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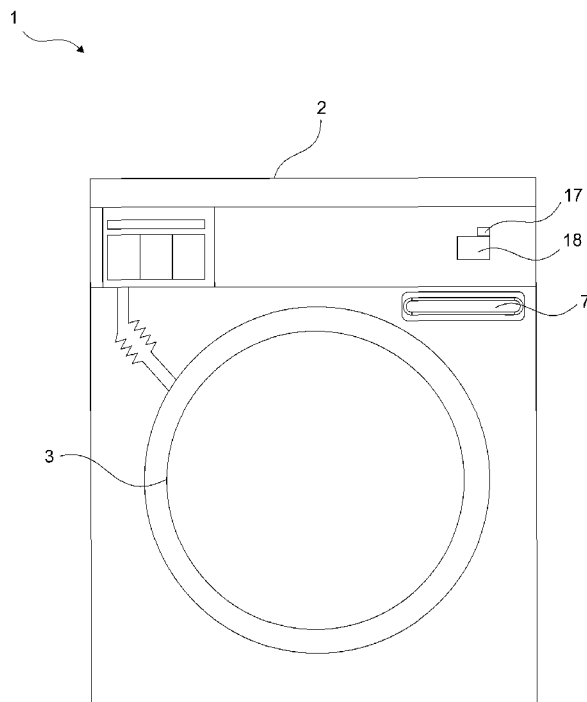
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(54) Title: A LAUNDRY WASHING AND DRYING MACHINE COMPRISING A FILTER

Figure 1



(57) Abstract: The present invention relates to laundry
washing and drying machine (1) comprising a body (2); a
drum (3) that is disposed in the body (2) and wherein the
laundry to be washed/dried is placed; an air circulation duct
(4) wherein the process air (PA) circulates, providing the
drying of the laundry, is performed in the drying process
after the washing process, and that has at least one horizontal
air duct (5) and a vertical air duct (6), and an opening (7)
that is arranged on the body (2) and that opens into the air
circulation duct (4).



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GW, KM, ML, MR, NE, SN, TD, TG).

Description**A LAUNDRY WASHING AND DRYING MACHINE COMPRISING A FILTER**

- [0001] The present invention relates to a laundry washing and drying machine comprising a filter that holds the particles like lint and fluff in the drying air.
- [0002] In closed cycle laundry dryers, the condensers of which are cooled with air, the drying process is provided with the interaction between the cooling air and the cycle air that do not directly contact each other. The cycle air is heated by a heater and directed into the drum, which then contacts the damp laundry and removes the moisture on the laundry and which is finally transferred to a condenser to be dehumidified. Meanwhile, the cooling air is sent onto the condenser by means of a fan and thus, the moisture in the cycle air is enabled to be condensed by the condenser being cooled. After the cycle air is dehumidified on the condenser, it is heated by the heater and sent to the drum by being put again into the drying cycle with low relative humidity rate and at high temperature. During this cycle of air, fiber particles break off the laundry and these fibers should be filtered before reaching the heater. Therefore, in laundry dryers, a filter is disposed on the air circulation path in order to filter these fibers.
- [0003] However, fibers gradually accumulate on the filter during operation and makes the circulation of the air difficult. As a result of this, the energy consumption of the dryer increases and the drying efficiency decreases. Consequently, these filters have to be cleaned by the user at certain intervals.
- [0004] In the state of the art United States Patent Application No. US3748746, a dryer is disclosed, that comprises a filter group that is disposed perpendicularly to the lateral wall thereof and that has a filter that can be removed by the user.
- [0005] In the state of the art United States Patent Application No. US5651188, a dryer is disclosed, that comprises a filter mounted to the cover disposed on the upper panel thereof.
- [0006] The aim of the present invention is the realization of a laundry washing and drying machine comprising a filter group that can be easily taken out and cleaned and that has more than one filter retaining particles in various

sizes.

[0007]

[0008] The laundry washing and drying machine realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a body; a drum that is disposed in the body and wherein the laundry to be washed/dried is placed; an air circulation duct wherein the process air circulates, providing the drying of the laundry, is performed in the drying process after the washing process, and that has at least one horizontal air duct and a vertical air duct, and an opening that is arranged on the body and that opens into the air circulation duct.

