



(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**25.06.2003 Bulletin 2003/26**

(51) Int Cl.<sup>7</sup>: **D06F 21/04**, D06F 23/02,  
D06F 23/06

(21) Application number: **01830784.3**

(22) Date of filing: **20.12.2001**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE TR**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventor: **Fumagalli, Silvano**  
**20052 Monza (Milano) (IT)**

(74) Representative: **Siniscalco, Fabio et al**  
**Jacobacci & Partners S.p.A.**  
**Via Senato, 8**  
**20121 Milano (IT)**

(71) Applicant: **CANDY S.p.A.**  
**I-20052 Monza (Milano) (IT)**

(54) **Improved drum for clothes washing machine**

(57) A drum (12) for a tub (10) of a clothes washing machine comprises a side wall (121) with a surface that is basically a surface of revolution, and a tubular part (122) attached to the said side wall (121). The tubular

part (122) extends along a circumference of the wall (121) and has apertures (124) for collecting, during the rotation of the drum (12), the liquid from the bottom portion (55) of the tub (10), in order to release it over the clothes from the upper portion of the tub (10).

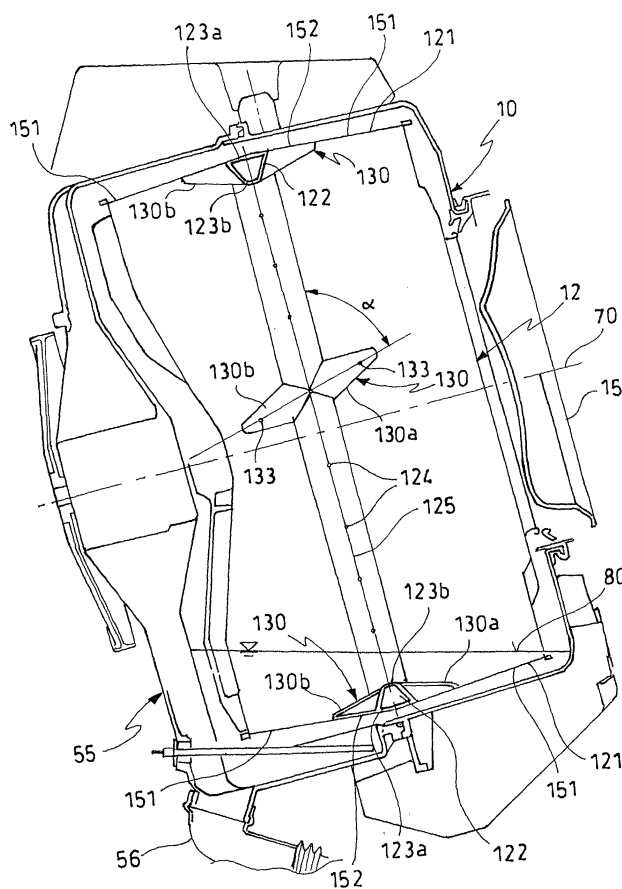


FIG.1

## Description

**[0001]** The present invention relates to a clothes washing machine drum of the type described in the preamble of Claim 1.

**[0002]** It is known that some conventional washing machines have a cylindrical drum whose axis of rotation is inclined with respect to the plane on which the machine is stood. By means of this inclination it is possible to produce a front-loading washing machine which is easier to load the clothes into. The inclination also means that there can be very good liquid levels in the drum without drawing more than a comparatively small amount of water from the water main, since the liquid collects mostly in the vicinity of the bottommost corner portion of the drum.

**[0003]** This configuration does not however wet the lower portion of the drum evenly because the front region immersed in the wash liquid is under a shallower depth of water than the rear region. For more even wetting of the clothes throughout the drum an auxiliary jet is required to recirculate the liquid and directly wet the load in the centre of the drum in the front area, whilst also wetting those regions which would not normally be the rotation of the drum.

**[0004]** There are known many different systems used in horizontal-axis washing machines that produce this kind of recirculating jet using driving blades arranged around the inside of the drum so as to lift up the load and a certain quantity of water. One system of this type is disclosed in Patent Application DE 40 01 422.

**[0005]** The abovementioned systems are not however capable of efficiently performing the abovementioned recirculation function, especially in the case of clothes washing machines on an inclined axis.

**[0006]** The object of the invention is therefore to provide a drum that optimizes the recirculation by raising as much liquid as possible and releasing it in those regions where the load would otherwise not be sufficiently wetted.

