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• **Cacioppo, Sandro**

I-60044 Fabriano (AN) (IT)

• **Bongini, Dino**

I-06060 Passignano sul Trasimeno (PG) (IT)

• **Faraldi, Paolo**

I-18038 Sanremo (IM) (IT)

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(71) Applicant: **Indesit Company S.p.A.**

60044 Fabriano (AN) (IT)

(74) Representative: **Dini, Roberto**

Metroconsult S.r.l.

Via Sestriere 100

10060 None (TO) (IT)

(72) Inventors:

• **Trillini, Silvia**

I-60030 San Marcello (AN) (IT)

(54) **Laundry treating machine**

(57) A laundry treating machine (1), in particular a laundry washing machine, of the type comprising at least one oscillating assembly (2) which comprises at least one rotary drum (7) housed in a tub (8), wherein said oscillating assembly (2) rests on an elastic layer (5).

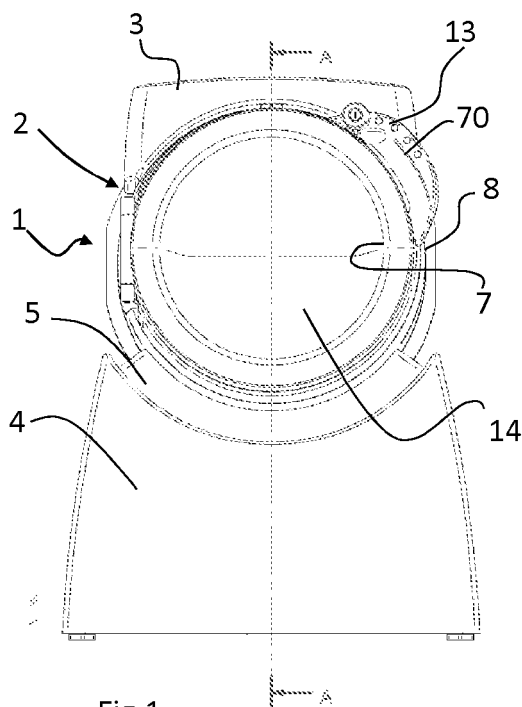


Fig.1

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Description

[0001] The present invention relates to a laundry treating machine according to the preamble of the first claim.

[0002] The term "laundry treating machine" will refer in this description and in the appended claims to a washing machine, a washing/drying machine or a clothes dryer.

[0003] Such machines are usually equipped with a rotary drum housed in a tub and driven by an electric motor.

[0004] The drum, the tub and other components, such as, for example, the electric motor, any pumps or the like, are typically parts of the oscillating assembly itself, the latter being that part of the machine which is suspended through elastic means from a frame, represented by the machine cabinet.

[0005] The elastic means are usually dampers adapted to damp the vibrations of the oscillating assembly during the various laundry treatment steps.

[0006] The cabinet of such known machines must therefore have certain strength characteristics to be able to act as a frame as well, i.e. to support the oscillating assembly: more in particular, the frame must be fitted with mounts for the dampers, feet for discharging the forces to the ground, and a sufficiently strong beam system capable of absorbing static and dynamic loads, and is therefore quite difficult to design and costly to manufacture.

[0007] Aiming at solving these problems, solutions have been conceived over the years wherein the machine cabinet does not act as a supporting frame.

[0008] One of these solutions has been described in Italian patent application IT2006TO00028 by the present Applicant.

[0009] In this case, the oscillating assembly is supported from below by four rigid support feet locally fastened to the tub in as many points, while the cabinet only acts as a cover for the functional parts.

[0010] In this case, however, the vibrations of the oscillating assembly are only absorbed by the elasticity of the material of the four rigid support feet, with unsatisfactory results in terms of noise reduction and vibration damping.

[0011] Another known and, to a certain extent, similar solution is the one disclosed in European patent application EP 1 462 562 by MERLONI ELETTRODOMESTICI SpA: in this case as well, the machine cabinet does not perform the structural function of supporting the oscillating assembly, which is supported by four damped support feet resting on the ground and comprising elastic elements to absorb the vibrations; again, the tub rests on the damping feet only at the points of contact therebetween.

[0012] In both of these solutions the tub also acts as a frame, and must therefore be designed appropriately; for example, it must be made of metal or thick plastic and feature suitable reinforcement ribs, especially at the mounting points of the support feet.

