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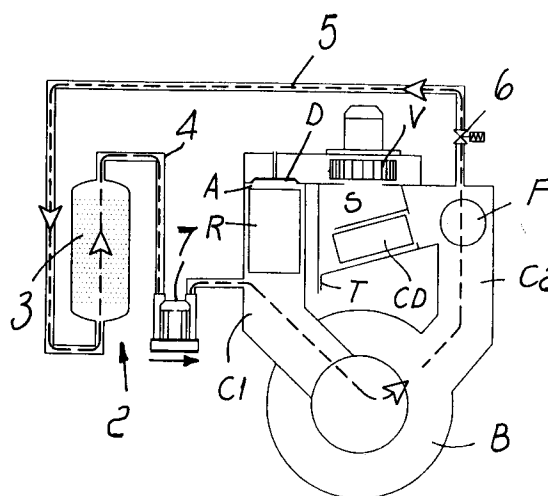
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**I-20123 Milano (IT)**(54) **Activated carbon solvent treatment unit for dry-cleaning machines with improved circuit for connection to the machine.**

(57) An activated-carbon solvent treatment unit for dry-cleaning machines with improved circuit for connection to the machine, comprising: a cylindrical vessel (2) that has a vertical axis, lies vertically, and contains the activated carbon (3); a first duct (4) for connecting the top of the filter (F) to the pipe (C1) for introducing the air in the drum (B) of the drying circuit; a second duct (5) for connecting the base of the filter (F) to the pipe (C2) for removing the air from the drum (B) of the drying circuit; a cutoff valve system (6) arranged in said second duct (5) and open during adsorption and regeneration to connect the drum to the activated-carbon filter; a blower (7) of the type that performs a pumping action in both of its directions of rotation, is mounted on said first duct (4), and is actuatable in opposite directions, so that during adsorption it draws the air from the activated-carbon filter (F) to introduce it in the drum (B), whereas during regeneration it draws air from the drum (B) to introduce in the filter (F) in counter-current.

**FIG.1****EP 0 685 588 A1**

The present invention relates to an activated-carbon solvent treatment unit for dry-cleaning machines with an improved circuit for connection to the machine.

Conventional dry-cleaning machines include the so-called deodorization cycle in order to eliminate residual traces of solvent from the washed garments: in practice, the washing drum is flushed by a stream of hot air that removes even small traces of solvent and moisture from the garments; this stream is conveyed onto an activated-carbon filter (adapted to retain the solvent present in the air) and is then returned to the drum.

When the carbon is saturated with solvent, the activated-carbon filter is flushed in countercurrent with hot air for a so-called regeneration cycle: in practice, after flowing through the filter, the air is returned to the drum and is passed through the condenser of the dry-cleaning machine to remove the solvent and the moisture contained therein.

In order to make the air stream circulate through the filter, the circuit includes a blower usually installed upstream of the filter (with reference to the adsorption cycle) and a large number of valve systems and pipes are provided to produce flow in the normal direction for adsorption and countercurrent flow for regeneration: an exchanger is also provided for cooling the air stream before adsorption, as required because of the heating that the air undergoes when passing through the blower.

Since pollution-control rules are becoming increasingly stricter, activated-carbon filters are required to operate ever more effectively: accordingly, it is convenient to prevent the temperature of the air sent to the filter from being too high during the solvent extraction cycle (adsorption), whereas during regeneration of the activated-carbon filter the air preferably has a high temperature.

It has also been noted that during regeneration the air temperature is substantially low when it is fed into the filter, that is to say, in the region where the activated carbon is less contaminated and where it would therefore be convenient to act with a stream of air at a higher temperature.

A principal aim of the present invention is to obviate the above mentioned drawbacks of known devices, that is to say, to provide an activated-carbon solvent treatment unit for dry-cleaning machines with an improved circuit for connection to the machine, having a series of ducts and valve systems for connection to the dry-cleaning machine that is highly simplified, does not entail the presence of an exchanger for cooling the air stream during adsorption, and allows to operate in the best temperature conditions during adsorption and during regeneration.

Within the scope of this aim, an object of the present invention is to achieve the above aim with a simple structure that is relatively easy to provide in practice, is safe in use, effective in operation, and has a relatively low cost.

