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(54) **Positioning system for a drying device**

(57) The present invention refers to a positioning system of a drying device (19) in a varnish and/or other material drying plant that comprises detection means (22) of at least one outline of the object to be dried and electronic means (24) for controlling the drying operations. The system is **characterised in that** said electronic control means (24) comprise graphical representation means (26) available to an operator and instructions adapted to generate on the graphical representation means (26) at least a virtual outline (P) corresponding to the profile of the object to be dried detected by said detection means (22). The instructions establish a correspondence between the graphical representation of the virtual outline (P) and the real position of the object to be dried. Said instructions further establish a correlation between the positioning controls of the drying device (19) on the object to be dried and the virtual outline (P).

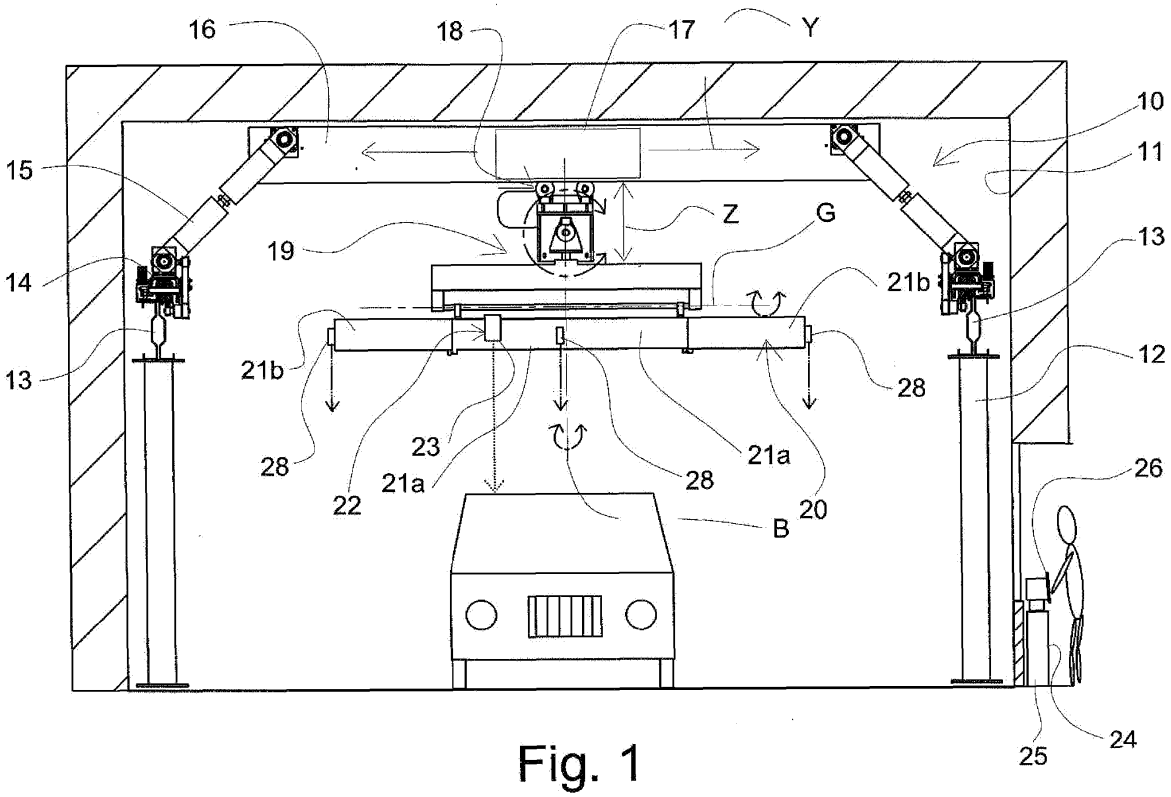

Fig. 1

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Description

[0001] The present invention concerns to the field of varnishing and drying plants for bodies of vehicles, and in particular it refers to a positioning system for a drying device in a varnish and/or other material drying plant.

[0002] As known, drying plants for drying varnishes applied to vehicle bodies generally comprise a tunnel-shaped cabin in which a movable scaffolding structure is arranged formed by vertical uprights up against the walls of the cabin and side guides supported by such vertical uprights. Slides are arranged on the side guides for moving a central beam. The latter constitutes the support of a drying device consisting of three flat groups of drying panels (in each group the panels are adjacent to one another and side by side). Such a device is fixed to a carriage which translates along the central beam. In particular, there are two groups of panels which are parallel with one another and orthogonal to the floor of the cabin and a central group of panels arranged between the first two, oriented parallel with the floor of the cabin; the three groups of panels together have an upside down U configuration which is adapted to surround the vehicle from above.

