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(71) Applicant: **DULEVO INTERNATIONAL S.p.A.**  
**43012 Fontanellato (PR) (IT)**

(72) Inventor: **Tagliaferri, Fabrizio**  
**43020 TRECASALI (Parma) (IT)**

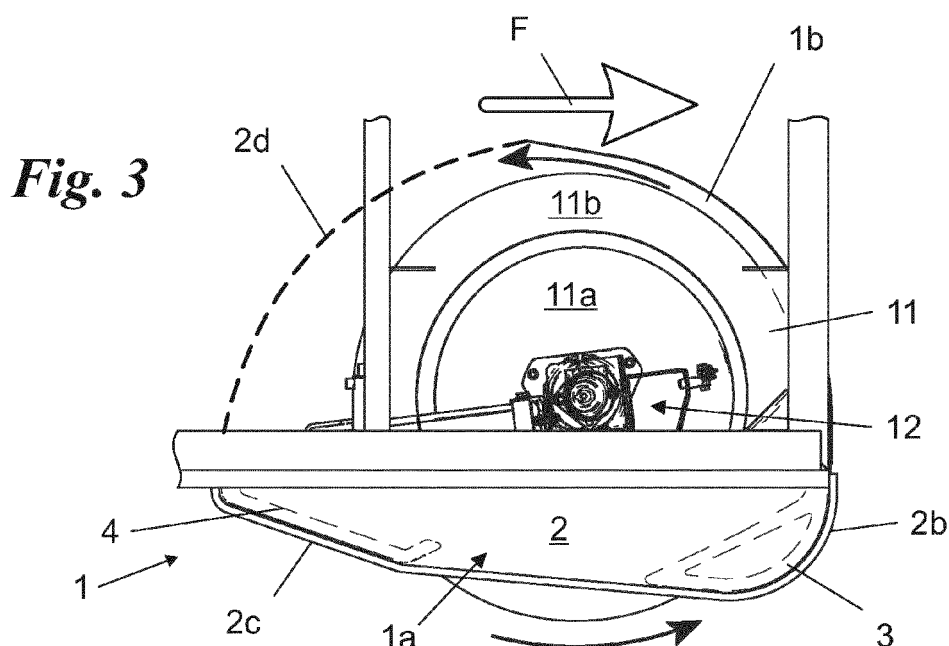
(74) Representative: **Lunati & Mazzoni S.r.L.**  
**Via Carlo Pisacane, 36**  
**20129 Milano (IT)**

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(54) **A covering device for cup-shaped brush and the like**

(57) It is provided a covering device (1) for a cup-shaped brush and the like adapted to be connected in correspondence with a cup-shaped brush (11) to a sweeping machine (10) comprising a suction system adapted to suck air and dust at the cup-shaped brush (11); the covering device (1) comprises a covering unit (2) defining: a conveying space (1 a) adapted to hold at least part of the cup-shaped brush (11); an inner opening (2d) available in the vicinity of the suction system in such

a manner as to enable depressurisation of the conveying space (1 a) when the sweeping machine (10) is in operation; an outer opening (2e) available at the outer side of the sweeping machine (10) and adapted to constitute the main air inlet in the conveying space (1 a), in such a manner as to enable creation of an air flow from the outer opening (2e) to the inner opening (2d) when the cup-shaped brush (11) is in rotation; the outer opening (2e) being further suitable to enable the cup-shaped brush (11) to jut out of the conveying space (1 a).



## Description

**[0001]** The present invention relates to a covering device for cup-shaped brushes and the like of the type pointed out in the preamble of the first claim. In particular, the invention relates to a device adapted to be positioned close to the brush belonging to a known sweeper, i.e. a machine adapted to sweep an extended surface inside a building (storehouses, corridors, entrance-halls, gymnasias, etc.) or outdoors (streets, squares, etc.).

**[0002]** It is known that the sweeping machine is a machine comprising one or more brushes made up, at the upper part thereof, of a stiff disc to the lower part of which fibres or bristles or hair are connected that, when the brush is driven in motion, become extended and open wide taking a frustoconical configuration so that they are referred to as cup-shaped brushes.

**[0003]** Typically, these brushes are placed laterally of the sweeper in such a manner as to enable particular areas to be cleaned, such as the junction areas between the wall surfaces and the floors, pavement corners or kerbs, road edges or borders, that otherwise could be hardly cleaned.

**[0004]** Finally, sweeping machines can carry out wet cleaning, i.e. with supply of a fluid such as water and solvent or, alternatively, dry cleaning, i.e. without fluid supply.

**[0005]** Due to the complexity of the sweeping machines for "wet" cleaning, dry cleaning machines are mostly used that however, due to the absence of fluids, can raise great amounts of dust that the machine is unable to fully collect and the dust is therefore dispersed in the surrounding atmosphere making cleaning not of optimal quality.