[0013] Moreover, discharging the vibrations onto four localised points of the tub implies not only considerable stresses in those points, but also the risk (especially when the support feet are independent and damped) of generating oscillations which may cause undesirable movements of the oscillating assembly: in fact, each damped support foot will be affected by the others and will compress and extend differently due to the stresses undergone in operation and the effect that each foot has onto the others.

[0014] The object of the present invention is to provide a laundry treating machine which can overcome this and other drawbacks.

[0015] The present invention relates to a laundry treating machine according to claim 1.

[0016] The idea at the basis of the present invention is to provide a washing machine comprising a base resting on the ground and an oscillating assembly which comprises at least one rotary drum housed in a tub, wherein between the oscillating assembly and the base there is at least one layer of elastic material.

[0017] This overcomes the drawbacks of prior-art solutions: in fact, the load of the oscillating assembly is distributed evenly onto the elastic layer.

[0018] The presence of the elastic layer also provides further advantages: the damped support feet of the above-discussed known solution, in fact, can only be used for damping vibrations along the same axis as their elastic element (typically a spring that compresses and extends in one direction when stressed), and therefore in a vertical plane only. Any vibrations in different planes are not absorbed in a satisfactory way by the damped support feet, and cause the machine to produce operating noise.

[0019] The layer of elastic material according to the present invention, on the contrary, can also absorb vibrations propagating in planes other than the vertical one, resulting in noise reduction.

[0020] Further advantageous features will be set out in the appended claims, which are intended as an integral part of the present text.

[0021] These features as well as further advantages of the present invention will become apparent from the following description of an embodiment thereof as shown in the annexed drawings, which are supplied by way of non-limiting example, wherein:

Fig. 1 shows a front view of a laundry treating machine according to the present invention;

Fig. 2 is a side view of the machine of Fig. 1;

Fig. 3 is a sectional view along the plane AA of Fig. 1;

Fig. 4 is a sectional view along the plane BB of Fig. 2;

Fig. 5 is an exploded view of the machine of Fig. 1;

Fig. 6 is a rear view of a part of the machine of Fig. 1.

[0022] Referring now to Figs. 1, 2 and 5, there is shown a preferred embodiment of a laundry treating machine 1 according to the present invention.

[0023] More specifically, the machine 1 is a laundry washing machine.

[0024] It comprises an oscillating assembly 2 which in turn comprises a rotary drum 7 and a tub 8 internally housing said drum 7.

[0025] Above the oscillating assembly 2, and secured thereto, there is a counterweight 3 that partially embraces the tub and rests thereon, secured through one or more screws or bolts or welded to the tub, e.g. through a vibration welding process as described in patent application W02007/101781.

[0026] The counterweight 3 therefore can move integrally with the oscillating assembly 2; in general, it must be pointed out right away that the counterweight 3 is optional.

[0027] Under the oscillating assembly 2 and in contact therewith there is an elastic layer 5; the oscillating assembly 2 rests on the elastic layer 5; in the preferred embodiment shown herein, the oscillating assembly 2 is fully supported by the layer 5 and has no other supports.

[0028] The elastic layer 5 rests on a base 4 laid on the ground, thus being wholly interposed between the tub 8 and the base 4.

[0029] Connection means may then be provided for connecting the oscillating assembly to the elastic layer and/or the elastic layer 5 to the base 4; for example, such means may comprise glue, joints or the like.

[0030] The oscillating assembly 2 (and therefore also the counterweight 3) is held in position by retaining means which allow it to move relative to the base 4.

[0031] In this embodiment, as shown in Fig. 6, the oscillating assembly 2 further comprises the electric motor 10 that drives the drum 7, the water drain pump 11 and, more in general, all those functional parts of the machine 1, including a control board 13 which may be secured directly to the tub 8.

[0032] Alternatively, as shown in Fig. 5, the control board 13 may be applied to the door 14, in particular to the handle 70 that opens the door 14, said handle 70 being advantageously raised with respect to the horizontal centre line of the door 14 to improve the ergonomics of the machine 1.

[0033] The functional components shown in Fig. 6 are advantageously protected from shocks or damage by a cover 80 applied onto the oscillating assembly 2, in particular onto the rear portion thereof (opposite to the door 14).

[0034] In the machine 1 of the example shown herein, in fact, the tub 8 is not covered by any cabinet, and therefore remains visible to the user and is also used as a support for the control board 13.