[0009] The laundry washing and drying machine of the present invention comprises a filter group that is disposed into the air circulation duct through the opening and that has a first filter extending towards the horizontal air duct and a second filter extending towards the vertical air duct. The filter group is slid to be placed into the air circulation duct and is pulled forward to be removed from the air circulation duct. By means of the opening positioned at the upper region of the body, the user can easily mount/dismount the filter.

[0010] In an embodiment of the present invention, the laundry washing and drying machine comprises the first filter that is disposed in a manner inclined to the horizontal air duct and the second filter that is disposed in a manner inclined to the vertical air duct. By means of the inclined positioning of the first filter and the second filter, the surface areas of the first filter and the second filter are increased. Thus, the filter group is enabled to be used for a longer period of time without clogging. Moreover, by enabling the user to clean the filter less frequently, user satisfaction is increased.

[0011] In another embodiment of the present invention, the filter group comprises a hinge that enable the first filter and the second filter to be engaged with each other and that comprises a shaft and more than one shaft bearing disposed on the first filter and the second filter. The first filter and the second filter are joined by means of the hinge and form the filter group. By means of the shaft, the first filter can rotate around the second filter. When the filter group is being placed into the opening, the first filter and the

second filter become coplanar. During the movement of the filter group in the air circulation duct, the second filter rotates around the first filter so that an angle smaller than 180° is found between the first filter and the second filter. Thus, while the filter is being slid into the air circulation duct, the first filter moves from the vertical air duct towards the horizontal air duct.

[0012] In another embodiment of the present invention, the laundry washing and drying machine comprises at least two opposing rails that are disposed on the side walls of the air circulation duct and that guide the movement of the filter group inside the air circulation duct. Thus, a slide structure is formed whereby the filter group moves inside the air circulation duct and the filter group is enabled to be easily moved.

[0013] In another embodiment of the present invention, the laundry washing and drying machine comprises a handle that is disposed on the filter group. Thus, a holding portion is formed for the user to pull forwards while taking out the filter group inside the air circulation duct. The handle is wide enough for the user to place his/her fingers. Moreover, the handle has a shape whereon the user can easily place his/her finger tips. Thus, the user is enabled to grasp the filter group better and consumer satisfaction is increased.

[0014] In another embodiment of the present invention, the filter group comprises the first filter and the second filter that have pores in different sizes. Thus, the filter group is enabled to filter fibers in different dimensions and the filtration performance of the filter group is improved.

[0015] In another embodiment of the present invention, the laundry washing and drying machine comprises a protrusion that is disposed on the horizontal air duct and that bears against the first filter when the filter group is placed into the air circulation duct. When the filter group is properly placed into the air circulation duct, the end of the first filter contacts the protrusion. With the first filter contacting with the protrusion, the user is assured that the filter group is tightly placed.

[0016] In another embodiment of the present invention, the laundry washing and drying machine comprises a sensor that is disposed on the protrusion and that detects the contact of the first filter with the protrusion and a control

unit that provides the transmission of the data received from the sensor to the user. By evaluating the data received from the sensor, the control unit determines if the filter group is placed into the air circulation duct. Upon detecting that the filter group is not placed into the air circulation duct, the control unit prevents the operation of the laundry washing and drying machine without the placement of the filter group.

[0017] By means of the present invention, a laundry washing and drying machine comprising a filter group that can be easily taken out by the user and that has more than one filter positioned at different parts of the air circulation duct is realized.

[0018] The laundry washing and drying machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0019] Figure 1 – is the schematic view of a laundry washing and drying machine.

[0020] Figure 2 – is the sideways cross-sectional view of the filter group and the air circulation duct in an embodiment of the present invention.

[0021] Figure 3 – is the perspective view of the filter group in an embodiment of the present invention.

[0022] Figure 4 – is the perspective view of the first filter and the second filter in an embodiment of the present invention.

