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54 **Improved clothes washing and drying appliance.**

57 Present invention refers to a washing and drying machine, comprising a circuit for air circulation, means for heating said air, means for conveying the heated air into the laundry basket (1) and a system for condensing the moisture extracted from the laundry; the main characteristic of the machine consists in that the machine provides for a top loading system for the laundry.

A second important characteristic of the machine consists in that said means for conveying the heated air into the laundry basket (1) are so realized that the inlet (15) of the air into the basket takes place through a hub (18) of the basket, which is axially hollow.

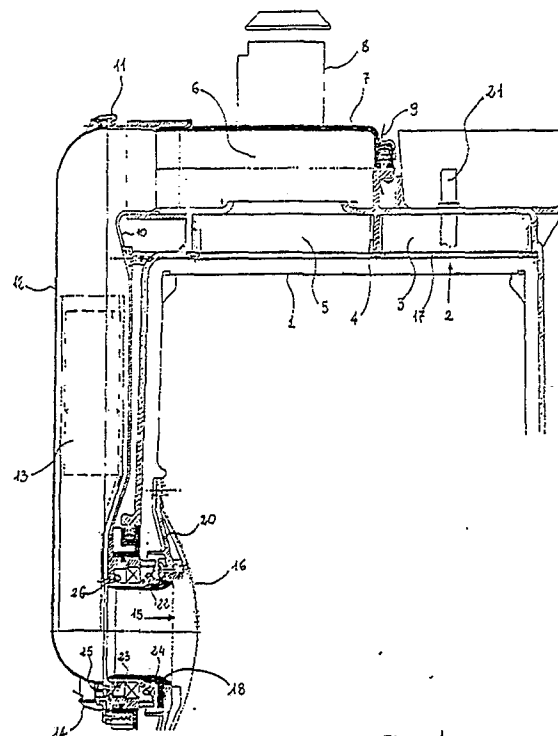


FIG. 1

Improved clothes washing and drying appliance

Present invention refers to a washing and drying machine, comprising a circuit for air circulation, means for heating said air, means for conveying the heated air into the laundry basket and a system for condensing the moisture extracted from the laundry.

Machines of the described type are normally in use to wash and dry household laundry.

They have a cabinet made out of enamelled metal sheet, allocating a washing tank, which in turn holds a basket containing the laundry to be washed and dried. The basket rotates during washing and drying phases round a hub, which is on the opposite side of the glass window, used for loading the laundry into the basket and watching the washing cycle.

At the end of the washing and spinning phases, the damp air is sucked out of the basket by a centrifugal fan, heated and dried by means of electrical resistors, conveyed again into the basket so as to act on the laundry, and so on.

Generally the air is conveyed into the basket through a suitable outlet, located near the porthole; the sucked damp air is conveyed into a condensing chamber, where it passes through a water rain so promoting the condensing of the moisture.

Also known are drying (non-washing) machines, wherein the air is conveyed into the basket through the rear wall thereof, by means of holes suitably located round the hub; it is important to point out that such non-washing driers shall not withstand the spinning stress, therefore they need much lighter and thinner hubs.

Front loading washing and drying machines of the described type show inconveniences, like the following:

- loading the laundry through the porthole is uncomfortable;
- the air conveyed into the basket gets partly lost through the gap between basket and bellows and also because it is sucked before acting onto the laundry;
- heated air hits the glass of the porthole; the relevant heat gets therefore lost as far as the laundry drying is concerned.

It is an object of the present invention to indicate a washing and drying machine, which does not show the said inconveniences of the known machine.

To obtain the said object, the subject of present invention is a washing and drying machine, comprising a circuit for air circulation, means for heating said air, means for conveying the heated air into the laundry basket and a system for condensing the moisture extracted from the laundry,

characterized in that the machine provides for a top loading system for the laundry.

In a preferred embodiment of the invention, the machine according to the invention is characterized in that said means for conveying the heated air into the laundry basket are so realized that the inlet of the air into the basket takes place through a hub of the basket, which is axially hollow.

Other objects and advantages of the present invention will be clear from the detailed description which follows and from the attached drawings, which are supplied only as an explanatory and not limiting example, wherein:

figure 1 shows a cross section of the part of the machine, expounding the system conveying the heated air into the basket and the condensing chamber, according to the invention;

figure 2 shows a cross section, at right angle to the previous one, expounding the condensing chamber of the machine according to the invention, wherein the horizontal axis is rotated clockwise of 30°;

figure 3 shows a third cross section of the condensing chamber of the machine according to the invention.