[0035] It should be noted in this regard that in this configuration the door 14 that closes the access opening for the drum 7, shown in Fig. 5, is hinged directly to the tub 8.

[0036] It must be pointed out that in principle the elastic layer 5 may be adopted in washing machines of any kind, even those having a cabinet that covers the oscillating assembly, without however departing from the teachings

of the present invention.

[0037] Nonetheless, the machine shown in the annexed drawings by way of non-limiting example represents an extremely advantageous setup with a view of obtaining laundry treating machines, in particular washing machines, which are economical and simple to manufacture.

[0038] In fact, the machines so made can advantageously do without a covering cabinet, resulting in lower costs and simpler production and assembly processes; in addition, the use of the elastic layer 5 as a substitute for the dampers provides a cost reduction without jeopardising the quiet and proper operation of the machine.

[0039] In the non-limiting example illustrated herein, the axis of rotation XX of the drum 7 shown in Fig. 3 is not horizontal, but slightly inclined, so as to facilitate the access to the drum; this position of the axis of rotation XX must not however be considered as limiting, in that it may alternatively be horizontal or vertical without any substantial variations.

[0040] Referring now to the elastic layer 5, its position is clearly shown in Figs. 3 and 4, whereas one possible embodiment thereof is visible in Fig. 5.

[0041] In substance, the elastic layer 5 acts as a support for the oscillating assembly 2 and, more in particular, for the tub 8, which is in direct contact therewith.

[0042] The support surface of the tub 8 on the layer 5 is therefore distributed and not localized (as is the case of prior-art support feet, the support surface of which may even be defined as punctual), thus improving the distribution of the various loads and weights, which in this case do not compel the manufacturer to provide the tub 8 with specific reinforcements in the form of ribs or the like because the contact surface between the tub 8 and the layer 5 is relatively large and the forces involved can be distributed evenly. In addition to the above-mentioned beneficial effects, the distributed support surface provided by the elastic layer 5 also ensures further advantages.

[0043] In the first place, it is important to underline that vibrations that propagate also in planes other than the vertical one are effectively absorbed by the elastic layer 5.

[0044] It should be noted that the tub 8 has a substantially cylindrical outer shape and the base 4 has a concave cylinder-shaped seat 15 having a diameter which is greater than the outer diameter of the tub 8.

[0045] Between the two there is thus room for housing the elastic layer 5, which layer is for this purpose designed like an elastic carpet (or mattress) and is curved in a manner such as to follow both the outer profile of the tub 8 and that of the concave seat 15 of the base 4.

[0046] As can be seen in Figs. 3 and 4, the elastic layer 5 extends under the tub at the front (near the door 14) and at the sides thereof, along the directrices of the tub 8 and substantially for the entire length thereof, so as to appear substantially C-shaped when viewed from above, with a front portion 51 and two side portions 52 and 53.

[0047] The reason for such a shape of the elastic layer 5 is primarily to be found in the fact that the electric motor

10, the pump 11 and other functional units of the machine 1 are fastened to the lower central area of the tub 8, so that they remain suspended from the tub 8 without touching the base 4, which for this purpose includes a housing recess 16 that opens into the concave seat 15 in a substantially central position relative to the vertical plane of symmetry of the drum 7.

[0048] Of course, although in the annexed drawings the elastic layer 5 is shown as one piece, it may alternatively be subdivided into a number of parts, even separate from one another, without however departing from the scope and teachings of the present invention.

[0049] As far as the material of the elastic layer 5 is concerned, any elastic material may be used, whether natural or synthetic, which proves to be suited to absorbing the vibrations generated when the machine is in operation, while at the same time ensuring a firm support for the oscillating assembly.

[0050] More specifically, some particularly suitable materials are polymeric materials like rubbers based on closed-cell ethylene-propylene synthetic caoutchouc, also called closed-cell EPDM, or foam polypropylene, also known as PPE, or closed-cell foam rubbers, or closed-cell foam polystyrene.

[0051] The internal friction of said materials of the elastic layer 5 dissipates the stresses generated in the oscillating assembly 2, in particular when the drum is operating at high speed, e.g. during the spin cycle.

[0052] The ideal thickness of the layer 5 may vary between 30 mm and 50 mm, and is preferably 40 mm.

[0053] The carpet-like or mattress-like elastic layer 5 may be manufactured, in general, by moulding it into either a curved or flat shape; in this latter case, the elastic layer will then be bent by the weight of the oscillating assembly 2.

