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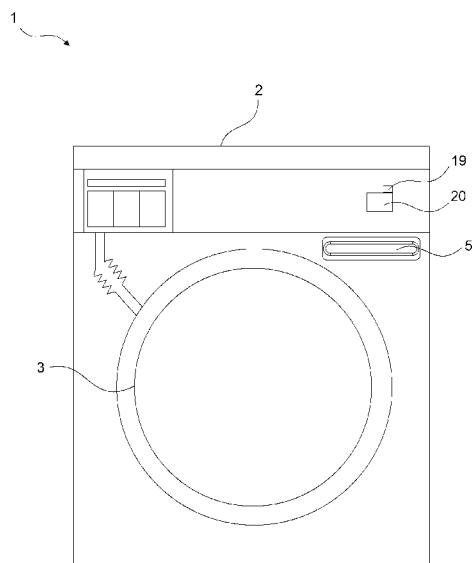
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(54) Title: A LAUNDRY WASHING AND DRYING MACHINE COMPRISING A FILTER

Figure 1



(57) Abstract: The present invention relates to a laundry washing and drying machine (1) comprising a body (2), a drum (3) that is disposed inside the body and wherein the laundry is placed, an air circulation duct (4) wherein the processing air (PA) that enables drying of the laundry in the drying process after the washing process is circulated, a first opening (5) that is disposed on the body (2) and that opens to the air circulation duct (4), a second opening (6) that is disposed on the side of the air circulation duct (4) facing the first opening (5), and a filter group (7) that is passed through the first opening (5) and the second opening (6) and placed into the air circulation duct (4).

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 retains particles such as fibers and lint in the drying air.
- [0002] In the heat pump laundry driers wherein closed-cycle drying process is performed and in the laundry driers of which the condenser is cooled with air, the drying process is provided by dehumidifying and heating the processing air. The processing air is heated by means of a heater and directed into the drum, and contacts and dehumidifies the laundry and then is 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. These filters are required to be cleaned by the user at certain intervals, and therefore an opening is provided on the body of the laundry washing and drying machine that enables attaching and detaching of the filter. However, due to the limited space on the body, the size of the filter is limited with the size of the opening. The reduced size of the filter causes clogging of the filter more quickly.
- [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 of which the filtering surface is increased and that can be easily removed and cleaned.

[0007] 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 on the body wherein the laundry to be dried is placed, an air circulation duct wherein the processing air (PA) that enables drying of the laundry in the drying process after the washing process is circulated, and a filter group that enables retaining of fibers in the circulation of the processing air (PA).

[0008] The laundry washing and drying machine of the present invention comprises a first opening that is disposed on the body and that opens from the body to the air circulation duct, a second opening that is disposed on the air circulation duct, and a filter group that is disposed on the air circulation duct by being passed through the first opening and the second opening. 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 first opening that is disposed on the upper part of the body, the filter can be easily attached and detached.

[0009] In an embodiment of the present invention, the laundry washing and drying machine comprises a filter group which has

- a carrier,
- a first filter and a second filter extending from the carrier,
- a closed position wherein the first filter and the second filter bear against the carrier so as to enable the filter group to pass through the first opening and the second opening, and
- an open position wherein the first filter and the second filter are disconnected from the carrier and bear against the walls of the air circulation duct when the filter group is placed into the air circulation duct.

[0010] After being passed through the first opening and the second opening to be

placed into the air circulation duct in the closed position, the filter group is brought to the open position. Thus, the filter group is enabled to form a wider filtering surface by means of the first filter and the second filter in the open position. When the filter group is in the open position, the first filter and the second filter extend in parallel with the carrier and when the filter group is brought to the open position, an angle of 0-90° occurs between the first filter and the second filter. Thus, the fibers carried over the laundry accumulate both on the first filter and the second filter and in the housing in the shape of V formed by the first filter and the second filter in the air circulation duct in the flow direction of the air and consequently, the filtering capacity of the filter group is increased.

[0011] In another embodiment of the present invention, the filter group comprises a biasing means that is connected to the first filter from one end and to the second filter from the other end, and that forces the filter group to remain in the open position. When the filter group is in the closed position, the biasing means applies force on the first filter and the second filter so as to bring the filter group from the closed position to the open position. In the closed position, the filter group is passed through the first opening and the second opening and the biasing means, preferably a spring, when the filter group is placed into the air circulation duct, brings the filter group from the closed position to the open position. As the filter group is brought from the closed position to the open position, the biasing means moves the first filter clockwise and the second filter counter-clockwise. Thus, in the open position, the first filter and the second filter contact the walls of the air circulation duct and entirely cover the air circulation duct and thus form a housing in the shape of V in the flow direction of the process air, that enables collection of the fibers therein.

