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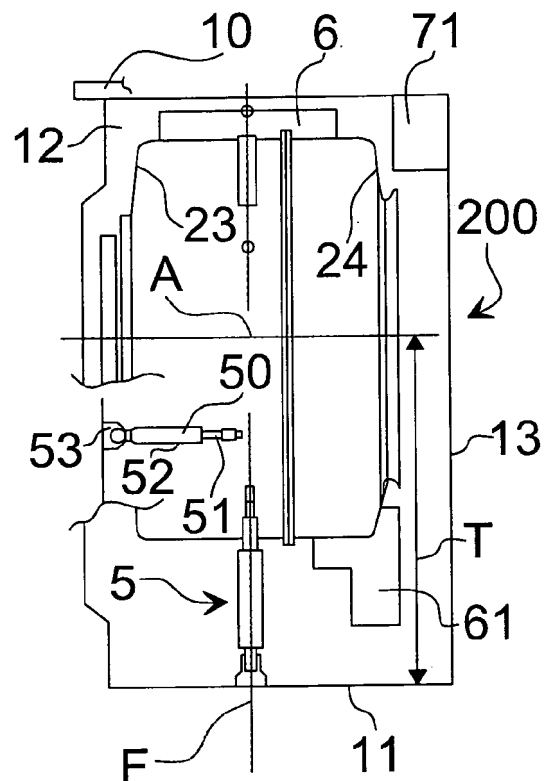
(72) Inventor: **Fumagalli, Silvano**  
**20900 Monza (MB) (IT)**

(74) Representative: **Mittler, Enrico et al**  
**Mittler & C. S.r.l.**  
**Viale Lombardia, 20**  
**20131 Milano (IT)**

(71) Applicant: **Candy S.p.A.**  
**20900 Monza (MB) (IT)**

(54) **Washing machine with improved damper apparatus**

(57) A washing machine is described, comprising a cabinet (1) where a washing tub (2) is accommodated, comprising a rotatable drum (3) for containing the laundry to be washed; the cabinet comprises a front wall (13) and a back wall (12), and the washing tub comprises a side-wall (25). The washing machine comprises a pair of dampers (50) anchored to the sidewall (25) of the washing tub and to the front (13) or back (12) wall of the cabinet.



**Fig.2**

## Description

**[0001]** The present invention relates to a washing machine with an improved damper apparatus.

**[0002]** Front or top loading washing machines are known, which are provided with a washing tub and dampers connected over and underneath the washing tub in order to damp the movements of the washing tub in the washing and centrifuge steps; the washing tubs are provided with counterweights, normally arranged below the washing tub, which help to reduce the axial shifting of the tub during the washing and centrifuge step of the drum within the washing tub.

**[0003]** The object of the present invention is to provide a washing machine with a damper apparatus which minimizes the axial shifting of the washing tub in the washing and centrifuge steps.

**[0004]** According to the present invention, said object is achieved by a washing machine comprising a cabinet where a washing tub is accommodated, comprising a rotatable drum for containing the laundry to be washed, said cabinet comprising a front wall and a back wall and said washing tub comprising a sidewall, **characterized in that** it comprises a pair of dampers anchored to the sidewall of the washing tub and to the front or back wall of the cabinet.

**[0005]** The features and advantages of the present invention will be more apparent from the following detailed description of a practical embodiment thereof, disclosed by way of non-limiting example with reference to the accompanying drawings, in which:

figure 1 shows a schematic front view of a front loading washing machine provided with a damper apparatus according to an embodiment of the present invention;

figure 2 shows a schematic side view of the washing machine in figure 1;

figure 3 shows a schematic top view of the washing machine in figure 1;

figures 4 and 5 show schematic views of a joint for the pair of dampers of the washing machine according to the present invention;

figure 6 shows a schematic view of a different type of joint for the pair of dampers of the washing machine according to the present invention;

figure 7 shows a schematic front view of a top loading washing machine provided with a damper apparatus according to a variation of the embodiment of the present invention;

figure 8 shows a schematic side view of the top loading washing machine in figure 7.

**[0006]** Figures 1-3 show a washing machine with a damper apparatus according to an embodiment of the present invention. The washing machine comprises a cabinet 1, where a washing device is accommodated, comprising a substantially cylindrical washing tub 2 of

the traditional type containing a drum 3 which is rotatable with respect to a rotation axis A; rotation axis A preferably coincides with the central symmetry axis of washing tub 2. The rotatable drum 3 is adapted to contain the laundry to be washed.

