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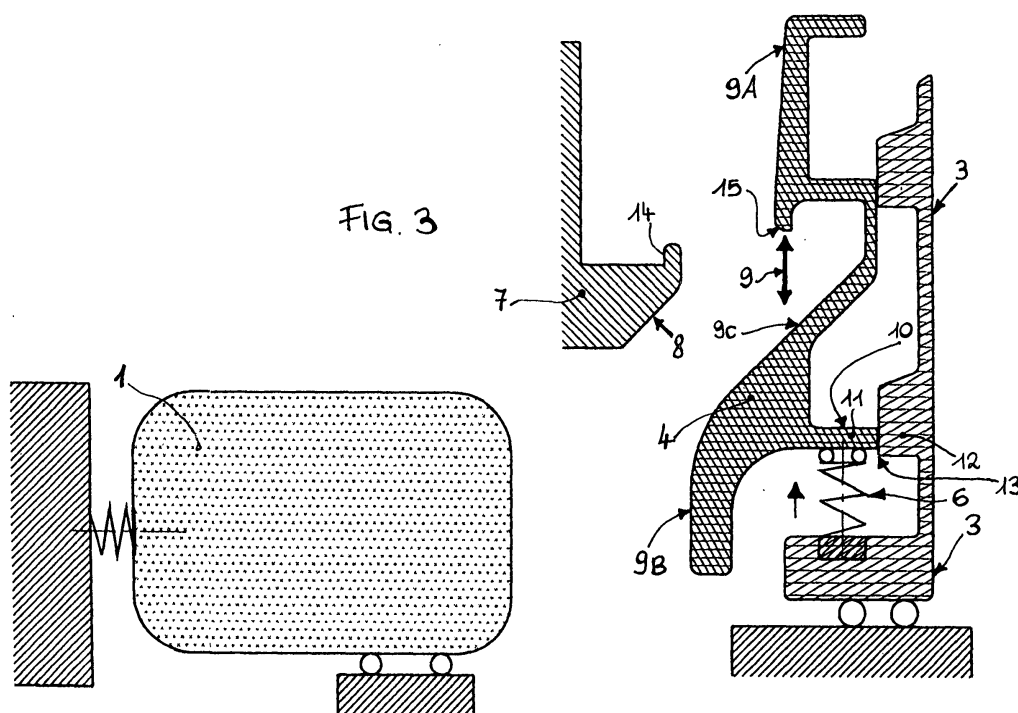
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(54) **Condenser-type household clothes drying machine with safety coupling of the condensation water collecting canister**

(57) Household-type clothes drying machine comprising a rotating drum holding the clothes to be dried, means adapted to circulate a flow of hot drying air through said drum, means adapted to condense the moisture contained in said drying air, a pull-out container (1) adapted to collect and contain the water resulting from said preceding condensation of the moisture contained in the drying air, a lid (3) capable of being opened from outside and adapted to enable access to be gained

to said pull-out container, in which said lid is provided with a pressure member (4) adapted to push said container inwardly as said lid moves into closing; said pressure member is applied on the inner face of said lid and is adapted to rotate relative to said lid with the aid of a pin means (5) secured to said lid; between said pressure member and said inner face of said lid there are provided abutment means adapted to delimit at a pre-determined distance the displacement extent of said pressure member (4) towards said lid.



Description

[0001] The present invention refers to an improved kind of condenser-type clothes drying machine, preferably of the type for use in households, which is adapted to perform clothes drying cycles, in which the drying process is carried out by circulating a flow of hot air within a drum holding the clothes to be dried; according to the prior-art, this hot drying air, upon having removed and taken up the moisture contained in the clothes, is blown in this moisture-laden state thereof onto a colder surface, so that said moisture is caused to condense and the resulting condensation water collects into an appropriate container that is usually arranged in the lower front portion of the machine.

[0002] For such a container to be capable of being conveniently emptied periodically, the same is located in an appropriate accommodation, to which access can be gained from outside through a swinging lid, i.e. a lid that opens by turning.

