 is foreseen, capable of deviating a part of the warmed up gas flow inside the pipe 37 which represents continuation of the finned pipe coil 35, so conveying the pressurized gas that has surrended a good part of its warm to the dyathermic oil contained inside the column 26. The delivery duct 23 is rising inside the column 26 wherein, in its top section, it originates the finned pipe coil 35. In the bottom of the column 26 the delivery duct 23 becomes straight again and in this area of said column 26 some resistors 38 are foreseen; through all or part of these the electrical current might pass, according to the thermal exigencies of the dry cleaning machine.

The pressurized gas, after having passed a good part of its warm to the dyathermic oil which is contained into the column 26 goes ahead, outside this one,up to entering into the radiator 39 wherein it terminates its cooling phase by passing the residual of calories to the environment with the help of a pair of fans 40 and 40', the first one sucking ambient air from the outside and forcing it downwards through the radiator 39, up to striking the warmed up column 26, the second fan 40'sucks the ambient air through the same radiator 39 from the area of column 25, forcing it upwards. The gas flows out from the radiator 39 being cooled, then enters the pipe 41 conveying it to a first collecting plenum chamber 42; from here it flows out, from the bottom of the same plenum chamber 42, through the pipe 43, inletting it in the plenum chamber 44 preceeding the gas expanding device 45 wherein the gas is cooled, so expanding itself, and enters into the pipe coil 46 placed inside the column 25. Here the gas incorporates the warm of the coolant contained inside the column itself before leaving it for entering in the duct 24, conveying it to the intake valve of the refrigerating compressor unit 22. In this way it is obtained the warmed up liquid inside the column 26, preferably diathermic oil, capable of heat transmission, in the necessary quantity, to the apparatuses 30, 29 and 19" using it, and the antifreeze liquid, inside the column 25, capable to cool the cooling elements 33 and 34.

The heating liquid is sucked from the column 26 by means of a motor driven pump 28 and, through a pipe 27, it is delivered to the heating element 29 immersed in the tank 6 for the chlorine-ethylene, as soon as the regeneration phase takes place.

In Fig. 4 is dyagrammatically shown the heating element 29, this consisting of one or more hollow plates in which the pipe 27 is entering, setting itself crosswise as indicated in Fig. 4 and bearing a number of holes on one side only,so to direct the oil flow in the direction of the longer side of the element. At the other end of the same heating element 29 is placed the oil return pipe 48, branching off from the above heating element by passing through the inspection door 47, through which the pipe 27 is passed too. This one, as dyagrammatically shown in Fig. 2, goes to feed warmed up oil also to the other heating elements 19" and 30, through which, after having yeld a part of its thermal energy, the oil flows out being conveyed by the return pipe 48 so arriving in the top section of the column 26, inside which it enters in the way as illustrated in Fig. 5, that is in the mid part of the column itself. The return pipe 48 is closed, at its end, by a shaped plate 49, covering the pipe coil 35, preferably made out of a finned copper tube. The back oil comes out from the return pipe 48 through a number of holes obtained in the pipe itself, as Fig. 5 shows, and goes to distribute itself on the inspection plate 49, coming down through a series of holes 50, opposite to the upper spiral of the finned pipe coil 35. The oil, in this manner, comes down settling itself on the bottom of the column 26 as soon as it is warmed up again. The level of the two liquids carrying energy to the columns 25 and 26 is controlled by means of the levels 51 and 51', these serving also to inlet the liquids themselves.

Inside the column 25 is lowered the temperature of the antifreeze liquid flowing out of the column itself through the pipeline 31, and which is put in circulation by means of the motor driven pump 32. Immediately past this one a flow rate variation device is foreseen, as dyagrammatically shown in 52. The coolant comes to the heat exchanger 34 through the pipe line 31 and then to the pipe coil 33 from which it comes out through the pipe 53 so entering into the top section of the column 25 in the same way as foreseen for the column 26.

Due to reasons of energetic recovery all the members which may come in contact with ambient air and concerned with the flow of warmed up or cooled fluids are foreseen as properly insulated,

while one only electric control board is foreseen to control and adjust the dry cleaning machine, including the air circulation, as well as generation and circulation of warm and cool liquids.