**[0006]** In order to obviate this drawback suitable covering devices have been recently conceived which substantially consist of protection caps or guards defining a housing volume inside which the cup-shaped brushes are received.

**[0007]** An example of these covering devices for cup-shaped brushes is described in patent EP1772561 of the same Applicant.

**[0008]** In this patent, it is described a covering device for cup-shaped brushes which has a flexible covering membrane defining a housing volume in which the brush is placed so as to prevent dust spreading in the external environment; and a supporting system connecting the aforesaid flexible membrane to the frame of the sweeping machine.

**[0009]** The known art mentioned above has some drawbacks.

**[0010]** A first problem is represented by the fact that known protection caps and in particular those described in patent application EP1772561 makes it difficult to carry out a visual control of wear and the exact position of the brushes.

**[0011]** This control operation is very important due to the high deterioration of the brushes and therefore for

carrying out an accurate checking, the protection caps are to be removed.

**[0012]** In patent EP1772561 these problems are partly solved by use of caps consisting of a transparent covering membrane.

**[0013]** Use of this particular transparent membrane however is not an optimal solution because the dust moved by the cup-shaped brush during washing of the surface, quickly soils the membrane reducing transparency thereof and sometimes even eliminating it.

**[0014]** Another important problem is also represented by the complexity of the operations required for carrying out maintenance works on the brush because in this case removal of the device becomes necessary.

**[0015]** A still further problem is represented by the fact that the protection caps or transparent membranes fully cover the cup-shaped brush being disadvantageously interposed between the brushes and the vertical surfaces or surfaces in overhanging to be cleaned and therefore make it impossible to carry out good cleaning of said surfaces in the vicinity of corners and pavement kerbs.

**[0016]** In addition, in case of impact between said caps and a pavement kerb, the caps are deformed and abut against the cup-shaped brushes so that they modify the brush structures and cause worsening of the quality of cleaning and deterioration both of the brush and the caps.

**[0017]** Under this situation, the technical task underlying the present invention is to conceive a covering device for cup-shaped brushes and the like capable of substantially obviating the mentioned drawbacks.

**[0018]** Within the scope of this technical task it is an important aim of the invention to provide a covering device for cup-shaped brushes that is capable of enabling practical and quick checking both of the exact position and the state of the cup-shaped brushes.

**[0019]** Another important aim of the invention is to make available a covering device enabling maintenance operations of the brush to be easily carried out.

**[0020]** A further advantage is to provide a device enabling a cleaning operation of high quality to be obtained.

**[0021]** The technical task and the aims specified are achieved by a covering device for cup-shaped brushes and the like as claimed in the appended claim 1. Preferred embodiments are highlighted in the subclaims.

**[0022]** The features and advantages of the invention are hereinafter clarified by the detailed description of a preferred embodiment of the invention, with reference to the accompanying drawings, in which:

**Fig. 1** shows a particular machine provided with a covering device according to the invention;

**Fig. 2a** is an enlarged view of a base portion of the machine showing the covering device seen in Fig. 1;

**Fig. 2b** is a bottom view of the portion in Fig. 2a;

**Fig. 3** is a section top view of the enlargement seen in Fig. 2a;

**Fig. 4a** is a side view of the portion seen in Fig. 2a; and

**Fig. 4b** is the same view as in Fig. 4a showing the portion of Fig. 2a in which the device is represented in a different configuration from that seen in Fig. 4a.

**[0023]** With reference to the drawings, the covering device for cup-shaped brushes and the like according to the invention is generally identified with reference numeral **1**.

**[0024]** It is adapted to be connected to a sweeping machine or sweeper **10**, i.e. a machine for carrying out wet washing or preferably dry cleaning of surfaces such as streets, pavements and industrial flooring, for example.

**[0025]** The machine **10** briefly comprises one or more cup-shaped brushes **11**, disposed laterally of the machine so as to enable cleaning of the edges or borders of a street or pavement, a suction system not shown in the figure, for sucking air and dust also at each cup-shaped brush **11** and an actuating assembly **12** adapted to drive the brushes **11** in rotation and move them relative to the surface to be cleaned.

**[0026]** Each cup-shaped brush **11** in known manner comprises a stiff disc **11a** adapted to enable the brush to be fastened to the actuating assembly **12** and a series of hair, fibres or bristles **11b** placed at the lower part of the stiff disc **11** and adapted to perform the cleaning operation removing dust from the surface to be cleaned. In particular, these brushes **11** when they are not in operation have the fibres **11b** in a gathered configuration; on the contrary, when the cup-shaped brushes **11** are in operation they are in rotation and the fibres **11b** pushed by the centrifugal force, tend to open wide and radially expand.

