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(54) **Method for treating air in a dryer for linen and the like and a dryer applying this method**

(57) Method for treating air in a dryer for linen and the like, in particular for heating the air used in the dryer (2), whereby this air is heated in a heating device (5) to

be subsequently led through a drying drum (1), in which the linen or the like to be dried is situated, characterized in that the air is pre-heated before being supplied to the above-mentioned heating device (5).

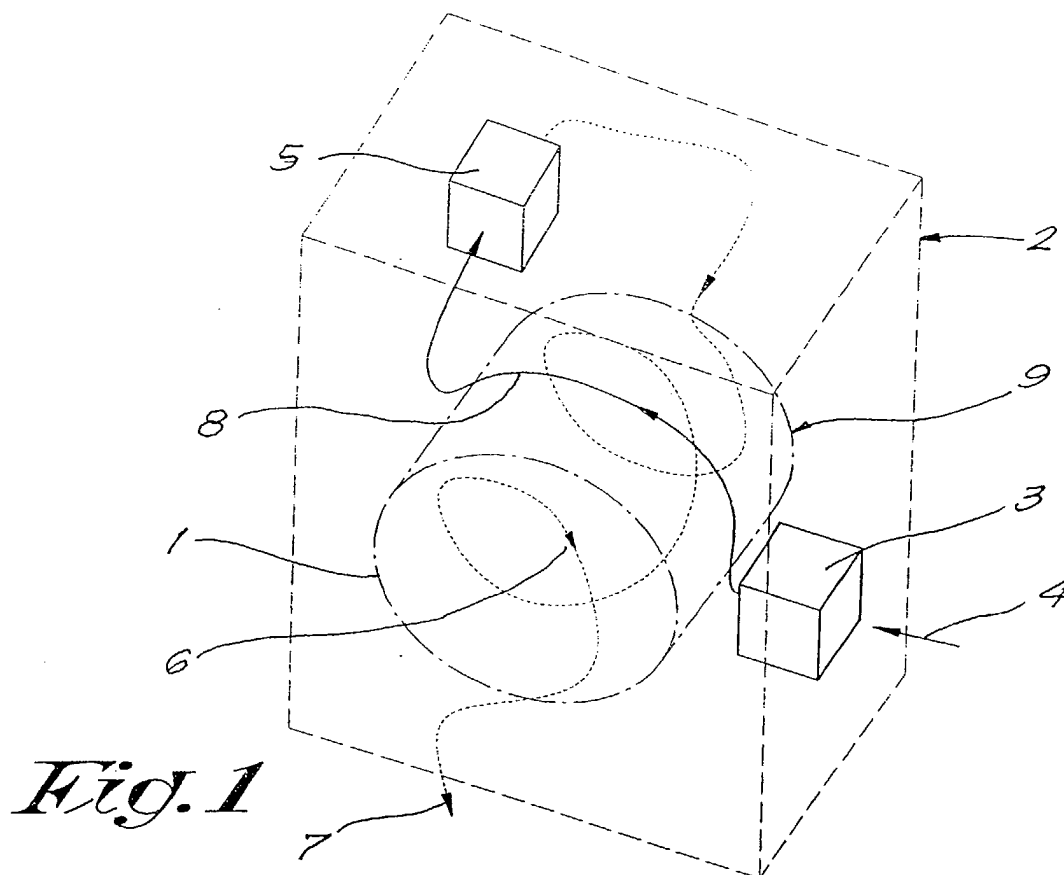


Fig. 1

EP 1 382 735 A1

Description

[0001] The present invention concerns a method for treating, in particular for heating air in a dryer for linen and the like, as well as a dryer applying this method.

[0002] It is known that with traditionally embodied dryers, the linen is dried by bringing it into contact with a hot air flow, whereby the linen is preferably also kept moving in this air flow, by putting said linen in a rotary drying drum. The hot air flow is obtained by drawing in air and by heating it in an electric heating device, built in in the dryer.