After having described as above the members which the original dry cleaning machine is composed by, we may now describe how the different phases of the dry cleaning cycle are carried out, according to the programming as preset in the control board. Dry cleaning phase - After having filled the barrel 1 with linen to be cleaned, a proper motor driven pump 54 sucks the regenerated Chlorine-ethylene from one of the tanks 4, sending it to the barrel 1 through the recycling duct 5, while the barrel 1 itself performs the preset cleaning program. At the end of this one, the blowing off valve 55 opens, discharging the chlorine-ethylene into the tank 2 below, while inside the barrel 1 the centrifugation phase takes place, during which the chlorine-ethylene is eliminated from the linen. During this last phase the fan 14 sucks air and vapor from the barrel 1 through the recycling duct 5, which comes back to the barrel 1 so closing the circuit. At the end of the recycling duct 5 is placed a thermostat 57 controlling the temperature of fluid inlet in the barrel 1. The thermostat 57 operates on the phases of adjustment and re-equilizing of the temperatures which control the cycle of the fluid inside the barrel 1 and the recycling duct 5. For this purpose the electrical control board, on a signal from the thermostat 57, sets at work the motor driven pump 28 by sending warmed up oil to the radiator 19" and, if needed, to the heating element 30. During the same phase the motor driven pump 32 is set at work, and sends the antifreeze to the heat exchanger 34 with a displacement throttled by a throttling valve 52. This heat exchanger 34, by cooling the fluid passing through it, makes the chlorine-ethylene droplets suspended in the air precipitated, so that they slide again towards the inside of the barrel 1.

Almost at the end of the centrifugation and drying process, the electric control board stops sending warmed up oil to the radiator 19" and fully deviates the air flow, through the deflecting valve 18, into the duct 5' which eliminates the crossing through the batery 19", so that more fresh and deodorized air arrives to the barrel 1 also because, at the same time, the electrical control board actuates the complete opening of the flow rate throttling valve 52, which results in a greater cooling of the heat exchanger 34. In this way, while emptying of chlorine-ethylene from barrel 1 takes place, through the blowing off valve 55, the fresh air recycling through the duct 5 gradually reduces the linen temperature and fully deodorises them.

During the last part of this phase of the process, the refrigerating unit puts into circulation antifreeze liquid only, so that in the column 26 is accumulated the energy for a fast starting of the following cycle. Moreover, the cycling of both hot and cold liquids and of the air being carefully adjustable, it is possible to obtain a slow heating and an identical slow cooling of the linen to be cleaned, so to avoid affecting the chlorine-ethylene features , which could result in serious damages to the machine and consequently to the personnel; besides, the quick cooling of the linen causes the chlorine-ethylene to incorporate itself in the lines, it having become sentless, and to appear again immediately after, during the ironing phase.

Chlorine-ethylene regeneration phase -After having been used, the chlorine-ethylene comes down to the tank 2 by passing through the blowing off valve 55; from here it is sucked again during regeneration phase and inlet into the tank 6 by means of a motor driven pump 58. Here it is warmed up to reaching the evaporation point, by the plate 29 inside which the hot oil coming from the column 26 is flowing. The vapors flow out from the tank 6 through the pipe 9 and enter into the condenser 33 wherein they find a pipe coil 10' inside which the antifreeze liquid is circulating, coming from the column 25. In this way the chlorine ethylene turns again to liquid condition, coming down through the pipe 13 into a tank 4, from which it will be sucked again by the motor driven pump 54 and again sent to the barrel 1 during the first phase of linen dry cleaning.

Claims

1. A unit for generation of a warmed up liquid, this preferably being dyathermic oil, and of cooled liquid, this preferably being antifreeze liquid, characterizing by the fact that the two above mentioned liquids, contained in two original columns, are the former heated and the latter cooled at the same time by a compressor of gas, freon type, sending the warmed up pressurized gas to heat the oil in one column and the cold liquid, after its expansion, to cool the antifreeze liquid contained in the other column.

2. A unit as per Claim 1, characterizing by the fact that all employed liquids and gases exchange the thermal energy each other being in motion, with the possibility of accurate adjustments of their temperature.

3. A unit as per Claim 1, characterizing by the fact that the heating of chlorine-ethylene inside the tank takes place by means of a metallic plate, in

shape of a parallelepiped, fitted on the closing door of the tank itself, so easily extractible and inspectable, inside which the heating oil is circulating.