In figure 1, which shows a cross section of the part of the machine, expounding the system conveying the heated air into the basket and the condensing chamber, according to the invention, reference number 1 indicates the basket of the washing and drying machine; said basket is fastened to bearing 20, which in turn is screwed to rear hub 18; front hub is not shown in the figure for the sake of compactness; as the washing and drying machine provides for top loading the customary porthole on the front is not present.

Damp air is sucked from basket 2 and passes, through a filter 17, into small chamber 3, which is a part of condensing chamber.

Small chamber 3 is divided from small chamber 5 by means of a baffle 4, which extends for a good part of the condensing chamber (see fig. 3); baffle 4 forces the air to a U shaped path to pass into small chamber 5, wherefrom it is sucked into small chamber 6, where there is located a centrifugal fan, not shown in the figure and driven by the electric motor 8.

During the path between small chambers 3 and 5, damp air comes in contact with a water shower, coming from outlet 21; water drops have the function to speed up the condensation of the humidity which is present in small chambers 3 and 5; the condensed moisture is collected in 19 (see fig. 2), wherefrom flows later in the machine tank.

From small chamber 6 the dried air is forced

into a duct, made by two pieces 10 and 12; such a duct may also be made by only one piece as well as by many pieces, according to specific manufacturing or economic problems. Inside said duct the air in contact with electric heating resistors 13, which heat and dry it, and then arrives again into basket 1 through the hollow rear hub 18; entering the basket the air passes through a filter 16, similar to filter 17.

The main fixed part 10 of the duct may be made of zamak die-casting or the like, or out of metal sheet; besides resistors 13 are fastened to part 12; in this way also duct 10 heats up so contributing to air heating and drying.

The lid 12 of the duct is also made out of metal sheet or by die-casting, e.g. an aluminium alloy, and is fastened to fixed part 10 by means of small springs 11 and 14.

Filter 16, as well as filter 17, may be made out of metal sheet or plastic material, while for the sake of inexpensiveness and ease of manufacturing they may be obtained by means of 2 mm dia round holes or different shaped holes, made in such a number that the free area represents about the 35% of the total area (measured as if it were full).

In this way the air does not meet a great impediment for entering the basket; on the other hand the coupling between duct and hub is airtight, thanks to suitable sealing means, some of them being shown at 22, 23, 24, 25 and 26. In this way no flow reduction is met and the necessary fan power, results being equal, is much lower than in the known washing and drying machines.

It may be seen that air inlet in the basket, indicated by arrow 15, is perfectly central; as a consequence the effect on the laundry of the heated and dried air is optimized, in that the laundry, owing to basket motion, tends to open centrally shifting towards basket walls, leaving free entry for the air and lending to very good uniformity of drying.

As shown in fig. 1, the condensing chamber is for a great part made enblock with the tank of the machine; lid 7 with motor 8 is attached by means of small springs, one of them being shown at 9.

It may be seen that the fan, located inside chamber 6, being far from heating resistors 13, may be advantageously made out of plastic material, so greatly reducing manufacturing costs.

On the other hand resistors 13 are nearer, in respect of known machines, to the entry point of the heated air into the basket, so reducing the amount of heat which is lost by dispersion; indeed the distance between the resistors and the entry point is, in the machine according to the invention, less than 30 cm, in comparison of 60 cm in the known machines.

In figure 2, which shows a cross section, at

right angle to the previous one, expounding the condensing chamber of the machine according to the invention, the elements bear the same reference numbers as in fig. 1; reference number 19 indicates the moisture collecting sump, taking in account that the horizontal axis here is rotated clockwise of 30°.

Reference number 27 indicates the top opening of the tank, where through the laundry to be washed and dried is loaded.

In figure 3, which shows a third cross section of the condensing chamber of the machine according to the invention, there is clearly shown the effect of the separating baffle 4 on the air path, indicated by arrow 28.

Condensing walls are obtained respectively from a piece of the tank, wall 29, and an additional wall 30, preferably made out of rustless metal. Metal wall 30 has the purpose of promoting the condensing process, on both sides, because it dissipates the heat better.

The operation of the air drying and heating circuit in the described washing and drying machine comes out clearly from the given description and from the attached drawings.

Also clear are the characteristics of the described machine.