**[0027]** The covering device **1** is placed on the sides of the sweeping machine **10** at least at a cup-shaped brush **11** and briefly comprises a covering unit or cover **2** defining a conveying space **1a** adapted to hold at least part of the cup-shaped brush **11** and two supporting blocks, a front one **3** and a rear one **4**, to enable said cover to define the aforesaid conveying space **1a**. In particular, as shown in Fig. 4a, said conveying space **1a** is defined by the seat normally provided in the presently used sweeping machines **10** and by cover **2**.

**[0028]** The covering unit or cover **2** mainly comprises a central portion **2a** substantially constituting the upper part of the conveying space **1a** and to which a front portion **2b** and a rear portion **2c** are connected at the lower part thereof, said portions being placed in the advancing direction **F** of the sweeping machine **10**, at the front part and rear part of the cup-shaped brush **11**, respectively. In particular, the front portion **2b** and rear portion **2c** can constitute two distinct bodies adapted to be easily attached to or separated from the central body **2a** by friction fits, screws, Velcro or other similar solutions adapted to enable a connection of the releasable type. More particularly, the front portion **2b** may comprise a second section **2f** fixed to the front supporting block **3** and not secured to the front portion **2b** but separated relative to the latter,

as shown in Fig. 2a. Hereinafter when referring to portion **2b**, portion **2f** too will be considered as being joined to portion **2b**.

**[0029]** Cover **2**, and in particular the front portion **2b** and rear portion **2c** are such shaped as to define an inner opening **2d** (Fig. 3), i.e. an opening substantially present inside the sweeping machine **10** and available in the vicinity of the suction system, and an outer opening **2e** disposed at the outer side of the machine **10** when installed, and therefore of the cup-shaped brush **11**. In detail, the outer opening **2e** constitutes the main air inlet to the conveying space **1a** while the inner opening **2d** is such sized that, when the sweeping machine **10** and more specifically the suction system is in operation, a depressurisation is created in the conveying space **1a** enabling creation of an air and dust flow coming out of such a space **1a** and entering the suction system. In order to create a correct air flow, the front portion **2b** has such a shape that it is substantially adjacent to the front part of the cup-shaped brush **11** and advantageously defines a thin slide channel **1b** (Fig. 3) enclosed between the front portion **2b** and brush **11** and passed through by said air flow.

**[0030]** In particular, the covering unit or cover **2** is a shell partly substantially adhering to brush **11**.

**[0031]** Consequently, the front portion **2b** has a substantially circular shape so that it follows the outer profile of the cup-shaped brush **11**. In particular, this front portion **2b** has a radius substantially less than 1.2 times the maximum radius of the cup-shaped brush **11** when it is in operation i.e. has the fibres **11b** spread apart and consequently is in its maximum extension. Preferably, said radius of the front portion **2b** is substantially less than 1.1 time the radius of the brush **11** in operation. In this way, concentration of the suction action and a quick air and dust flow is created in the slide channel **1b**.

**[0032]** In addition, due to the size of the two openings **2d** and **2e**, when the cup-shaped brush **11** is in rotation, an air flow is created that moves from the outer opening **2e** to the inner opening **2d** in a direction substantially coincident with rotation of brush **11**.

**[0033]** The outer opening **2e** is advantageously formed in the lower part of cover **2** and, more specifically, is placed in the lower part of cover **2** and is defined between the front portion **2b** and rear portion **2c**, as shown in Fig. 2a. In particular, the outer opening **2e** faces the surface to be cleaned and allows the cup-shaped brush **11** to come out of the conveying space **1a** at least when said brush **11** is in operation.

**[0034]** At the front part and rear part of cover **2**, device **1** is provided with the front supporting block **3** and rear supporting block **4** respectively, which are adapted to keep cover **2** in the correct position enabling it to define the housing volume or conveying space **1a**.

**[0035]** In detail, each of the two blocks **3** and **4** comprises an arm, **3a** and **4a**, connected in a motion-admitting manner to the sweeping machine **10**, and absorption members adapted to define an extended position in

which said arms have the maximum distance from the machine 10 and at least one retracted position in which the distance of at least one of said arms 3a and 4a from the sweeping machine 10 is at least smaller than the maximum distance. The absorption members comprise spring means **3b** and **4b** adapted to control motion of the arms at least from the retracted position to the extended position and, in some cases, damping means, i.e. elements adapted to absorb part of the energy preventing a strong impact from damaging cover 2.

**[0036]** The spring means 3b and 4b and damping means, if any, when the covering device 1, and more specifically cover 2, is submitted to an impact, are compressed causing rotation of arms 3a and 4a that therefore move from the extended position to the retracted position. In particular, the spring means 3b and 4b, during this compression, absorb energy that, once the impact has finished, is released making the spring means 3b and 4b automatically bring back the relative arm 3a and 4a from the retracted position to the extended position.

