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[Continued on next page]

(54) **Title:** A VACUUM CLEANER

Figure 3

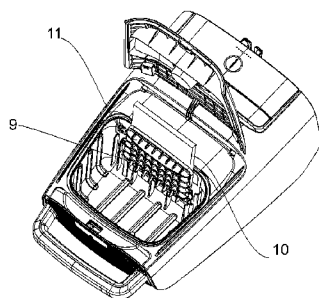
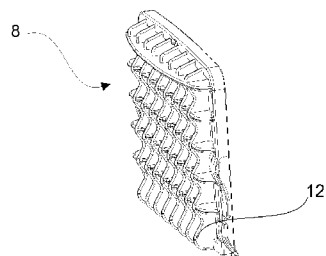


Figure 4



(57) **Abstract:** The present invention relates to a vacuum cleaner (1) comprising a body (2); a motor (3) disposed inside the body (2); a cleaning head (4) in contact with the surface to be cleaned; a delivery line (5) that is connected to the body (2) with one end and to the cleaning head (4) with the other end and that enables the dust particles on the surface to be cleaned to be vacuumed into the body (2) by transferring the suction force created by the motor (3) to the cleaning head (4); a dust bag (6) into which the dirty air sucked through the delivery line (5) is fed and wherein the dirt inside the dirty air is substantially collected; a chamber (7) that is arranged in the body (2) and that is suitable to receive the dust bag (6), and a motor inlet filter (8) that is positioned between the chamber (7) and the motor (3), that enables the air passing through the chamber (7) to be filtered before being delivered to the motor (3).

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Description**A VACUUM CLEANER**

- [0001] The present invention relates to a vacuum cleaner comprising a filter.
- [0002] The vacuum cleaners operate with the vacuum effect generated as a result of the air pressure difference. The pressure inside the vacuum cleaner decreases by means of the fan driven by the electric motor and thus, the ambient air at the atmospheric pressure is moved from the surface into the vacuum cleaner. The air that is vacuumed together with the dust is separated from the dust by means of various retainers and discharged out of the vacuum cleaner.
- [0003] Since air containing a certain amount of dust is fed back to the environment to be cleaned if the said discharged air is discharged without being properly filtered, attaining hygiene gets difficult, thus causing health problems.
- [0004] Since the air passing through the vacuum cleaner is fed to the motor section, if not properly filtered, the said air plays an important role in decreasing the life span of the motor.
- [0005] The vacuum cleaners that collect the sucked dirt particles inside filters, chambers or dust bags or that collect the sucked dirt particles by passing them through a tank filled with water are known.
- [0006] In the state of the art United States of America Patent Document No. US7837772, the filtering members that provides the separation of the dusty air in the vacuum cleaners are disclosed.
- [0007] The aim of the present invention is the realization of a vacuum cleaner with increased air filtering performance.
- [0008] The filter realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof is designed so as to be installed to the air outlet opening in the cylindrical vacuum cleaner widely preferred for domestic use.
- [0009] The vacuum cleaner realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises the motor inlet filter. The vacuum cleaners can be produced in various types and specifications. Today, canister type vacuum cleaners

are the most preferred vacuum cleaners for domestic use. The cylindrical vacuum cleaners comprise a body that moves on wheels, a motor that is disposed inside the body, a fan driven by the motor, and a chamber, which is separated from the section into which the motor and the fan are positioned in the body, suitable for placing the dust bag therein. The chamber is sized so as to receive the dust bag therein. Increasing the size of the chamber causes the body to get bigger, thus causing a vacuum cleaner structure with difficulty of use. Since decreasing the size of the chamber will reduce the volume of the dust bag, the dust bag will be required to be frequently changed, thus preventing an effective usage.