[0003] The drying device can be moved together with the entire central beam of the scaffolding in the direction (defined here as direction X) of longitudinal development of the cabin; moreover, the device can translate along the direction of development of the central beam itself (defined here as direction Y). In addition to these motion directions of the drying group there are also, only for the central group of panels, a vertical translation (direction Z) which allows for the upper panels to be brought closer to the top portion of the vehicle, as well as a rotation around an axis (parallel to the direction Y) transversal to the cabin, allowing the central group of panels to be tilted so as to follow the profile of the vehicle or even to be arranged vertically so as to approach the front or rear side of the vehicle.

[0004] The operative drying steps of the body of a vehicle are carried out in a substantially semiautomatic fashion. In practice the vehicle is positioned inside the cabin. On a side wall of the cabin there is a metric scale which extends in the longitudinal direction that indicates the distance from a "zero" point. The vehicle is positioned inside a range "zero to maximum distance" measured on such a metric scale. The movable scaffolding is made to translate from a point behind the vehicle measured on the metric scale to a point in front of the vehicle. The translation command is given by a worker who inputs, through a keypad, the numeric values of such end points inside a control station. The estimation of these points is given by a visual reading: the worker roughly verifies by the eye which are the values nearest to the front and back ends of the vehicle.

[0005] On the scaffolding there is a sensor which detects the longitudinal outline of everything within the detected range, i.e. the longitudinal outline of the vehicle. Such an outline line is stored inside the control station. At this stage the worker, again through visual reading with reference to the metric scale positioned on the wall of the cabin, verifies in which position the group of drying panels must be arranged in order to be available to carry out the drying of a determined region of the vehicle. For example, in the case in which only the bonnet of the vehicle is to be dried, the operator commands the drying device to translate in the position within a certain range and ensures that only the drying panels of the upper group of panels are switched on (the group of side panels are turned off but are forced to follow the upper group). The scaffolding thus moves within such a range with the upper group panels which are oriented so as to always be orthogonal to the surface of the vehicle within the selected range (this thanks to the storage of the outline line made previously). Once the drying device has finished passing through the range, the drying step of the vehicle is finished.

[0006] Such a drying system, although known and used for many years, has substantial drawbacks.

[0007] A first drawback, for example, is related to the fact that when the worker inserts the range data into the control station there can be mistakes in reading the values on the metric scale, as well as in "typing" the numeric values.

[0008] Moreover, in order to reduce the risk of such mistakes, the operator is induced to insert range values which are greater than necessary, with a consequent excess of translation stroke of the drying device, thus causing great waste of heat and a longer drying time.

[0009] Yet another drawback is related with the fact that the distance of the drying panels during the drying step is fixed, given the knowledge of the outline and its height from the ground, and it includes a safety additional height to avoid accidental bumping into the body of the vehicle, since the detection of the outline is carried out only on a longitudinal line and does not take into account other spatial parameters. Such a safety height implies the need to have a greater heating than in case of a panel placed closer, with obvious energy waste deriving from it.

[0010] The main object of the present invention is therefore that of overcoming the aforementioned drawbacks, by providing a positioning system of a drying device in a varnish and/or other material drying plant which is adapted to reduce to a minimum the mistakes due to human actions in determining the space parameters in the cabin used for the drying operations.

[0011] Another important object of the present invention is to provide a positioning system of a drying device which makes it possible to obtain a reduction in the management costs of the drying plant in which it is inserted.

[0012] These and other objects, which shall become clearer hereafter, are achieved with a positioning system of a drying device in a varnish and/or other material drying plant which comprises detection means of at least an outline of an object to be dried and electronic means for controlling the drying operations. The system is **charac-**

terized in that the electronic control means comprise graphical representation means available to an operator and instructions adapted to generate on said graphical representation means at least a virtual outline corresponding to the profile of the object to be dried detected by the detection means; the instructions establish a correspondence between the graphical representation of the virtual outline and the real position of the object to be dried; the instructions further establish a correlation between the positioning controls of the drying device on the object to be dried and the virtual outline.

[0013] The characteristics and the advantages of the system according to the present invention will become clearer from the following description of one of its embodiments, given as an example and not for limiting purposes with reference to the attached drawings, in which:

- figure 1 represents a schematic front view of a drying plant using a positioning system according to the invention;
- figure 2 shows a schematic side view of the plant of figure 1;
- figures 3, 4 and 5 show three schematic views of portions of the plant of figure 1 with the drying device arranged in different arrangements;
- figure 6 shows a top schematic view of the group of drying panels of the device shown in the previous figures, highlighting with a broken line the possibility of rotating around an axis which is orthogonal to the group itself;
- figure 7 represents a touch-screen type display showing the detected outlines of a vehicle the body of which is to be dried.

