(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 069 799 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**21.09.2016 Bulletin 2016/38**

(51) Int Cl.:
***B08B 9/093*** *(2006.01)* ***B60S 3/00*** *(2006.01)*

(21) Application number: **15159633.5**

(22) Date of filing: **18.03.2015**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**MA**

(71) Applicant: **Leemans Waste Centre B.V.**
**7602 KA Almelo (NL)**

(72) Inventor: **Lemans, Arjan Bert Leendert**
**7671 AT Vriezenveen (NL)**

(74) Representative: **'t Jong, Bastiaan Jacob**
**Inaday Patent B.V.**
**Hengelosestraat 141**
**7521 AA Enschede (NL)**

(54) **Cleaning assembly for cleaning the inner walls of a container and combination of a cleaning assembly and a container to be cleaned**

(57) The invention relates to a cleaning assembly (1) for cleaning the inner walls of a container, comprising:
- a guiding frame (4), with a first end, which guiding frame is moveable in a direction of transport;
- a cleaning frame (14), moveable in the direction of transport along the guiding frame; and
- at least one cleaning head (16), attached to the cleaning frame and hingeable along an axis parallel to the direction of travel, the cleaning head comprising at least one cleaning nozzle, connected to cleaning means.

The invention further relates to a combination of a cleaning assembly and a container to be cleaned.

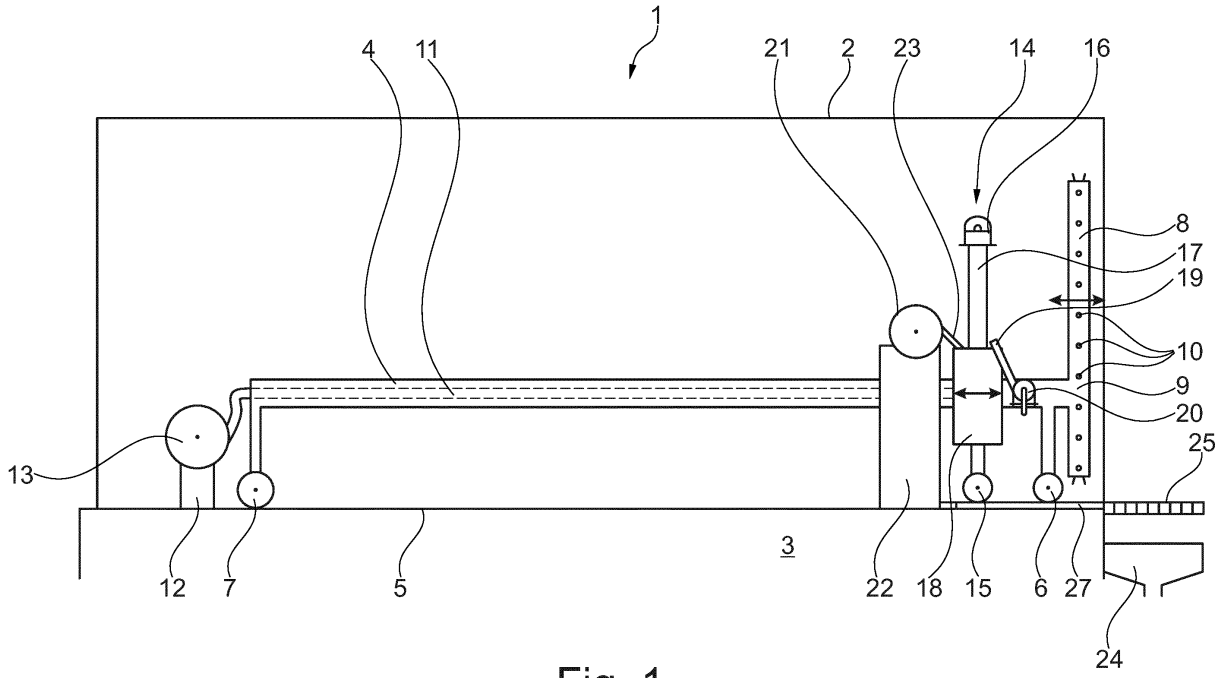


Fig. 1

EP 3 069 799 A1

## Description

**[0001]** The invention relates to a cleaning assembly for cleaning the inner walls of a container and a combination of a cleaning assembly and a container to be cleaned.

**[0002]** In transport, a wide variety of loads are shipped in shipping containers, which containers may shaped as a rectangular box. The containers are then moved by a vehicle to which the container is connected. The same containers are often used for multiple types of loads. While some containers may be loaded regardless of the type of load previously loaded in the container, certain types of load, such as for instance refuse, most often require cleaning of the inner walls of the container before reuse. Cleaning of the inner walls of a container may also be useful at other occasions.

**[0003]** In order to clean the inner walls of a container, cleaning assemblies are known.

**[0004]** One such a cleaning assembly is described in GB 2299770A. This document describes a rectangular frame, mounted on a telescopic boom, that may be moved by the boom along the walls of a container. The cleaning assembly is provided with nozzles, which nozzles are directed towards the walls of the container, for distributing a cleaning solution.

**[0005]** Since the nozzles are arranged outwardly directed from on the frame, their number is necessarily large to obtain adequate cleaning characteristics. In addition, due to the predetermined positions of the nozzles, there is no possibility to adapt the cleaning without modifying the frame, for instance when one of the walls of the container requires more thorough cleaning than other walls. This cleaning assembly further requires movement of the complete frame with the boom to adjust its position. Because the boom is because of its length often required to travel along a relatively long the container, the boom is generally heavy and therefore relatively slow. For these reasons, the cleaning assembly from GB 2299770A is not efficient.

**[0006]** Another cleaning assembly is known from PCT Application WO 2012/022881. This document describes a moveable base and a carriage moveable with respect to the base. The carriage is provided with two rectangular frames, each provided with outwardly directed nozzles, of which the first frame is used for distributing a cleaning solution, and of which the second frame is used for distributing compressed air for drying the walls of the container.

**[0007]** The rectangular frame for distributing the cleaning solution is similar to the frame of GB 2299770A and thus suffers from similar disadvantages. In addition, because of the relatively large freedom of movement of the carriage in the container, the carriage may misalign in the container relatively easily, for instance because of blockages and dirt inside the container or irregularities in the surface of the container.