[0023] The elements illustrated in the figures are numbered as follows:

1. Laundry washing and drying machine
2. Body
3. Drum
4. Air circulation duct
5. Horizontal air duct
6. Vertical air duct
7. Opening
8. First filter
9. Second filter
10. Filter group
11. Hinge
12. Shaft bearing
13. Shaft

14. Rail
15. Handle
16. Protrusion
17. Sensor
18. Control unit

[0024] The laundry washing and drying machine (1) comprises a body (2); a drum (3) that is disposed in the body (2) and wherein the laundry to be washed/dried is placed; an air circulation duct (4) wherein the process air (PA) circulates, providing the drying of the laundry, is performed in the drying process after the washing process, and that has at least one horizontal air duct (5) and a vertical air duct (6), and an opening (7) that is arranged on the body (2) and that opens into the air circulation duct (4) (Figure 1 and Figure 2).

[0025] The laundry washing and drying machine (1) of the present invention comprises a filter group (10)

- that is placed into the air circulation duct (4) through the opening (7) and
- that has a first filter (8) extending towards the horizontal air duct (5) and a second filter (9) extending towards the vertical air duct (6).

[0026] In an embodiment of the present invention, the filter group (10) comprises the first filter (8) that is disposed in a manner inclined to the horizontal air duct (5) and the second filter (9) that is disposed in a manner inclined to the vertical air duct (6). By means of the inclined positioning of the first filter (8) and the second filter (9), the surface areas of the first filter (8) and the second filter (9) become more than the cross-sectional area of the horizontal air duct (5) and the vertical air duct (6), perpendicular to the flow direction of the process air (PA). Thus, the surface areas of the first filter (8) and the second filter (9) are increased and the filtration performance of the filter group (10) is improved.

[0027] In another embodiment of the present invention, the filter group (10) comprises a hinge (11) that enable the first filter (8) and the second filter (9) to be engaged with each other and that comprises a shaft (13) and more than one shaft bearing (12) disposed on the first filter (8) and the second filter (9). The filter group (10) is formed by joining the first filter (8)

and the second filter (9) by means of the hinge (11). By means of the shaft (13), the first filter (8) can rotate around the second filter (9). Thus, while the filter group (10) is being pushed in the horizontal axe through the opening (7) to be placed into the air circulation duct (4), the first filter (8) rotates around the shaft (13) and moves in the vertical direction from the vertical air duct (6) towards the horizontal air duct (5). Accordingly, while the second filter (9) closes the vertical air duct (6), the first filter (7) can close the horizontal air duct (5).

[0028] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises at least two opposing rails (14) that are disposed on the side walls of the air circulation duct (4) and that guide the movement of the filter group (10) inside the air circulation duct (4). Thus, the forward-backward movement of the filter group (10) inside the air circulation duct (4) can be controllably realized and the filter group (10) is enabled to easily move inside the air circulation duct (4).

[0029] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises a handle (15) that is disposed on the filter group (10). The handle (15) closes the opening (7) in a leak-proofing manner and prevents the process air (PA) from leaking to the outer environment. When the user desires to take out the filter group (10) for cleaning purposes, he/she holds the handle (15) and pulls the filter group (10) out of the air circulation duct (4). Thus, the user is enabled to grasp the filter group (10) better and consumer satisfaction is increased.

[0030] In another embodiment of the present invention, the filter group (10) comprises the first filter (8) and the second filter (9) that have pores in different sizes. Thus, the filter group (10) is enabled to filter fibers in different dimensions. In this embodiment, in the air circulation duct (4), the second filter (9) that is located before in the flow direction of the air has larger pores than the first filter (8). Thus, large size fibers are held on the second filter (9) and small size fibers that have passed through the second filter (9) are accumulated on the first filter (8). Thus, the filter group (10) is enabled to be used for a longer period of time without clogging and user satisfaction is improved.

- [0031] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises a protrusion (16) that is disposed on the horizontal air duct (5) and that bears against the first filter (8) when the filter group (10) is placed into the air circulation duct (4). When the filter group (10) is properly placed into the air circulation duct (4), the end of the first filter (10) contacts the protrusion (16). Thus, when the first filter (8) bears against the protrusion (16) while the user places the filter group (10) into the air circulation duct (4), the user is assured that the filter group (10) is properly placed. Moreover, by providing the proper placement of the filter group (10), the filter group (10) is prevented from dislodging during the operation of the laundry washing and drying machine (1).
- [0032] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises a sensor (17) that is disposed on the protrusion (16) and that detects the contact of the first filter (8) with the protrusion (16) and a control unit (18) that provides the transmission of the data received from the sensor (17) to the user. By evaluating the data received from the sensor (17), the control unit (18) determines if the filter group (10) is placed into the air circulation duct (4). In case the filter group (10) is not placed into the air circulation duct (4), the control unit (18) enables the user to be warned with an audio or light warning.
- [0033] In the laundry washing and drying machine (1), fibers in different sizes breaking off the laundry and entering the air circulation duct (4) are collected by the filter group (10) comprising two different filters, namely a first filter (8) and a second filter (9). Thus, fibers are prevented from being carried from the air circulation duct (4) onto the components located in the drying line, such as fan, condenser, etc.