**[0007]** These and other objects are achieved with a clothes washing machine drum according to Claim 1.

**[0008]** There will now be described an illustrative and non-limiting embodiment of the invention, reference being made to the accompanying drawings in which:

Figure 1 is a partially sectioned schematic side view of a washing machine tub comprising a drum according to the present invention;

Figure 2 is an enlarged view in axial section of a detail of the drum shown in Fig. 1, when in a low position inside the tub during the rotation of the drum; and

Figure 3 is an enlarged view in axial section of the detail shown in Fig. 2 when in a raised position within the tub.

**[0009]** According to Fig. 1, a washing tub 10 is shown

inside a washing machine housing. The tub 10 houses a centrifugal drum 12 mounted rotatably on the rear portion of the tub 10, and is fitted with a closable door 15. A bottom portion 55 of the tub 10 is connected to an outlet pipe 56 which leads to a plumbing circuit of known type (not shown) used for supplying and removing liquid to and from the tub 10.

**[0010]** As can be seen, the axis of rotation 70 of the drum 12, and hence the tube 10 that surrounds this drum 12, have a given inclination, of for example  $15^\circ$ , with respect to the horizontal plane on which the clothes washing machine is stood. As a consequence, a liquid that fills the bottom 55 of the tub has a surface level 80 such that the depth of liquid inside the drum 12 at the front of the drum (nearest the door 15) is substantially less than in the rear portion (towards the left in Fig. 1).

**[0011]** The drum 12 according to the invention is basically cylindrical in shape and has an at least partly perforated side wall 121. The side wall 121 is essentially formed by one or more surfaces of revolution about the axis of rotation 70, for example two cylindrical or frusto-conical coaxial surfaces in contact with each other around the circumferences of their larger bases. This is to be understood as one possible, but not the only, embodiment of the invention since the side wall 121 could equally be curved or concave, such as to give the drum 12 the approximate shape of a barrel.

**[0012]** Around the contacting edges of the two frusto-conical surfaces, that is approximately halfway up the height of the side wall 121, and integral with it, is a tubular part 122 that runs around the circumference of the wall 121.

**[0013]** Advantageously, the tubular part 122 may form a closed annulus.

**[0014]** In accordance with one embodiment, the tubular part 122 is roughly triangular in radial cross section, having one side 123a in contact with the side wall 121, and a rounded vertex 123b radially directed towards the interior of the drum 12. The tubular part 122 contains a plurality of holes 124 separated more or less regularly from each other along a circular ridge 125 corresponding to the vertex 123b of the triangular section.

**[0015]** The tubular part 122 advantageously also comprises a plurality of receptacle parts 130 spaced apart more or less regularly from each other. These receptacle parts 130 are integral with the tubular part 122 and project to at least one side, but preferably to both sides, of the tubular part 122 in a direction preferably inclined with respect to the axis of rotation 70. The angle of inclination  $\alpha$  of the receptacle parts 130 with respect to the circumferential direction of the tubular part 122 is itself preferably other than  $90^\circ$ .

**[0016]** In accordance with the embodiment presented in Fig. 2, a receptacle part 130 is made up of two hollow shells 130a, 130b which are arranged and extend transversely in opposite directions from the tubular part 122. In shape they are somewhat like the tip of a spear (Fig. 1), with a concavity on the radially outward side with re-

spect to the axis 70. These shells 130a, 130b each have an edge portion 131a, 131b inclined in such a way that, when the receptacle part 130 is at the lowest possible position of the tub 10, the edge portion 131a of the axially forward shell 130a is approximately parallel to the surface level 80 of the liquid, and, when the receptacle part 130 is at the highest possible position of the tub 10, it is the edge portion 131b of the axially rearward shell 130b that is approximately parallel to the surface level 80.

**[0017]** The shells 130a, 130b, which act as liquid fill chambers, have an internal cavity in fluid communication with the interior of the tubular part 122 through communication apertures 122a formed for example in the latter's side walls, and with the exterior of the drum 12 through filling apertures 132 formed in the radially outer wall 134 of the shells 130a and 130b and in the wall 121 of the drum 12.