**[0008]** It is an object of the invention to reduce of even obviate the above mentioned disadvantages.

**[0009]** This object is achieved with a cleaning assembly for cleaning the inner walls of a container, comprising:

- a guiding frame, with a first end, which guiding frame is moveable in a direction of transport;
- a cleaning frame, moveable in the direction of transport along the guiding frame; and
- at least one cleaning head, attached to the cleaning frame and hingeable along an axis parallel to the direction of travel, the cleaning head comprising at least one cleaning nozzle, connected to cleaning means.

**[0010]** The cleaning assembly according to the invention is provided with a guiding frame moveable in a direction of transport, for instance into a container from the open end of the container toward its end wall. A cleaning frame is moveable back and forth along the guiding frame, for instance using wheels adapted to a profiling in the guiding frame, in the same direction of transport and as such, the cleaning frame provides a guide for the movement of the cleaning assembly, reducing the chance of misalignments due to irregularities and increasing the speed of movement of the cleaning assembly since it does not require movement of the complete guiding assembly.

**[0011]** At least one cleaning head is hingeably attached to the cleaning frame. Hinging the cleaning head allows it to be directed from a first surface of the container towards a second surface more easily. The cleaning head may for instance be moved hydraulically. At least one cleaning nozzle is attached to the cleaning head for distributing a cleaning means such as a cleaning solution, e.g. water, soap or a mixture thereof, preferably pressurized. The cleaning nozzle may be moveable with respect to the cleaning head, for instance by the use of a water motor. The cleaning assembly may also be provided with means for assisting the cleaning process, e.g. brushes contacting the walls of the container to be cleaned. Especially when the cleaning means is a liquid, it is preferred to slope the container, preferably towards the open end of the container in order to have the liquid drain from the container more easily.

**[0012]** The cleaning assembly may be provided with one or more further cleaning heads, with may be moveable or fixed. These further cleaning heads may for instance comprise two cleaning heads, arranged at a position near the lower half with respect to the side walls of a container to be cleaned, each of the cleaning heads directed towards an opposing side wall.

**[0013]** The cleaning assembly may be provided with a controller, such as a PLC controller, for controlling the movement of the guiding frame, the cleaning frame, the at least one cleaning head, e.g. its hinging movement, the cleaning nozzle disposed thereon, e.g. the movement thereof with respect to the cleaning head, or its on-off switch. The controller may be provided with one or more

preprogrammed programs. Each of the programs may be adapted to the dimensions of individual containers. The controller may be connected to a security sensor, for instance connected to a door, for aborting the program when the security sensor is triggered.

**[0014]** In a preferred embodiment of the cleaning assembly according to the invention, the cleaning assembly further comprises a drying frame, fixed at the first end of the guiding frame, comprising at least one outwardly directed drying nozzle, connected to drying means.

**[0015]** After cleaning the container, the cleaning means may, especially when liquid, remain attached to the walls of the container. While the container may be sloped to minimize the contents of liquid cleaning means remaining, it will take a relatively long period for a container to dry completely through such a procedure. Liquids remaining may cause smells and even fungal growth in the container when not adequately removed by drying after cleaning.

**[0016]** It is therefore preferred to use adequate drying nozzles, provided on a drying frame. These nozzles may for instance be provided with compressed gaseous stream, such as with air or nitrogen, to create a forced stream towards to walls to remove liquids from the wall. To assist this process, the stream may be heated. The nozzles may be arranged rotatably with respect to the drying frame to allow the nozzles to be directed to the walls of a container to be cleaned.

**[0017]** By positioning the drying frame at the first end of the guiding frame, the drying frame will be placed at the ultimate position with respect to the open end of the container at which cleaning is required, since the guiding frame limits the range of motion of the cleaning frame in this direction. After the cleaning frame has finished cleaning in a certain area, the drying frame may be pulled to dry that area.

**[0018]** The drying frame, e.g. its movement and the nozzles mounted thereon, may be controlled by a controller.

**[0019]** In another preferred embodiment of the cleaning assembly according to the invention, the cleaning assembly comprises a supply tube extending through the guiding frame, connected to at least one drying nozzle.

**[0020]** Because of the fixed position of the drying frame on the guiding frame, it is efficient to use the guiding frame, which already extends over a relatively large span in the direction of travel to allow for movement of the cleaning frame along it, for supplying the drying frame with its means for executing its drying action. The guiding frame may thus be provided with the supply tube extending through the guiding frame, preferably from the second end, opposing the first end to which the drying frame is fixed, to the drying frame. The tube may be a hose but preferably is integrated into the shape of the guiding frame, for instance by an aperture surrounded by the walls of the guiding frame along the length of the guiding frame, which also reduces the chance of damage or malfunctioning of the supply.

**[0021]** In yet another preferred embodiment of the cleaning assembly according to the invention, the cleaning assembly further comprises a base frame, arranged around the guiding frame such that the cleaning frame is arranged between the base frame and the first end of the guiding frame.

**[0022]** The base frame thereby determines the range of motion of the cleaning frame between the first end of the guiding frame and the base frame and prevents the cleaning assembly from accidentally running of the guiding frame.

**[0023]** The base frame may be provided with one or more spools connected to the at least one cleaning nozzle of the at least one cleaning head of the cleaning assembly for supplying the cleaning means to the cleaning nozzle, allowing adequate supply. The spools may be provided with a motor to wind the spools depending on the position of the cleaning frame with respect to the base frame, which may be controlled by a controller.

**[0024]** Preferably, the base frame is at a fixed position, in which it is adjacent to a basic position of the cleaning frame. The base frame may be provided with means for supporting the cleaning frame in such basic position.

**[0025]** In even another preferred embodiment of the cleaning assembly according to the invention, at least one of the guiding frame and cleaning frame comprises at least one outwardly directed guiding wheel for guiding the movement along the walls, the roof or the floor of a container to be cleaned.

**[0026]** The movement of at least one of the guiding frame, including an eventual drying frame fixed thereto, and the cleaning frame is preferably guided by providing at least one rotatable wheel, supported on at least one of the mentioned surfaces. Preferably, the cleaning assembly is supported in at least two directions perpendicular to each other and perpendicular to the direction of transport for increased stability.