**[0007]** Tub 2 is elastically supported within cabinet 1 and is provided with all those devices to load and drain detergents and washing liquid, which belong to a traditional washing machine.

**[0008]** The washing machine also comprises counterweights 6 and 61 arranged over and underneath the washing tub 2, a motor 7 for moving drum 3 within the washing tub 2 and a zone 71 where the washing machine control devices, knobs, buttons, etc., are installed.

**[0009]** The washing machine comprises members 4, dampers or springs, anchored to the upper part 20 of the washing machine and to the top wall 10 of cabinet 1 and adapted to keep the washing tub 2 suspended within cabinet 1. The washing machine also comprises a pair of dampers 5 anchored to the bottom 11 of cabinet 1 and to the lower part 21 of the washing tub 2. Dampers 5 are preferably of the friction or hydraulic type and together with dampers or springs 4 they allow vibrations to be absorbed during the washing and/or centrifuge steps of the drum of the washing tub. Dampers 5 and dampers or springs 4 are preferably arranged along the suspension axis F.

**[0010]** Washing tub 2 is accommodated within cabinet 1 so that its base walls 23, 24 are opposite and preferably parallel to the back 12 and front 13 walls of cabinet 1, respectively; in the case of a front loading washing machine, front 13 and back 12 walls of cabinet 1 indicate the wall where the opening for loading the laundry to be washed is provided and the wall opposite thereto, respectively, while in the case of a top loading washing machine, they are the walls opposite to the base walls 23, 24 of the washing tub 2. Considering the front loading washing machine described in figures 1-3, the base walls 23, 24 are opposite and preferably parallel to the back 12 and front 13 walls of cabinet 1, and the circular sidewall 25 is opposite to sidewalls 14, 15 and to the top 10 and bottom 11 walls of cabinet 1.

**[0011]** The washing tub 2 together with rotatable drum 3 and motor 7 form a tub assembly 200 supported by springs 4 and dampers 5.

**[0012]** If the vibrations generated by the tub assembly 200 are transmitted to cabinet 1, they reduce the reliability of the washing machine and may generate an annoying noise.

**[0013]** According to the present invention, in order to minimize the vibrations transmitted by the tub assembly 200 and in particular the axial shifting of the washing tub 2 in the washing and centrifuge steps, the washing machine comprises a further pair of dampers 50 anchored to the circular sidewall 25 of the washing tub 2 and to the back 12 or front 13 wall of cabinet 1, preferably to the back wall 12 of cabinet 1.

**[0014]** The anchoring points of the dampers of said

pair of dampers 50 on sidewall 25 of the washing tub 2 are preferably arranged in a substantially symmetric manner with respect to the vertical plane B, in particular orthogonally to the bottom wall 11 of cabinet 1, passing through the central axis A of the washing tub, and their distance D1 is less than diameter D of the washing tub 2.

**[0015]** The distance D1 of the anchoring points of the dampers of said pair of dampers 50 on the sidewall 25 of the washing tub is preferably longer than distance D2 between the anchoring points of dampers 5 on sidewall 25 of the washing tub.

**[0016]** The anchoring points of the dampers of said pair of dampers 50 are preferably arranged at a first distance T1 from bottom 11 of cabinet 1 longer than the second distance T2 of the anchoring points of dampers 5 on the sidewall of the washing tub from bottom 11 of the cabinet and shorter than distance T between the central axis A and bottom 11 of cabinet 1. In this way, the size of cabinet 1 and of washing tub 2 does not need to be changed with respect to known washing machines.

**[0017]** Preferably, the anchoring points of dampers 50 on sidewall 25 of the washing tub 2 are at a certain distance F1 with respect to the suspension axis F passing through dampers 5 and springs or dampers 4.

**[0018]** The dampers of said pair of dampers 50 are preferably arranged substantially parallel to bottom 11 of cabinet 1 of the washing machine.

**[0019]** Dampers 50 preferably are of the friction or hydraulic type with a piston 51 sliding within a cylinder 52. Cylinder 52 is anchored to the back or front wall of cabinet 1 by means of a joint 53.