[0054] As can be seen in Figs. 3 and 4, the elastic layer 5, once it has been positioned between the tub 8 and the base 4, arranges itself therebetween in a manner such as to support the tub 8 at the sides and front thereof.

[0055] More specifically, it can be noted in Fig. 4 that, with respect to the axis of rotation of the drum 7, both side portions 52 and 53 of the layer 5 are arranged at about 60° along the outer perimeter of the tub 8, thus supporting the latter firmly.

[0056] As regards the base 4, it is typically made of hard plastic materials, and in the machine 1 illustrated and described herein it is the only fixed part of the machine 1: in fact, it is the only part resting directly on the ground, since all the other parts of the machine 1 (oscillating assembly 2, counterweight 3, door 14, control board 13, motor 10, pump 11 and more in general anything being a functional part of the machine 1) rest on the ground through the interposed elastic layer 5.

[0057] Many changes may of course be made by those skilled in the art without however departing from the scope and teachings of the present invention.

[0058] For example, the layer 5 may in principle have different shapes or be made of different materials, or be

applied to a traditional machine equipped with a cabinet.

[0059] The elastic layer 5 may also be used in combination with normal dampers of a traditional machine, e.g. in order to reduce the operating noise, although this will reduce the cost advantages.

[0060] Also, the base 4 may have different shapes not partially embracing the tub 8, unlike the example shown in the annexed drawings.

[0061] Furthermore, the base 4 may be made of elastic material or the elastic layer 5 may be advantageously shaped in a manner such that it also acts as a base, extending downwards to touch the ground; of course, in this case the man skilled in the art will have to employ different thicknesses and shapes for the elastic layer 5: for example, for this purpose the latter may have an annular or substantially toroidal shape on which the oscillating assembly 2 is laid; moreover, in this latter case the lower support portion is preferably flat, so as to ensure a firm support on the floor or on the ground.

[0062] Finally, aiming at simplifying the method of manufacturing the machine 1, it is conceivable that the elastic layer 5 is co-moulded onto the tub 8 or onto the base 4 (if the latter is sufficiently rigid).

Claims

1. A laundry treating machine (1), in particular a laundry washing machine, of the type comprising at least one oscillating assembly (2) which comprises at least one rotary drum (7) housed in a tub (8),
characterised in that
said oscillating assembly (2) rests on an elastic layer (5).
2. Machine (1) according to claim 1, further comprising a base (4) which can be laid on the ground, and wherein said elastic layer (5) is interposed between said oscillating assembly (2) and said base (4).
3. Machine (1) according to claim 1 or 2, wherein said oscillating assembly (2) is completely supported by the elastic layer (5).
4. Machine (1) according to claim 1 or 2 or 3, wherein said elastic layer (5) is wholly interposed between said tub (8) and said base (4), so as to provide a distributed support surface for said tub (8).
5. Machine (1) according to one or more of claims 1 to 4, wherein said machine (1) further comprises retaining means for holding said oscillating assembly (2) in position relative to said base (4), said retaining means being adapted to allow at least one relative movement of said oscillating assembly (2) with respect to said base (4).
6. Machine (1) according to one or more of claims 1 to

4, wherein said elastic layer (5) is made of a polymeric material, in particular of rubbers based on closed-cell ethylene-propylene synthetic caoutchouc, or foam polypropylene (PPE), or closed-cell foam rubbers.

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7. Machine (1) according to one or more of claims 1 to 6, wherein said tub (8) has a substantially cylindrical outer shape and the base (4) has a concave cylinder-shaped seat (15) having a diameter which is greater than the outer diameter of said tub (8), the elastic layer (5) being interposed between the two and being curved in a manner such as to follow both the outer profile of the tub (8) and that of said concave seat (15) of the base (4).
8. Machine (1) according to claim 7, wherein said elastic layer (5) extends at least under the tub at the front and sides thereof, along the directrices of said tub (8) and substantially for the entire length thereof.
9. Machine (1) according to one or more of claims 1 to 8, wherein said tub (8) is accessible and visible from the outside, said machine (1) having no cabinet covering the tub (8), wherein a door (14) is hinged to said tub (8) for preventing access to the drum (7), and wherein said tub (8) supports at least one of a control board (13) for controlling the operation of said machine (1), an electric motor (10) for driving the drum (7), a water pump (11), or similar functional parts of the machine (1).
10. Machine (1) according to claim 1, wherein said elastic layer (5) can be laid directly on the ground.