**[0027]** One or more rails may be provided to support the movement of the wheel.

**[0028]** In again another preferred embodiment of the cleaning assembly according to the invention, at least one of the cleaning nozzles is rotatable with respect to the cleaning head along an axis, and preferably along at least two axes, which axes are preferably perpendicular to each other.

**[0029]** By providing the cleaning heads with rotatable cleaning nozzles, a greater flexibility is achieved in the possibilities of directing the cleaning nozzles in an adequate position. The movement along one or both axes is preferably determined by a controller.

**[0030]** In yet another preferred embodiment of the cleaning assembly according to the invention, the cleaning assembly further comprises a housing, comprising a cleaning assembly room, enclosing the cleaning frame and the guiding frame in a basic position of the cleaning assembly.

**[0031]** By providing the cleaning assembly with a housing, enclosing the cleaning frame and the guiding frame,

and preferably an eventual drying frame fixed thereto, the cleaning assembly may be moved more easily between different locations. Preferably, the housing also comprises doors to be able to fully cover the cleaning assembly in a basic position.

**[0032]** The housing also allows sheltered movement of the cleaning assembly in operation. When the cleaning assembly is provided with a security sensor, the security sensor may be provided at one of the walls of the housing for triggering the sensor when the housing is entered by a person to increase security.

**[0033]** A base frame which may be part of the cleaning assembly may be fixed on the floor of the housing in the cleaning assembly room. An eventual rail for supporting a wheel may be fixed to any of the sides of the container.

**[0034]** In a further preferred embodiment of the cleaning assembly according to the invention, the housing has a first side, to which the first end of the guiding frame is directed, and a second side opposite the first side, and wherein the housing further comprises a supply room, accessible through the second side, securely separated from the cleaning assembly room, provided with a room supply, connected to at least one nozzle.

**[0035]** A supply room is preferably supplied in the housing behind the range of movement of the guiding frame in the direction of transport. The supply room is preferably provided with one or more room supplies, which supplies may be connected to the nozzles, such as a cleaning nozzle or a drying nozzle. The placement of the supply room separated from the cleaning assembly room allows for secure access to the room supply.

**[0036]** The separation of the cleaning assembly room and the supply room may comprise a separation wall provided with a door, e.g. for maintenance to the parts of the cleaning assembly inside the cleaning assembly room, in which case the door is preferably provided with a security sensor such as described above.

**[0037]** In another preferred embodiment of the cleaning assembly according to the invention, the cleaning assembly further comprises a collection reservoir, arranged adjacent to the first end of the guiding frame in a basic position of the guiding frame for collecting residues from an open end of a container to be cleaned.

**[0038]** When cleaning a container with the cleaning assembly, residues and a cleaning solution may be released through the open end of the container. It is preferred to provide the cleaning assembly with a collection reservoir to collect residues and any eventual cleaning solution. The contents received by the collection reservoir may be disposed but may also be partially or completely recycled to the supply of the cleaning heads, preferably after passing a filter.

**[0039]** When the guiding assembly or the cleaning assembly is provided with wheels in contact with the bottom of a container to be cleaned, the cleaning assembly is preferably provided with a rail for at least one of the wheels to bridge its travel over the collection reservoir into the container.

**[0040]** In again another preferred embodiment of the cleaning assembly according to the invention, the cleaning assembly further comprises a leveling table disposed under at least one of the guiding frame and the cleaning frame in at least one position for leveling the frame with an open end of a container to be cleaned.

**[0041]** Containers to be cleaned may be disposed on a chassis with a different height. For proper vertical alignment of the cleaning assembly, especially the guiding frame and the cleaning frame with respect to the container, it is preferred to provide a leveling table disposed under at least one of these to shift this frame.

**[0042]** The object of the invention is further achieved with a combination of a cleaning assembly according to any of the preceding claims and a container to be cleaned, the container comprising an open end and an end wall, opposite the open end, wherein the first end of the guiding frame is directed towards the end wall of the container.

**[0043]** By having the first end of the guiding frame directed towards the end wall of the container, the part of the guiding frame along which the cleaning frame will travel is substantially parallel to the direction of the side walls of the container, increasing the ease of homogeneous cleaning of the total container using the cleaning assembly.

**[0044]** In a preferred embodiment of the combination according to the invention, the cleaning assembly further comprises an aligning frame, provided with a cavity in which the cleaning frame is preferably arranged, and two arms on both sides of the cavity, surrounding the container at opposite sides.

**[0045]** In order to correctly align a container, possibly arranged on a chassis of a vehicle, efficiently with the cleaning assembly, the cleaning assembly may be provided with a cavity, and two arms extending on both sides. Such two arms, which are visible from the side mirrors of the vehicle to which the container is attached assist the driver in proper alignment of the container to the cleaning assembly.

**[0046]** These and other features of the invention will be elucidated in conjunction with the accompanying drawings.

Figure 1 shows a side view of a cleaning assembly according to the invention in a basic position with the side wall removed from the housing.

Figure 2 shows a side view of the cleaning assembly according to figure 1 in combination with a container, in which both the side wall from the container and from the housing are removed.

Figure 3 shows a front view of a cleaning frame of the cleaning assembly according to the invention.

Figure 4 shows a front view of a drying frame of the cleaning assembly according to the invention.

Figure 5 shows a detail of a cleaning head according to the invention.

Figure 6 shows a top view of a detail of a cleaning

assembly according to the invention.
Figure 7 shows a top view of a cleaning assembly according to the invention.

**[0047]** Figure 1 shows a cleaning assembly 1 comprising a housing 2 arranged on a base 3. In the housing 2, a guiding frame 4 is moveably arranged on the floor 5 through wheels 6, 7. The guiding frame 4 is provided with a drying frame 8 at its first end 9. A number of drying nozzles 10 are distributed outwardly arranged on the drying frame 8.

**[0048]** A tube 11 is arranged throughout the guiding frame 4 to supply the drying frame 8 with compressed air from a compressed air source 12. Compressed air source 12 comprises a spool 13 to allow for adjustment of the distance between the guiding frame 4 and the compressed air source 12.

**[0049]** A cleaning frame 14 is moveably arranged along the guiding frame 4. The cleaning frame 14 is provided with wheels 15 for movement over floor 5. Cleaning frame 14 is further provided with a cleaning head 16 hingeable via an arm 17 with which it is attached to the body 18 of cleaning frame 14. Also attached to the cleaning frame 14 is one of two lower cleaning arms 19 with a cleaning head 20.