[0003] Upon having so opened said lid, and duly taken out and emptied said container, the latter is then inserted again in the related accommodation, which is in turn closed again by shutting the related lid.

These operations, although quite simple and most easy to perform, have however turned out to have a weak point in the circumstance that, quite often, this container, when so re-inserted in its accommodation, is not pushed all the way to the bottom thereof, but only up to a certain depth, and this causes the related water-transfer openings, fittings and valves to fail to couple and connect together in the due manner.

[0004] This fact, which is most likely to be ascribed to the circumstance that said accommodation for said container lies practically at the level of the floor and, as a result, in a rather inconvenient and awkward position, causes the condensation water to spill and fall out of the appropriate collecting container, thereby giving rise to easily imaginable annoyances.

[0005] In view of doing away with such a problem, various solutions have been hitherto conceived. According to one of these solutions, use is made of a position detector, usually a micro-switch, mounted on the inner wall of the lid, or within the accommodation of said container, in such a manner as to ensure that a possible irregular placement of the container in the accommodation thereof is immediately detected and an appropriate signal is generated to inhibit the machine from operating. However, this solution, although quite effective and safe, has a drawback in that it implies additional costs that cannot certainly be disregarded in the particular case of clothes drying machines, i.e. a kind of product that typically requires a most careful, exacting control of its manufacturing costs.

[0006] According to a second solution, it is contemplated that it is the lid itself that pushes, when being closed, the container into its accommodation all the way up to its correct position. However, this requires a cer-

tainly not negligible force to be exerted by the user onto the lid when closing it, since it shall be considered that that the pushing action exerted by the lid against the container must overcome not only the frictional resistance thereof, but also, and above all, the resistance opposed by the retaining springs that normally secure the coupling of the container with the remaining water-carrying circuit and that must in turn overcome the resistance of the valve springs acting horizontally and in the same direction as the insertion movement of the container.

[0007] For it to be able to sustain such an effort exerted thereonto, the lid, along with the related hinge, must be adequately sized, which again means undesirable added costs.

[0008] It would therefore be desirable, and it is actually a main purpose of the present invention, to provide a clothes drying machine provided with a container for collecting condensation water, which is accommodated in a related compartment adapted to be closed by a respective lid, in which closing said lid automatically ensures that said container, i.e. the inlet valve thereof, is caused to be coupled to the water-carrying circuit included in the machine to convey the condensation water thereinto.

[0009] According to the present invention, this aim is reached in a particular type of condenser-type clothes drying machine that is provided with a lid closing the compartment accommodating the condensation-water collecting container as described below by mere way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a perspective view of a simplified embodiment of the present invention;
- Figure 2 is a corresponding perspective view of an improved embodiment of the present invention;
- Figures 3, 4, 5 and 6 are symbolical views of a device according to the present invention in four respective operating positions thereof as the lid is being closed, as viewed along the section plane Z-Z in Figure 2;
- Figures 7 to 9 are symbolical views of the same device shown in the preceding Figures, as illustrated in respective phases thereof as the lid is being opened.

[0010] With reference to Figure 1, a clothes drying machine according to the present invention comprises a rotating drum (not shown) holding the clothes to be dried, in which there is circulated a flow of hot drying air. The condensation water from the moisture removed from the clothes, as produced with means that have no relevance to the present invention, is conveyed for collection into an appropriate container 1, which is normally

housed in an appropriate accommodation 2 situated on the front lower side of the machine, said accommodation being closable by an appropriate lid 3.

[0011] On the inner face of said lid there is arranged a pressure member 4 that is designed so that, when the lid is being closed, said pressure member 4 is caused to first come into contact and then push with a gradually increasing force said container, in such a manner as to make it impossible for said container not to come into correct coupling with the corresponding circuit provided in the machine to convey the condensation water thereinto.