**[0037]** In addition, the spring means 3b and 4b are preferably preloaded and therefore allow a force to be exerted on arms 3a and 4a even in the extended position, so as to move the arms themselves away from the sweeping machine therefore enabling cover 2 to be kept taut.

**[0038]** The covering unit or cover 2 finally comprises an upper element **5** connected to the upper part of cover 2 and a deactivation apparatus **6** adapted to move cover 2 relative to the sweeping machine 10.

**[0039]** In particular, the upper element 5 can consist of a band of deformable material such as elastomer for example, that in case of impact takes an interposed position between the wall and cover 2 and becomes deformed following deformation of cover 2.

**[0040]** The deactivation apparatus 6 is adapted to move at least cover 2 in such a manner as to dispose the covering device 1 in a use configuration shown in Fig. 4a, in which cover 2 defines the conveying space 1a and therefore encloses the cup-shaped brush 11 at least partly, and an intervention configuration (Fig. 4b) in which the cover is moved away from the cup-shaped brush 11 and consequently allows free access to the brush 11.

**[0041]** This deactivation apparatus 6 is preferably adapted to carry out passage between the aforesaid configurations through rotation carried out relative to an axis substantially parallel or perpendicular to the surface to be washed. Alternatively, apparatus 6 allows two distinct rotation actions of cover 2 to be carried out relative to the sweeping machine 10, one around an axis almost parallel to the surface to be washed and one substantially perpendicular to this surface.

**[0042]** Preferably, it allows rotation around an axis substantially parallel to the surface to be washed and therefore can comprise at least one piston **6a** adapted to move cover 2, one or more pins **6b** adapted to connect in a motion-admitting manner cover 2 to the sweeping machine 10 and defining a rotation axis, and control means enabling said piston 6a to be operated and available on

the machine 10 in the vicinity of device 1 or inside the control site of the sweeping machine 10.

**[0043]** In order to facilitate passage of the cover between the two configurations, the front portion 2b, as shown in Fig. 2a, consists of a first part rigidly connected to the covering device 1 and a second part rigidly connected to the sweeping machine 10 so that only the first part is moved by the deactivation apparatus 6. Operation of a covering device for cup-shaped brushes and the like described above as regards structure, is the following.

**[0044]** At the beginning, device 1 is connected to the sweeping machine 10 and is in the use configuration (Fig. 4a), while the two blocks 3 and 4 are in said extended position.

**[0045]** At this point the operator carries out activation of the suction system putting the conveying space 1a under vacuum, and movement of the cup-shaped brush 11 that starts rotating.

**[0046]** In detail, brush 11 starts rotating causing fibres 11b to open wide so that, as a result, they lead brush 11 to increase its extension and therefore to partly come out of the conveying space 1a through the outer opening 2e, as shown in Fig. 3. In conclusion, due to rotation of brush 11 and the vacuum created by the action of the suction system, an air flow is formed that enters the conveying space 1a from the outside through the outer opening 2e, runs through the slide channel 1b, i.e. the part of space 1a enclosed between the front portion 2b and brush 11, comes out of the conveying space 1a and is then collected by the suction system.

**[0047]** When the sweeping machine 10 has to clean the border or edge of a street, the operator moves the machine 10 close to the edge bringing the cup-shaped brush 11, and more specifically the part of brush 11 coming out of the conveying space 1a, laterally into contact with the street edge.

**[0048]** Should the covering device 1 be submitted to an impact due to the presence of an obstacle for example, cover 2 becomes deformed and adapts itself to the obstacle thus enabling optimal cleaning even in the presence of an obstacle.

**[0049]** In detail, the impact causes passage of at least one of the two blocks 3 and 4 from the extended position to the retracted position enabling cover 2 to deform. This change of position makes one of arms 3a and 4a approach the sweeping machine 10 and, as a result, the respective elastic means 3b and 4b is loaded, which enables blocks 3 and 4 to go back to the extended position when the obstacle has been passed, the cover therefore taking again its original shape. Finally, if it is necessary to replace brush 11, the operator through the deactivation apparatus 6 causes displacement of cover 2 to the intervention configuration (Fig. 4b).

**[0050]** In detail, cover 2 is substantially moved through 180° so that the cup-shaped brush 11 is completely cleared and intervention on brush 11 is allowed, as well as on the suction system and the actuating assembly.

**[0051]** The invention achieves important advantages.

**[0052]** A first advantage is the possibility of creating an air flow entering the outer opening 2e and passing through the slide channel 1 b.

**[0053]** In fact, this particular air flow allows an optimal dust sucking action to be achieved as dust, being entrained in said flow, is mostly directed towards the suction system.