**[0050]** The cleaning heads 16, 20 are provided with a cleaning nozzle (see for an example figure 5) for distributing a cleaning solution received from a spool 21 arranged on a base frame 22, connected to the cleaning frame through a hose 23. The spool 21 thereby allows adjustment of the distance between the base frame 22 and the cleaning frame 14.

**[0051]** A collection reservoir 24 is arranged at the end of the housing 2 to which the first end 9 of the guiding frame 4 is directed. The collection reservoir 24 serves to collect residues from a container to be cleaned, as can be seen from figure 2. Above the collection reservoir 24, a platform 25 is disposed adjacent to the housing 2 allowing the guiding frame 4, drying frame 8 and cleaning frame 14 to safely enter a container 26.

**[0052]** Figure 2 shows the cleaning assembly 1 in combination with a container 26. Coming from the basic position as shown in figure 1, the leveling table 27 is leveled to allow the cleaning assembly to enter the container 26. First, guiding frame 4 with drying frame 8 and cleaning frame 14 located at any position thereon is placed with its first end 9 adjacent to the end wall 28 of container 26. Cleaning frame 14 is moved according to a predefined program over the guiding frame 4 and cleaning heads 16, 20 and the cleaning nozzles disposed thereon are moved along the walls of the container 26 according to the program. After completing a certain part of the container when viewed from the end wall 28, the drying frame 8 may be pulled by pulling the guiding frame 4 to which it is attached backwardly and the drying nozzles 10 disposed on the drying frame 8 may be used to direct a compressed air stream towards the walls of the container 26, including the floor.

**[0053]** The container 26 is placed under an angle with respect to the housing 2, in order to allow residues to flow under the force of gravity towards the open end 29 of the container 26.

**[0054]** Figure 3 shows a cleaning frame 14 according to the invention disposed around a guiding frame 4. The cleaning frame 14 is provided with wheels 30 guided in a profiling of guiding frame 4. Mounted on the guiding frame 4 is a cleaning head 16, hingeable along an axis parallel to the length direction of the guiding frame 4. Two further cleaning heads 20, 31 are also provided. The cleaning frame 14 is further provided with wheels 32, 33 for guiding the cleaning frame 14 over a floor. Cleaning frame heads 16, 20, 31 are each provided with a cleaning nozzle 34, 35, 36, rotatable along two axes perpendicular to each other.

**[0055]** Figure 4 shows a drying frame 8, comprising a frame 37 with drying nozzles 10 disposed thereon facing outwardly. The drying nozzles 10 are supplied through a supply tube 38, connected through the tube 11 through the guiding frame 4. The drying frame 8 is also provided with wheels 39, 40 for guiding the drying frame 8 over a floor.

**[0056]** Figure 5 shows a cleaning head 16, 20, 31 in greater detail. The cleaning head 16, 20, 31 comprises a first housing 41, through which a first axis 42 is directed, and around which second housing 43 may rotate. A cleaning nozzle 34, 35, 36 are rotatable with respect to second housing 43 around an axis 44.

**[0057]** Figure 6 shows a housing 2 of the cleaning assembly 1 and a container 26 arranged next to the housing 2. To assist in proper aligning of the length axis 45 of the container 26 with the direction of transport of the cleaning assembly 1, the cleaning assembly 1 is provided with two alignment arms 46, 47, disposed on opposite sides of the container 26.

**[0058]** Figure 7 shows a cleaning assembly 1 in a housing 2 with a cleaning assembly room 48 and a supply room 49 and a wall 50 separating these rooms 48, 49. supply lines 51, 52 are provided, opening up into supply room 49 allowing for safe access to these supplies without entering the cleaning assembly room 48.

## Claims

1. Cleaning assembly for cleaning the inner walls of a container, comprising:

   - a guiding frame, with a first end, which guiding frame is moveable in a direction of transport;
   - a cleaning frame, moveable in the direction of transport along the guiding frame; and
   - at least one cleaning head, attached to the cleaning frame and hingeable along an axis parallel to the direction of travel, the cleaning head comprising at least one cleaning nozzle, connected to cleaning means.

2. Cleaning assembly according to claim 1, further comprising a drying frame, fixed at the first end of the guiding frame, comprising at least one outwardly directed drying nozzle, connected to drying means.

3. Cleaning assembly according to claim 2, comprising a supply tube extending through the guiding frame, connected to at least one drying nozzle.

4. Cleaning assembly according to any of the preceding claims, further comprising a base frame, arranged around the guiding frame such that the cleaning frame is arranged between the base frame and the first end of the guiding frame.

5. Cleaning assembly according to any of the preceding claims, wherein at least one of the guiding frame and cleaning frame comprises at least one outwardly directed guiding wheel for guiding the movement along the walls, the roof or the floor of a container to be cleaned.

6. Cleaning assembly according to any of the preceding claims, wherein at least one of the cleaning nozzles is rotatable with respect to the cleaning head along an axis, and preferably along at least two axes, which axes are preferably perpendicular to each other.

7. Cleaning assembly according to any of the preceding claims, further comprising a housing, comprising a cleaning assembly room, enclosing the cleaning frame and the guiding frame in a basic position of the cleaning assembly.

8. Cleaning assembly according to claim 7, wherein the housing has a first side, to which the first end of the guiding frame is directed, and a second side opposite the first side, and wherein the housing further comprises a supply room, accessible through the second side, securely separated from the cleaning assembly room, provided with a room supply, connected to at least one nozzle.

9. Cleaning assembly according to any of the preceding claims, further comprising a collection reservoir, arranged adjacent to the first end of the guiding frame in a basic position of the guiding frame for collecting residues from an open end of a container to be cleaned.

10. Cleaning assembly according to any of the preceding claims, further comprising a leveling table disposed under at least one of the guiding frame and the cleaning frame in at least one position for leveling the frame with an open end of a container to be cleaned.

11. Combination of a cleaning assembly according to any of the preceding claims and a container to be cleaned, the container comprising an open end and an end wall, opposite the open end, wherein the first end of the guiding frame is directed towards the end wall of the container.