Claims

1. A laundry washing and drying machine (1) **comprising** a body (2); a drum (3) that is disposed in the body (2) and wherein the laundry to be washed/dried is placed; an air circulation duct (4) wherein the process air (PA) circulates, providing the drying of the laundry, is performed in the drying process after the washing process, and that has at least one horizontal air duct (5) and a vertical air duct (6), and an opening (7) that is arranged on the body (2) and that opens into the air circulation duct (4), **characterized by** a filter group (10)
 - that is placed into the air circulation duct (4) through the opening (7) and
 - that has a first filter (8) extending towards the horizontal air duct (5) and a second filter (9) extending towards the vertical air duct (6).
2. A laundry washing and drying machine (1) as in Claim 1, **characterized by** the filter group (10) comprising the first filter (8) that is disposed in a manner inclined to the horizontal air duct (5) and the second filter (9) that is disposed in a manner inclined to the vertical air duct (6).
3. A laundry washing and drying machine (1) as in Claim 1, **characterized by** the filter group (10) comprising a hinge (11) that enable the first filter (8) and the second filter (9) to be engaged with each other and that comprises a shaft (13) and more than one shaft bearing (12) disposed on the first filter (8) and the second filter (9).
4. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** at least two opposing rails (14) that are disposed on the side walls of the air circulation duct (4) and that guide the movement of the filter group (10) inside the air circulation duct (4).
5. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** a handle (15) that is disposed on the filter group (10).
6. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** the first filter (8) and the second handle (9) that have pores in different sizes.
7. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** a protrusion (16) that is disposed on the horizontal air duct (5) and that bears against the first filter (8) when the filter group (10) is placed into the air circulation duct (4).

8. A laundry washing and drying machine (1) as in Claim 7, **characterized by** a sensor (17) that is disposed on the protrusion (16) and that detects the contact of the first filter (8) with the protrusion (16) and a control unit (18) that provides the transmission of the data received from the sensor (17) to the user.