[0014] With reference to the above mentioned figures, the varnish and/or other material drying plant is wholly indicated with reference numeral 10 and is housed inside a cabin 11. Such a plant comprises a support frame of the type having a movable scaffolding comprising vertical uprights 12 adjacent to the side walls of the cabin, which support two parallel beams 13, for guiding the movable scaffolding support along a motion direction which coincides with the direction of development of the cabin, indicated with X. Arranged on the guide beams 13 there are motorised slides 14 that, through arms 15, support the central beam 16 that defines the movable scaffolding. Such a beam 16 extends transversally to the cabin, that is orthogonally with respect to the direction X. Such a transverse direction is indicated with Y.

[0015] On the central beam 16 there is a motorized carriage 17 which slides in the direction Y and that supports a drying device 19 through a frame 18 with an articulated quadrilateral fashion. Such a frame 18 allows the device 19 to translate vertically (direction Z). In practice the drying device is adapted to translate according to three axes orthogonal to one another, oriented according to main directions of the cabin 11 in which the device operates.

[0016] The drying device 19, in this embodiment, comprises a single group 20 of side by side drying panels 21a-21b so as to define the drying surface. In the example here described, there are four adjacent drying panels 21 (two inner panels 21a and two outer panels 21b) that, in their normal configuration, substantially lie on the same plane. In such a normal configuration, the panels offer a generally rectangular drying surface. The outer panels 21 b can rotate at its sides adjacent to the respective inner panels 21 a until they are orthogonal to them, this in order to take on a useful configuration for drying angle regions.

[0017] The drying device has three degrees of rotational freedom with respect to the movable scaffolding which supports it, thanks to motorized rotation means of the group 20 of drying panels 21 around three rotation axes orthogonal to one another: a turnover axis R parallel to the direction X of development of the cabin 11, a revolution axis B which is orthogonal to the floor of the cabin 11 when the group of panels 20 is oriented with the drying surface parallel to the cabin, as shown in figures 1 and 2, and a rotation axis G orthogonal to the other two axes R and B, respectively.

[0018] In practice, the drying device 19 allows the group of panels 21 to be placed according to arrangements with any orientation inside the cabin 11 and in particular: 1) a first arrangement in which the group of panels is parallel to the floor of the cabin, with the rectangular development of the group oriented transversally to the development direction X of the cabin itself (see figures 1 and 2); 2) a second arrangement in which the group of panels is flipped around the axis R by 90° starting from the first arrangement of figure 1 (see figure 2), i.e., with the rectangular development of the group oriented towards the top of the cabin and with the drying surface directed laterally (direction Y); 3) a third arrangement in which, starting from the first arrangement, the group of panels is rotated by 90° around the rotation axis G (see figure 5), i.e., with the rectangular development of the group oriented transversally to the development direction X of the cabin 11 and with the drying surface directed parallel to the same direction X; 4) a fourth arrangement in which, starting from the third arrangement, the group of panels is rotated by 90° around the revolution axis B (see figure 4), i.e., with the rectangular development of the group oriented parallel to the direction X and with the drying surface directed laterally (direction Y).

[0019] On the group 20 of panels 21 detection means 22 are provided for detecting the outline of the vehicle (indicated with V), the body of which is to be dried after the varnishing step.

[0020] In this embodiment, such outline detection means 22 comprise a detection sensor 23, for example of the laser type, fixed to the periphery of the inner panels 21 a and oriented orthogonal to them. Such a detection sensor 23 is connected with electronic control means 24 of the plant 10, like for example an electronic processor comprised in a control station 25 arranged at the side of

the cabin and operated by a worker (see figure 1).

[0021] The control station 25 is provided with graphical representation means, i.e., a video interface like a screen 26 which makes it possible to observe and control the drying steps. According to the invention, an electronic program is loaded in the management and control processor 24 of the plant which allows a virtual outline P, corresponding to the outline of the vehicle detected with the detection sensor 23, to be generated on the screen 26, as visible in figure 7.

[0022] In the electronic program a correspondence is implemented between the graphic representation of the virtual outline P on the screen and the real position of the object to be dried in the cabin 11. Such a correspondence requires plant installation parameters (inserted into the electronic program only once at the moment of first operation of the plant), i.e.:

- total length of the longitudinal axis of the cabin 11 (axis X);
- height of the cabin (axis Z);
- total width of the cabin (axis Y);
- lateral stroke of the drying device;
- distance between the two end stops for the drying device in the direction X of the cabin;
- maximum height from the ground of the drying device;
- position of the detection sensor 23 when the drying device is on the "zero" of the cabin.

[0023] The system learns the position of the vehicle in the cabin 11 in the following way. Through the control station 25, the drying device is commanded to move from the position "zero" in direction X with the group of panels 21 arranged in the first arrangement, i.e. drying panels parallel to the floor of the cabin with the rectangular development transverse to the cabin. This movement allows the detection sensor 23 to pass above the vehicle, thus detecting the longitudinal outline. Once the longitudinal outline has been detected, and once stored the number of steps taken at the beginning of the detection and the number of steps taken at the end of the detection of the longitudinal outline (for example: beginning detection at 1720 steps and end of the detection at 7230 steps), it is then necessary to detect the lateral outline of the vehicle by carrying out the following procedure.