12. Combination according to claim 11, wherein the cleaning assembly further comprises an aligning frame, provided with a cavity in which the cleaning frame is preferably arranged, and two arms on both sides of the cavity, surrounding the container at opposite sides.

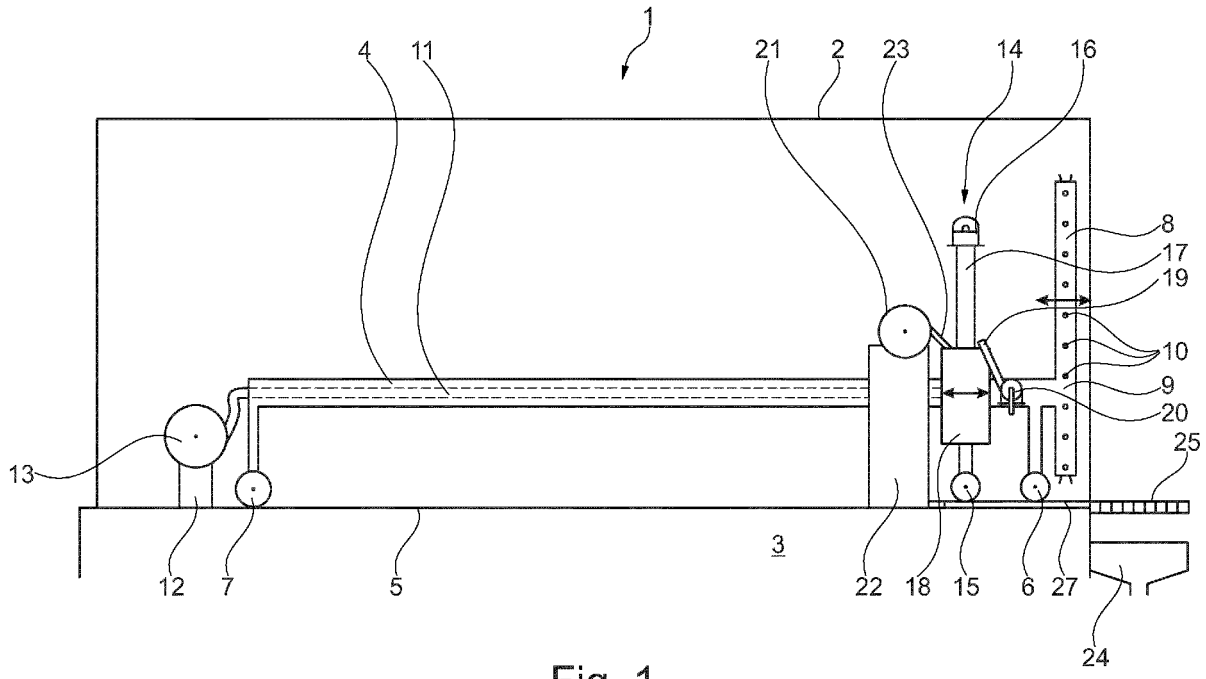


Fig. 1

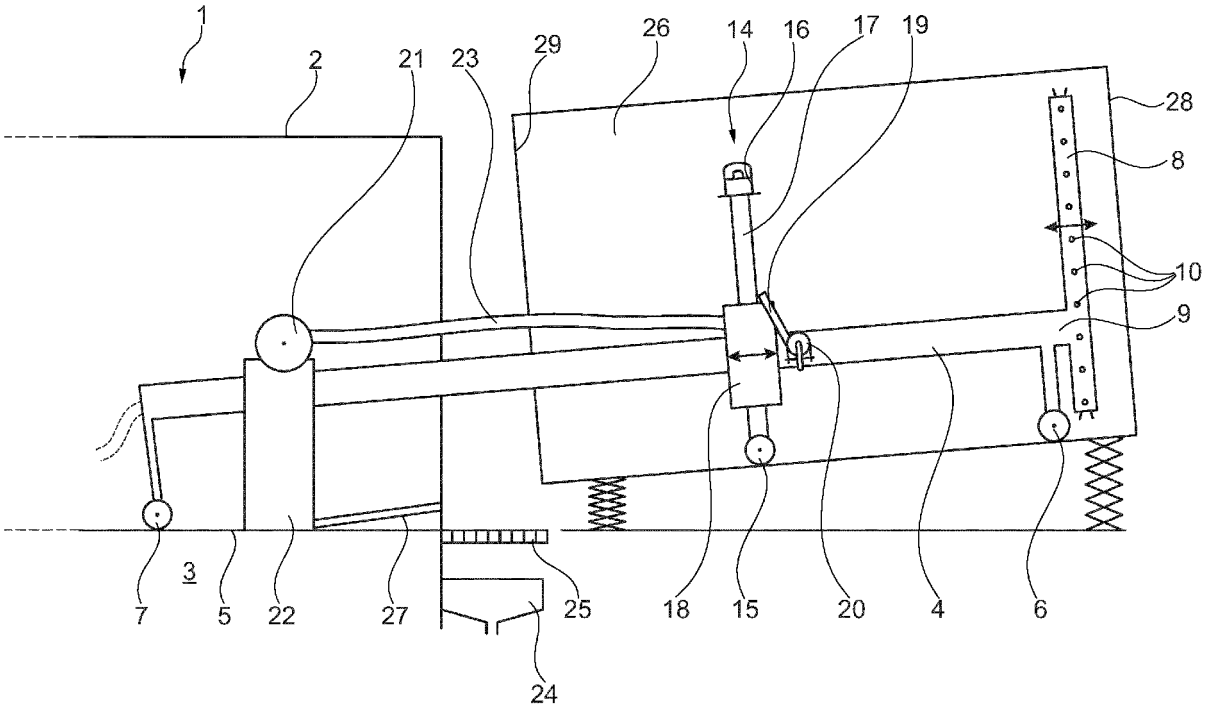


Fig. 2

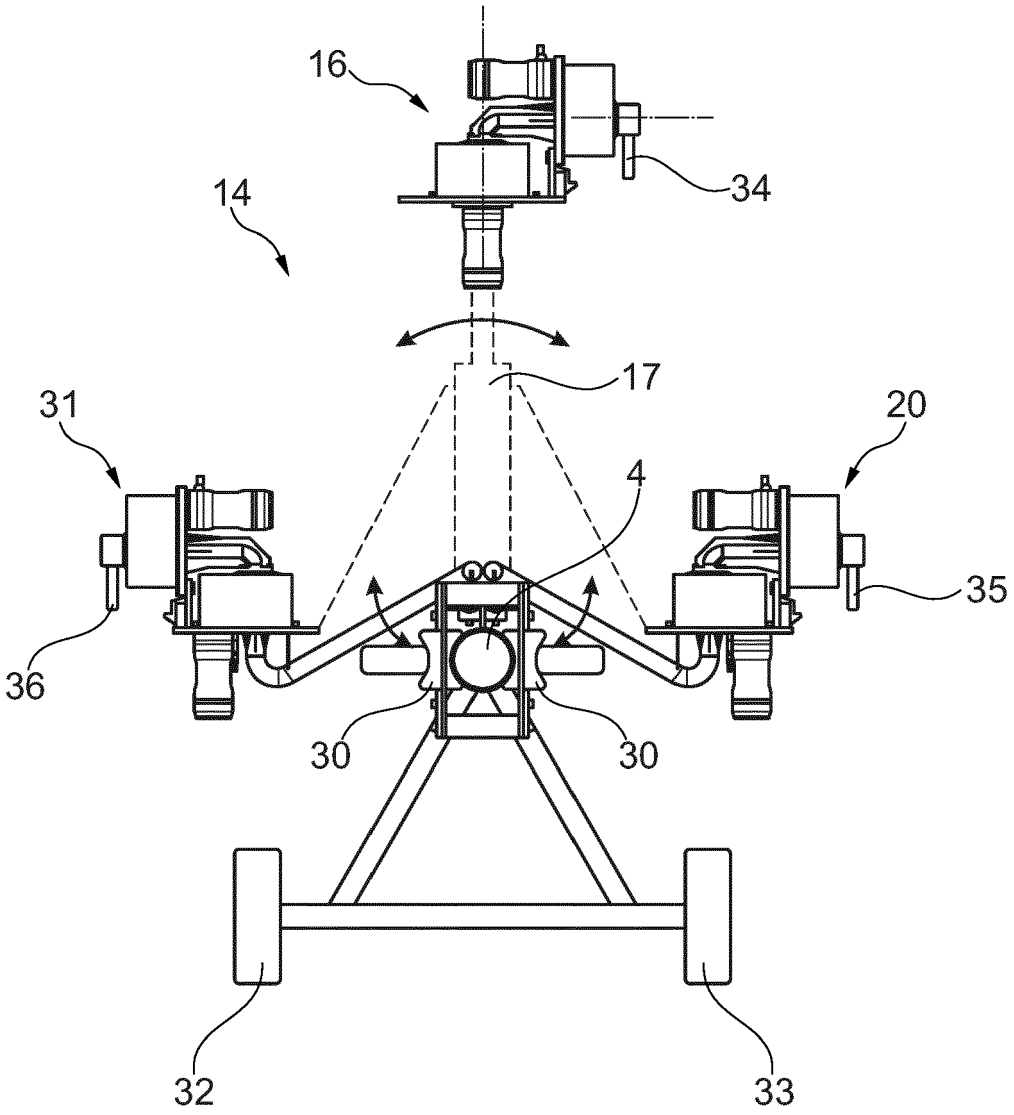


Fig. 3

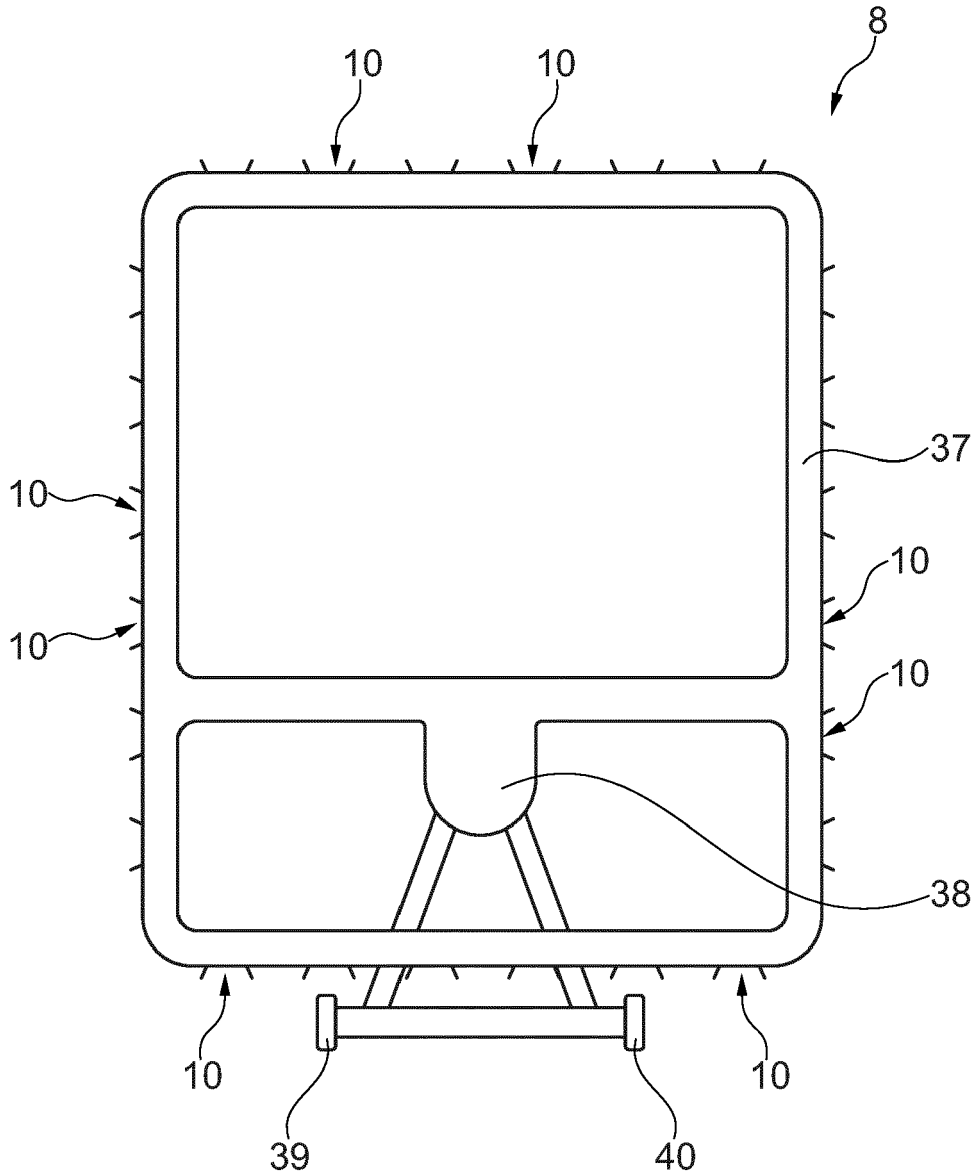


Fig. 4

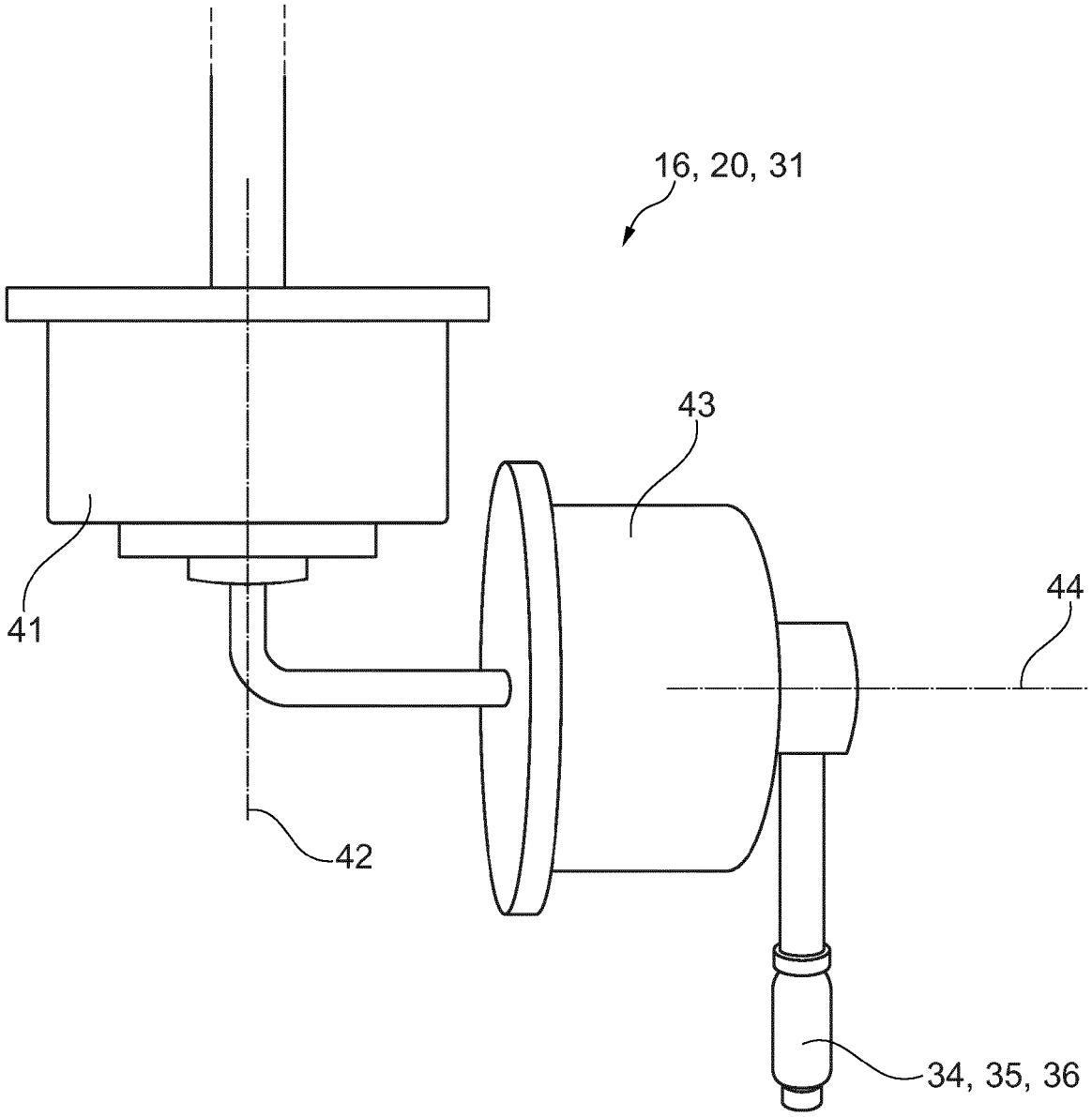


Fig. 5

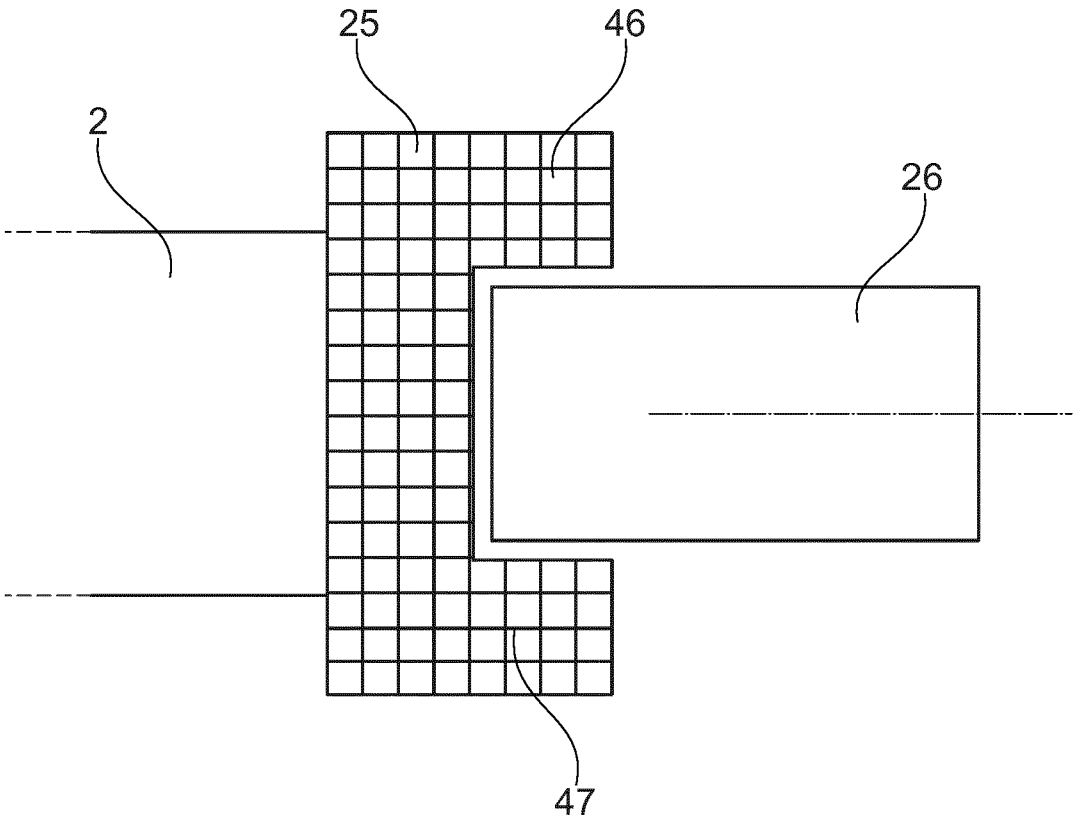


Fig. 6

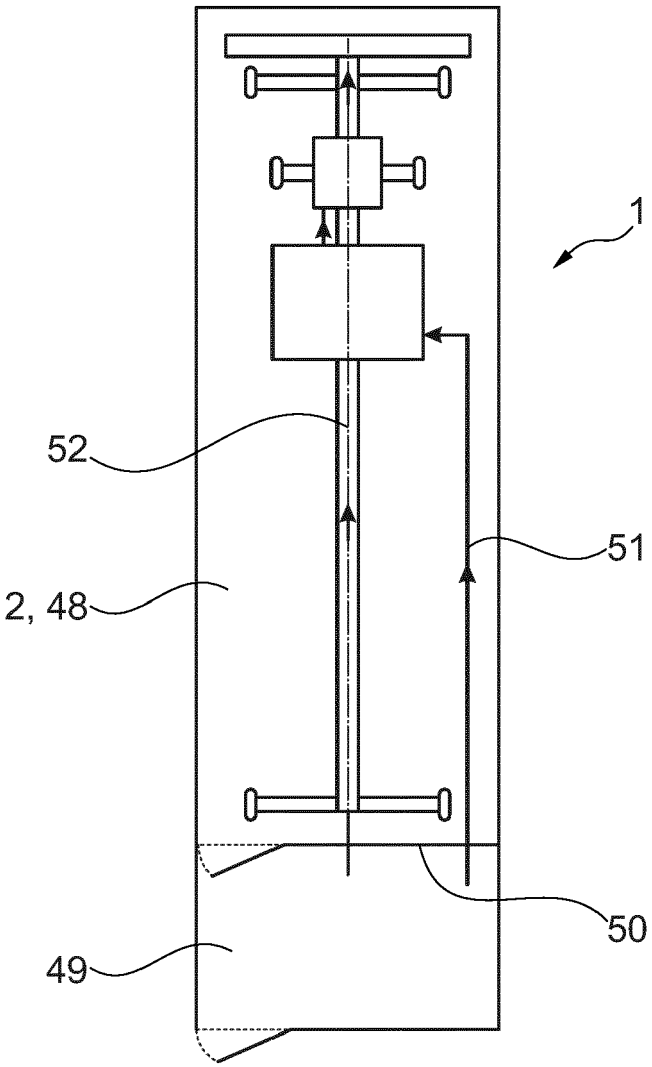


Fig. 7

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 15 15 9633