Clear too are the advantages of the washing and drying machine according to the invention. Particularly they are represented by:

- practically air tight circuit between the fan and the basket;
- reduced heat dispersion; better heating efficiency for laundry drying;
- absolutely central air inlet into basket, hence greater uniformity of effect on the laundry;
- easier and more comfortable loading of the laundry;
- condensing effect on the gap area of the metal wall.

It is clear that many variations to the machine described as an example are possible to the skilled in the art, without departing from the novelty principles inherent to the invention.

Among the possible variations there is the possibility to realize the damp air condensation through the contact between said air and a cold wall. In this sense the variation can be obtained realizing the wall 30 with an inner space wherein cold water is circulated. In this way the temperature of wall 30 is kept constantly cold so promoting the condensation and avoiding the water shower from outlet 21.

Claims

1. Washing and drying machine, comprising a

circuit for air circulation, means for heating said air, means for conveying the heated air into the laundry basket and a system for condensing the moisture extracted from the laundry, characterized in that the machine provides for a top loading system for the laundry.

2. Washing and drying machine, comprising a circuit for air circulation, means for heating said air, means for conveying the heated air into the laundry basket and a system for condensing the moisture extracted from the laundry, characterized in that said means for conveying the heated air into the laundry basket show airtight sealing characteristics so that the air circuit, from the sucking point to the basket entry is practically airtight.

3. Washing and drying machine, comprising a circuit for air circulation, means for heating said air, means for conveying the heated air into the laundry basket and a system for condensing the moisture extracted from the laundry, characterized in that said means for conveying the heated air into the laundry basket are realized in such a way that the air entry into the basket takes place through a hub (18) of the basket, which is axially hollow.

4. Washing and drying machine, comprising a circuit for air circulation, means for heating said air, means for conveying the heated air into the laundry basket and a system for condensing the moisture extracted from the laundry, characterized in that said system for condensing the moisture extracted from the laundry comprise a condensing chamber (3,4,5), at least a part of which is obtained enbloc with the washing tank (29) and has an additional wall (30) preferably made out of rustless metal.

5. Washing and drying machine, according to claim 3, characterized in that said means for conveying the heated air into the laundry basket comprise a duct (10, 12) connecting the small chamber (6) of the air circulating fan with the basket hub (18).

6. Washing and drying machine, according to claim 5, characterized in that said air circulating fan is preferably of the centrifugal type.

7. Washing and drying machine, according to claim 5, characterized in that said duct comprises a main part (10) made out of metal sheet or by die-casting, and a lid (12) attached to the main part, and airtight means (25) between said main part and said lid.

8. Washing and drying machine, according to claim 5, characterized in that said duct (10,12) is attached to said basket hub (18) by airtight means (22, 23, 24, 26).

9. Washing and drying machine, according to claim 3, characterized in that between said hollow hub (18) and the inside of the basket there is provided a filter (16) made out of a metal sheet or by casting a plastic material, with a plurality of

holes having a suitable shape.

10. Washing and drying machine, according to claim 9, characterized in that the empty/full ratio of this filter is greater than 0.3.

11. Washing and drying machine, according to claim 5, characterized in that said duct (10,12) comprises internally said heating means (13) for heating and drying the air.

12. Washing and drying machine, according to claim 11, characterized in that said heating means (13) are fastened at least to one of the internal walls (10,12) of the duct.

13. Washing and drying machine, according to claim 11, characterized in that said heating means comprise electric resistors (13).

14. Washing and drying machine, according to claim 11, characterized in that said heating means (13) are located at a distance from the air entry point (15) into the basket which is less than 40 cm.