Figure 1

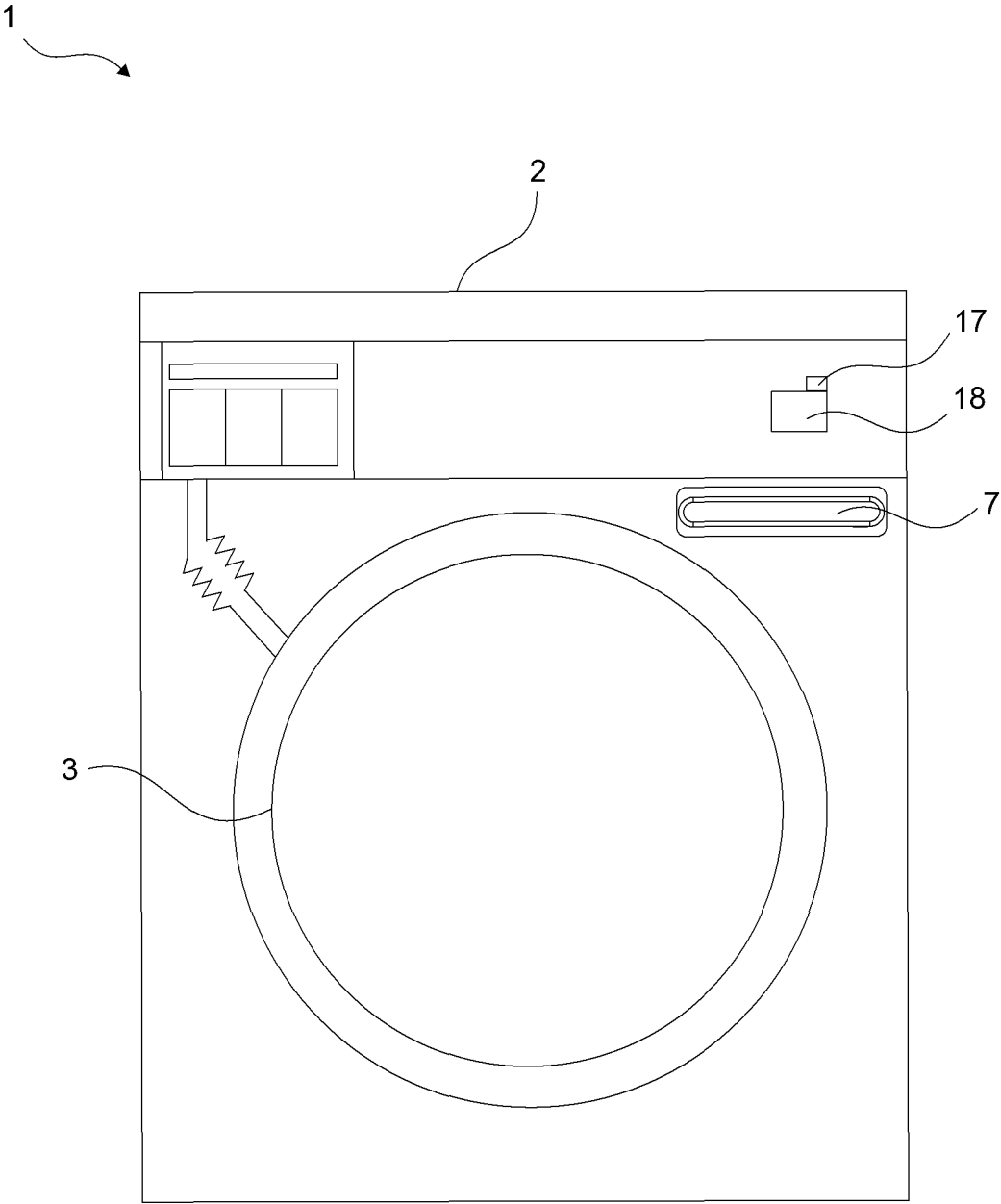


Figure 2

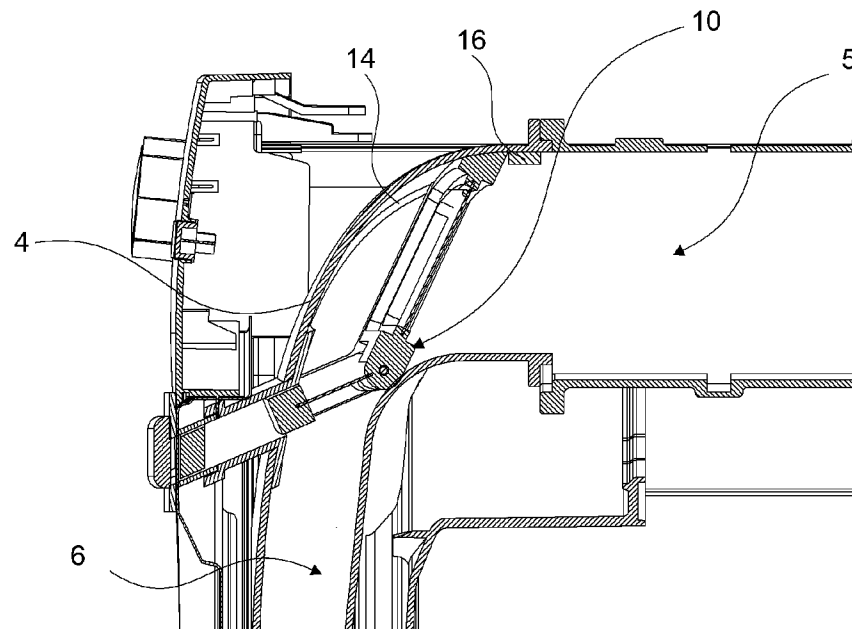


Figure 3

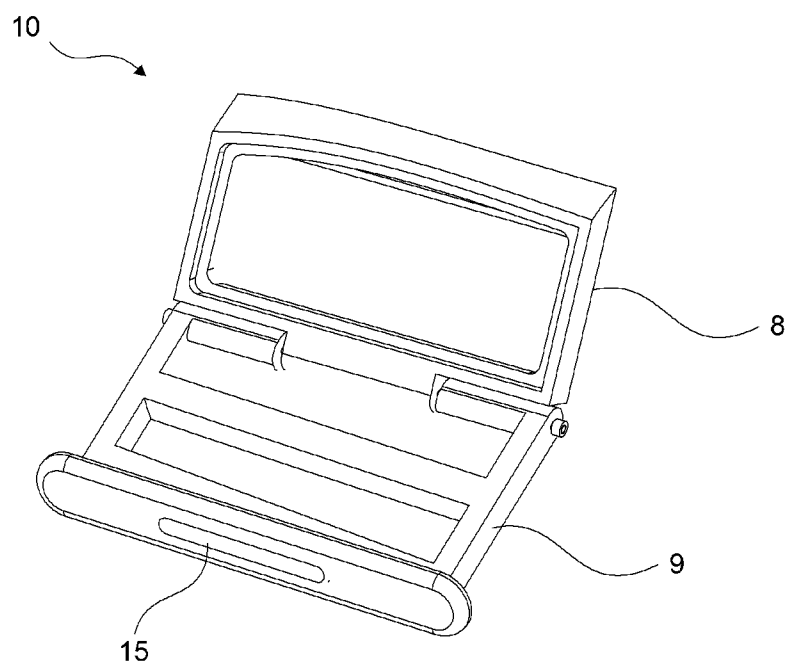
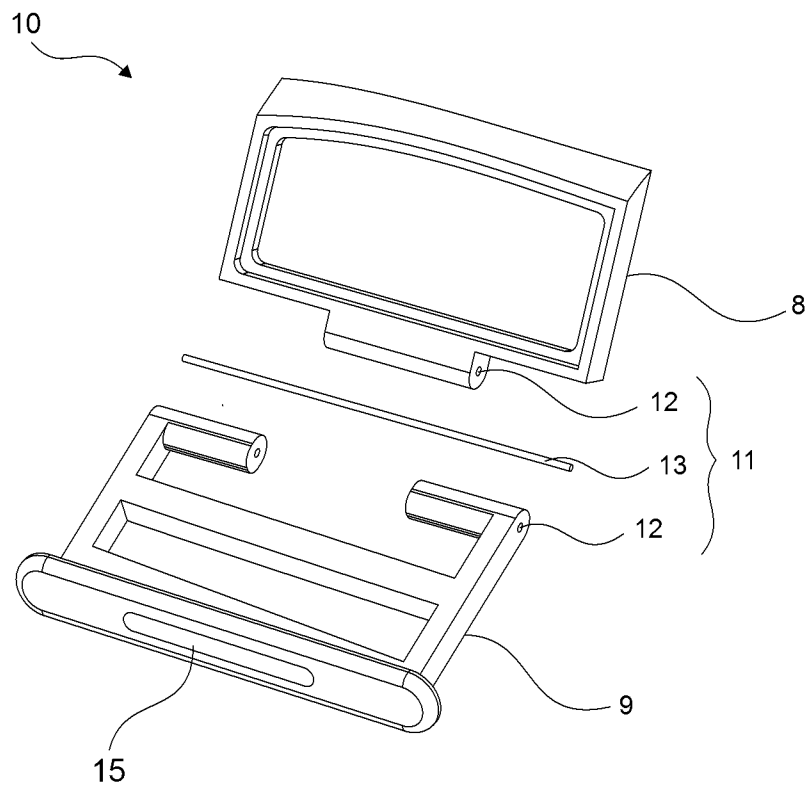


Figure 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/056716

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F58/22
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	DE 100 58 141 A1 (MIELE & CIE [DE]) 29 May 2002 (2002-05-29) figure 1 -----	1
A	US 4 653 200 A (WERNER KURT [US]) 31 March 1987 (1987-03-31) figures 1,3,6 -----	1
A	DE 86 05 014 U1 (MTM OBERMAIER GMBH & CO KG) 24 April 1986 (1986-04-24) page 5, paragraph 7 - page 7, paragraph 1; figure 1 -----	1,2,7
	-/--	



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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