[0010] A delivery line that is connected to the body and that enables the dirty air to be delivered into the body is provided. A cleaning head in contact with the surface to be cleaned, that is suitable for sweeping and directing the dirt into the delivery line is provided on the other end of the delivery line. The fan is rotated with the operation of the motor and the pressure inside the body is decreased. As the ambient air at the atmospheric pressure moves towards the interior of the body, wherein the air pressure is lower, vacuum is created. The dirt together with the air is moved with the cleaning head, which is the last element in the direction of the vacuum opening to outside. The sucked dirty air is delivered to the connection point between the delivery line and the body by passing through the delivery line. At the said connection point, the delivery line directly feeds dirty air to the inlet of the dirt bag, which is disposed into the chamber. The dust bag has a porous, air permeable structure. Since there is air flow in opposite directions through the inlet section of the dust bag, the dirty air continues to be sucked towards the rear section of the dust bag. The porous structure substantially eliminates the dirt in the air and thus, collects the dirt inside the dust bag.

[0011] The dust particles that are too small to be kept inside the dust bag continue their movement towards the section into which the motor and the fan are disposed. When there are dust particles in the air that is fed back to the motor, the said particles may collect inside the motor and cause problems such as the burning of the motor, etc. Therefore, before the

delivery of the air into the motor, it is necessary to provide a gap between the chamber and the motor section and to dispose a motor inlet filter into the said gap. The motor inlet filter is also referred to as the motor filter, the air filter, the inlet filter, etc. The air passing through the filter is discharged to the outer environment after being delivered to the motor. In case of frequent usage, the volume of the dust bag increases as the amount of dirt collected therein increases. Consequently, with this increase, the area occupied by the bag expands and the bag bears against the motor inlet filter. As the dust bag bears against the air inlet portion of the motor inlet filter, air passage through the filter is limited and the dusty air directly contacting the filter is delivered to the motor without being efficiently filtered.

- [0012] In order to prevent the dust bag from contacting the port of the motor inlet filter, the surface of the motor inlet filter facing the chamber is designed to be in a structure protruding towards the dust bag. This structure can be applied in a wavy manner as being convex, concave and convex in the direction of the chamber. By means of this embodiment, the direct contact of the dust bag to the motor inlet filter is minimized and the necessary area for air entry is provided.
- [0013] In an embodiment of the present invention, the motor inlet filter is composed of a casing and a filtering member. The casing portion is produced from plastic material as a single piece. The casing is shaped as suitable to receive the filtering member therein. In a different embodiment, the casing can be disposed on the surface of the filtering member facing the chamber so as to fix the filtering member onto the body. The filtering member is produced independently from the casing. The filtering member is produced from a spongy, porous material that allows the passage of air therethrough while preventing the passage of unwanted particles. Alternatively, the filtering member can be paper or fabric. Since the filtering member is produced from an easily deformable material due to its structure, the shape thereof is prevented from being deformed with the effect of the air passing therethrough by being used together with a hard casing. The filtering member loses its porous structure due to the collected

dust due to usage and cannot perform efficient filtering. Therefore, the filtering member is required to be replaced at certain intervals to use the vacuum cleaner. By means of the filtering member independently produced from the casing, instead of replacing the entire motor inlet filter, the filtering member that is provided therein and that causes the clogging is replaced and the continuous usage of the vacuum cleaner is assured. By means of this embodiment where only a single component is replaced, cost advantage is provided.

[0014] In another embodiment of the present invention, the vacuum cleaner comprises the grill-shaped casing. The filtering member has an easily flexible and deformable structure due to the material the same is produced from. The air that will pass through the filtering member with the vacuum effect may cause the filtering member to be deformed and easily lose its function. Therefore, the case is enabled to be produced in a grill form so as to maintain the form of the filtering member. By means of the grill shape, the filtering member and the casing contact at more than one point, thus minimizing the deformation of the filtering member. Moreover, the sharp items that can be vacuumed from the outer environment are prevented from piercing through the dust bag to pass to the motor section.

[0015] In another embodiment of the present invention, the vacuum cleaner comprises the motor inlet filter that can be detachably mounted to the body. Recesses are arranged around the opening that provides the passage of air between the chamber and the motor section in the body. Protrusions corresponding to the said recesses are provided on the plastic portion of the motor inlet filter. The recesses and the protrusions detachably engage with each other so that no gap remains between the motor inlet filter and the opening. In the alternative embodiments of the connection of the motor inlet filter so as to completely cover the opening, the protrusion can be provided around the opening and the recess can be arranged on the motor inlet filter. Moreover, the said connection can be provided by means of a separate locking mechanism. By means of these embodiments, the motor inlet filter can be replaced by the user when the life span thereof expires.