This aim and this object are both achieved by the present activated-carbon solvent treatment unit for dry-cleaning machines with improved circuit for connection to the machine, characterized in that it comprises: a cylindrical vessel that has a vertical axis, lies vertically, and contains the activated carbon; a first duct for connecting the top of the filter to the pipe for introducing the air in the drum of the drying circuit; a second duct for connecting the base of the filter to the pipe for removing the air from the drum of the drying circuit; a cutoff valve system arranged in said second duct and open during adsorption and regeneration to connect the drum to the activated-carbon filter; a blower of the type that performs a pumping action in both of its directions of rotation, is mounted on said first duct and actuatable in opposite directions, so that during adsorption it draws the air from the activated-carbon filter to introduce it in the drum, whereas during regeneration it draws air from the drum to introduce it in the filter in countercurrent.

Further characteristics and advantages will become apparent from the following detailed description of a preferred but not exclusive embodiment of an activated-carbon solvent treatment unit for dry-cleaning machines with an improved circuit for connection to the machine, according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figures 1 and 2 are schematic side views of an activated-carbon solvent treatment unit for dry-cleaning machines with improved circuit for connection to the machine, according to the invention, illustrating the air streams of the adsorption step and of the regeneration step respectively; figures 3 and 4 are schematic side views of a treatment unit according to the invention in an alternative embodiment, illustrating the air streams of the adsorption and regeneration steps respectively.

With particular reference to the above figures, the reference numeral 1 generally designates an activated-carbon solvent treatment unit for dry-cleaning machines with an improved circuit for connection to the machine, according to the invention.

The treatment unit 1 comprises a vessel 2 having an advantageously cylindrical shape and a vertical axis, arranged vertically, and filled with activated carbon 3.

The treatment unit 1 is connected to a dry-cleaning machine, the components whereof that concern the present invention have been shown in

the figures: in particular, B designates a washing drum, C1 designates the feed pipe, and C2 designates the pipe for removing air from the drum; the pipe C2 is provided, at the top, with a filter F and is connected to a condenser CD adapted to condensate and extract the solvent provided therein; said solvent is removed through a tube T, and the air stream is circulated by the centrifugal fan V and fed into the pipe C1, at the top whereof a heating battery R is provided, through an upper opening A that is cutoff by a shutter D.

The reference numeral 4 designates a first duct for connecting the top of the filter to the pipe C1, and the reference numeral 5 designates a second duct for connecting the base of the filter to the pipe C2.

A cutoff valve system 6 (electric valve) is arranged in the second duct 5 and is open during adsorption and regeneration to connect the drum to the activated-carbon filter.

The reference numeral 7 designates a blower of the type that produces a pumping action in both of its directions of rotation, is mounted on the first duct 4 and actuatable in opposite directions so that during the adsorption step it draws air from the activated-carbon filter to feed it into the drum (in the direction shown by the arrows of figure 1), whereas during the regeneration step it draws air from the drum to feed it into the filter in countercurrent (in the direction shown by the arrows of figure 2); during the adsorption step, the shutter D is closed and the fan V is idle, whereas during the regeneration step the shutter D is open and the fan V runs so as to make the air stream pass over the condenser CD and extract the solvent removed from the activated carbon: in other words, during regeneration, part of the air that flows between the drum and the condenser is diverted into the vessel 2 to extract the solvent from the activated carbon 3.

The cylindrical vessel contains heating elements 8 activated during regeneration and advantageously constituted by a coil connected to a source of superheated steam.

It should be noted that the arrangement of the pump in the duct 4 prevents the air entering the filter from being heated by the pump during the adsorption step, whereas during the regeneration step the pump heats the air before it enters the filter: in other words, during the regeneration step the heating of the air caused by the pump is made to occur in an optimum region, so as to have hot air at the very point of the filter where solvent concentration is lowest, therefore requiring high air temperature, and where instead the heating element 8 has not yet effectively heated all the mass of activated carbon.

It should also be stressed that by operating as mentioned in conditions in which the temperature

of the air stream through the activated carbon is optimum (low during adsorption and high during regeneration), it is possible to perform the filter regeneration cycle less frequently and to have a cleaner activated-carbon filter, achieving higher efficiency of the machine (faster adsorption cycles and greater extraction of solvent particles from the air).

In order to improve the efficiency of the treatment unit according to the invention, the end of a tube 9 can be connected to the duct 4 between the pump 7 and the pipe C1; said tube is connected to the second duct 5 at the other end and is affected by a valve system 10 adapted to be opened during regeneration to allow partial recirculation of the air on the activated-carbon filter to achieve a higher air temperature in the first region where it is introduced in the filter.

It has thus been observed that the invention achieves the intended aim and objects.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent ones.