[0012] This solution is extremely simple, but has also some quite obvious drawbacks: in fact, if an elastic pressure is to be brought about, which is exerted solely onto the container in order to avoid putting any excessive strain on the lid itself, the need arises for an appropriate elastic device 4A to be inserted between the lid and the pressure member themselves. This, however, does no longer ensure that such a pressure can be exerted onto the lid as necessary in view of achieving the above-cited coupling of the container with the water-carrying circuit.

[0013] Conversely, if an adequate pressure is to be desirably exerted on the container, one must act upon said elastic device 4A, so as to be able to transfer said pressure from the lid. However, this again implies that the resistance opposed by the container be almost totally passed on to the lid in a permanent manner, thereby replicating a typical drawback of prior-art solutions.

[0014] In view of overcoming all these practical drawbacks, an advantageous improvement is therefore proposed in this connection: with reference to Figures 2 through to 6, the above-cited pressure member 4 is not only provided so as to be movable relative to the lid by hinging it on a pin 5 secured to said lid, but it also provided so as to be displaceable axially relative to said pin. From the illustrations in said Figures it clearly appears that the hinging pin is arranged in a vertical position, i. e. a position that is similar to the axis of the hinge, so that, when the lid is open and still, said pressure member 4 is capable of rotating in the sense of moving closer to or away from the container.

[0015] In addition, there is provided a spring 6 that acts onto said pressure member, biasing it into sliding in a pre-determined direction A with respect to an axis that extends parallel to the axis of rotation of said pin 5, for a mode of operation that shall be explained in greater detail further on.

[0016] Between said lid 3 and said container 1 there is arranged an actuating member 7 that is capable of rotating relative to an axis extending parallel to the axis of rotation of the lid 3, and is provided with an inclined portion 8; in said pressure member 4 there is provided an aperture 9 that is delimited by an upper portion 9A on top and a lower portion 9B at the bottom, wherein said lower portion is so shaped as to include a surface 9C, which is in turn inclined towards the inside of the lid and is situated on the lower border of said aperture 9.

[0017] On said pressure member 4 there is provided, integrally therewith a facing the inside of the lid, an abutting member 11, whereas on the inner surface of the lid there is provided a counter-abutting member 12 delimited downwards by an appropriate edge 13.

[0018] The operation of the above-described devices is as follows: with reference to Figure 4, at a first operating moment when the lid is being closed, said lower surface 9C is pushed into contact with said actuating member 7; at the same time, said abutting member 11 moves into contact, under pressure, with the counter-abutting member 12.

[0019] At a second moment of operation, as the lid keeps being moved into shutting (Figure 5), the pressure exerted by the inclined portion 8 of the actuating member 7 against said inclined surface 9C urges the latter into displacing elastically, obviously jointly with the entire pressure member 4, in the direction indicated by the arrow B, i.e. opposite to the biasing direction (arrow A) of the spring 6, up to the moment at which the upper edge 10 of the abutting member 11, integral with the pressure member 4, is lowered to a point beyond the lower edge of the counter-abutting member 12, thereby stepping downwards over the lower edge 13 thereof. At the same time, the pressure member 4 presses against the container 1 and, since it cannot yield towards the inside of the lid, pushes said container with a force as necessary to ensure its full insertion.

[0020] It will prove adequate if said two inclined surfaces 8 and 9C are so made as to have the same inclination, in such a manner as to facilitate their sliding relative to each other, thereby avoiding detrimental frictional resistances.

[0021] At the immediately subsequent moment of operation (Figure 6), owing to said upper edge of the abutting member having so stepped over the lower edge of the counter-abutting member, said abutting member 11, which is no longer hindered by the counter-abutting member 12, snaps backwards covering a length C and this, of course, causes the entire said pressure member 4 to move backwards, thereby relieving it of the stress imparted to it following its contact with the container. At this point, anyway, said container will have just been fully inserted in its correct position during the preceding phase of operation, so that such a stress relieving effect does in no way and by no means affect or jeopardize the coupling of said container 1 with the related valves controlling the conveyance of condensed moisture thereinto.