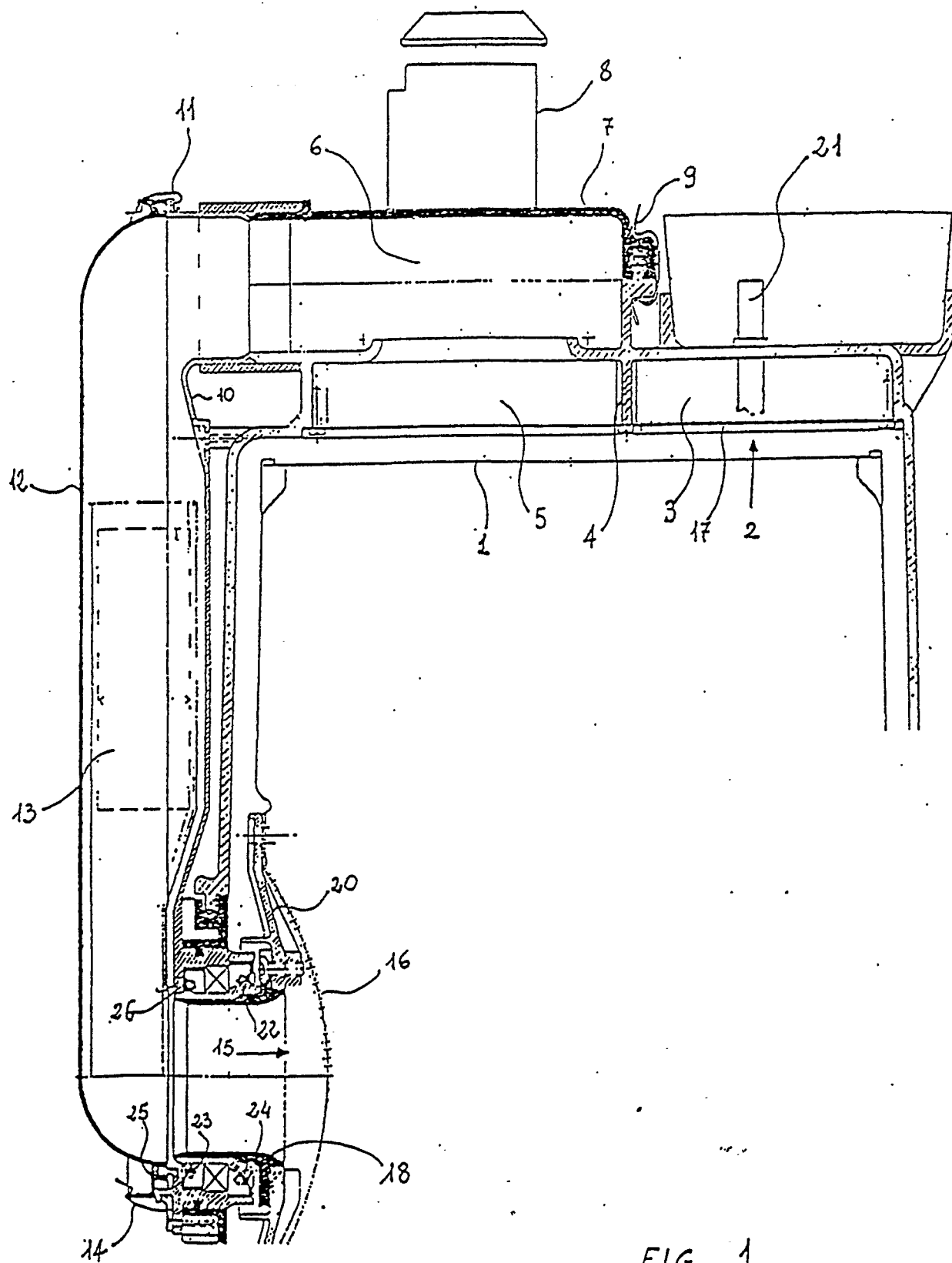
15. Washing and drying machine, according to claim 4, characterized in that said condensing chamber (3,4,5) comprises a separating baffle (4) which forces the air to increase its path inside the chamber.

16. Washing and drying machine, according to claim 4, characterized in that said condensing chamber (3,4,5) is associated to an air circulating fan.

17. Washing and drying machine, according to claim 16, characterized in that the air circulating fan is made out of plastic material.

18. Washing and drying machine, according to claim 4, characterized in that inside said condensing chamber (3,4,5) there is an outlet (21) hitting the damp air with a water shower, so speeding up the humidity condensation.

19. Washing and drying machine, according to claim 4, characterized in that said additional wall (30) of the condensing chamber (3,4,5) provides for a double wall with an internal space for the circulation of a refrigerating liquid, particularly water, in order to realize the condensation of the damp air.