[0016] In another embodiment of the present invention, the vacuum cleaner comprises the motor inlet filter with a handle. The motor inlet filter is a component that should be replaced at certain intervals since the same loses its porous structure due to the accumulation of dusts thereon. If the motor inlet filter is not replaced, sufficient air intake into the motor is not provided. Moreover, due to the filter that has lost its efficiency, the dusty air is fed to the motor and the vacuum cleaner cannot be used. In order to be easily replaced by the user, the motor inlet filter comprises a handle on the plastic portion thereof, that extends into the chamber. The handle is produced as a single piece with the plastic portion of the motor inlet filter. Thus, ease of production is provided.

[0017] By means of the present invention, a vacuum cleaner comprising a motor inlet filter with improved cleaning efficiency is realized.

[0018] The vacuum cleaner realized in order to attain the aim of the present invention is illustrated in the attached figures where

[0019] Figure 1 is the perspective view of the vacuum cleaner.

[0020] Figure 2 – is the perspective view of the body when the door is open.

[0021] Figure 3 – is the perspective view of the body when the dust bag is not in the chamber.

[0022] Figure 4 – is the perspective view of the motor inlet filter.

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

1. Vacuum cleaner
2. Body
3. Motor
4. Cleaning head
5. Delivery line
6. Dust bag
7. Chamber
8. Motor inlet filter
9. Casing
10. Filtering member
11. Handle
12. Protrusion

[0024] The vacuum cleaner (1) comprises a body (2); a motor (3) disposed inside the body (2); a cleaning head (4) in contact with the surface to be cleaned; a delivery line (5) that is connected to the body (2) with one end and to the cleaning head (4) with the other end and that enables the dust particles on the surface to be cleaned to be vacuumed into the body (2) by transferring the suction force created by the motor (3) to the cleaning head (4); a dust bag (6) into which the dirty air sucked through the delivery line (5) is fed and wherein the dirt inside the dirty air is substantially collected; a chamber (7) that is arranged in the body (2) and that is suitable to receive the dust bag (6), and a motor inlet filter (8) that is positioned between the chamber (7) and the motor (3), that enables the air passing through the chamber (7) to be filtered before being delivered to the motor (3) and that has at least one curved protrusion (12) on the surface of the motor inlet filter (8) facing the chamber (7) (Figure 1).

[0025] In the vacuum cleaner (1) of the present invention, the motor inlet filter (8) has a curved structure in the direction of the chamber (7) (Figure 2, Figure 4). With the ambient air moved by the suction force depending on the pressure difference generated due to the operation of the motor (3), the dirt on the surface to be cleaned is enabled to be transmitted to the delivery line (5) passing through the cleaning head (4) and from there to the chamber (7) in the body (2). The dust bag (6) inlet is arranged at the connection point of the delivery line (5) into the chamber (7). The dirty air coming through the delivery line (5) is directly fed to the dust bag (6). The dust bag (6) is produced from a airpermeable material. The dirt is substantially trapped in the dust bag and the air together with the dust particles small enough to pass through the dust bag (6) is delivered to the motor inlet filter (8) between the chamber (7) and the motor (3) via the rear side of the dust bag (6). The motor inlet filter (8) is disposed on an opening that is arranged on the surface of the chamber (7) facing the motor (3) section and that allows air passage through so as to completely cover the opening. The air filtered in the motor inlet filter (8) is cleansed of the dust particles to pass to the motor (3), then discharged to the outer environment by means of the motor outlet filter. The volume of the dust

bag (6) expands with the amount of dirt collected therein increasing and bears against the port of the motor inlet filter (8). With the covering obtained, the air entry into the filter is limited, since the filter (8) directly contacts the dust bag (6), the efficiency of the filter (8) decreases and the dirty air is enabled to be discharged to the motor (3) and then to the outer environment. By providing a structure curved into the chamber (7) on the surface of the motor inlet filter (8) facing the chamber (7), the dust bag (6) is prevented from directly contacting the filter (8). Thus, the direct contact between the motor inlet filter (8) and the filter (8) surface for every usage condition is reduced to minimum and the filtering performance is improved.