[0003] The present invention aims an improved method for treating air in a dryer, as well as an improved dryer applying this method, in particular a method and a dryer which are more efficient to use, seen from the viewpoint of the heating and the air flow used thereby.

[0004] To this end, the invention in the first place concerns a method for treating air in a dryer for linen and the like, in particular for heating the air used in the dryer, whereby this air is heated in a heating device to be subsequently led through a drying drum, in which the linen or the like to be dried is situated, characterized in that the air is pre-heated before being supplied to the above-mentioned heating device.

[0005] As the air is pre-heated, the heating will be more efficient. Consequently, the temperature difference which must then be bridged at the main heating, in particular the above-mentioned heating device, can be reduced, which results in a better output.

[0006] The air is preferably pre-heated by putting it into contact with parts of the dryer which are situated behind the heating device, seen in the direction of flow of the air, and which are heated thanks to the produced hot air flow and/or the warmth produced by the heated linen or the like. In this manner, heat is recycled, resulting in a considerable energy saving and consequently also an efficiency improvement.

[0007] According to the most preferred embodiment, the air is at least pre-heated by putting it into contact with the drying drum, in particular the outside of the drying drum and/or with a fixed drum situated around the actual drying drum. Since these are the hottest parts of the dryer, and since these parts moreover have a relatively large outer surface from which warmth for the pre-heating can be abstracted, a very efficient pre-heating is obtained in this manner.

[0008] In practical embodiments, the air is put into contact with the drying drum or with a fixed drum situated around the actual drying drum, two or several times in a row in different places.

[0009] Thanks to the repeated contacts, the air will be better mixed in between, thanks to the canalization through which it has to move, which results in a more uniformly heated air flow, so that in the second and possibly ensuing pre-heating stages, good results for a further heating can be guaranteed.

[0010] Secondly, the invention naturally also con-

cerns a dryer to realize the above-mentioned method. To this end, such a dryer according to the invention comprises a drying drum, as well as an air heating device and means for leading the heated air through the drying drum, and it is characterized in that it at least also comprises means to subject the air to a pre-heating before supplying said air to the aforesaid heating device.

[0011] According to the above-mentioned method, the means for subjecting the air to a pre-heating preferably consist of a canalization which brings said air into contact with parts of the dryer situated behind the heating device according to the direction of flow of the air, and which are heated thanks to the produced hot air flow and/or the warmth produced by the heated linen or the like. As mentioned above, these parts are preferably formed of the dryer drum, in particular the outside of the dryer drum and/or a fixed drum situated around the actual dryer drum.

[0012] The invention can be applied to dryers for domestic use as well as to dryers for industrial use.

[0013] In order to better explain the characteristics of the invention, the following preferred embodiments are described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 represents the method of the invention in a highly schematic manner;

figure 2 schematically represents a section of a dryer according to the invention;

figure 3 schematically represents a view in perspective of the dryer from figure 2, partly dismantled;

figure 4 represents a view analogous to that in figure 2 of a variant of a dryer according to the invention.

[0014] Figure 1 schematically represents a drying space, in particular a drying drum 1, of a dryer 2, which drying drum 1 can usually be driven in a rotating manner, for example by means of an electric motor which is not represented in the figure. The drying takes place, as is normally the case, by drawing in air via a suction device 3 and a suction opening 4 and by heating it in a heating device 5, for example an electric heating, after which this air, as indicated by arrow 6, is led through the drying drum 1, so that the linen to be dried which is present there is heated and the moisture which is thereby released is carried off together with the air via the schematically represented discharge 7. This discharge 7 may have a free connection with the surroundings and may for example open into the outside air via a pipe. According to a variant, it may also be connected to a condensing device which has either or not been built in in the dryer 2, designed to remove the moisture from the exhaust air.