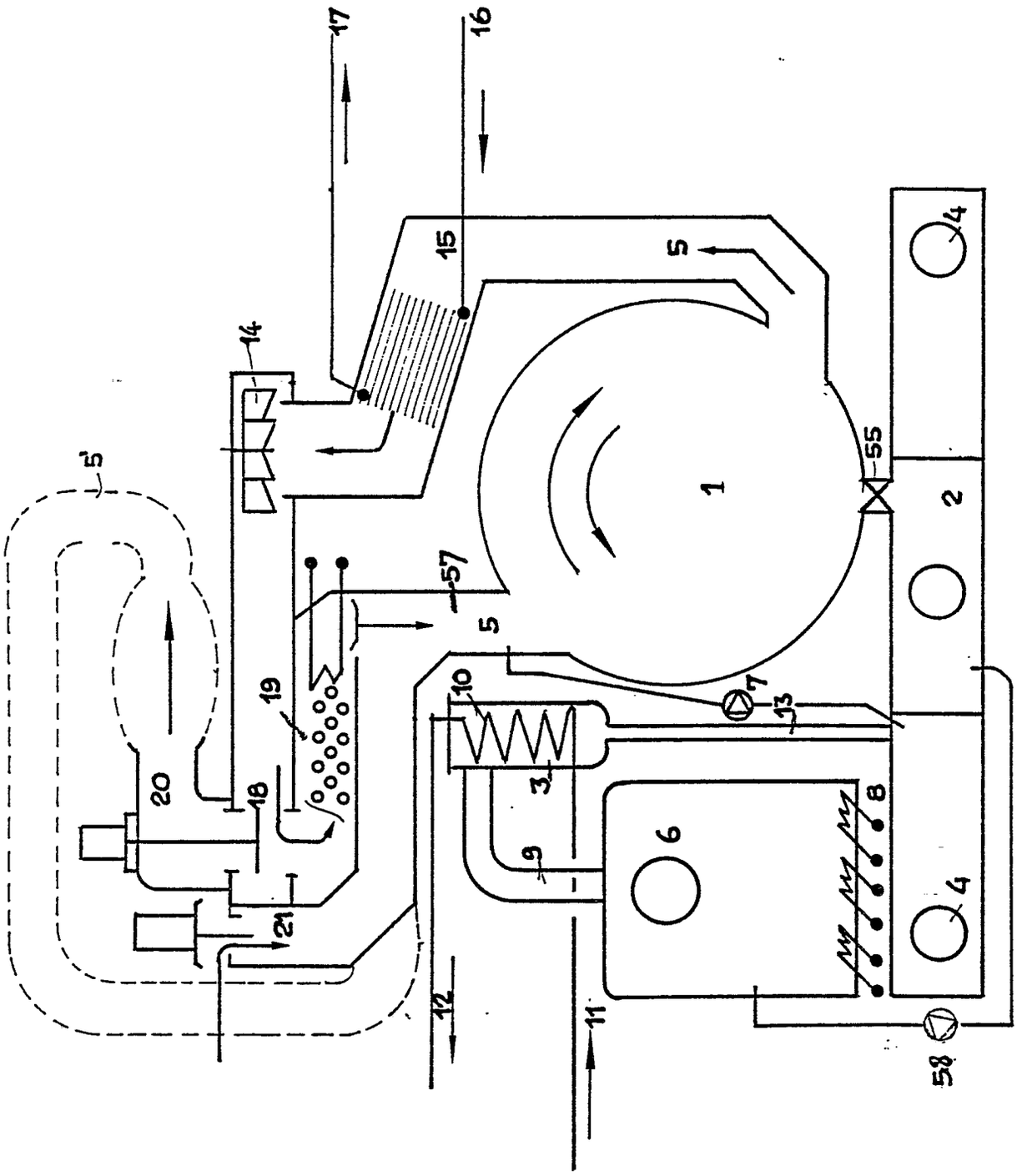

Fig.1

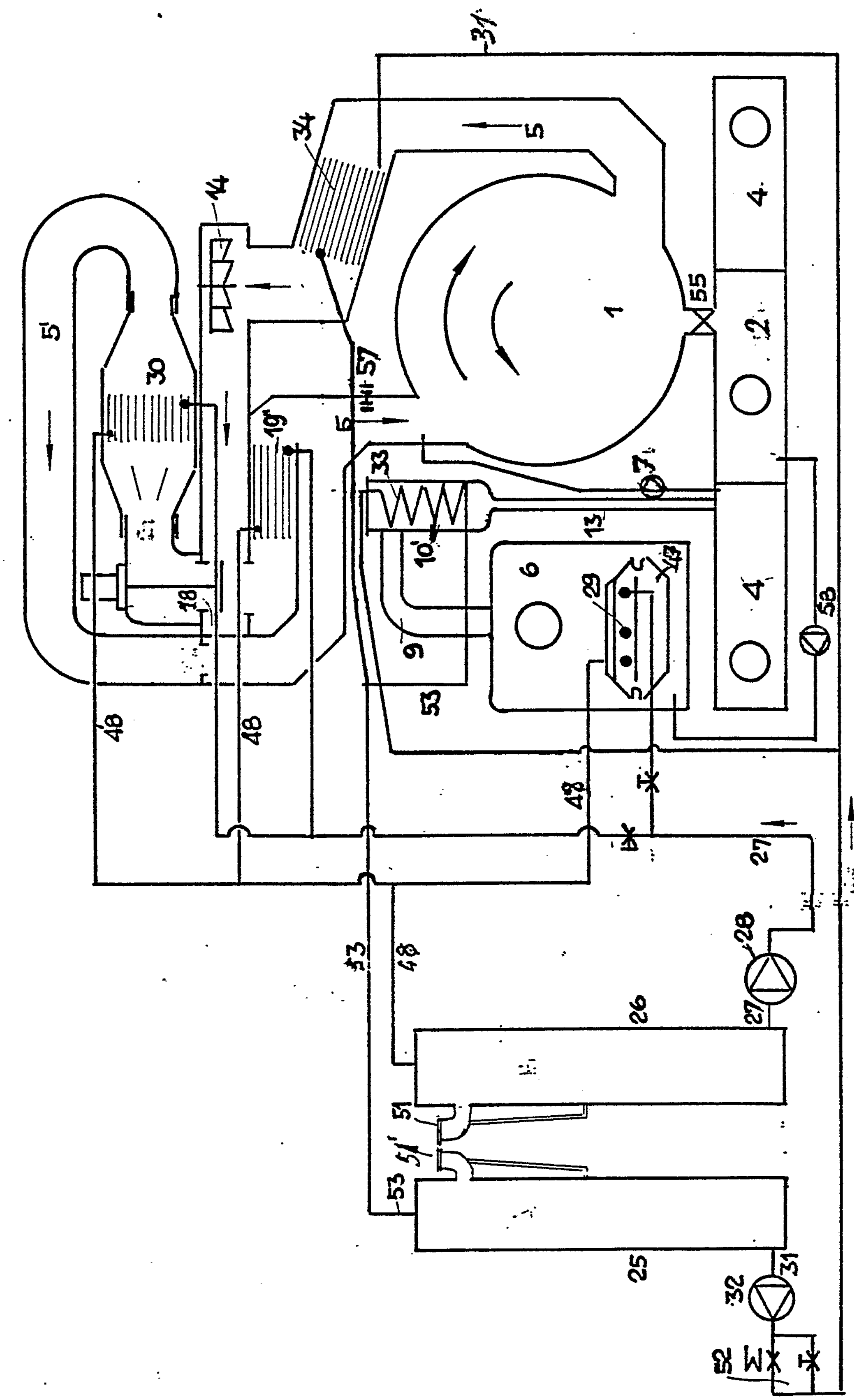
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Fig.2