[0012] In another embodiment of the present invention, the filter group comprises a hinge that has more than one shaft bearing that are disposed on the first filter, the second filter and the carrier, and a shaft, the hinge enabling the fastening of the first filter and the second filter to the carrier. 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 and the second filter can rotate

around the carrier. By rotating the first filter and the second filter around the carrier, the filter group is moved from the open position to the closed position and from the closed position to the open position.

- [0013] In another embodiment of the present invention, the filter group comprises a sealing element that is disposed on the carrier and that, when the filter group is placed into the air circulation duct, seals the second opening and blocks discharge of air from the air circulation duct. When the filter group is placed into the air circulation duct, the sealing element bears against the wall of the air circulation duct enclosing the second opening and seals the second opening and thus blocks discharge of the processing air (PA) from the second opening.
- [0014] In another embodiment of the present invention, the filter group comprises a handle. By means of the handle, a holding zone is formed in order that the user can pull the filter group forward when removing the filter group from 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.
- [0015] In another embodiment of the present invention, the laundry washing and drying machine comprises a channel extending between the first opening and the second opening. The channel has equal height and width with the first opening and the second opening. Thus, the filter group, passed through the first opening and the second opening in the closed position, is prevented from shifting from the closed position to the open position while moving between the first opening and the second opening. Thus, while the filter group is being removed from the air circulation duct, the fibers that are retained between the first filter and second filter and the carrier can be taken out without falling into the laundry washing and drying machine.
- [0016] In another embodiment of the present invention, the laundry washing and drying machine comprises a protrusion that is disposed on the air circulation duct and that bears against the first filter or the second filter when the filter group is placed in the air circulation duct. When the filter group is properly placed on the air circulation duct, the tip of the first filter

or the second filter contacts the protrusion. Contact of the first filter or the second filter with the protrusion enables the user to be sure that the filter group is placed firmly.

- [0017] In another embodiment of the present invention, the laundry washing and drying machine comprises a sensor that is disposed on the protrusion, that detects contact of the protrusion with the first filter or the second filter, and a control unit that transmits this data 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.
- [0018] In another embodiment of the present invention, the filter group comprises one wheel that is disposed on each of the first filter and the second filter. When the filter group is placed into and removed from the air circulation duct, the wheels move by contacting the walls of the air circulation duct and facilitate the movement of the filter group. While the filter group is being passed through the duct, the wheels move by bearing against the walls of the duct.
- [0019] 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.
- [0020] The laundry washing and drying machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:
- [0021] Figure 1 – is the schematic view of a laundry washing and drying machine.
- [0022] Figure 2 - is the lateral cross-sectional view of the filter group and the air circulation duct when the filter group is in the closed position in an embodiment of the present invention.
- [0023] Figure 3 - is the lateral cross-sectional view of the filter group and the air circulation duct when the filter group is in the open position in an embodiment of the present invention.
- [0024] Figure 4 – is the perspective view of the filter group in an embodiment of

the present invention.

[0025] Figure 5 – is the perspective view of the filter group in an embodiment of the present invention.

[0026] 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. First opening

6. Second opening

7. Filter group

8. Carrier

9. First filter

10. Second filter

11. Biasing means

12. Hinge

13. Shaft bearing

14. Shaft

15. Sealing element

16. Handle

17. Channel

18. Protrusion

19. Sensor

20. Control unit

21. Wheel

[0027] The laundry washing and drying machine (1) comprises a body (2), a drum (3) that is disposed inside the body and wherein the laundry is placed, an air circulation duct (4) wherein the processing air (PA) that enables drying of the laundry in the drying process after the washing process is circulated, and a filter group (7) that enables the retaining of the fibers in the course of the circulation of the processing air (PA).

[0028] The laundry washing and drying machine (1) of the present invention a first opening (5) that is disposed on the body (2) and that opens to the air

circulation duct (4), a second opening (6) that is disposed on the side of the air circulation duct (4) facing the first opening (5), and the filter group (7) that is passed through the first opening (5) and the second opening (6) and placed into the air circulation duct (4) (Figure 1).