[0015] According to the present invention, the air, before being supplied to the heating device 5, is pre-heated by bringing it into contact, as illustrated by means of the schematically represented canalization 8, with one

or several of the parts of the dryer 2 which, while the dryer 2 is in use, are heated due to the produced hot air flow and/or the heat produced by the heated linen or the like. In the schematic example of figure 1, the outer surface 9 of the drying drum 1 is used as a heated part.

[0016] According to a variant, not the outer surface 9 of the drying drum 1 itself will be used as a heated part, but the surface of a fixed drum surrounding the drying drum 1, which can usually be driven in a rotating manner.

[0017] Thanks to the contact with the heated part, i.e. the drying drum 1 and/or possibly the fixed drum situated around it, the supplied air is already heated in the canalization 8, and pre-heated air is consequently supplied to the actual heating device 5, which results in the advantages as explained in the introduction.

[0018] It is clear that the aforesaid contact of the air with the heated parts, as well as the canalization 8 applied thereby, can be realized in any way whatsoever. Two examples thereof will be further described in detail by means of figures 2 to 4.

[0019] Figures 2 and 3 represent a first embodiment whereby the air, in order to subject it to a pre-heating, is put into contact with the rotating drying drum 1.

[0020] According to a practical aspect, use is made to this end of a canalization 8 which is at least partially formed of a double-walled structure, consisting of walls 10 and 11, which structure extends along at least one side of the housing 12 of the dryer 2. This double-walled structure, together with a number of canalization parts 19-20-21-22 opening therein via openings 13-14-15-16-17-18 in the wall 10, forms the canalization 8. The canalization part 19 hereby forms a connection between the suction device 3 and the double-walled structure. The canalization part 20 extends in such a manner that the air led through it is put into contact with the drying drum 1 a first time, whereas the canalization part 21 makes sure that this air is put into contact with the drying drum 1 a second time. The canalization part 22 finally provides for a connection with the actual heating device 5.

[0021] Naturally, the necessary partitions 23 are provided in the double-walled structure, and additional air conducting means 24 may be present in the canalization parts 20 and 21, so that the air is forced to make contact with the surface of the drying drum 1.

[0022] For clarity's sake, neither the canalizations for leading the air as of the heating device 5 into the drying drum 1, as well as for discharging said air from the drying drum 1, nor the drive for the drying drum 1 are represented in the figures.

[0023] The working of the above-described dryer 2 can be easily derived from figure 2. After the linen to be dried has been put in the drying drum 2, the latter is driven in a rotating manner in the known way. Air is drawn in via the suction device 3 and carried through the canalization 8 towards the heating device 5. In the heating device 5, said air is heated, after which it is led through

the drying drum 1, so that the linen is dried.

[0024] Initially, the outer surface 9 of the drying drum 1 is at room temperature, but after a short while it will have a considerable temperature as heated air is being carried through the drying drum 1. This has for a result that the air supplied to the heating device 5 is pre-heated, as it is put into contact with the heated outer surface 9 in the canalization 8, in particular in the canalization parts 20 and 21, which results in a more efficient energy consumption.

[0025] As the air is put into contact with the drying drum 1 at least twice in a row, in the canalization parts 20 and 21 respectively, this offers the advantage that the air has the possibility to mix in the meantime, which results in a better heat exchange.

[0026] According to the variant of figure 4, the canalization 8 is not directly connected to the rotating drying drum 1, but to a fixed drum 25 which extends around the drying drum 1.

[0027] However, the operation is analogous as in the embodiment from figure 2.

[0028] It is clear that the suction device 3 must not necessarily be situated at the entrance of the canalization 8, but that it may also be situated in or at the end of said canalization 8.

[0029] It is also clear that the present invention cannot only be applied to dryers 2 having a rotary drying drum 1, but possibly also to dryers whereby the linen is moved in another manner in a drying space. According to the present application, by the term 'drying drum' should be understood any form of drying space, whether it has a drum shape or not or whether it can rotate or not.

[0030] The invention is by no means limited to the above-described embodiments given as an example and represented in the accompanying drawings; on the contrary, such a method for treating air in a dryer, as well as such a dryer, can be made in all sorts of variants while still remaining within the scope of the invention.