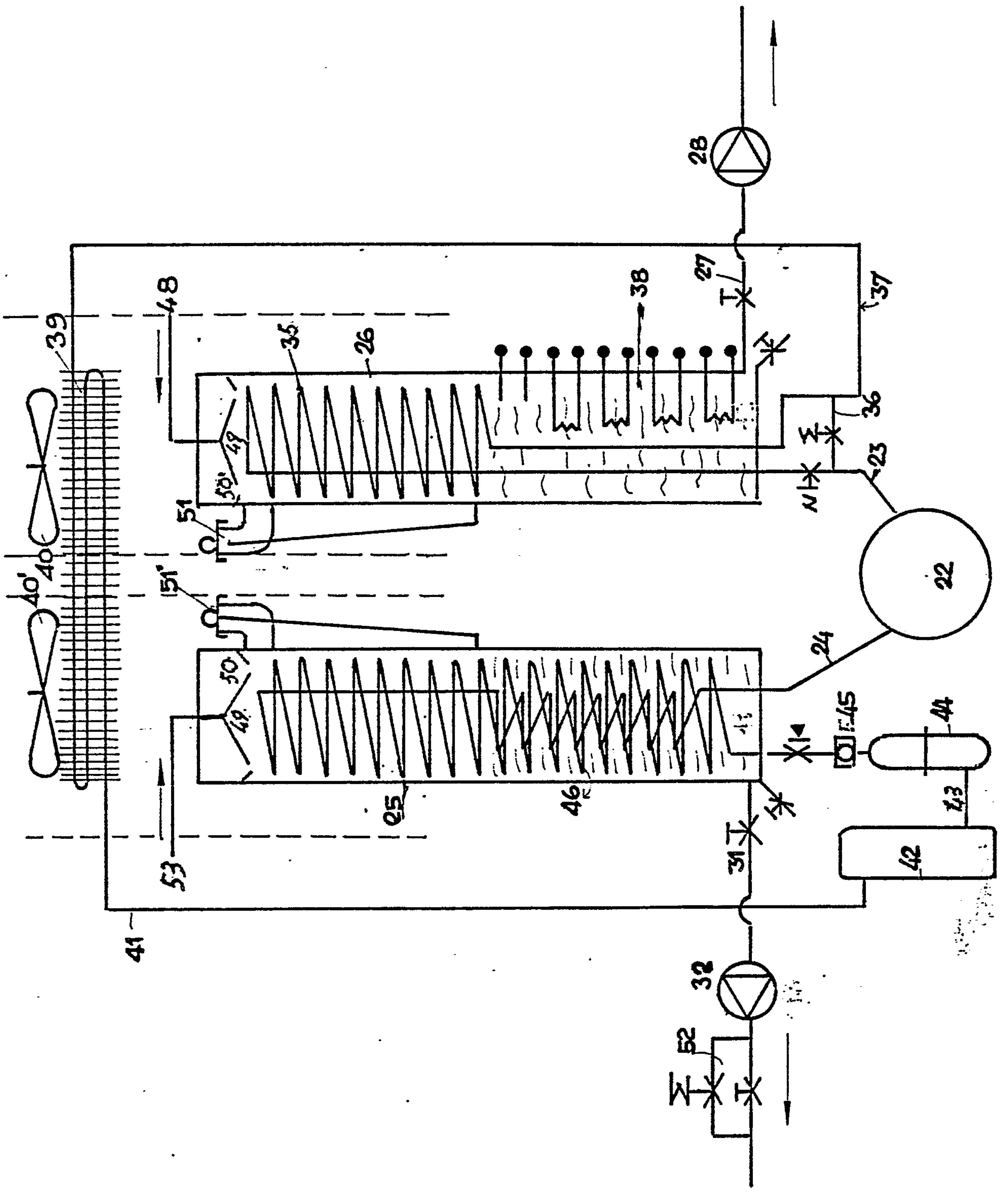
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Fig.3