**[0054]** Another advantage is represented by the high quality of cleaning ensured by device 1. This advantage is substantially due to the particular flow that, together with the vacuum present in the conveying space, prevents the dust raised by the cup-shaped brush 11 from going out of the outer opening 2e or of possible free spaces present between the devices and the surface to be washed.

**[0055]** A further advantage is represented by the fact that the operator is able to easily control the state of the cup-shaped brush 11, as this brush by partly coming out of the outer opening 2e corresponding to the geometric projection of fibres 11 b, can be controlled without requiring removal of cover 2.

**[0056]** An important objective reached by the present device 1 also resides in that the cup-shaped brush 11 coming out of the cover is adapted to come into direct contact with possible corners and pavement kerbs or other surfaces which are usually contacted by the brush only laterally.

**[0057]** In particular, due to the fibres 11 b coming out of the outer opening 2e, the brush 11 can contact corners and pavement kerbs while preventing the cover 2 from being worn out due to possible impacts between the cover and these side surfaces, which will involve long duration of the cover itself.

**[0058]** In addition, this aspect allows the contact between the cup-shaped brush 11 and cover 2 to be limited even in case of impact and therefore the brush duration is longer and also increased is the cover lifetime.

**[0059]** Another advantage consists in the presence of two supporting blocks 3 and 4 that, being placed in the front and rear part of the cover, enable impacts to be absorbed in an optimal manner, irrespective of the running direction of the sweeping machine 10.

**[0060]** Therefore, due to the presence of the two blocks 3 and 4, and to the fact that the fibres 11 b come out of the outer opening 2e, optimal cleaning can be obtained, irrespective of the conformation of the surface laterally contacted by the brush 11.

**[0061]** As a further advantage, displacement of the covering unit or cover 2 can be obtained, and the covering device 1 can be disposed in an intervention configuration, i.e. cover 2 can be moved away from brush 11 so that the operator can intervene on this area in a particularly easy manner. In detail, this possibility allows both the cup-shaped brush 11 to be easily replaced and the suction system or actuation assembly 12 to be acted upon with ease.

## Claims

1. A covering device (1) for cup-shaped brushes (11) and the like including fibres (11 b), said covering device (1) being adapted to be connected to a sweeping machine (10) comprising a suction system adapted to suck air and dust at said cup-shaped brush (11); said covering device (1) comprising: a covering unit (2) internally defining a conveying space (1a) adapted to hold at least part of said cup-shaped brush (11) and being **characterised in that** said covering unit (2) comprises an inner opening (2d) available in the vicinity of said suction system in such a manner as to enable depressurisation of said conveying space (1a) when said sweeping machine (10) is in operation, an outer opening (2e) available at the outer side of said sweeping machine (10), and suitable to constitute the main inlet of said air in said conveying space (1 a) in a manner adapted to enable creation of an air flow from said outer opening (2e) to said inner opening (2d), when said cup-shaped brush (11) is in rotation; and **in that** said outer opening (2e) is suitable to enable said fibres (11 b) of said cup-shaped brush (11) to jut out of said conveying space (1 a) at least when said cup-shaped brush (11) is in operation.
2. A covering device (1) as claimed in claim 1 or 2, wherein said covering unit (2) comprises a front portion (2b) adjacent and close to said cup-shaped brush (11) so as to define a slide channel (1b) enclosed between said front portion (2b) and cup-shaped brush (11) and adapted to be passed through by said air flow.
3. A covering device (1) as claimed in the preceding claim, wherein said front portion (2b) is of substantially circular shape and its radius is substantially less than 1.2 times the radius of said cup-shaped brush (11) when said cup-shaped brush (11) is in operation.
4. A covering device (1) as claimed in one or more of the preceding claims, comprising a movable front supporting block (3) and a movable rear supporting block (4) adapted to support said covering unit (2) so as to define said conveying space (1 a).
5. A covering device (1) as claimed in the preceding claim, wherein each of said supporting blocks (3, 4) comprises an arm (3a, 4a) connected in a motion-admitting manner to said sweeping machine (10) and absorption members adapted to define an extended position in which said arms (3a, 4a) have the maximum distance from said sweeping machine (10) and at least one retracted position in which the distance of at least one of said arms (3a, 4a) from said sweeping machine (10) is at least smaller than said maxi-

mum distance.