- [0026] The vacuum cleaner (1) of the present invention comprises the motor inlet filter (8) that has a casing (9) and a changeable filtering member (10) (Figure 3). The portion of the casing (9) facing the chamber is shaped in a convex manner and creates a curved structure into the chamber (7). The filtering member (10) has generally a flat structure. The casing (9) enables the filtering member (10) to be positioned at an opening at the joint of the body (2) where the chamber (7) and the motor (3) are disposed, so as to cover the entire opening. The casing (9) is partially or completely detachably mounted to the body (2) so as to allow the filtering member (10) therein to be changed if desired. Thus, when the filtering member (10) loses its efficiency due to the accumulated dust particles due to intensive usage can be replaced with a new one, thus providing an efficient performance. The life span of the motor (3) is accordingly extended.
- [0027] In an embodiment of the present invention, the vacuum cleaner (1) comprises the casing (9) that has the protrusions (12) intersecting each other in the horizontal and vertical directions. The filtering member (10) is generally produced from a spongy, very soft material. When the filtering member (10) is directly fed due to the vacuum effect, the latter easily stretches and cannot perform an efficient filtering. Therefore, the filtering member (10) is fixed by means of a casing (9) with a stiffness that cannot be affected by the vacuum. By means of the grill-shaped structure created at the region where the casing (9) fixes the filtering member (10), fixing is

provided at more than one point. By means of the grill-shaped structure, the air passage is not prevented. Moreover, in case large sharp items are vacuumed due to the vacuum effect and pierce through the dust bag (6), the said items are retained by the grill-shaped structure and prevented from damaging the motor (3).

- [0028] In another embodiment of the present invention, the vacuum cleaner (1) comprises the motor inlet filter (8) that can be detachably mounted to the body (2). Recesses are arranged on the body (2) around the opening between the chamber (7) and the motor (3). Protrusions are provided on the motor inlet filter (8), corresponding to the recesses around the opening. By detachably engaging the recesses and protrusions with each other so that no gap remains between the opening and the motor inlet filter (8), the motor inlet filter (8) is mounted to the body (2). Thus, when the motor inlet filter (8) loses its efficiency due to excessive dust collection, the filter (8) can be replaced with a new one by the user. Thus, the life span of the vacuum cleaner (1) is extended.
- [0029] In another embodiment of the present invention, the vacuum cleaner (1) comprises the motor inlet filter (8) that has a handle (11) on the upper side thereof. The handle (11) is preferably produced integrated with and from the same material as the outer portion of the motor inlet filter (8). The handle (11) enables the entire motor inlet filter (8) or only the casing (9) thereof to be easily attached and detached by the user. Thus, when the life span of the motor inlet filter (8) or the filtering member (10) expires, the same can be replaced with a new one.
- [0030] By means of the present invention, a vacuum cleaner (1) comprising the motor inlet filter (8) with improved cleaning efficiency is realized.

Claims

1. A vacuum cleaner (1) **comprising** a body (2); a motor (3) disposed inside the body (2); a cleaning head (4) in contact with the surface to be cleaned; a delivery line (5) that is connected to the body (2) with one end and to the cleaning head (4) with the other end and that enables the dust particles on the surface to be cleaned to be vacuumed into the body (2) by transferring the suction force created by the motor (3) to the cleaning head (4); a dust bag (6) into which the dirty air sucked through the delivery line (5) is fed and wherein the dirt inside the dirty air is substantially collected; a chamber (7) that is arranged in the body (2) and that is suitable to receive the dust bag (6), and a motor inlet filter (8) that is positioned between the chamber (7) and the motor (3), that enables the air passing through the chamber (7) to be filtered before being delivered to the motor (3), **characterized by** the motor inlet filter (8) that has at least one curved protrusion (12) on the surface thereof facing the chamber (7).
2. A vacuum cleaner (1) as in Claim 1, **characterized by** the motor inlet filter (8) that has a casing (9) and a changeable filtering member (10).
3. A vacuum cleaner (1) as in Claim 2, **characterized by** the casing (9) comprising protrusions (12) intersecting each other in the horizontal and vertical directions.
4. A vacuum cleaner (1) as in any one of the above claims, **characterized by** the motor inlet filter (8) that can be detachably mounted to the body (2).
5. A vacuum cleaner (1) as in any one of the above claims, **characterized by** the motor inlet filter (8) that has a handle (11) on the upper side thereof.