**[0018]** The filling apertures 132 are preferably spoon-shaped to assist the intake of liquid during rotation of the drum 12, and may be formed on the radially outer side 123a of the tubular part 122, as an alternative or as an addition to the apertures present in the shells 130a, 130b of the receptacle part 130. The inside of the shells 130a, 130b is also in fluid communication directly with the interior of the drum 12 through outlet holes 133 on the edge portions 131a, 131b. The total area of the filling apertures 132 is advantageously greater than that of the holes 124 and 133.

**[0019]** Figure 3 illustrates the relationship between the volumes of liquid present in the tubular part 122 and in the receptacle parts 130 at the top of the drum 12, that is during the phase of release of the liquid. The limited possibility of escape of the liquid from the tubular part compared with the volume of liquid supplied to it enables a comparatively high level of liquid to be maintained inside the tubular part and transported up to the top before being released completely.

**[0020]** The structure described above acts in such a way that, when the rotation of the drum 12 carries a receptacle part 130 below the surface level 80 of the liquid, the shells 130a, 130b are filled through the filling apertures 132. In the course of rotation, the liquid flows from these shells 130a, 130b into the tubular part 122. As one of the receptacle parts 130 nears the highest part of the tub assembly 10, the liquid tends to drain out of the holes 124 and 133 and rain down on the clothes.

**[0021]** As will be appreciated, this kind of arrangement of the tubular part 122 and receptacle parts 130 also results in an improved stirring of the clothes by giving them not only a circular motion but also an axial thrust towards the rear region of the drum where there is a greater depth of liquid. The length and slope of the shells 130a, 130b and their number may vary to suit the depth of the drum 12 and the characteristics of speed, rotation and revolution imparted to the load.

**[0022]** The tubular part 122 also creates a separation within the drum 12, creating two sectors separate from

each other in the axial direction, the lower of which collects the heavier items, while the higher sector permits washing of the lighter items, thus bringing about a differentiated washing action.

**[0023]** In the case of a tilted drum 12, the side wall 121 of the drum 12 preferably contains holes in the rear axial end region 151 and central region 152, that is in the lower regions immersed in the wash liquid. The forward axial end region 151, which is higher relative to the surface level 80 of the liquid, may advantageously have no holes in order to contain the liquid pushed there by centrifugal force.

**[0024]** As can be appreciated, although such an arrangement of the tubular part and receptacle parts is particularly advantageous when using tilted drums, it could equally well be used in a horizontal-axis drum.

**[0025]** Although only a few embodiments of the invention have been illustrated and described, it will be clear that numerous variants and modifications are possible within the scope of the same inventive concept.

## Claims

1. Drum (12) for a washing tub (10) of a clothes washing machine, comprising a partly perforated side wall (121) formed by a surface that is basically a surface of revolution,  
**characterized in that** it also comprises a basically tubular part (122) attached to the said side wall (121), in which the said tubular part (122) extends effectively along a circumference of the side wall (121) and has apertures (124) capable of collecting, during the rotation of the drum (12), the liquid from the bottom portion (55) of the tub (10), in order to release it over the clothes from the upper portion of the tub (10).
2. Drum (12) according to Claim 1, in which the tubular part (122) forms a closed annulus that extends along a basically central circumference of the side wall (121) and that projects radially into the drum (12).
3. Drum (12) according to Claim 1 or 2, in which the said tubular structure (122) comprises a plurality of receptacle parts (130) with concavities turned radially outwards from the drum (12) and capable of collecting, transporting and releasing an additional volume of liquid.
4. Drum (12) according to Claim 3, in which the said receptacle parts (130) are elongate in an approximately transverse direction with respect to the line of the tubular part (122).
5. Drum (12) according to Claim 4, in which the receptacle parts (130) are inclined with respect to the axis

of rotation (70) of the drum (12) in such a way as to present inclined surfaces capable of applying an axial force to the clothes.