1. revolution of the panel 20 by an angle of -90° through the rotation around the axis Z;
2. translation of the carriage 17 towards the far left side of the cabin (left if looking from the entrance of the same cabin);
3. returning back towards the home-position for a number of steps equal to half of the entire extension stroke of the longitudinal detection of the vehicle; for example 7230 - 1720 = 5510 steps = total extension of the length of the vehicle; in this case it is sufficient to return back by (5510 : 2) = 2755 steps;
4. detection of the width of the vehicle, in the same way as the detection of the longitudinal outline (final steps - initial steps = width of the vehicle);
5. rotation of the panel 20 by +90° through a rotation around the axis G;
6. descent according to the axis Z up to 150 mm from the ground and at the same time detection of the lateral outline of the vehicle.

[0024] Once the lateral summary outline of the vehicle has been detected, through simple mirroring operations with respect to the longitudinal axis of the vehicle, the summary outlines of the front and rear of the vehicle of figure 7 are defined.

[0025] Defining the summary outline from the top is carried out by joining the ends of the longitudinal detection profile with two lines orthogonal to the same longitudinal detection and with two lines parallel to the longitudinal detection passing through the right and left outline of the lateral detection.

[0026] The electronic program translates the acquisition of the outline in a graphical representation, as shown in the central panel C1 of the screen of the video interface of the control station, shown in figure 7.

[0027] Once visualized the virtual outline P of the vehicle on the screen 26, the operator must order the drying device 19 to position itself on the vehicle V relative to the part of body to be dried. According to the invention, the positioning commands of the drying device are correlated with the virtual outline of the vehicle on the screen so that the operator can give such commands based upon information displayed on the screen. For such a purpose the invention, advantageously, provides for the possibility that such a screen 26 is of the "touch-screen" type and that at each area of the screen occupied by a portion of the virtual profile P there is a corresponding indication of space coordinates to the electronic means 24, said coordinates corresponding to an area of the object on which the drying is to be carried out. To this purpose, on the screen 26 there are appropriate virtual space references associated with the virtual outline P and corresponding to the space of the plant in which the vehicle to be dried is arranged. In the preferred embodiment, such space references are made up of a grid 27 to which Cartesian space coordinates correspond. To each portion of the screen corresponding to one slot of the grid 27 there is a corresponding indication, directed to the positioning commands of the group of drying panels, of what the drying area must be.

[0028] When the worker presses a slot (like in the central panel of the screen of figure 7) corresponding to an area of the body of the vehicle to be dried, he indicates to the control station where the group of drying panels must be positioned. The program comprises the possibility of also indicating more than one drying area, by pressing a plurality of slots of the grid, thus allowing for a drying sequence to be ordered.

[0029] As described, the drying device 19 allows the

group of drying panels 21 to be oriented in any fashion inside the cabin, said group in practice being able to translate according to the three main directions of the cabin (longitudinal X, transversal Y and vertical Z) and to rotate according to three axes (turnover R, revolution B and rotation G) which are orthogonal to one another and orthogonal to the three main directions X, Y and Z. Such a mobility of the group of panels makes it possible to carry out detections of further outlines in addition to the longitudinal one. It is indeed possible to arrange and move the group of panels so as to make the detection sensor 23 carry out a stroke (or many strokes) transverse to the vehicle, thus storing its transverse outline and thus being adapted to provide, for example, a graphical representation from the top of the vehicle on the screen 26 (in figure 7 this representation is shown in the bottom right panel). Moreover, it is possible to arrange the group of drying panels on the side or at the rear (or front) of the vehicle according to a vertical orientation, so that the detection sensor 23 is orthogonal to the side of the vehicle, and to make the detection sensor 23 itself translate vertically. In this way it is possible to provide graphic representations of outlines of the vehicle according to different directions, like the five orthogonal views shown in the panels of the screen of figure 7, i.e., front view, rear view, right and left side views, and a top view. In practice it is also possible to reconstruct a substantially three dimensional view of the vehicle. By having such graphical representations on the screen it is possible to select the areas to be dried, indicating to the drying device the positions that the group of drying panels have to take on.

[0030] Advantageously, the drying device also comprises sensor means for signalling obstacles, such as, in this embodiment, ultrasound signalling sensors 28 mounted on the drying panels 21 and oriented according to the drying direction. Such sensors 28 make it possible to signal the distance of the group of panels from the surface to be dried to the control station and thus make it possible to keep said group as close as possible to such a surface, without the risk of bumping, optimizing in this way the heating.

[0031] It goes without saying that such obstacle signalling sensors can be of different types, for example of the laser type, just as the detection sensor of the outline of the vehicle can, for example, also be of the ultrasound type. Furthermore, in other embodiments, the detection sensor and obstacle signalling sensors can be integrated in a single device which carries out both the functions.