6. A covering device (1) as claimed in the preceding claim, wherein said absorption members are adapted to automatically bring said arm (3a, 4a) back from said retracted position to said extended position. 5
7. A covering device (1) as claimed in one or more of the preceding claims, comprising a deactivation apparatus (6) adapted to alternately dispose said covering device (1) in a use configuration in which said covering unit (2) defines said conveying space (1a) and in an intervention configuration in which said cover (2) allows free access to said cup-shaped brush (11). 10 15
8. A sweeping machine (10) comprising at least one covering device (1) as claimed in one or more of the preceding claims. 20

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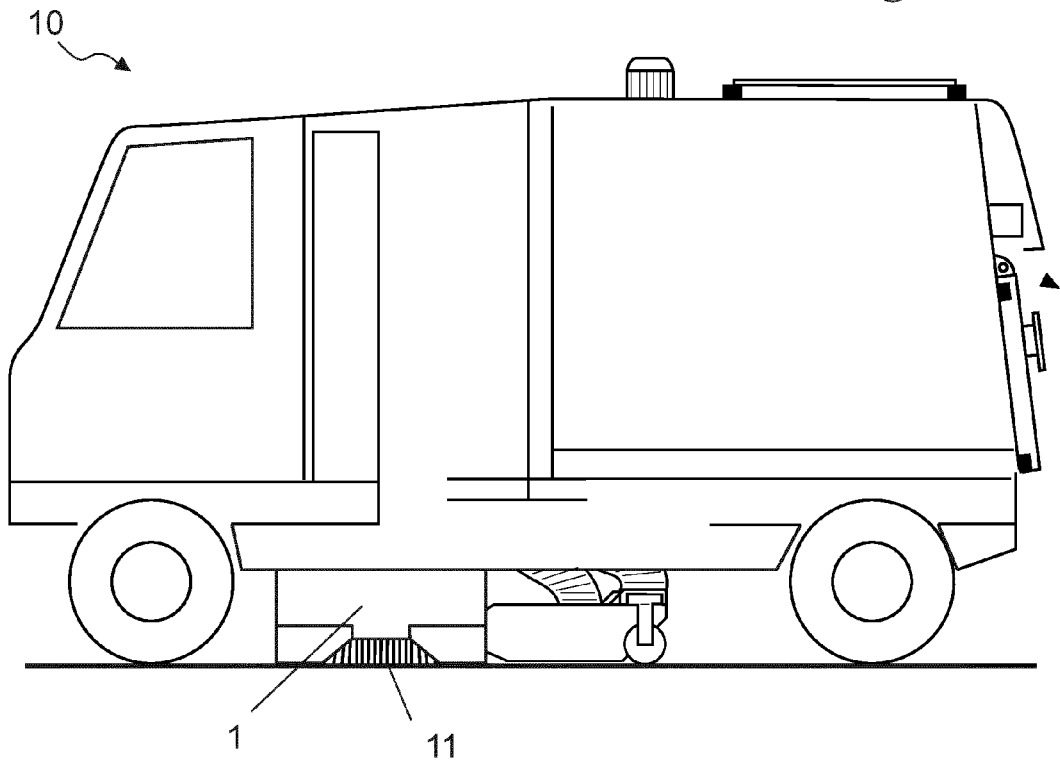
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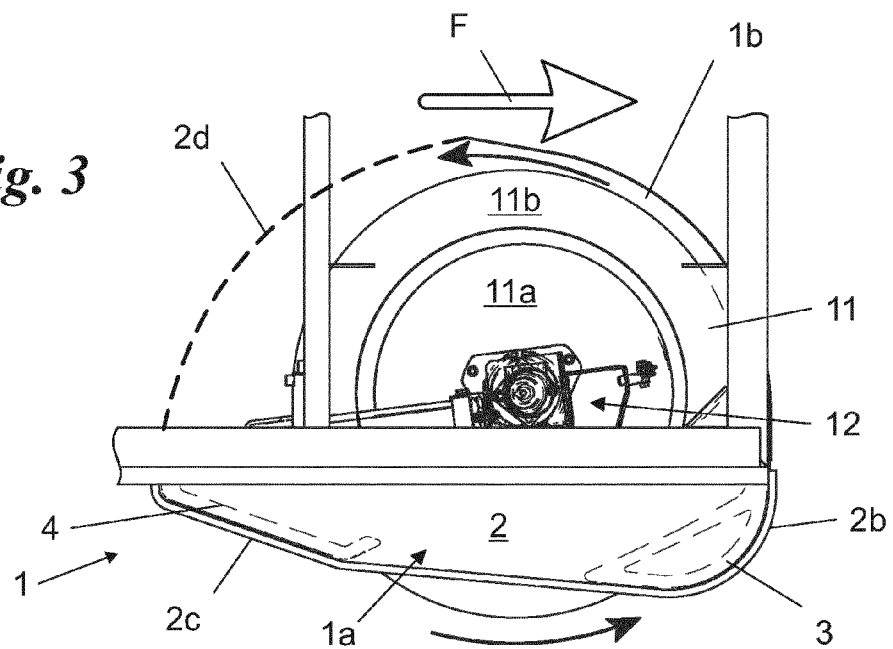
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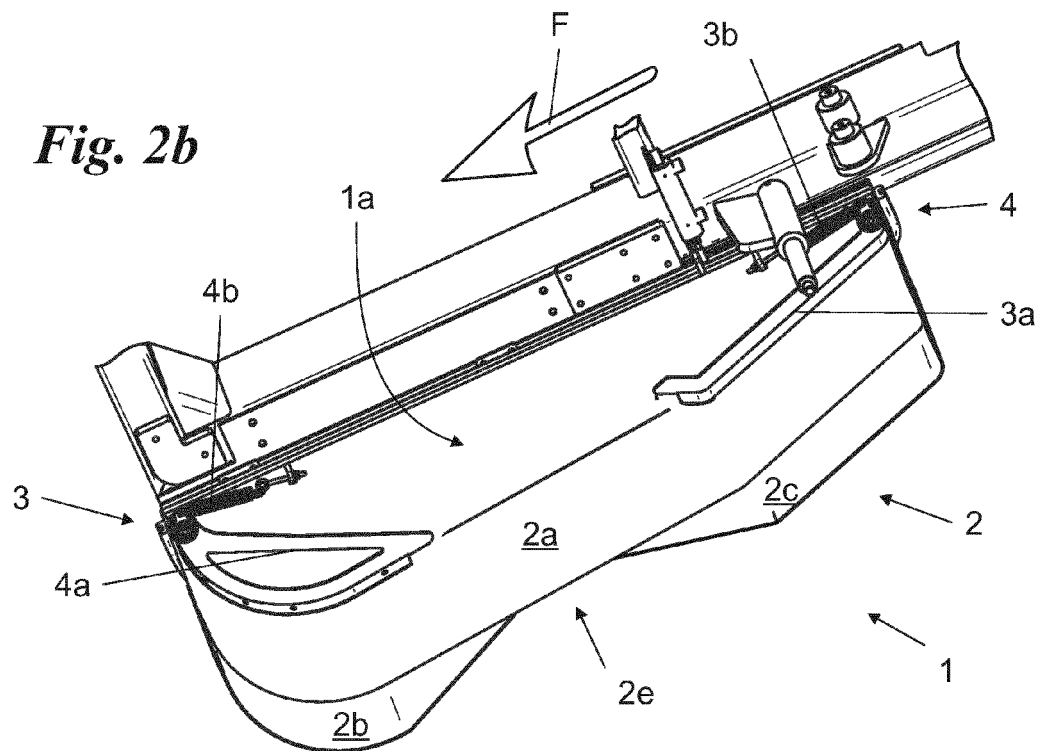
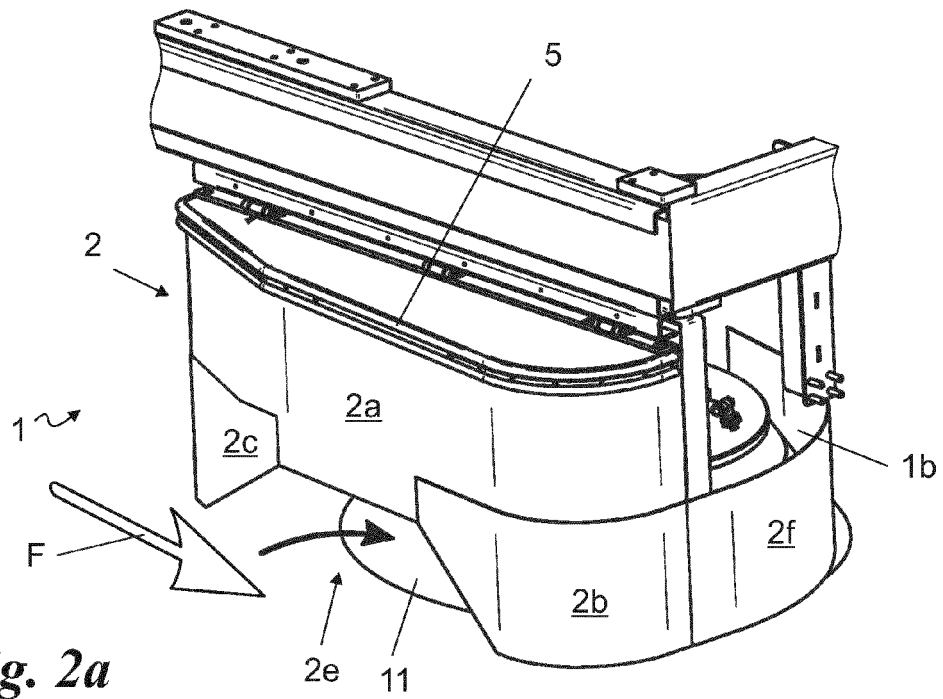
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*Fig. 1*