Figure 1

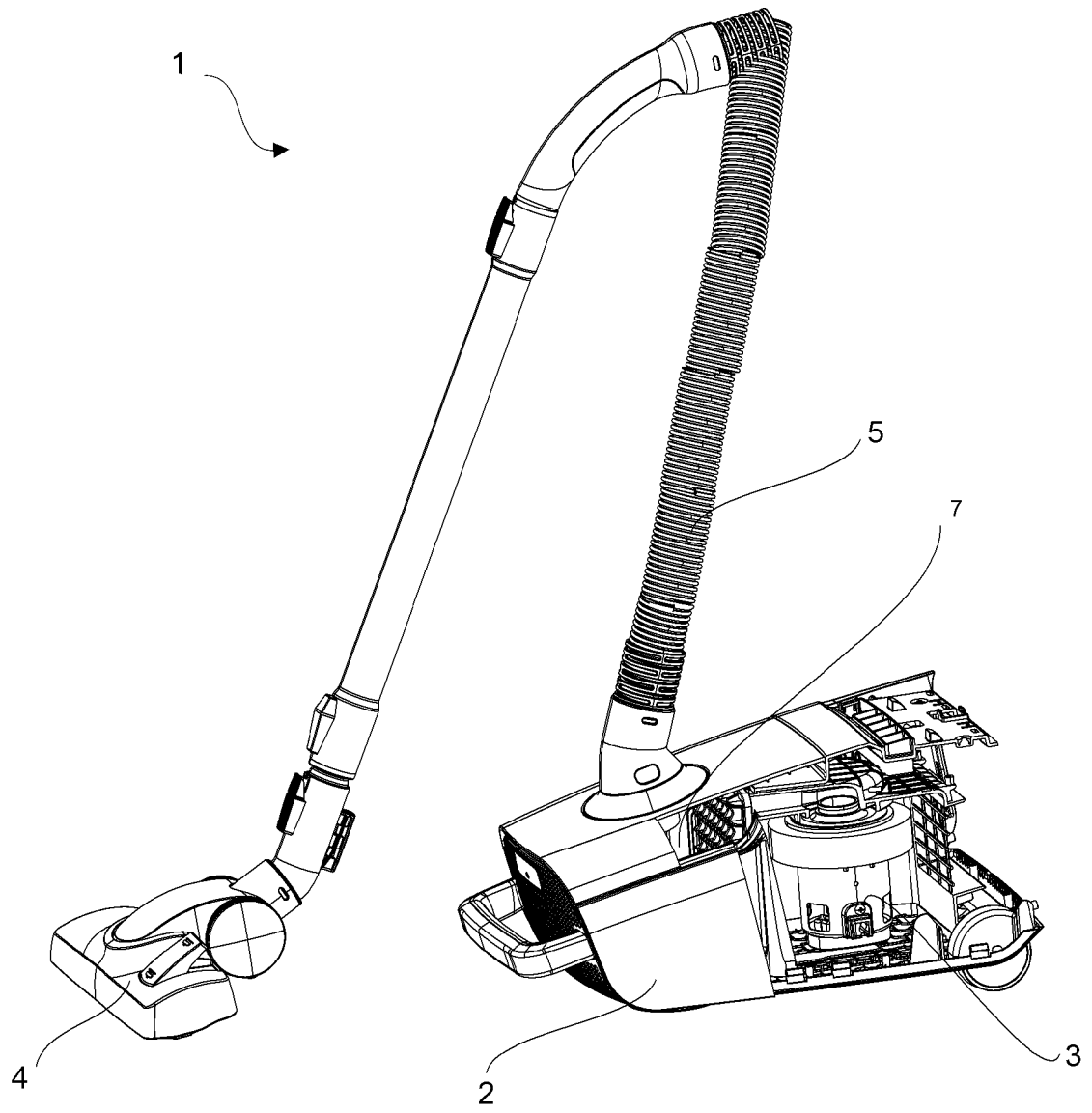


Figure 2

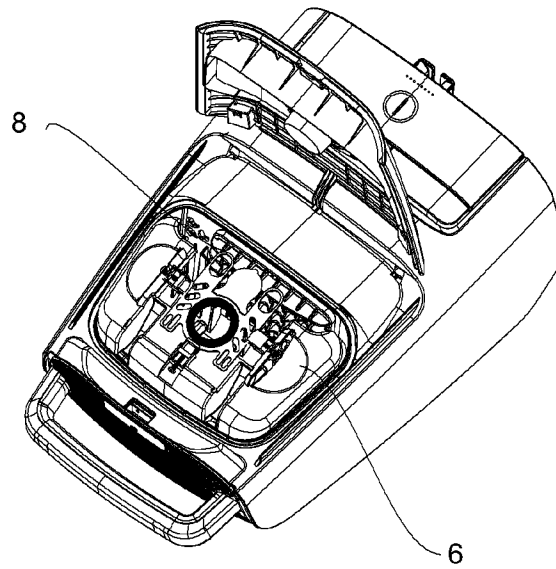


Figure 3

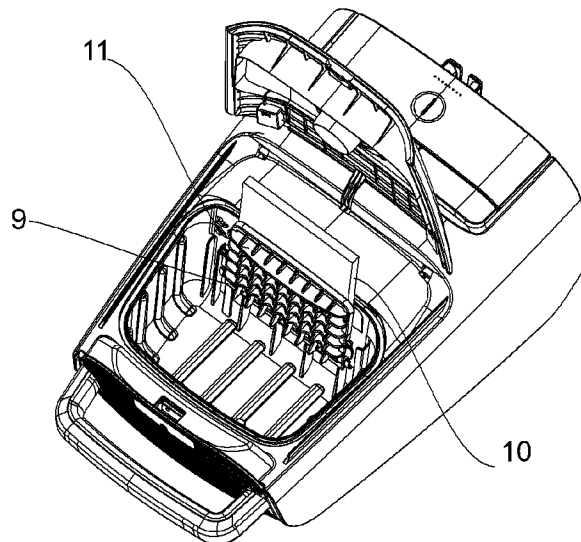
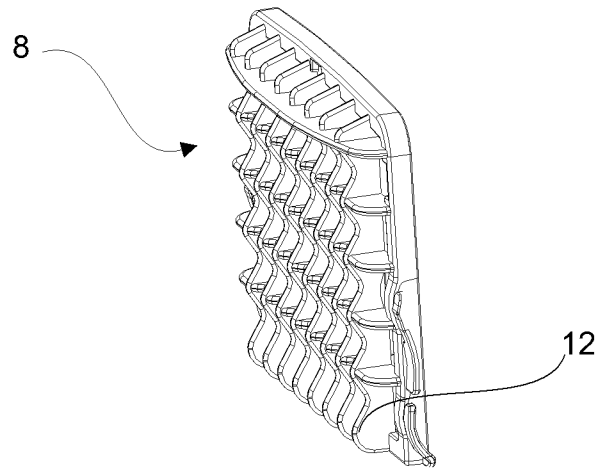


Figure 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/055027

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L9/12
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)
A47L

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)

EP0-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	WO 2014/135192 A1 (ELECTROLUX AB [SE]) 12 September 2014 (2014-09-12) page 4, line 12 - page 8, line 23; figures 1-4 -----	1-5
X	EP 2 281 497 A2 (LUX INTERNAT AG [CH]) 9 February 2011 (2011-02-09) abstract; figures 1-8 -----	1-5
X	CH 701 532 A2 (LUX INTERNAT AG [CH]) 31 January 2011 (2011-01-31) abstract; figures 1,2 -----	1-5
X	WO 2010/024526 A1 (SAMSUNG KWANGJU ELECTRONICS CO [KR]; HAN JUNG-GYUN [KR]; OH JANG-KEUN) 4 March 2010 (2010-03-04) abstract; figures 1-4 ----- -/--	1,4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search

19 May 2017

Date of mailing of the international search report

30/05/2017

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/055027

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/184684 A1 (BUGLI NEVILLE J [US] ET AL) 7 August 2008 (2008-08-07) abstract; figure 1 -----	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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