Claims

1. Method for treating air in a dryer for linen and the like, in particular for heating the air used in the dryer (2), whereby this air is heated in a heating device (5) to be subsequently led through a drying drum (1), in which the linen or the like to be dried is situated, **characterized in that** the air is pre-heated before being supplied to the above-mentioned heating device (5).
2. Method according to claim 1, **characterized in that** the air is pre-heated by putting it into contact with parts of the dryer (2) which are situated behind the heating device (5), seen in the direction of flow, and which are heated thanks to the produced hot air flow and/or the warmth produced by the heated linen or the like.

3. Method according to claim 2, **characterized in that** the air is at least pre-heated by putting it into contact with the drying drum (1), in particular the outer surface (9) of the drying drum (1) and/or with a fixed drum (25) situated around the actual drying drum (1). 5

4. Method according to claim 3, **characterized in that** the air is put into contact with the drying drum (1) or with a fixed drum (25) situated around the actual drying drum (1) two or several times in a row in different places. 10

5. Dryer for drying linen or the like, in particular a dryer (2) applying the method according to any of the preceding claims, whereby this dryer (2) comprises a drying drum (1), as well as an air heating device (5) and means for leading the heated air through the drying drum (1), **characterized in that** the dryer (2) also comprises means to subject the air to a pre-heating before supplying said air to the aforesaid heating device (5). 15 20