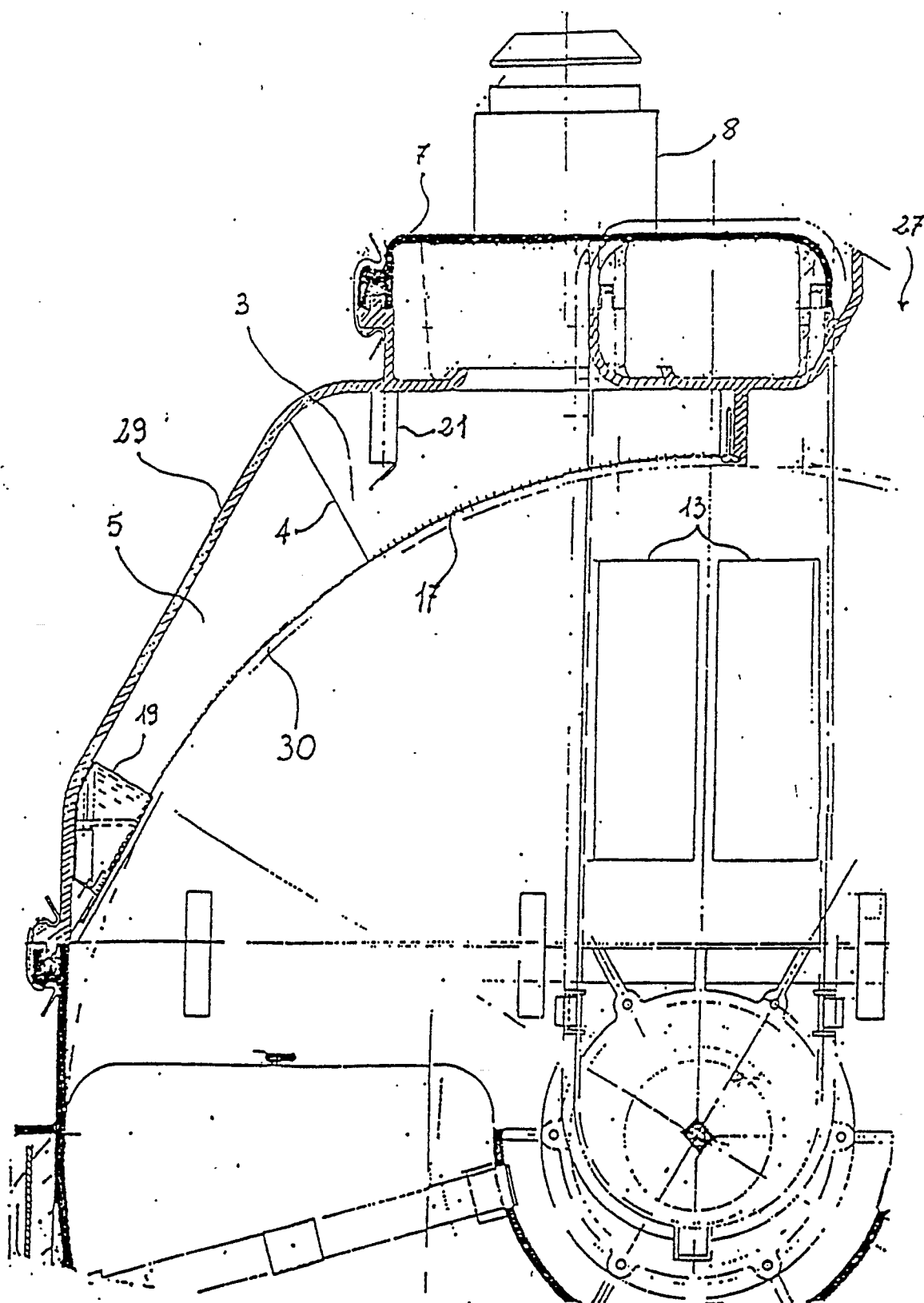
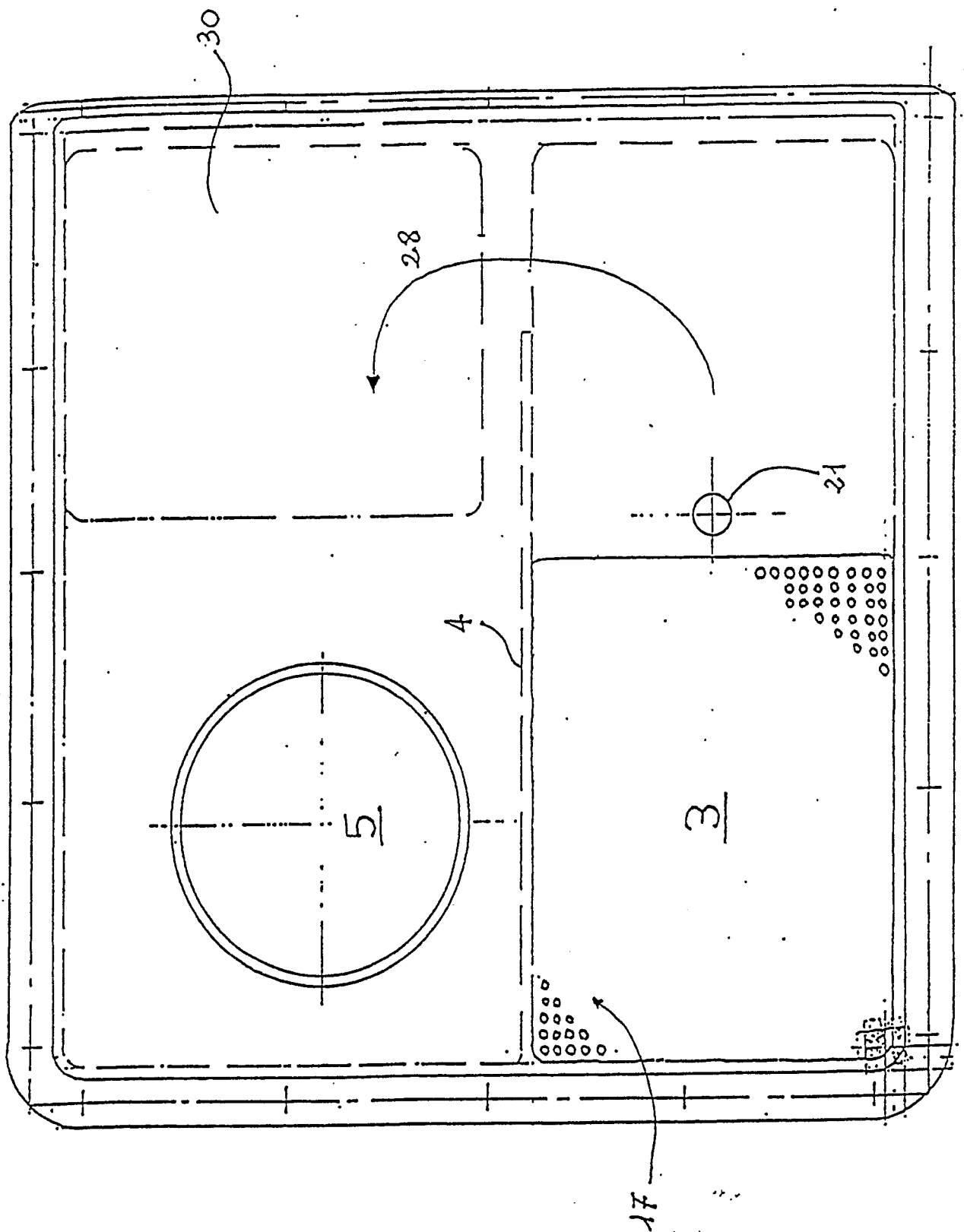