[0032] Furthermore, the positioning system according to the invention can be used with any type of object to be dried and not only with vehicles. For example, it can be used for the drying of body parts which are not fixed to the vehicle, like the doors, mudguards, bonnets etc., which are also hanging or resting on suitable racks inside the drying cabin. The system will provide for moving the device on the rack so as to detect the outlines of the various hanging or support elements.

[0033] It should be clear from what has been described thus far that the system according to the invention accomplishes the aforementioned objects. Indeed, with such a system it is possible to visualize the outline of the vehicle on a screen and, through a correlation between such a virtual outline represented on the screen and the movement commands of the drying device, it is possible to precisely indicate, and without any chance of error, the areas of the vehicle on which the drying panels must be positioned for the drying. The fact that such a correlation is given by "touch-screen" interaction makes it possible to further simplify the identification and the selection of the parts onto which the drying device should be positioned, making the system very easy to use.

[0034] Furthermore, the fact of knowing the entire outline of the vehicle according to different directions makes it possible to select the areas of the vehicle to be dried in a very precise fashion, thus being available to optimize the number of panels switched on for drying, offering benefits in terms of overall energy consumption of the plant. Again concerning energy saving, the fact that the panels can remain at an optimal distance from the vehicle means that less thermal energy is necessary for heating compared to the case in which the distance is increased by a safety value to avoid accidents.

[0035] It goes without saying that the system thus conceived can undergo numerous modifications and variants, all of which fall within the scope of the invention; moreover, all the details can be replaced by technically equivalent elements, without for this reason departing from the scope of protection of the invention itself.

[0036] In practice, the materials used, as long as they are compatible with the specific use, as well as the sizes and shape, can be any according to the requirements and the state of the art.

[0037] Whenever the characteristics and techniques mentioned in any claim are followed by a symbol, these have been enclosed, as an example, for the sole purpose of making the claims clearer and consequently do not limit in any way the interpretation of each element they identify.

Claims

1. A positioning system of a drying device (19) in a drying plant of varnish and/or other material, the system comprising:

   - detection means (22) of at least an outline of an object to be dried;
   - electronic means (24) for controlling the drying operations, **characterized in that** said electronic control means (24) comprise: graphical representation means (26) available to an operator;
   - instructions adapted to generate on said graphical representation means (26) at least a virtual outline (P) corresponding to said at least one profile of the object to be dried detected by said

detection means (22), said instructions establishing a correspondence between the graphical representation of said virtual outline (P) and the real position of the object to be dried, said instructions further establishing a correlation between the positioning controls of the drying device (19) on the object to be dried and said virtual outline (P)

2. The positioning system according to claim 1, **characterized in that** said instructions are adapted to generate on said graphical representation means (26), with reference to the direction of the development of the environment in which said drying device operates, at least a representation of the outline of the object to be dried in relation with a side view and/or a top view and/or a front view and/or a back view.

3. The positioning system according to claim 1, **characterized in that** said instructions is adapted to generate on said graphical representation means (26) a three-dimensional representation of the object to be dried.

4. The positioning system according to one or more of the previous claims, **characterized in that** said graphical representation means comprise a touch screen (26) video interface (26), one or more virtual outlines (P) of the object to be dried being represented on said screen (26), each area of the screen occupied by a portion of a virtual outline (P) being associated with an indication to said electronic control means of spatial coordinates corresponding to a specific object region to be dried.

5. The positioning system according to one or more of the previous claims, **characterized in that** said graphical representation means comprise virtual spatial references (27) associated with said at least one virtual outline (P) and corresponding to the space of the implant in which the object to be dried is placed.

6. The positioning system according to claim 5, **characterized in that** said virtual spatial references (27) consist in a grid displayed on said screen (26), each portion of the screen corresponding to a slot of the grid (27) being associated with an indication on the drying area to the positioning controls of a group of drying panels.

7. The positioning system according to one or more of the previous claims, **characterized in that** it comprises rotation means around three rotation axis (R, G, B) for a group of drying panels (21 a, 21 b) of the drying device (19).

8. The positioning system according to claim 6 or 7, **characterized in that** said detection means (22) of at least an outline of the object to be dried comprise at least a detection sensor (23) placed on said group (20) of drying panels (21a, 21b), said detection sensor (23) being of a laser or ultrasound type.

9. The positioning system according to one or more of claims 6 to 8, **characterized in that** it comprises sensor means (28) for signaling obstacles, arranged on said group of drying panels.

10. The positioning system according to one or more of the previous claims, **characterized in that** said instructions are adapted to handle the procedures described at the pages 6 and 7 of the present description.