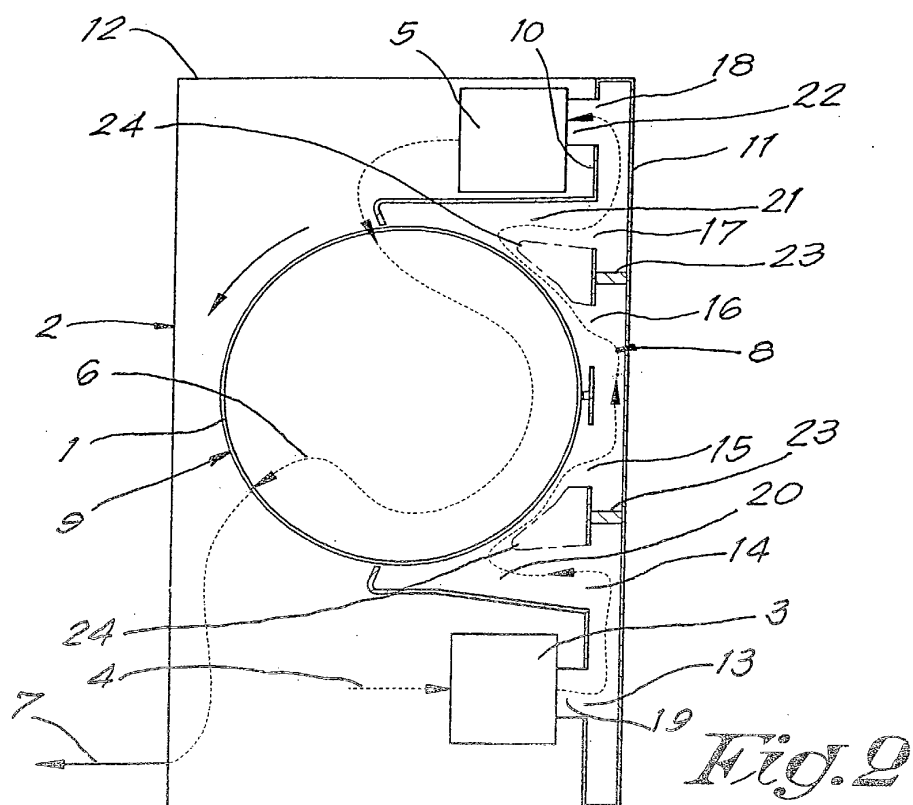
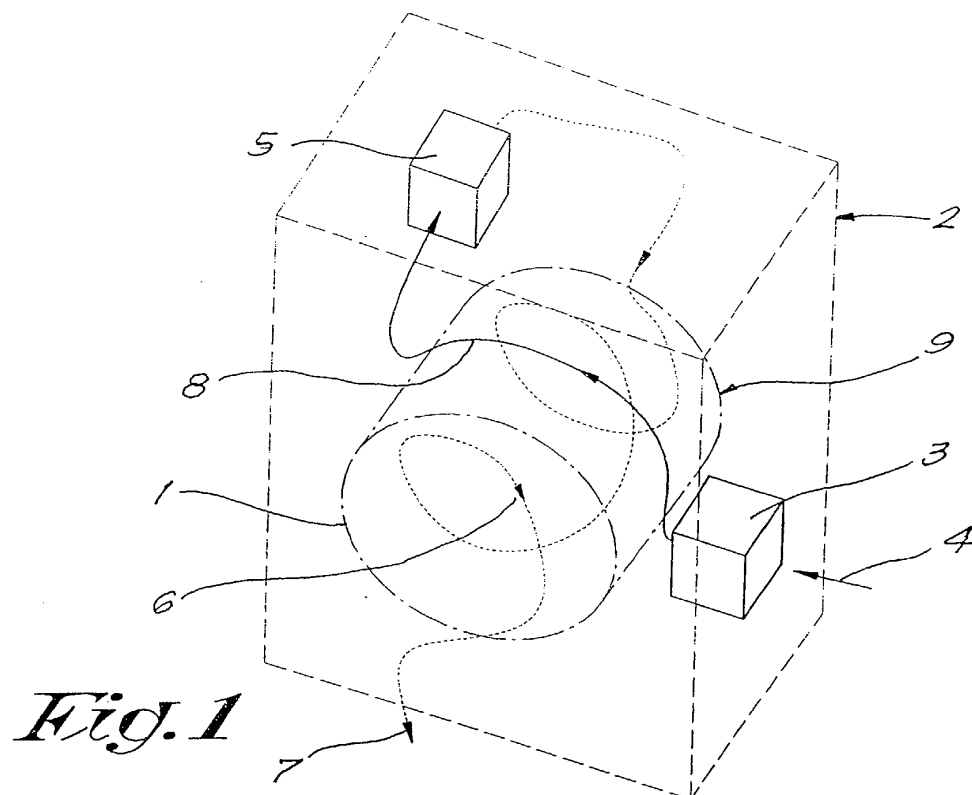
6. Dryer according to claim 5, **characterized in that** the above-mentioned means for subjecting the air to a pre-heating preferably consist of a canalization (8) which brings said air into contact with parts of the dryer (2) situated behind the heating device (5) according to the direction of flow of the air, and which are heated thanks to the produced hot air flow and/or the warmth produced by the heated linen or the like. 25 30

7. Dryer according to claim 6, **characterized in that** the above-mentioned canalization (8) works in conjunction with, in particular extends along, the drying drum (1), in particular the outer surface (9) of the drying drum (1), and/or with a fixed drum (25) situated around the actual drying drum (1). 35 40

8. Dryer according to claim 7, **characterized in that** the canalization (8) extends such that the air is put into contact with the drying drum (1) or with a fixed drum (25) situated around the actual drying drum (1), two or several times in a row in different places. 45

9. Dryer according to any of claims 6 to 8, **characterized in that** the canalization (8) which is at least partially formed of a double-walled structure extends along at least one side of the housing (12) of the dryer (2), from where the air is put into contact with the dryer drum (1) or with the above-mentioned fixed drum (25). 50

10. Dryer according to any of the preceding claims, **characterized in that** the above-mentioned heating device (5) consists of an electric heating. 55