6. Drum (12) according to either of Claims 4 and 5, in which the receptacle parts (130) include at least one edge portion (131a, 131b) which, when the said receptacle parts (130) are in the bottom portion (55) of the tub (10), is parallel to the surface level (80) of the said liquid. 5 10
7. Drum (12) according to any one of the preceding claims, in which the said receptacle parts (130) contain filling apertures (132) capable of collecting the liquid from the bottom portion (55) of the tub (10) and outlet apertures (133) capable of releasing the liquid into the drum (12). 15
8. Drum (12) according to either of Claims 6 and 7, in which the said receptacle parts (130) include communication apertures (122a) communicating with the interior of the tubular part (122) and capable of transferring the said liquid from the receptacle parts (130) into the tubular part (122). 20 25
9. Drum (12) according to Claim 7, in which the said filling apertures (132) are in radially more outward positions, and the said outlet apertures (133) are in radially more inward positions. 30
10. Drum according to Claim 7, in which the total area of the said filling apertures (132) is less than the total area of the said outlet apertures (133) and of the apertures (124) of the tubular part (122). 35
11. Drum (12) according to Claim 7, in which the said filling apertures (132) are spoon-shaped. 40
12. Drum (12) according to any one of the preceding claims, whose axis of rotation (70) is inclined with respect to the surface of the liquid (80) in such a way as to raise the front or loading portion of the drum (12). 45
13. Drum (12) according to Claim 12, in which, when the receptacle part (130) is at the bottom, a first edge portion (131a) thereof is parallel to the surface level (80) of the liquid, and, when the receptacle part (130) is up, its edge portion (131b) on the opposite side to the said first edge portion (131a) is parallel to the surface level (80) of the liquid. 50
14. Drum (12) according to Claim 12, in which the side wall (121) of the drum (12) has regions without apertures in the said front portion. 55
15. Drum (12) according to any one of the preceding claims, in which the said side wall (121) is basically

cylindrical.

16. Drum (12) according to any one of Claims 1 to 14, in which the said side wall (121) consists of two basically frustoconical portions joined around the circumferences of their larger bases.