[0022] It can be readily appreciated that the shapes and sizes of the afore described devices, as well as their position relative to each other, must be such as to ensure that the above-described mode of operation can effectively occur, but this is fully within the abilities of those skilled in the art.

[0023] A further improvement of the present invention may be easily achieved by taking into account the fact that any closing operation of the lid, as just described

above, is of course followed by an opening one.

[0024] In this case, the need first of all arises for the initial operating state of both the lid and the pressure member 4 to be duly restored. To this purpose, the actuating member 7 is provided, at the outward facing extremity thereof, with hook-up means 14, whereas the upper portion 9A is provided with appropriate engagement means, which are represented by way of example in Figure 3 in the form of a particularly shaped edge 15 delimiting on top the aperture 9, in such a manner as to ensure that these means are capable of automatically engage each other (Figure 7), so that, at a certain point as the lid is being opened, the hook-up means 14 starts pulling the edge 15 and, as a result, the entire pressure member 4 with it.

[0025] Being so pulled, said pressure member 4 moves away from the lid and the abutting member 11 thereof disengages the lower edge 13 of the counter-abutting member 12 (Figure 8); finally, owing to the action of the spring 6, the pressure member 4 rises (Figure 9) up to the point at which said means 14 and 15 are capable of disengaging each other, thereby returning conclusively to the initial situation existing immediately before the lid having been so closed, as illustrated in Figure 3.

[0026] A last improvement can be easily achieved if the pin 5 is allowed to coincide with the pin ensuring the rotation of the lid relative to the casing of the machine; this would in fact introduce a manufacturing simplification and a corresponding reduction in costs, without affecting the functional effectiveness and operating reliability of the present invention to any appreciable extent.

Claims

1. Clothes drying machine comprising:

- a rotating drum holding the clothes to be dried,
- means adapted to circulate a flow of hot drying air through said drum,
- means adapted to condense the moisture contained in said drying air,
- a pull-out container (1) adapted to collect and contain the water resulting from said preceding condensation of the moisture contained in the drying air,
- a lid (3) capable of being opened from outside and adapted to enable access to be gained to said pull-out container,

characterized in that

- said lid is provided with a pressure member (4) adapted to push said container (1) inwardly as said lid moves into closing,
- said pressure member (4) is applied on the inner face of said lid,

- said pressure member is adapted to rotate relative to said lid with the aid of a pin means (5) secured to said lid,
- between said pressure member and said inner face of said lid there are provided abutment means adapted to delimit at a pre-determined distance the displacement extent of said pressure member (4) towards said lid.

2. Clothes drying machine according to claim 1, **characterized in that**

- said pressure member is adapted to slide axially relative to said pin (5), and is provided with an inclined surface (9C),
- there is provided a spring (6) adapted to bias said pressure member into sliding in a pre-established direction (A) with respect to the axis of said pin,
- there is provided an actuating member (7) adapted to rotate relative to both said machine and said lid about an axis that is substantially parallel to the axis of rotation of said lid, and adapted to engage said pressure member,
- said actuating member (7) is adapted to slide against said inclined surface (9C), so that, when said pressure member acts against said actuating member during the closing phase of the lid, said pressure member (4) is biased into sliding in the opposite direction (B) with respect to said pre-established direction (A).
- there are provided disengagement means (13) between a portion (11) of said pressure member and a corresponding portion (12) of said lid (3), said means being adapted to enable said respective portions to disengage each other when said pressure member (4) is displaced in said opposite direction (B), said pressure member (4) being enabled to continue to move towards said lid displace for a further displacement length (C) upon said disengagement having so occurred.

3. Clothes drying machine according to claim 2, **characterized in that**

- said actuating member is provided with hook-up means (14) and said pressure member is provided with mating engagement means (15), said means being adapted to automatically engage each other during the initial opening phase of said lid, and
- said hook-up means (14) are adapted to attract said pressure member, when said lid is moving into opening, by pulling it into covering a backward displacement length up to a point at which said disengagement means (13) release said two portions (11, 12) from each other.