**[0020]** Joint 53 may be of the universal type and is connected to the front or back wall of cabinet 1 so that the cylinder may oscillate in horizontal direction (figure 4) or in vertical direction (figure 5). With the universal joint connected to the front or back wall of cabinet 1 as shown in figure 4, dampers 50 limit the oscillations of the tub assembly 200 in the vertical direction and may be considered as a system for correcting the oscillation of the tub assembly 200. With the universal joint connected to the front or back wall of cabinet 1 as shown in figure 5, dampers 50 limit the crosswise oscillations of the tub assembly 200 while promoting the oscillations thereof along the vertical direction.

**[0021]** As an alternative to the universal joint 53, dampers 50 are provided with a ball and socket joint 54 which allows the oscillations thereof in any direction (figure 6).

**[0022]** While the washing machine shown in figures 1-3 is of the front loading type, the washing machine according to a variation of the embodiment of the present invention may be of the top loading type, as shown in figures 7 and 8; in this case, dampers 50 are again anchored to sidewall 25 of the washing tub 2 and to the walls of cabinet 1, opposite to the base walls 23, 24 of the washing tub, but as only difference with respect to the washing machine in figures 1-3, the anchoring position of dampers 50 to sidewall 25 of the washing tub may preferably be arranged on axis F of the standard connec-

tion of the washing tub 2 with cabinet 1, i.e. substantially along the suspension axis F where the anchoring of dampers 5 occurs. The top loading washing machine in figures 7 and 8 also comprises counterweights 62, 63 different from counterweights 6, 61 of the front loading washing machine in figures 1-3.

## Claims

1. A washing machine comprising a cabinet (1) where a washing tub (2) is accommodated, comprising a rotatable drum (3) for containing the laundry to be washed, said cabinet comprising a front wall (13) and a back wall (12) and said washing tub comprising a sidewall (25), **characterized in that** it comprises a pair of dampers (50) anchored to the sidewall (25) of the washing tub and to the front (13) or back (12) wall of the cabinet.
2. A washing machine according to claim 1, **characterized in that** the anchoring points of the dampers (50) of said pair of dampers are symmetrically arranged with respect to the vertical plane (B) passing through the symmetry axis (A) of the washing tub and their distance (D1) is less than the diameter (D) of the washing tub.
3. A washing machine according to claim 2, **characterized in that** it comprises a further pair of dampers (5) anchored to the lower part (21) of the washing tub (2) and to the bottom (11) of the cabinet.
4. A washing machine according to claim 3, **characterized in that** the distance (D1) of the anchoring points of the dampers (50) of said pair of dampers on the sidewall of the washing tub is longer than the distance (D2) between the anchoring points of the dampers (5) of said further pair of dampers on the sidewall of the washing tub.
5. A washing machine according to claim 4, **characterized in that** the anchoring points of the dampers of said pair of dampers are arranged at a distance (T1) from the bottom (11) of the cabinet longer than the distance (T2) again from the bottom (11) of the cabinet at which the anchoring points of the dampers of said further pair of dampers on the sidewall of the washing tub are arranged, and shorter than the distance (T) of the symmetry axis (A) from the cabinet bottom.
6. A washing machine according to any one of the preceding claims, **characterized in that** the dampers (50) of said pair of dampers are arranged substantially parallel to the cabinet bottom.
7. A washing machine according to any one of the pre-

ceding claims, **characterized in that** the anchoring points of the dampers (50) of said pair of dampers are arranged substantially along the suspension axis (F) of the washing tub (2).

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8. A washing machine according to any one of the preceding claims, **characterized in that** the dampers of said pair of dampers are anchored to the back or front wall of the cabinet by means of universal joints (53).

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9. A washing machine according to claim 8, **characterized in that** said universal joints are adapted to allow a vertical oscillation of the dampers of said pair of dampers.

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10. A washing machine according to claim 8, **characterized in that** said universal joints are adapted to allow a horizontal oscillation of the dampers of said pair of dampers.

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11. A washing machine according to any one of claims 1 to 7, **characterized in that** the dampers of said pair of dampers are anchored to the back or front wall of the cabinet by means of ball and socket joints (54).