In practice, the materials employed, as well as the shapes and the dimensions, may be any according to the requirements without thereby abandoning the scope of the protection of the appended claims.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

## Claims

1. Activated-carbon solvent treatment unit for dry-cleaning machines with improved circuit for connection to the machine, comprising: a cylindrical vessel that has a vertical axis, lies vertically, and contains the activated carbon; a first duct for connecting the top of the filter to the pipe for introducing the air in the drum of the drying circuit; a second duct for connecting the base of the filter to the pipe for removing the air from the drum of the drying circuit; a cutoff valve system arranged in said second duct and open during adsorption and regeneration to connect the drum to the activated-carbon filter; a blower of the type that performs a pumping action in both of its directions of rotation, is mounted on said first duct and actuatable in opposite directions, so that during adsorption it

draws the air from the activated-carbon filter to introduce it in the drum, whereas during regeneration it draws air from the drum to introduce it in the filter in countercurrent.

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2. Treatment unit according to claim 1, characterized in that said cylindrical vessel contains heating elements that are activated during regeneration.

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3. Treatment unit according to claim 2, characterized in that said heating elements are constituted by a coil connected to a source of superheated steam.

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4. Treatment unit according to claim 1, characterized in that the end of a tube is connected between said pump and said pipe for introducing the air in the drum of the drying circuit, said tube being connected to the second duct at its other end and being affected by a valve system adapted to be opened during regeneration to allow partial recirculation of the air on the activated-carbon filter so as to achieve a higher temperature of the air in the first region where it enters the filter.

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5. Activated-carbon treatment unit for solvents for dry-cleaning machines with improved circuit for connection to the machine, according to one or more of the preceding claims and according to what is described and illustrated for the specified purposes.

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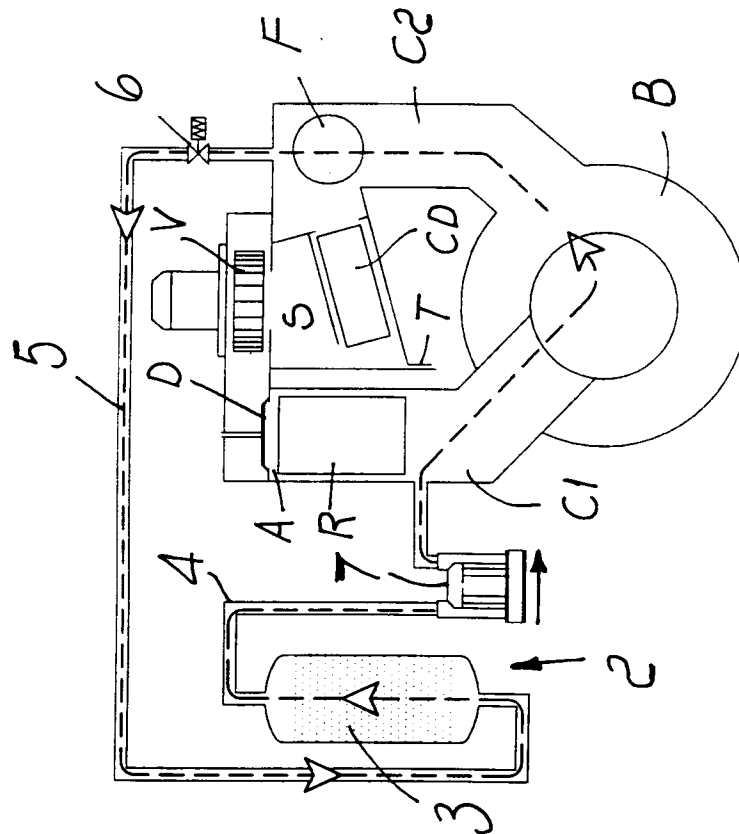