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br>Y | CH 698 563 A2 (ZEINTRA AG [CH])<br>31 August 2009 (2009-08-31)<br>* abstract *; figures *<br>* paragraph [0018] - paragraph [0025] *<br>* paragraph [0082] - paragraph [0086] *<br>* paragraph [0114] - paragraph [0130] * | 1,5,6<br>2-4,7-12 | INV.<br>B08B9/093<br>B60S3/00 |
| Y,D | GB 2 299 770 A (SYSTEMS [GB])<br>16 October 1996 (1996-10-16)<br>* the whole document * | 4,7-10 | |
| Y | US 4 112 533 A (BRAGER DOUGLAS R)<br>12 September 1978 (1978-09-12)<br>* abstract *; figures *<br>* page 4, line 63 - page 6, line 41 * | 11,12 | |
| Y | EP 0 940 192 A2 (LARSEN THORBEN [DK])<br>8 September 1999 (1999-09-08)<br>* abstract *; figures *<br>* paragraphs [0001], [0026] *<br>* claim 1 * | 2,3 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC) |
| A | US 2006/124154 A1 (RIVALTO MICHAEL A [US])<br>15 June 2006 (2006-06-15)<br>* abstract *paragraph 26, paragraph 39; figures * | 1-12 | B08B<br>B60S |
| A | EP 2 255 897 A1 (IB CLEANING AB [SE])<br>1 December 2010 (2010-12-01)<br>* abstract *; figures *<br>* paragraph [0010] - paragraph [0034] * | 1-12 | |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 2 September 2015 | Plontz, Nicolas |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 15 9633

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02-09-2015

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| CH 698563 A2 | 31-08-2009 | NONE | |
| GB 2299770 A | 16-10-1996 | NONE | |
| US 4112533 A | 12-09-1978 | NONE | |
| EP 0940192 A2 | 08-09-1999 | NONE | |
| US 2006124154 A1 | 15-06-2006 | NONE | |
| EP 2255897 A1 | 01-12-2010 | AT 536224 T | 15-12-2011 |
| | | CN 102458700 A | 16-05-2012 |
| | | DK 2255897 T3 | 19-03-2012 |
| | | EP 2255897 A1 | 01-12-2010 |
| | | ES 2378192 T3 | 09-04-2012 |
| | | SG 176216 A1 | 29-12-2011 |
| | | US 2012273009 A1 | 01-11-2012 |
| | | US 2015122288 A1 | 07-05-2015 |
| | | WO 2010136305 A1 | 02-12-2010 |

EPO FORM P0459

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

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- GB 2299770 A **[0004] [0005] [0007]**
- WO 2012022881 A **[0006]**