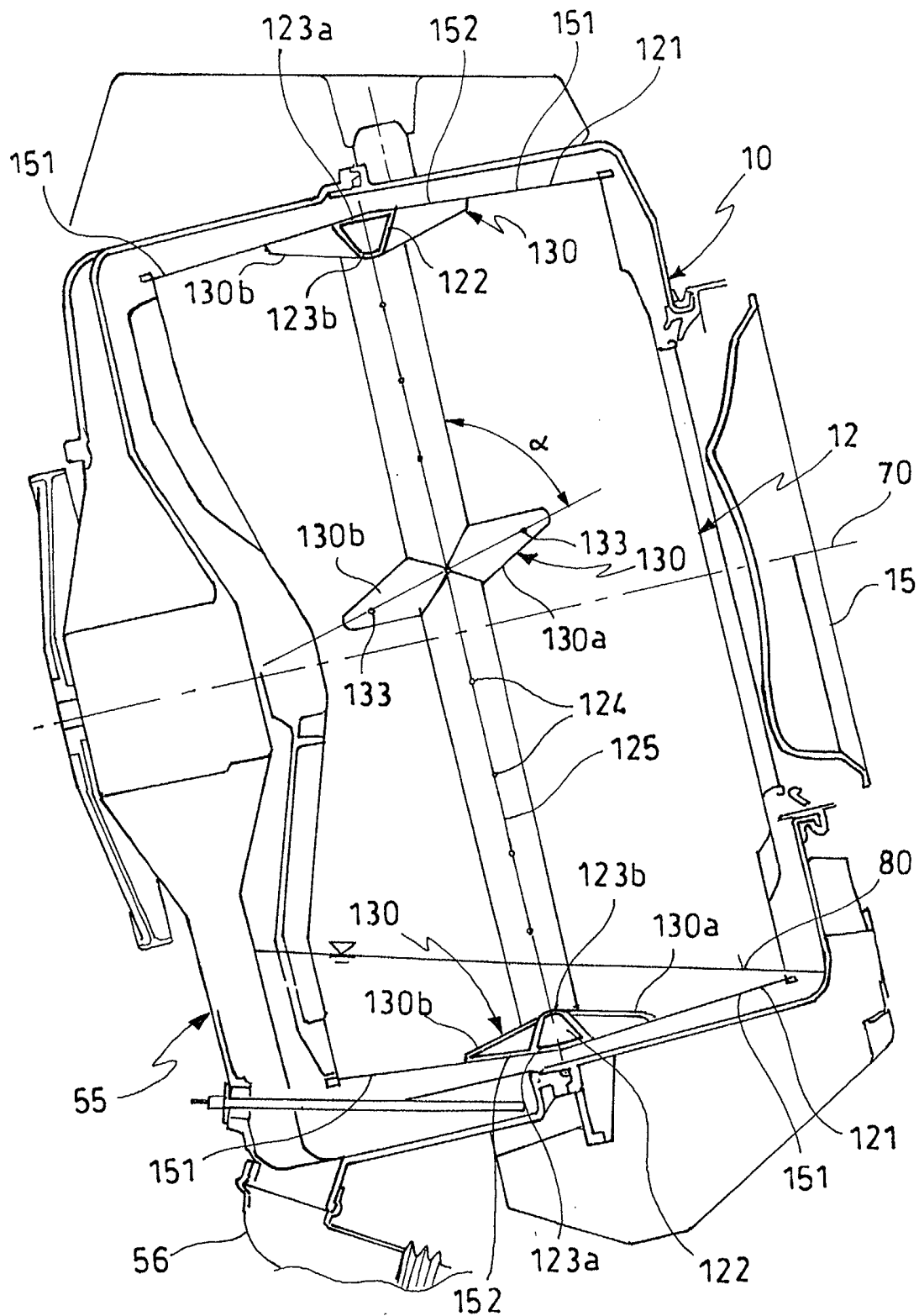
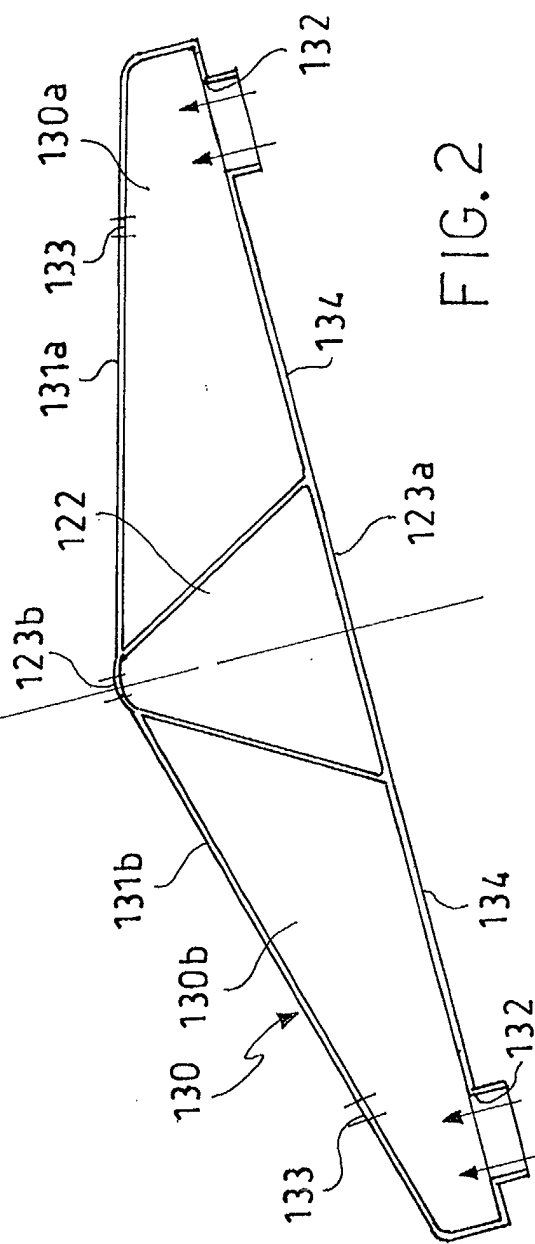
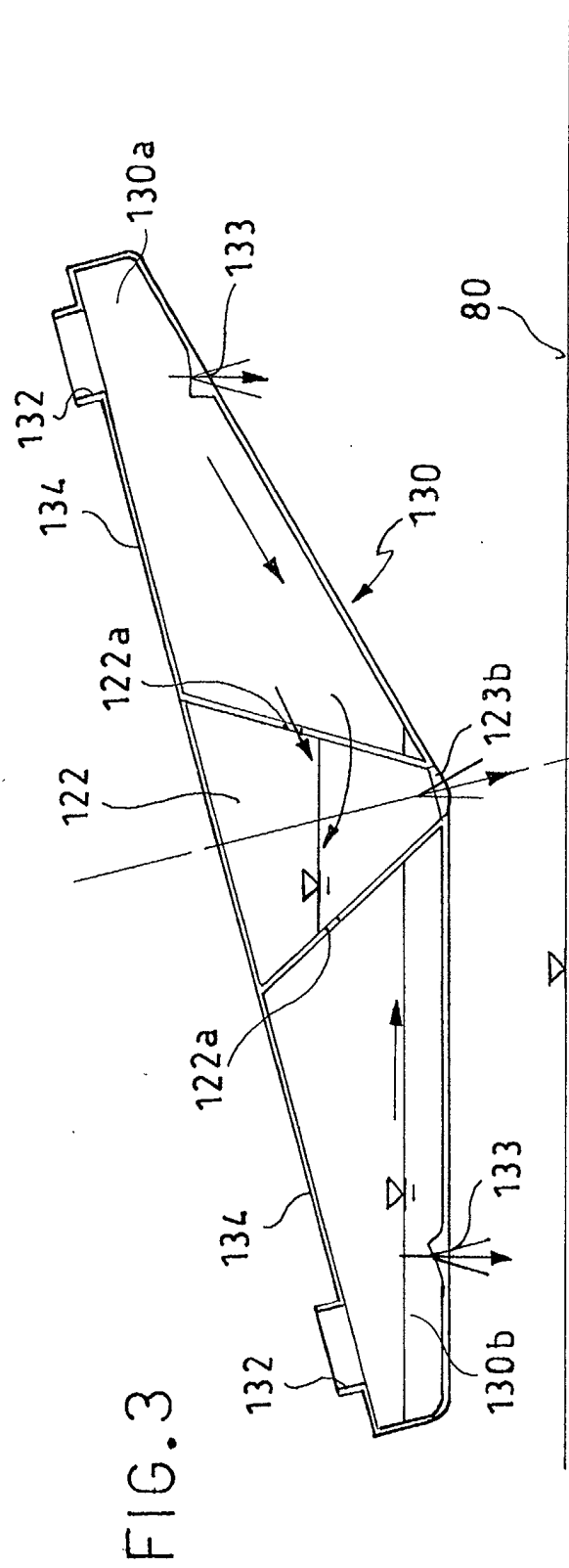