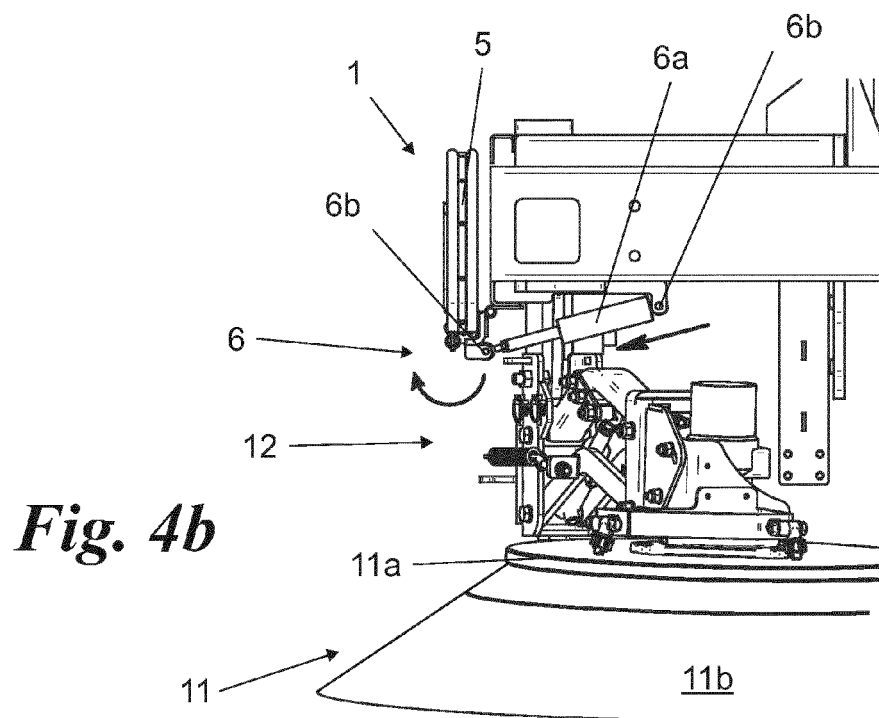
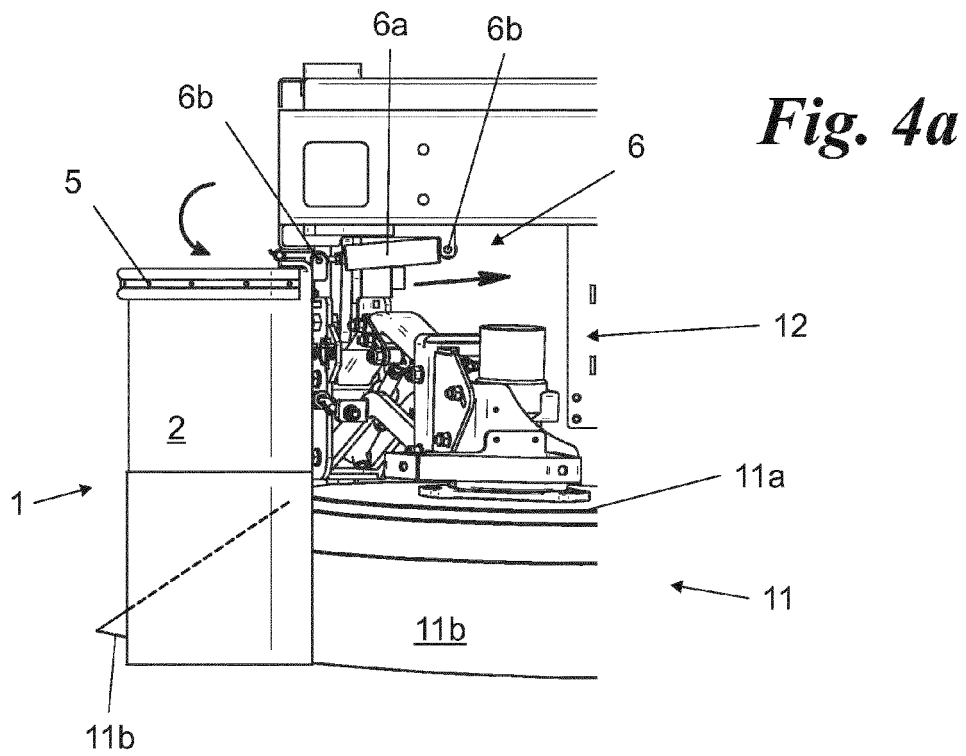


**Fig. 3**











## EUROPEAN SEARCH REPORT

Application Number  
EP 12 16 2636

| DOCUMENTS CONSIDERED TO BE RELEVANT   |   |  |   |
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| The present search report has been drawn up for all claims  |   |  |   |
| Place of search<br>The Hague  |   | Date of completion of the search<br>12 July 2012 | Examiner<br>Tran, Kim Lien              |
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 12 16 2636

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

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