[0029] The laundry washing and drying machine (1) of the present invention comprises a filter group (10)

- a carrier (8),
- a first filter (9) and a second filter (10) extending from the carrier (8),
- a closed position wherein the first filter (9) and the second filter (10) bear against the carrier (8) so as to enable the filter group (7) to pass through the first opening (5) and the second opening (6), and
- an open position wherein the first filter (9) and the second filter (10) are disconnected from the carrier (8) and bear against the walls of the air circulation duct (4) when the filter group (7) is placed into the air circulation duct (4)

[0030] (Figure 2 and Figure 3).

[0031] In an embodiment of the present invention, the filter group (7) comprises a biasing means (11) that is connected from one end to the first filter (9) and from the other end to the second filter (10), and that forces the filter group (7) to stay in the open position. When the filter group (7) is in the open position, the biasing means (11) is in the free position between the first filter (9) and the second filter (10). When the filter group (7) is shifted from the open position to the closed position, the first filter (9) and the second filter (10) move toward the carrier (8) and the biasing means (11) is stretched and tensioned between the first filter (9) and the second filter (10) and applies force on the first filter (9) and the second filter (10) so as to bring the filter group (7) from the closed position to the open position. When the filter group (7) is placed on the washing and drying machine (1), the first filter (9) and the second filter (10) bear against the walls of the first opening (5). As the filter group (7) is slid toward the air circulation duct (4), the first filter (9) and the second filter (10) are pushed between the walls of the first opening (5) toward the carrier (8), thus, the filter group (7) moves from the open position to the closed position. When the filter group (7) is

brought to the closed position, the first filter (9) and the second filter (10) bear against the carrier (8) so as to be passed through the first opening (5). After being passed through the first opening (5) and the second opening (6), the first filter (9) and the second filter (10) are fitted in the air circulation duct (4). When the filter group (7) is placed in the air circulation duct (4), with the force applied by the biasing means (11), the first filter (9) and the second filter (10) move away from the carrier (8) and the filter group (7) is brought from the closed position to the open position (Figure 2 and Figure 3).

[0032] In another embodiment of the present invention, the filter group (7) comprises a hinge (12) that has more than one shaft bearing (13) disposed on the first filter (9), the second filter (10) and the carrier (8), and a shaft (14), the hinge (12) enabling the fixing of the first filter (9) and the second filter (10) to the carrier (8). The first filter (9), the second filter (10) and the carrier (8) are combined with the hinge (12) so as to form the filter group (7). By means of the shaft (13), the first filter (9) and the second filter (10) rotates around the carrier (8). Thus, the filter group (7) is pushed along the horizontal axis, passed through the first opening (5) and the second opening (6) to be placed into the air circulation duct (4), while the first filter (9) and the second filter (10) rotate around the shaft (13) and open outward from the carrier (8). Consequently, the first filter (9) extends towards the upper wall of the air circulation duct (4) and the second filter (10) towards the lower wall of the air circulation duct (4) (Figure 4).

[0033] In another embodiment of the present invention, the filter group (7) comprises a sealing element (15) that is disposed on the carrier (8), that closes the second opening (6) when the filter group (7) is placed into the air circulation duct (4) and thus prevents air discharge from the air circulation duct (4). When the filter group (7) is placed into the air circulation duct (4), the sealing element (15) covers the second opening (6) completely and prevents leakage of the processing air (PA) from the second opening (6) to the outer environment.

[0034] In another embodiment of the present invention, the filter group (7) comprises a handle (16). When the filter group (7) is placed into the air

circulation duct (4), the handle (16) leak-proofingly closes the first opening (5), preventing leakage of the processing air (PA) to the outer environment. When the user desires to take out the filter group (7) for cleaning purposes, he/she holds the handle (16) and pulls the filter group (7) out of the air circulation duct (4). Thus, the user is enabled to grasp the filter group (7) better and consumer satisfaction is increased.

[0035] In another embodiment of the present invention, the washing and drying machine (1) comprises a channel (17) extending between the first opening (5) and the second opening (6). Having two open ends opening to the first opening (5) and the second opening (6), the channel (17) guides the movement of the filter group (7) between the first opening (5) and the second opening (6) when the filter group (7) is placed into the air circulation duct (4) and removed from the air circulation duct (4). During the movement of the filter group (7) within the channel (17), the first filter (9) and the second filter (10) bear against the walls of the channel (17), the filter group (7) is prevented from shifting from the closed position to the open position during its movement between the first opening (5) and the second opening (6) (Figure 2 and Figure 3).