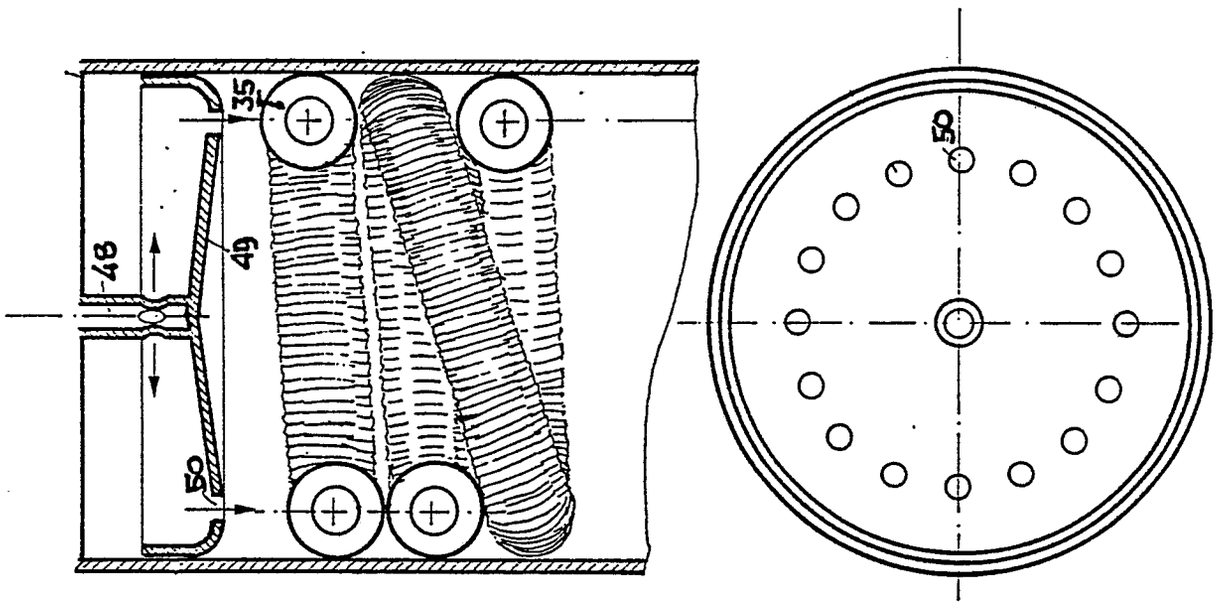

Fig.5

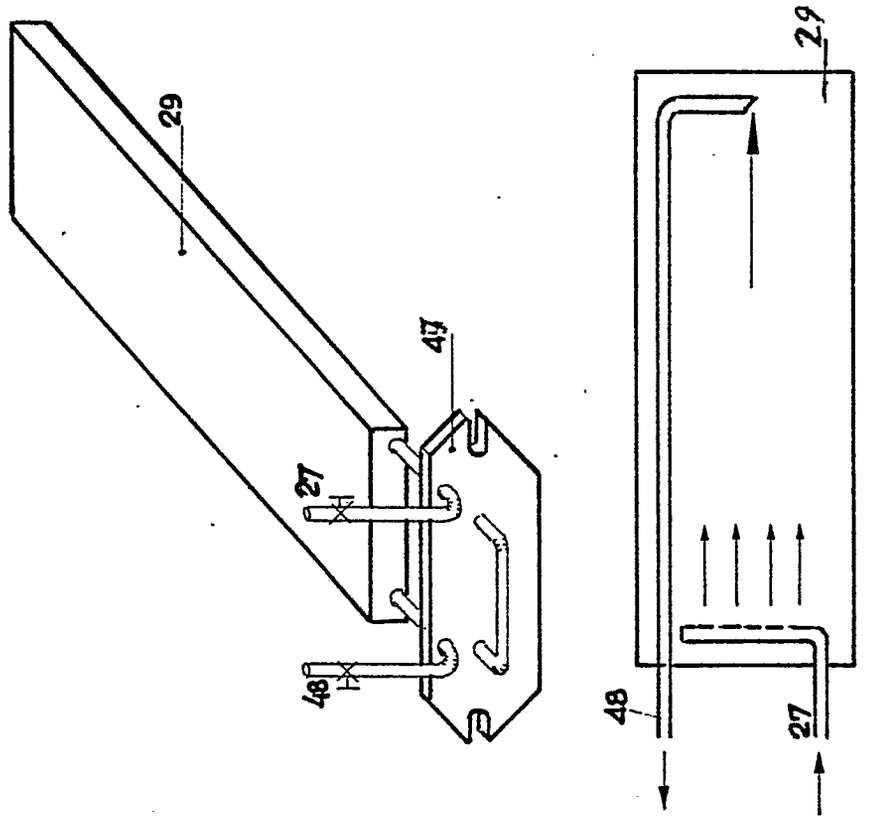

Fig.4

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EUROPEAN SEARCH REPORT

Application number

EP 86 10 4595

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	FR-A-2 417 260 (CLEREN) * Figure 3; page 3, lines 33-39; pages 4,5 *	1,2	D 06 F 43/08 F 25 B 29/00
X	DE-A-2 908 355 (CELI) * Figure 1; page 16, lines 20-26 *	1,2	
X	FR-A- 977 113 (NESSI) * Figures 1,2; claims *	1,2	
A	EP-A-0 114 579 (FIRBIMATIC) * Figures 1,4; claims *	1,2	
A	FR-A-1 319 400 (COUROULEAU) * Figures 1,3; claims *	3	
A	US-A-3 391 550 (L.T. INDUSTRIES)		TECHNICAL FIELDS SEARCHED (Int. Cl.4) D 06 F F 25 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02-12-1986	COURRIER, C.L.A.

CATEGORY OF CITED DOCUMENTS

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