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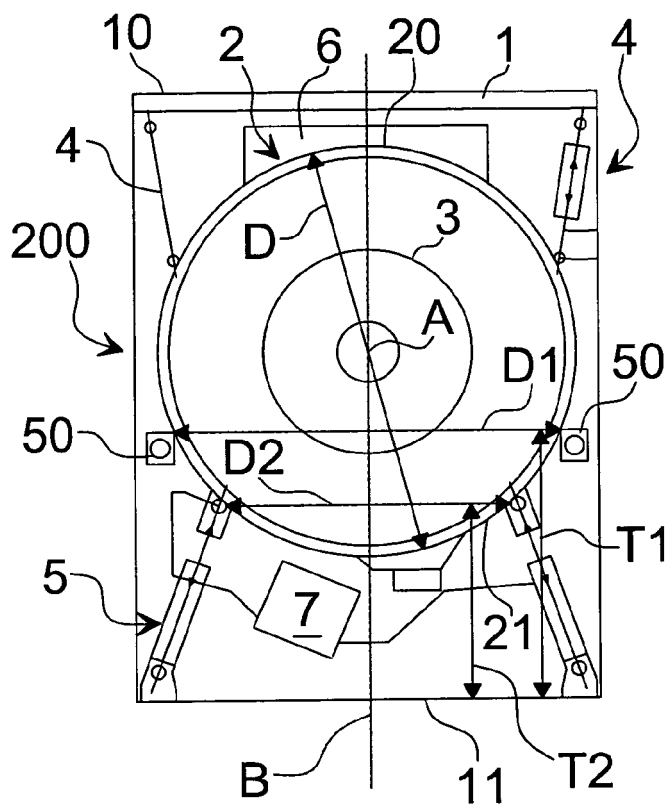