[0036] In another embodiment of the present invention, the washing and drying machine (1) comprises a protrusion (18) that is disposed on the air circulation duct (4) and that, when the filter group (7) is placed into the air circulation duct (4), bears against the first filter (9) or the second filter (10). When the filter group (7) is properly placed into the air circulation duct (4), the tip of the first filter (9) or the second filter (10) contacts the protrusion (18). Thus, while the user places the filter group (7) into the air circulation duct (4), the user is assured that the filter group (7) is properly seated into place when the first filter (9) or the second filter (10) bears against the protrusion (18). Thus, the filter group (7) is enabled to be properly placed and the filter group (7) is prevented from dislodging during operation of the washing and drying machine (1).

[0037] In another embodiment of the present invention, the washing and drying machine (1) comprises a sensor (19) that is disposed on the protrusion (18) and that detects the contact of the protrusion (18) with the first filter

(9) or the second filter (10), and a control unit (20) which transmits the data received from the sensor (19) to the user. By evaluating the data received from the sensor (19), the control unit (20) determines if the filter group (7) is placed into the air circulation duct (4). In case the filter group (7) is not placed into the air circulation duct (4), the control unit (20) enables the user to be warned with an audio or light warning.

[0038] In another embodiment of the present invention, the filter group (7) comprises one wheel (21) that is disposed on each of the first filter (9) and the second filter (10). When placed into the air circulation duct (4), the filter group (7) shifts from the closed position to the open position and the wheels (21) on the first filter (9) and the second filter (10) bear against the walls of the air circulation duct (4). Thus, when the filter group (7) is placed into the air circulation duct (4) and removed from the air circulation duct (4), movement of the first filter (9) and the second filter (10) by rubbing against the walls of the air circulation duct (4) is prevented. Consequently, the filter group (7) is placed into the air circulation duct (4) and taken out from the air circulation duct (4) by being easily slid and thus the user satisfaction is increased.

[0039] In the washing and drying machine (1) of the present invention, the fibers breaking off from the laundry and entering the air circulation duct (4) are retained by a filter group (7) comprising two filters as a first filter (9) and a second filter (10) which form a wider filtering surface by opening after being placed into the washing and drying machine (1). 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 inside the body and wherein the laundry is placed, an air circulation duct (4) wherein the processing air (PA) that enables drying of the laundry in the drying process after the washing process is circulated, and a filter group (7) that enables the retaining of the fibers in the course of the circulation of the processing air (PA), **characterized by** a first opening (5) that is disposed on the body (2) and that opens to the air circulation duct (4), a second opening (6) that is disposed on the side of the air circulation duct (4) facing the first opening (5), and the filter group (7) that is passed through the first opening (5) and the second opening (6) and placed into the air circulation duct (4).
2. A laundry washing and drying machine (1) as in Claim 1, **characterized by** the filter group (7) which has
 - a carrier (8),
 - a first filter (9) and a second filter (10) extending from the carrier (8),
 - a closed position wherein the first filter (9) and the second filter (10) bear against the carrier (8) so as to enable the filter group (7) to pass through the first opening (5) and the second opening (6), and
 - an open position wherein the first filter (9) and the second filter (10) are disconnected from the carrier (8) and bear against the walls of the air circulation duct (4) when the filter group (7) is placed into the air circulation duct (4)
3. A laundry washing and drying machine (1) as in Claim 2, **characterized by** the biasing means (11) that is fixed from one end to the first filter (9) and from the other end to the second filter (10) and that forces the filter group (7) to stay in the open position.
4. A laundry washing and drying machine (1) as in Claim 2, **characterized by** the filter group (7) comprising a hinge (12) that has more than one shaft bearing (13) disposed on the first filter (9), the second filter (10) and the carrier (8), and a shaft (14) that enables the fixing of the first filter (9) and the second filter (10) to the carrier (8).
5. A laundry washing and drying machine (1) as in Claim 2, **characterized by** a

sealing element (15) that is disposed on the carrier (8) and that, when the filter group (7) is placed into the air circulation duct (4), prevents air discharge from the air circulation duct (4) by closing the second opening (6).