4. Clothes drying machine according to any of the preceding claims, **characterized in that** said pin means (5) is integral (coincides) with the hinging pin about which said lid rotates relative to said machine.

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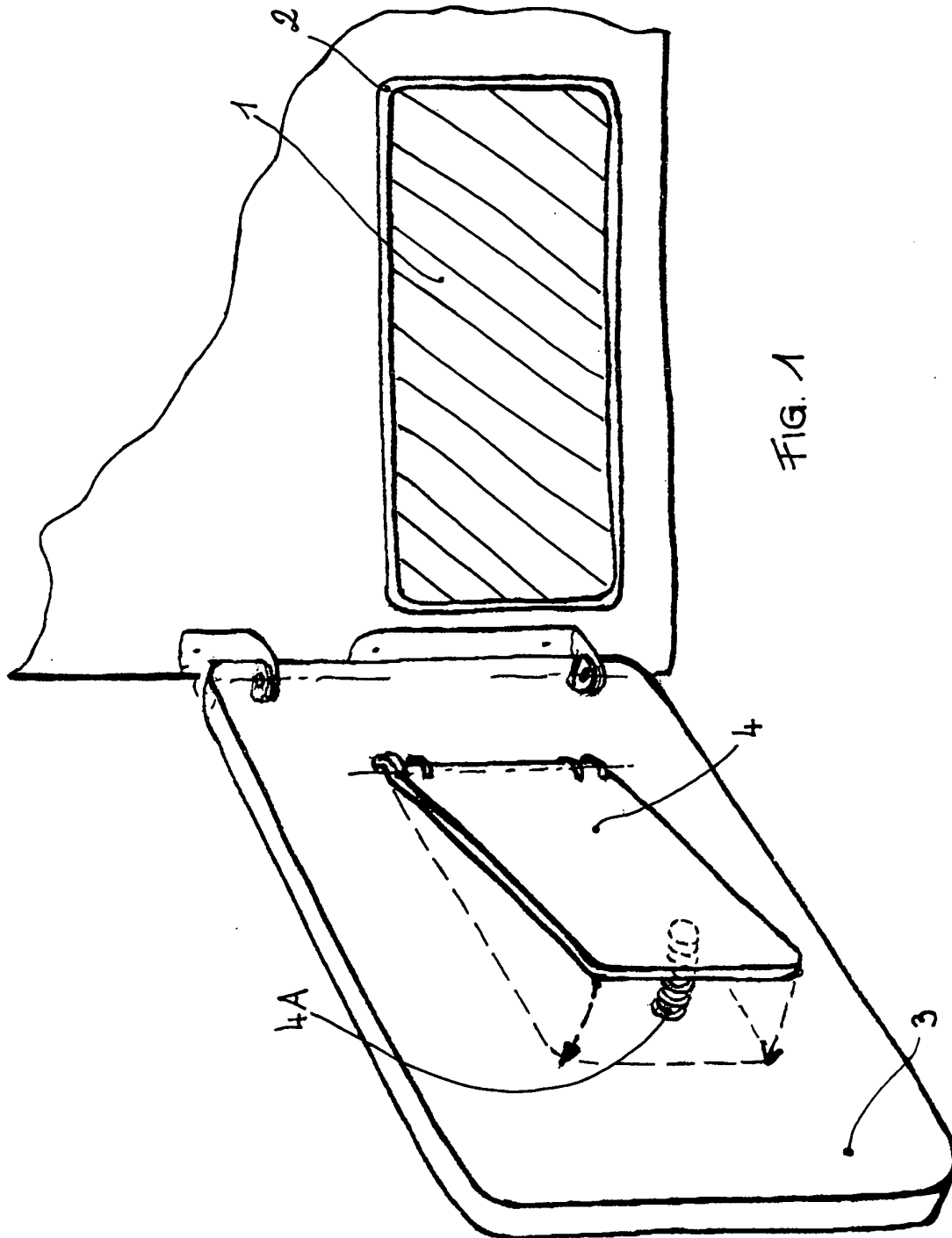
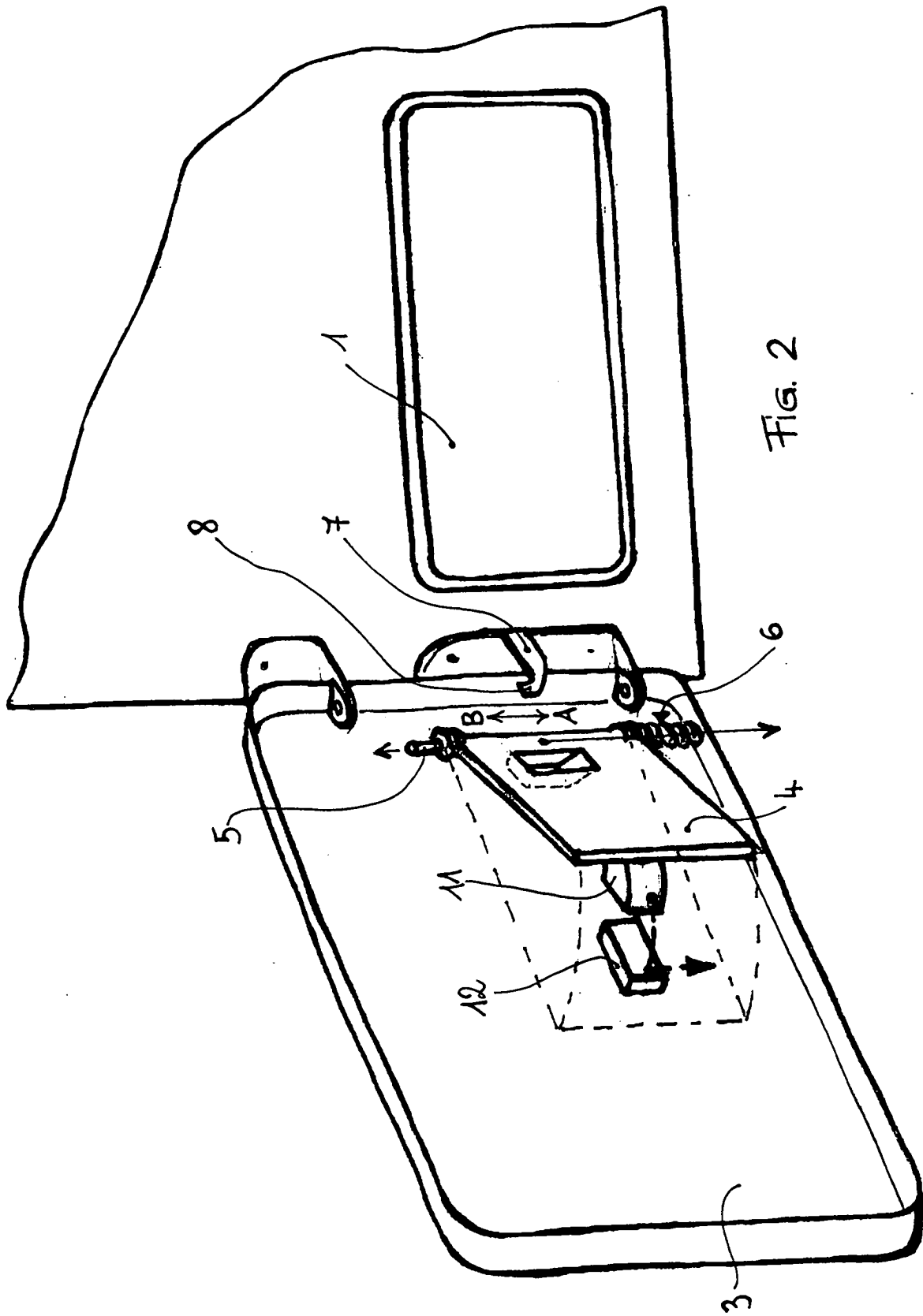
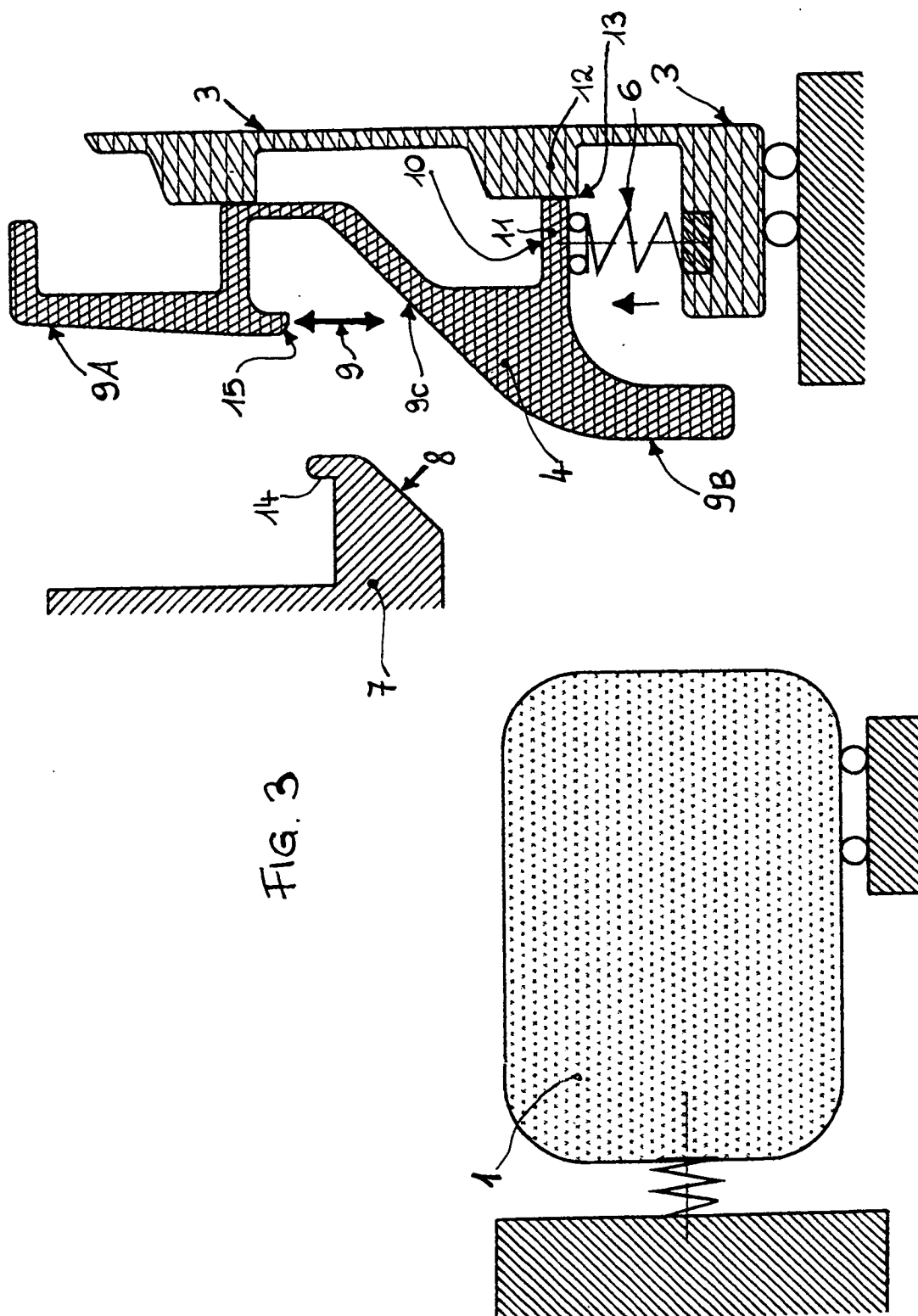
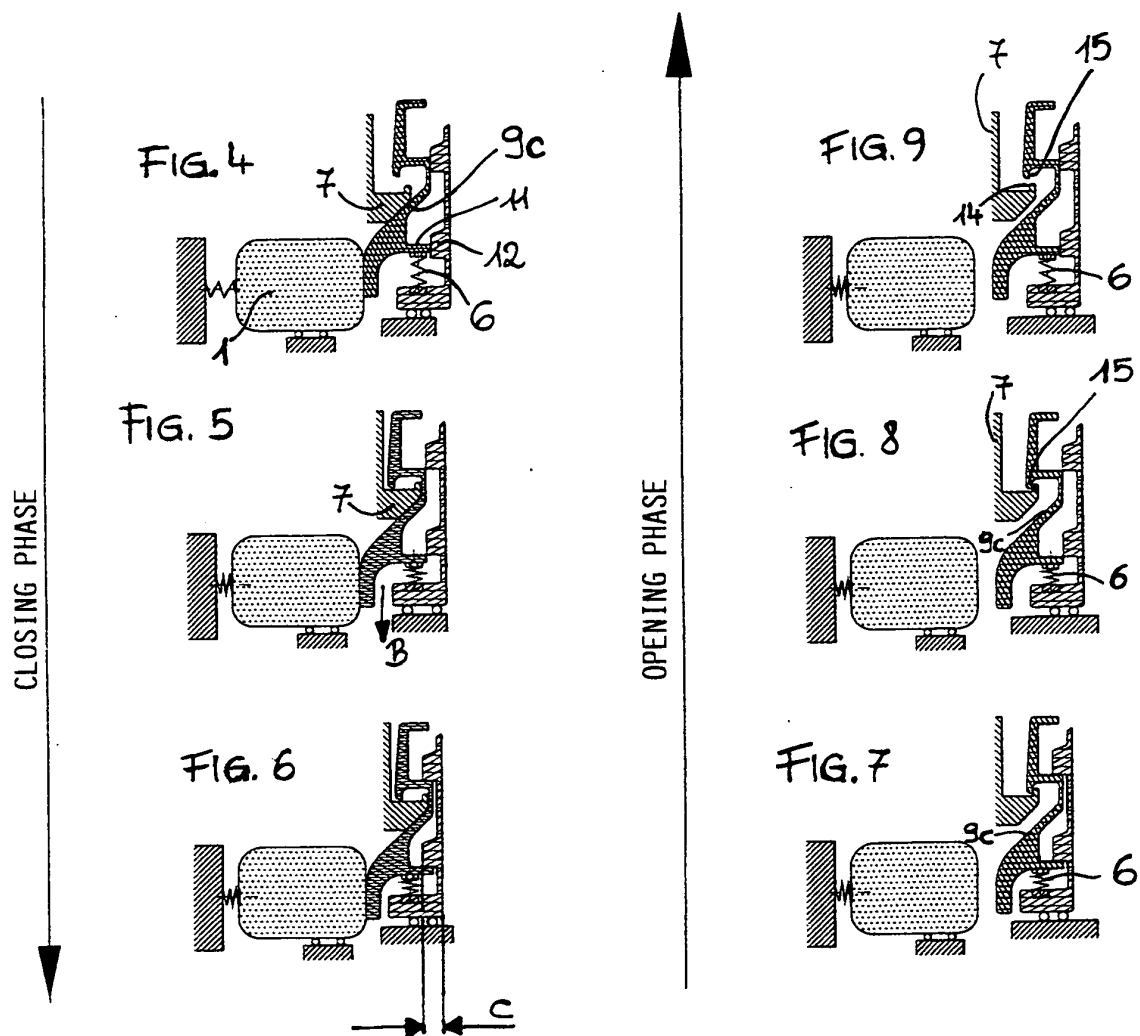


FIG. 1









European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 02 3370

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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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 March 2004	Examiner Ureta, R
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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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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