FIG.1

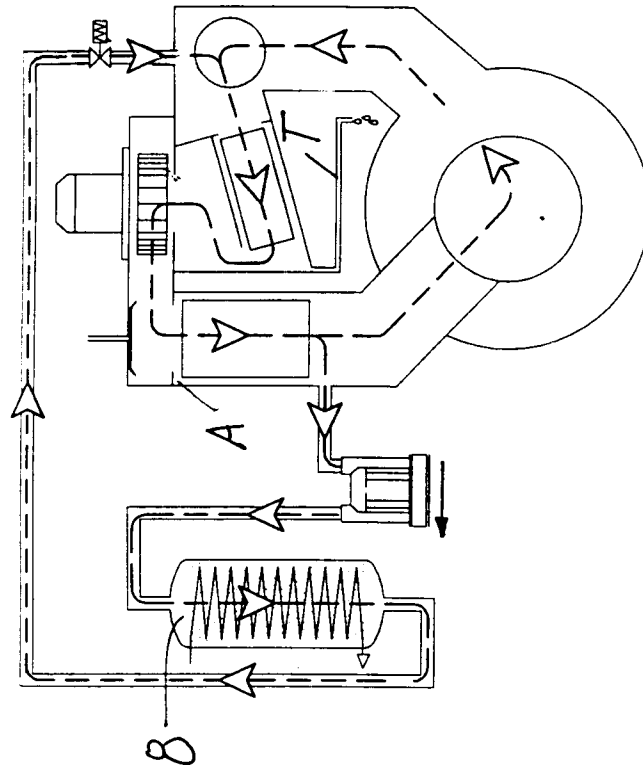


FIG.2

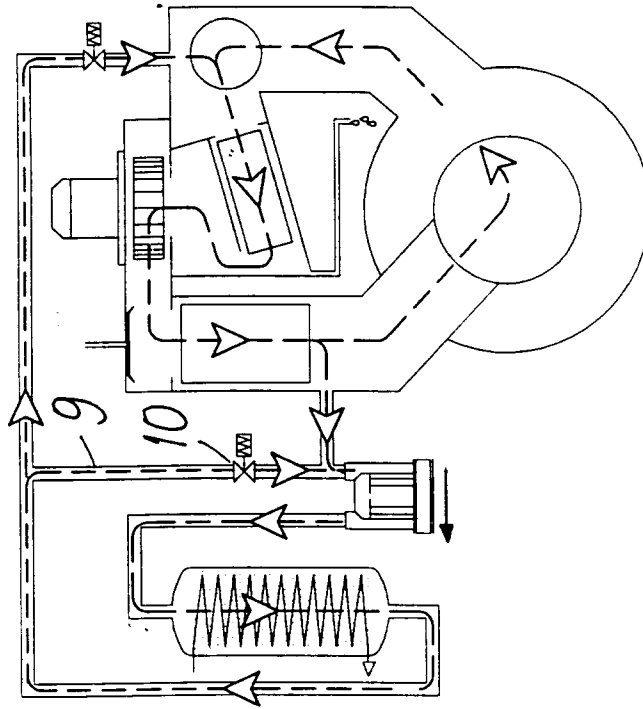


FIG. 4

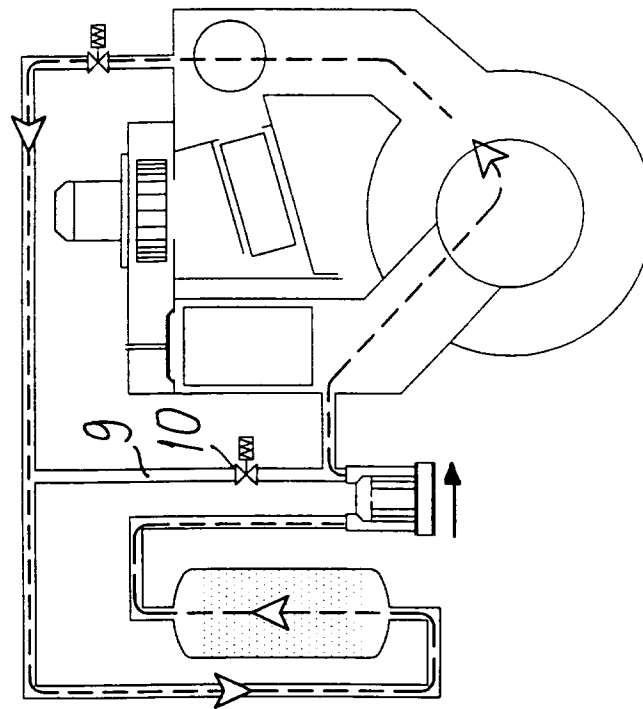


FIG. 3



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## EUROPEAN SEARCH REPORT

Application Number  
EP 95 10 7796

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.6)
A	DE-U-89 00 304 (BÖWE REINIGUNGSTECHNIK GMBH) * claims; figures * ---	1,2,4	D06F43/08
A	EP-A-0 302 280 (BÖWE REINIGUNGSTECHNIK GMBH) * claims; figure 1 * ---	1	
A	PATENT ABSTRACTS OF JAPAN vol. 15 no. 504 (C-0896) ,19 December 1991 & JP-A-03 221099 (MITSUBISHI HEAVY IND LTD) 30 September 1991, * abstract * ---	1	
A	DE-A-37 06 073 (CENTRAL NYJ NAUCNO-ISSLEDOVATEL SKIJ INSTITUT BYTOVOGO OBSLUZIVANIJA ) * claims; figure * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			D06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 September 1995	Examiner Courrier, G
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			