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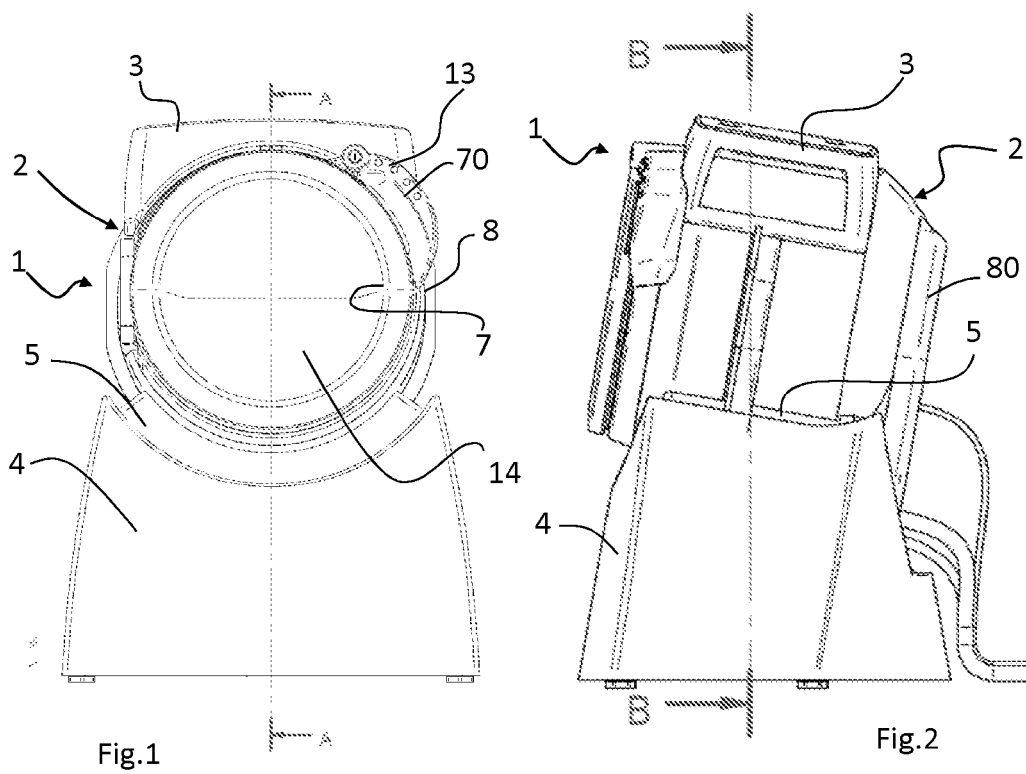
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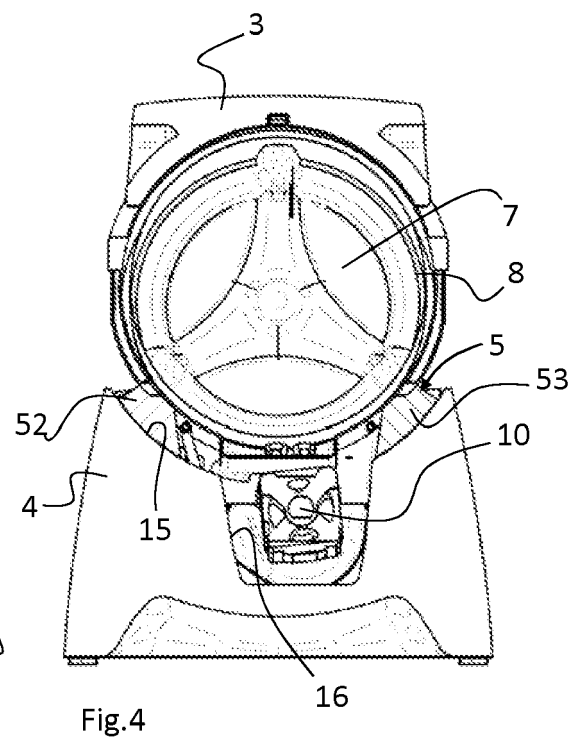
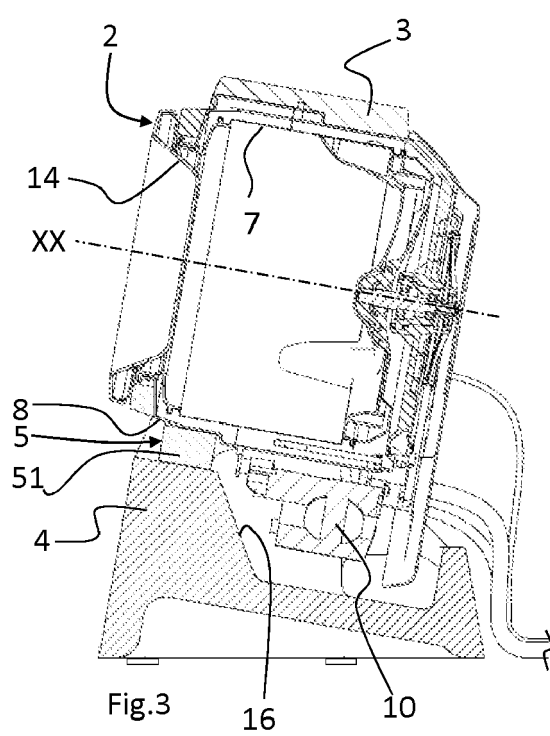
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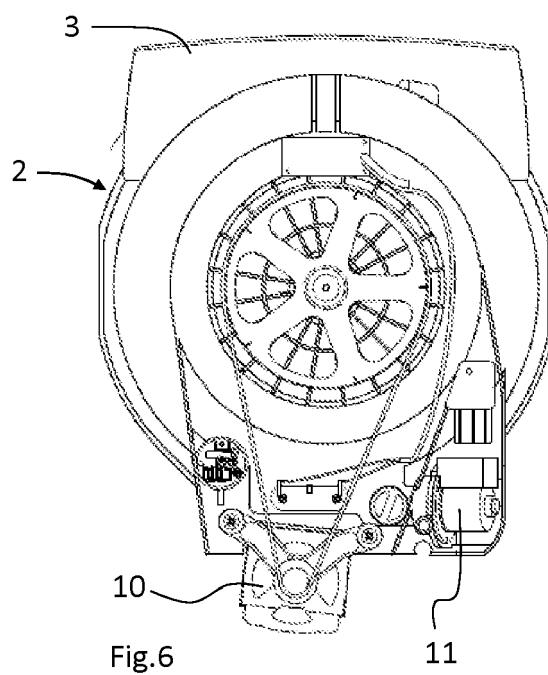
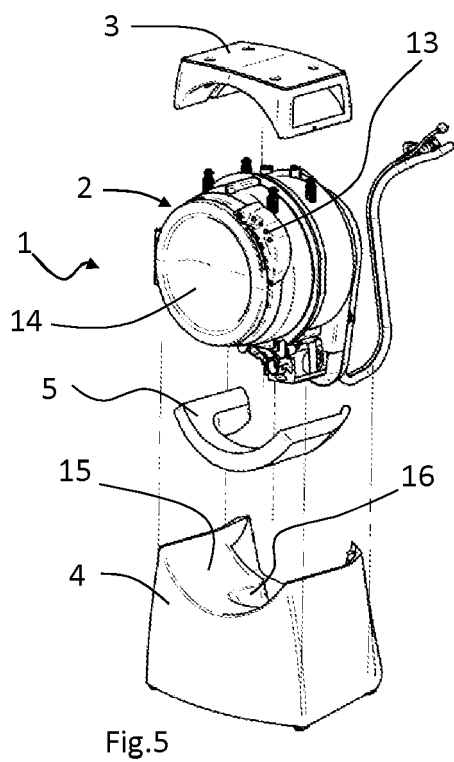
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EUROPEAN SEARCH REPORT

Application Number
EP 11 15 2867

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 1 380 305 A (VERGER) 27 November 1964 (1964-11-27) * column 2, line 24 - column 3, line 29 * -----	1-3,5	INV. D06F37/20
X	US 5 934 107 A (LEE MIN-SOO [KR] ET AL) 10 August 1999 (1999-08-10) * column 5, lines 5-16; figure 1 * -----	1-3,5,6, 10	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 May 2011	Examiner Stroppa, Giovanni
CATEGORY OF CITED DOCUMENTS		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	
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			

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

EP 11 15 2867

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The members are as contained in the European Patent Office EDP file on
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25-05-2011

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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