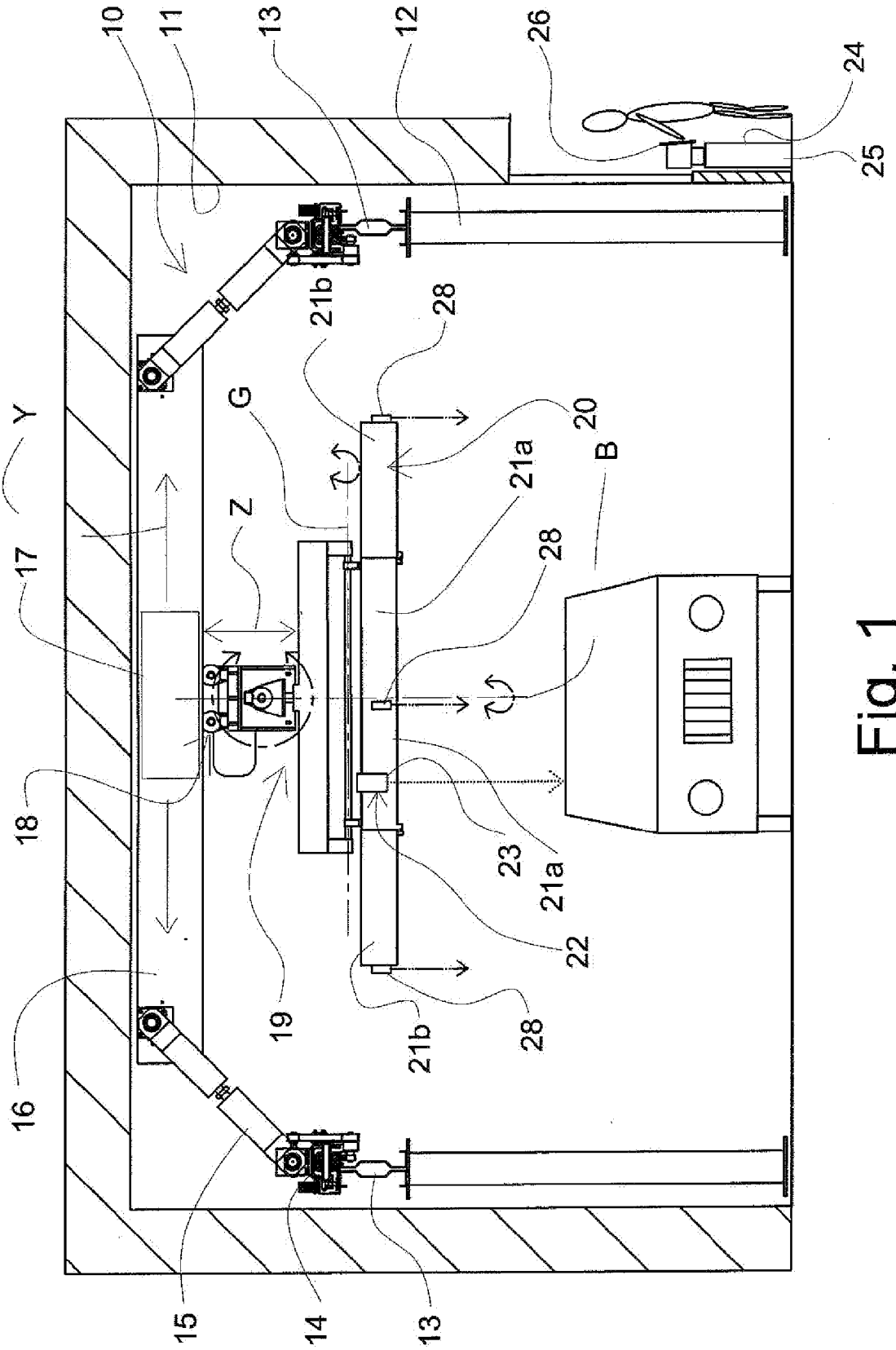
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Fig. 1