FIG. 2

FIG. 3





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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.5)
X	FR-A-2146643 (F. REVOY) * page 1, lines 1 - 2, 36 - 40 * * page 2, lines 41 - 51, 54 - 57, 71 - 73 * * claims 1-3; figure 1 *	1, 3	D06F58/02 D06F58/24 D06F25/00
A	---	2, 5-8, 11-14, 17	
X	DE-A-1410206 (SIEMENS-ELEKTROGERÄTE GMBH) * page 5, last paragraph - page 7, paragraph 2 * * figure 1 *	1, 3	
A	---	2, 4-19	
X	FR-A-1204186 (S. HEIEN) * page 1, right-hand column, paragraphs 6, 7 * * page 2, left-hand column, paragraphs 4 - 7 * * figures *	1, 3	
A	---	2, 4-19	
X	FR-A-2279878 (COMPAGNIE VENDOME) * page 1, lines 1-5 ; page 3, lines 10-31 * * page 4, lines 21-29 ; page 6, lines 2-33 * * figures *	1, 3	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	---	2, 4-19	D06F
P,X	WO-A-8902003 (MIELE & CIE GMBH & CO) * page 4, paragraph 3 - page 5, paragraph 3 * * page 5, paragraph 5 - page 6, paragraph 1 * * figure *	1	
A	---	2-19	
A	FR-A-2392161 (ITT INDUSTRIES INCORPORATED)		
A	DE-A-1610046 (SIEMENS-ELEKTROGERÄTE GMBH)		
A	DE-A-1610098 (SIEMENS-ELEKTROGERÄTE GMBH)		
A	EP-A-0252323 (INDUSTRIE ZANUSSI S.P.A.)		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 MAY 1990	Examiner BOURSEAU A.M.
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	