Fig.1

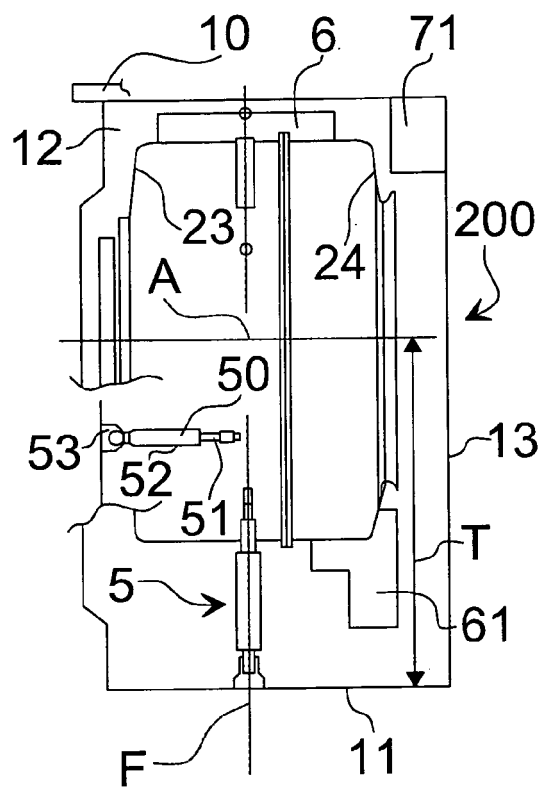


Fig.2

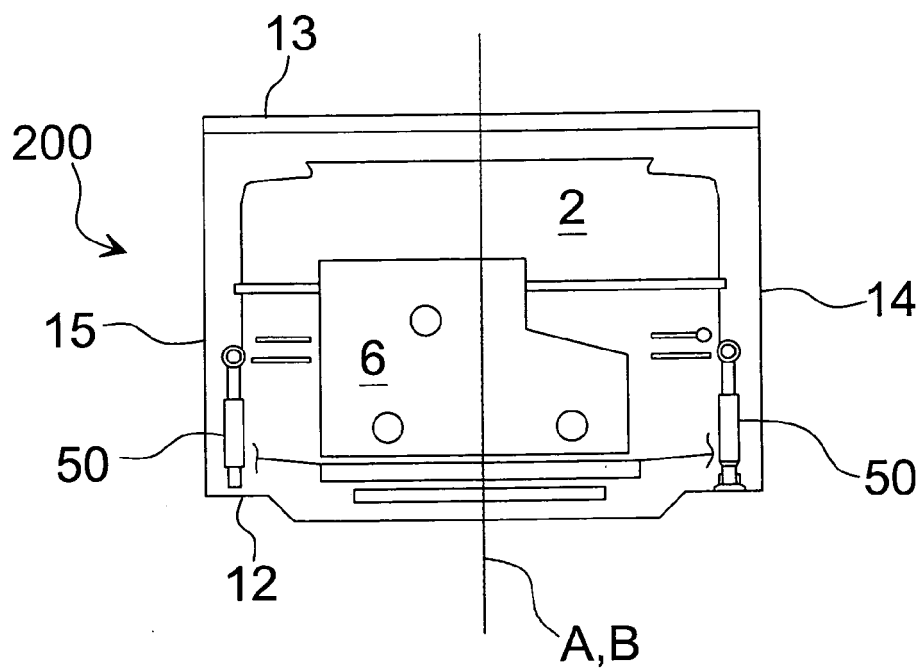


Fig.3

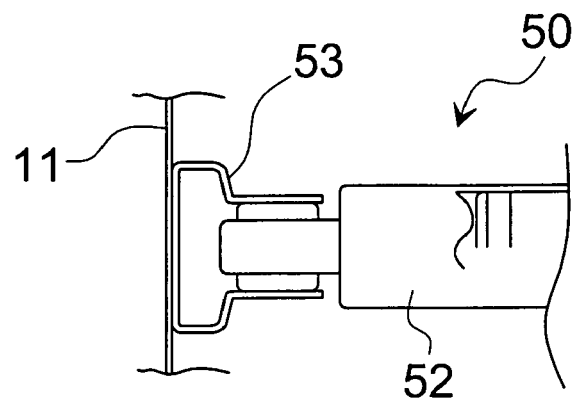


Fig.4

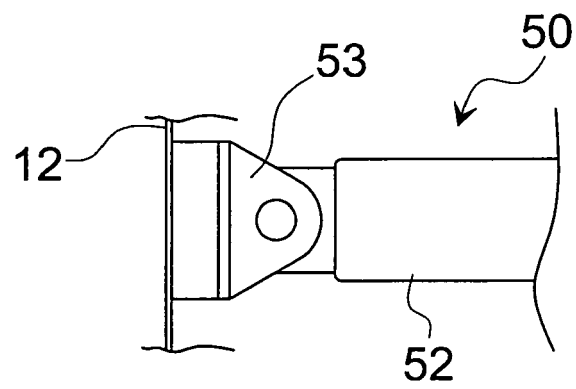


Fig.5

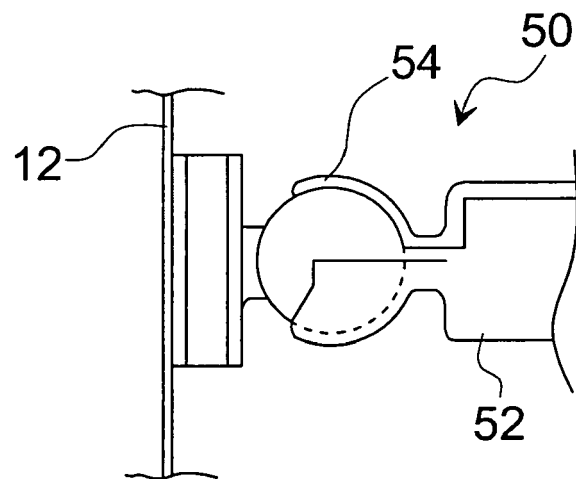


Fig.6

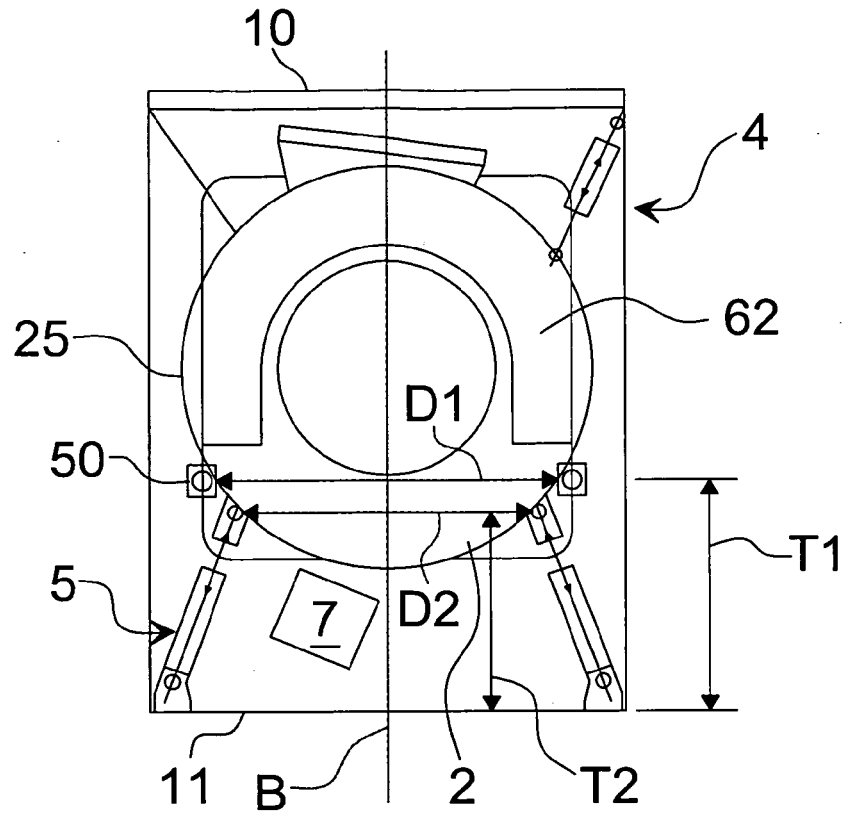


Fig.7

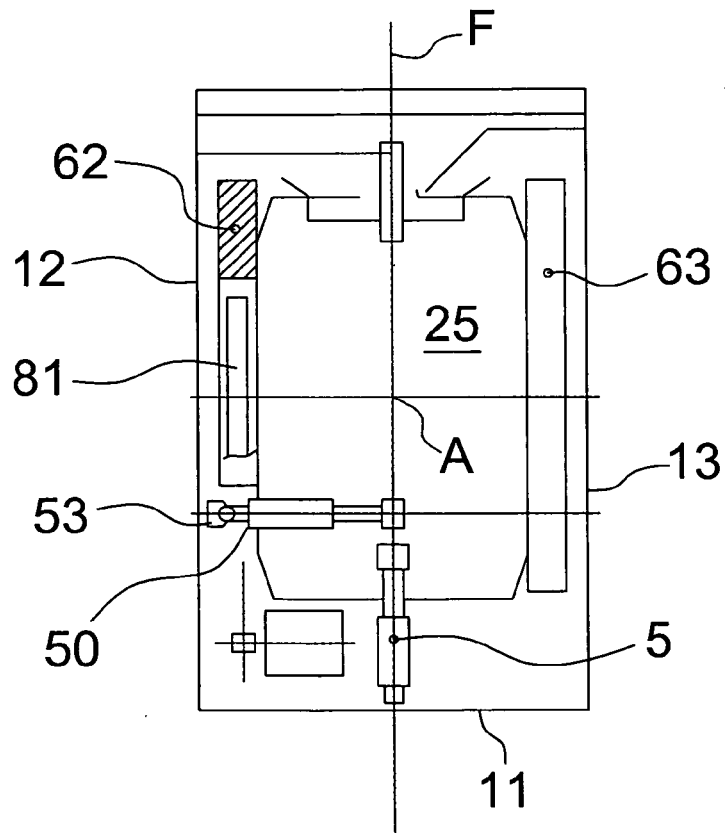


Fig.8



## EUROPEAN SEARCH REPORT

Application Number  
EP 12 42 5032

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                         |                                                  |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                           | Relevant to claim                                | CLASSIFICATION OF THE APPLICATION (IPC) |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 5 528 913 A (SAVKAR SUDHIR D [US])<br>25 June 1996 (1996-06-25)<br>* columns 3,4; figure 1 *         | 1                                                | INV.<br>D06F37/20<br>D06F37/26          |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 2011/041563 A1 (KIM YONG KWON [KR] ET AL)<br>24 February 2011 (2011-02-24)<br>* the whole document * | 1                                                |                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                         |                                                  | TECHNICAL FIELDS SEARCHED (IPC)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                         |                                                  | D06F                                    |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                         |                                                  |                                         |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                         | Date of completion of the search<br>23 July 2012 | Examiner<br>Stroppa, Giovanni           |
| <p>CATEGORY OF CITED DOCUMENTS</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> |                                                                                                         |                                                  |                                         |

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EPO FORM 1503 03.82 (P04C01)

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

EP 12 42 5032

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  
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23-07-2012

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