FIG.1





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 01 83 0784

| 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) |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | US 3 201 958 A (GEOFFREY SMITH)<br>24 August 1965 (1965-08-24)<br>* the whole document *                                       | 1, 3, 4                                                 | D06F21/04<br>D06F23/02<br>D06F23/06          |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | GB 2 268 939 A (ZANUSSI ELETTRODOMESTICI)<br>26 January 1994 (1994-01-26)<br>* the whole document *                            | 1, 2, 7                                                 |                                              |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DE 43 10 006 A (INST ANGEWANDTE FORSCHUNG GMBH ; STOLL MANFRED (DE))<br>28 October 1993 (1993-10-28)<br>* the whole document * | 1, 16                                                   |                                              |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FR 1 297 787 A (HOOVER LTD)<br>6 July 1962 (1962-07-06)<br>* the whole document *                                              | 1, 12                                                   |                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                |                                                         | TECHNICAL FIELDS SEARCHED (Int.Cl.7)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                |                                                         | D06F                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                |                                                         |                                              |
| Place of search<br><b>THE HAGUE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                | Date of completion of the search<br><b>11 June 2002</b> | Examiner<br><b>Norman, P</b>                 |
| <p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone<br/> Y : particularly relevant if combined with another document of the same category<br/> A : technological background<br/> O : non-written disclosure<br/> P : intermediate document</p> <p>T : theory or principle underlying the invention<br/> E : earlier patent document, but published on, or after the filing date<br/> D : document cited in the application<br/> L : document cited for other reasons<br/> &amp; : member of the same patent family, corresponding document</p> |                                                                                                                                |                                                         |                                              |

EPO FORM 1503 03/92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 83 0784

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-06-2002

| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) |             | Publication<br>date |
|-------------------------------------------|---|---------------------|----------------------------|-------------|---------------------|
| US 3201958                                | A | 24-08-1965          | GB                         | 1003199 A   | 02-09-1965          |
| GB 2268939                                | A | 26-01-1994          | IT                         | PN920026 U1 | 21-01-1994          |
|                                           |   |                     | DE                         | 9310938 U1  | 09-09-1993          |
|                                           |   |                     | ES                         | 1025271 U1  | 01-12-1993          |
|                                           |   |                     | FR                         | 2694026 A1  | 28-01-1994          |
| DE 4310006                                | A | 28-10-1993          | DE                         | 4310006 A1  | 28-10-1993          |
| FR 1297787                                | A | 06-07-1962          | NL                         | 264558 A    |                     |