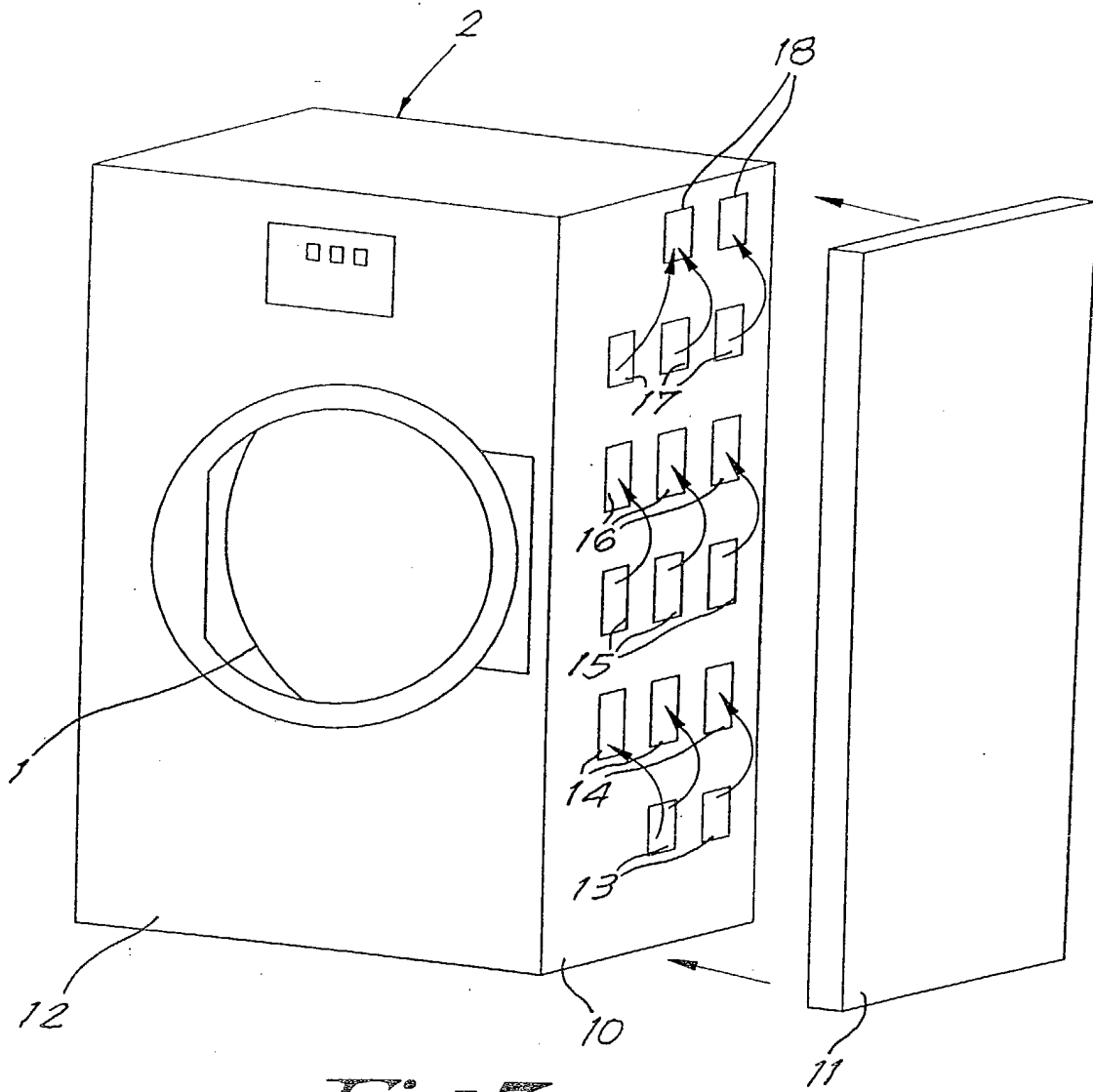


Fig. 3

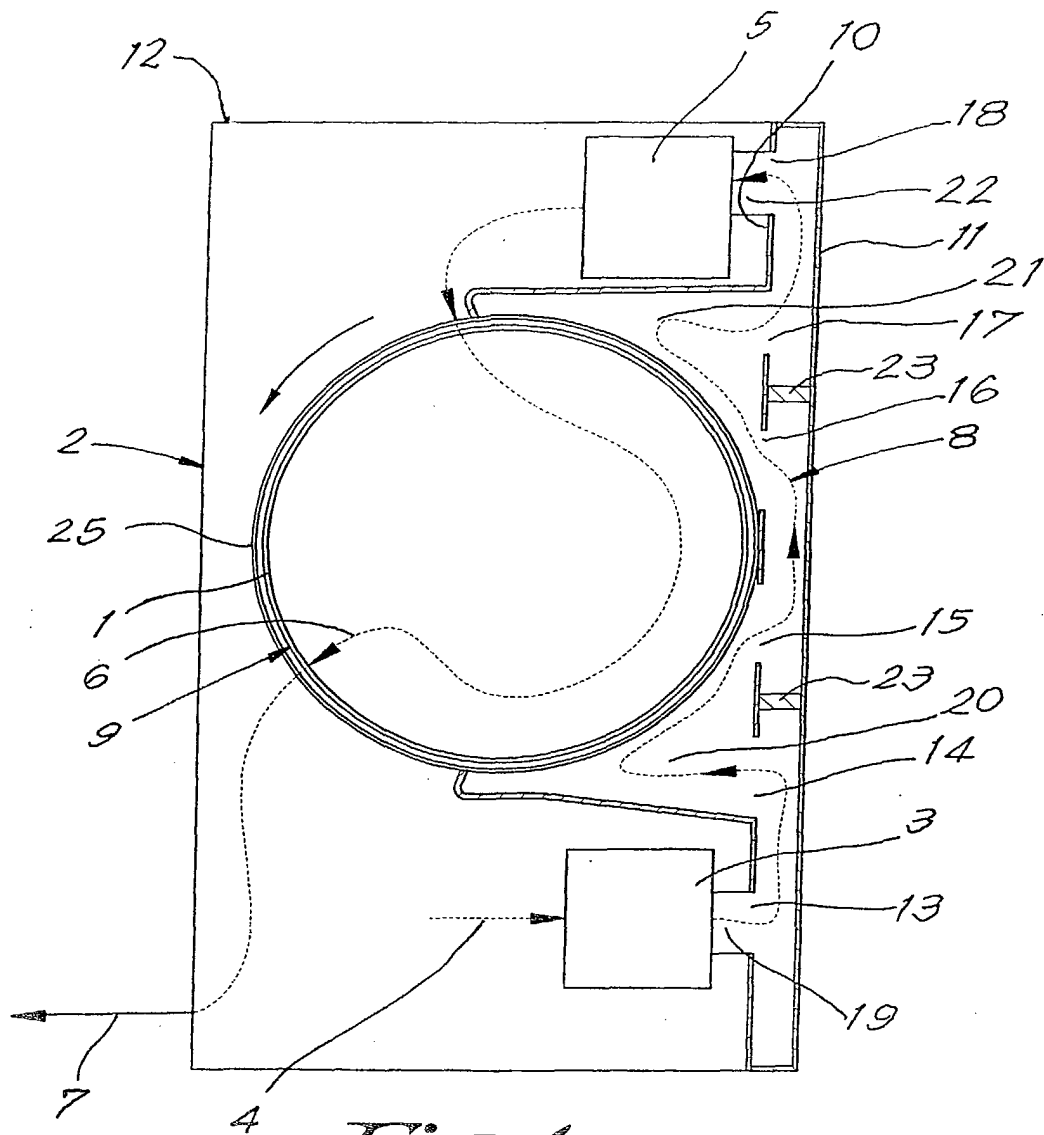


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 03 07 7218

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.7)
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A	* column 2, line 43 - line 56; figure 1 *	4,6	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D06F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		13 October 2003	Courrier, G
CATEGORY OF CITED DOCUMENTS 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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 03 07 7218

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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