6. A laundry washing and drying machine (1) as in Claim 1, **characterized by** a handle (16) that is disposed on the filter group (7).
7. A laundry washing and drying machine (1) as in Claim 1, **characterized by** a channel (17) extending between the first opening (5) and the second opening (6).
8. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** a protrusion (18) that is disposed on the air circulation duct (4) and that, when the filter group (7) is placed into the air circulation duct (4), bears against the first filter (9) or the second filter (10).
9. A laundry washing and drying machine (1) as in Claim 8, **characterized by** a sensor (19) that is disposed on the protrusion (18) and that detects contact of the protrusion (18) with the first filter (9) or the second filter (10), and a control unit (20) that enables transmission of the data received from the sensor (19) to the user.
10. A laundry washing and drying machine (1) as in Claim 2, **characterized by** one wheel (21) that is disposed on each of the first filter (9) and the second filter (10).

Figure 1

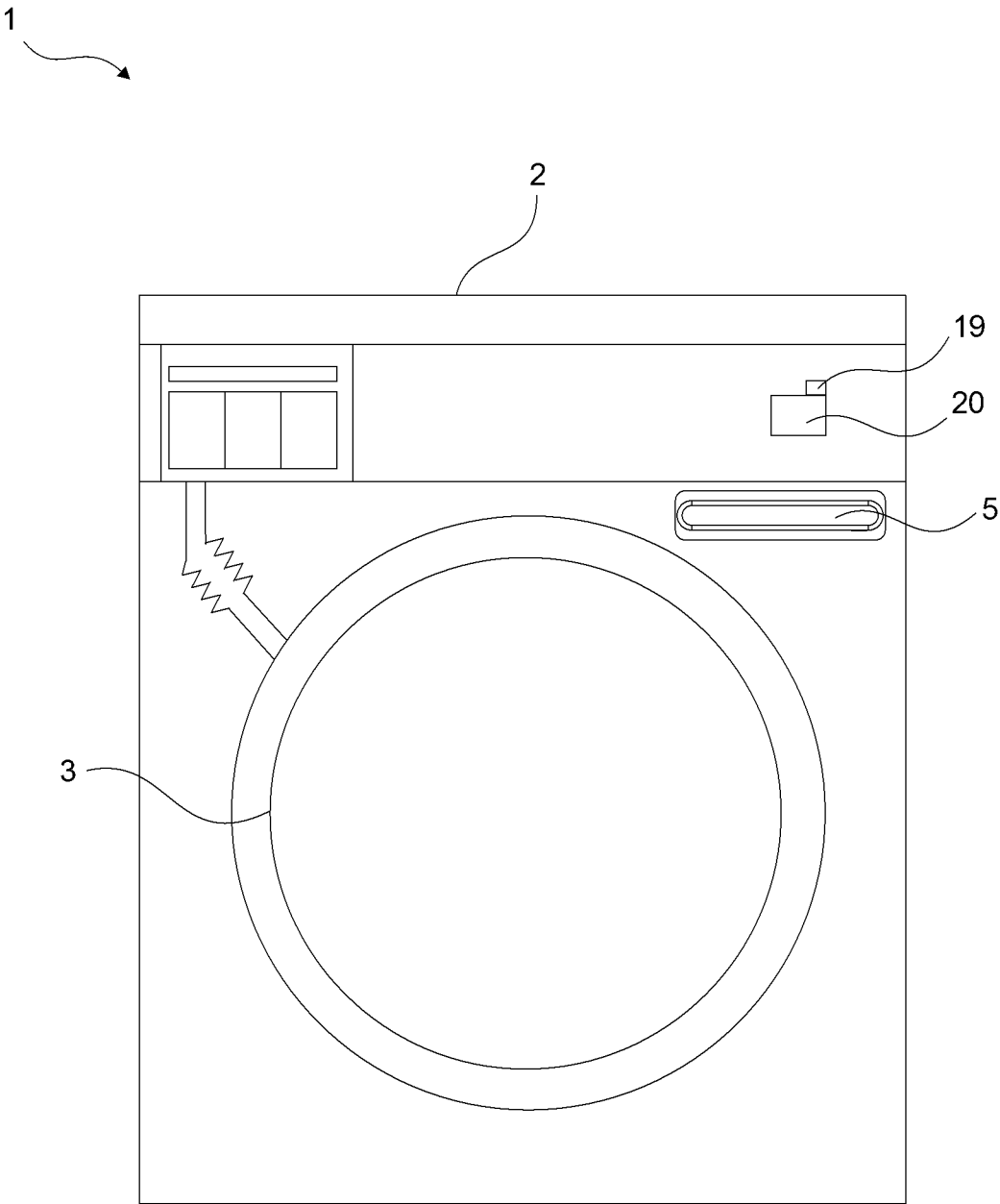


Figure 2

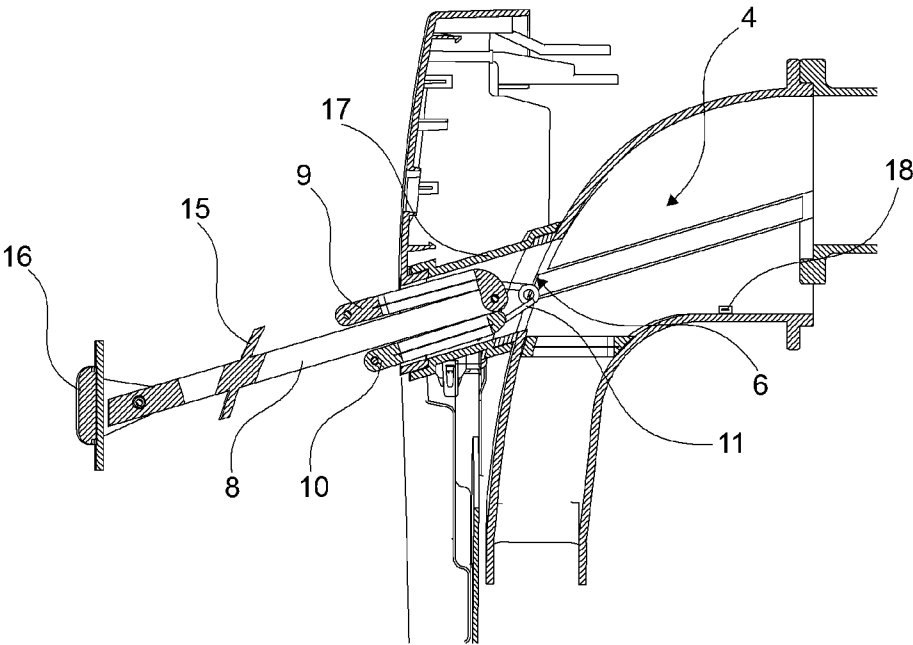


Figure 3

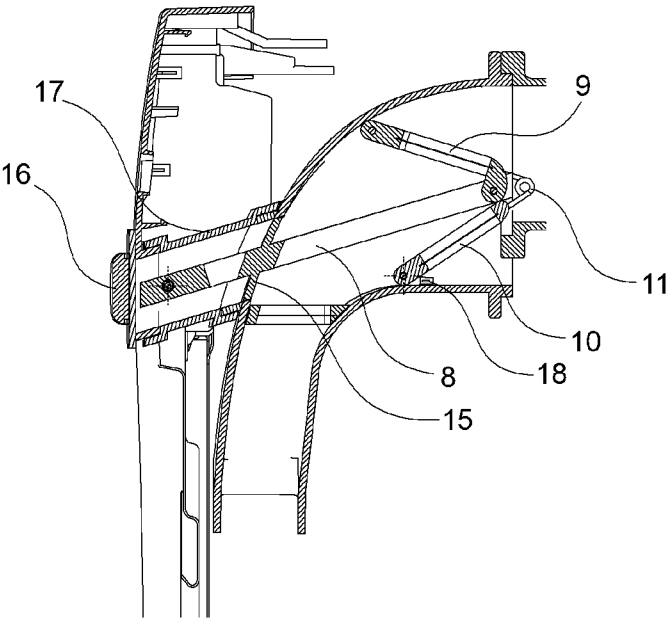


Figure 4

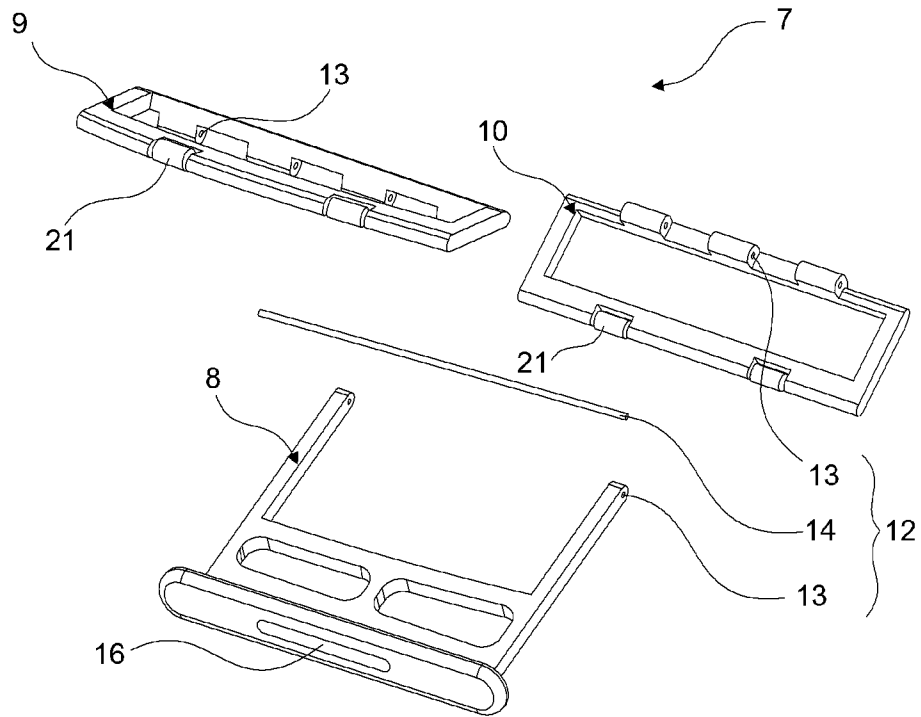
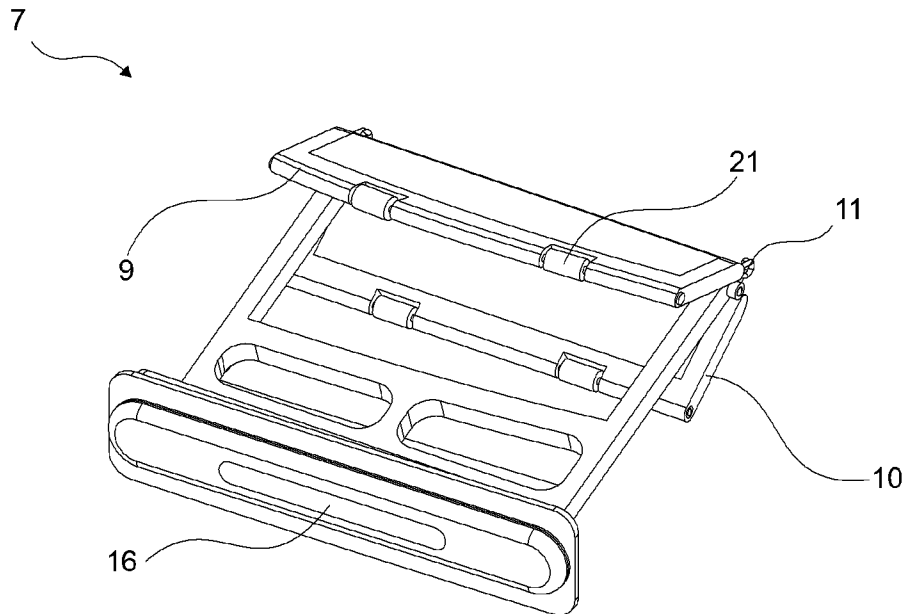


Figure 5



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/060996

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F25/00 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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2007 117137 A (MATSUSHITA ELECTRIC IND CO LTD) 17 May 2007 (2007-05-17)	1,6-9
A	paragraph [0016]; figures 1-5 -----	2-5,10
X	US 2014/208603 A1 (KIM YOUNGSUK [KR] ET AL) 31 July 2014 (2014-07-31)	1,6,7
A	paragraphs [0046], [0061] - [0075]; figures 1, 3, 5-7 -----	2-5,8-10
X	JP 2015 042216 A (TOSHIBA CORP; TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORP) 5 March 2015 (2015-03-05)	1,6,7
A	paragraph [0018]; figures 1, 2, 7 -----	2-5,8-10
A	US 4 653 200 A (WERNER KURT [US]) 31 March 1987 (1987-03-31) column 2, lines 10-68; figures 1-3 -----	1-10



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

13 July 2016

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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