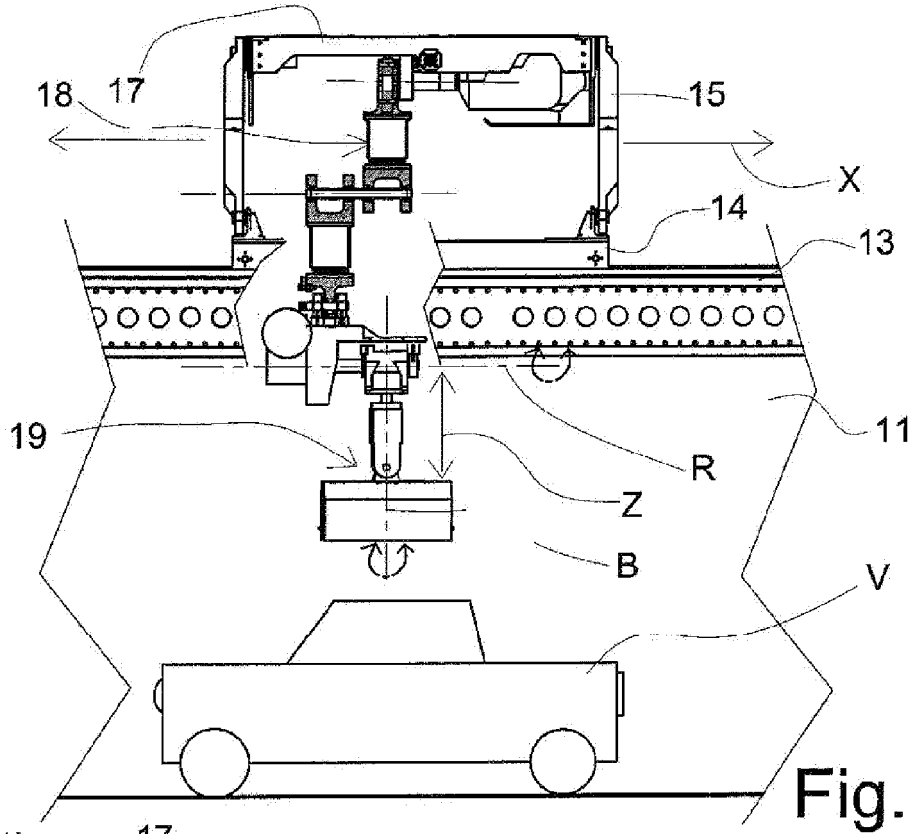

Fig. 2

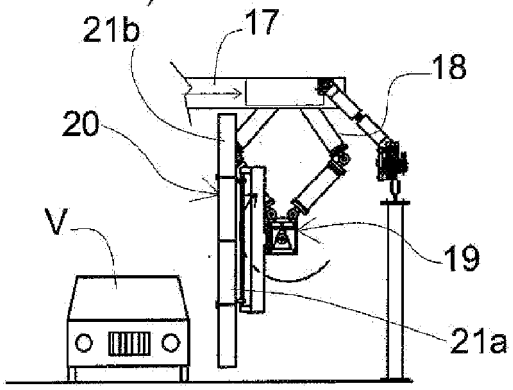

Fig. 3

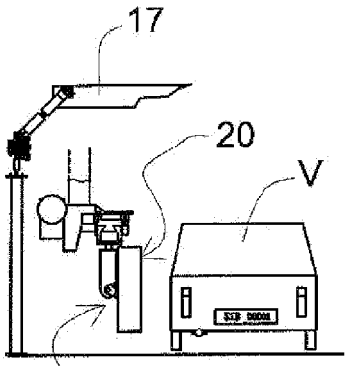

Fig. 4

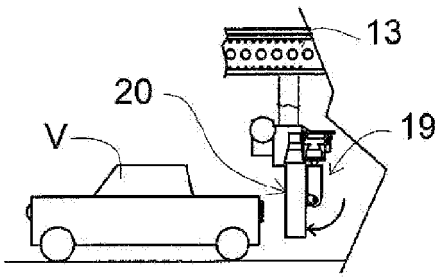

Fig. 5

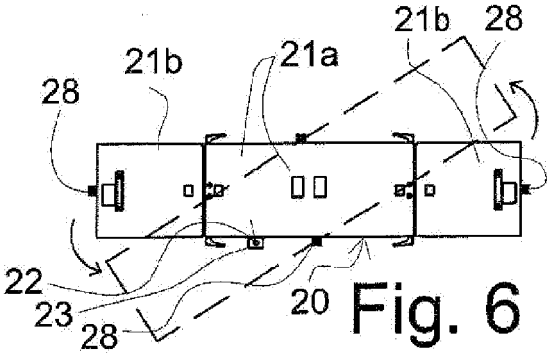

Fig. 6

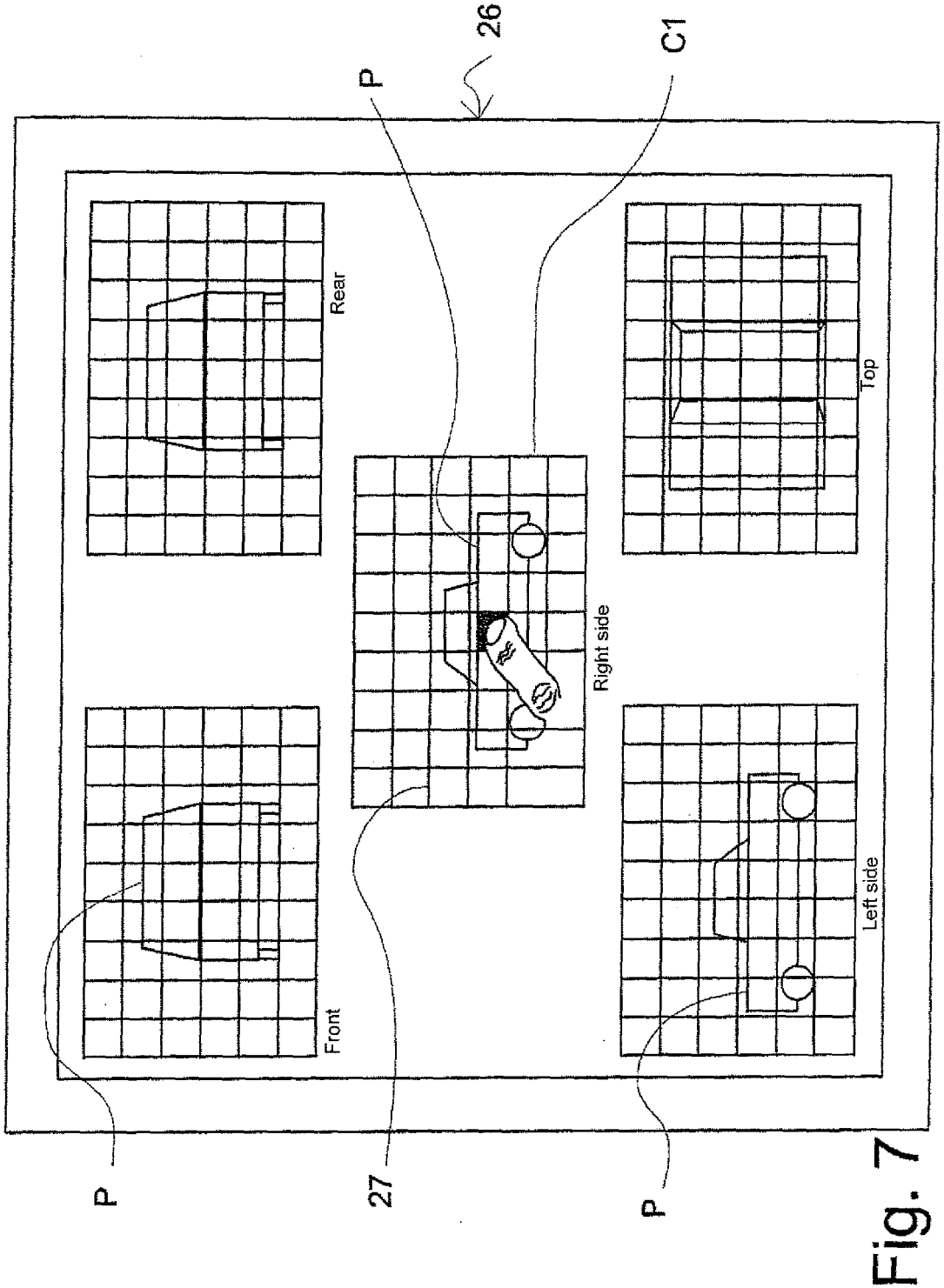

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 5368

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 Y	US 5 517 768 A (AVIV ZVI [IL]) 21 May 1996 (1996-05-21) * the whole document *	1-3,5 7	INV. F26B3/28 F26B3/30
Y	DE 103 12 381 A1 (VOLKSWAGEN AG [DE]) 30 September 2004 (2004-09-30) * claim 20 *	7	
A	US 2006/291829 A1 (NELSON JAMES S [US] ET AL) 28 December 2006 (2006-12-28) * the whole document *	1,4,7	
A	US 2007/272150 A1 (SWOBODA WERNER [DE] ET AL) 29 November 2007 (2007-11-29) * paragraphs [0019] - [0023], [0057] - [0059] *	1,4	
A	EP 1 488 857 A (WOLF VERWALTUNGS GMBH & CO KG [DE]) 22 December 2004 (2004-12-22) * paragraph [0012] *	1,4	
A	WO 02/095311 A (SYMACH S R L [IT]; BERGAGLIO OSVALDO [IT]; LUGLI GIANCARLO [IT]) 28 November 2002 (2002-11-28) * the whole document *	1,8-9	TECHNICAL FIELDS SEARCHED (IPC) F26B
A	EP 0 851 193 A (PENTARA COMMERCIAL ENTERPRISES [GB] PENTARA COMMERCIAL ENTPR LLC [US]) 1 July 1998 (1998-07-01) * the whole document *	1,8	
A	DE 199 15 059 A1 (INDUSTRIESERVIS GES FUER INNOV [DE]) 19 October 2000 (2000-10-19) * claim 12 *	7	
A	EP 1 867 941 A (B LUX IMPIANTI ELETTRICI SNC [IT]) 19 December 2007 (2007-12-19)	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 March 2010	Silvis, Henk

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 17 5368

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17-03-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5517768 A	21-05-1996	NONE	
DE 10312381 A1	30-09-2004	NONE	
US 2006291829 A1	28-12-2006	CA 2548656 A1	03-12-2006
US 2007272150 A1	29-11-2007	CA 2533580 A1	10-02-2005
		EP 1651918 A2	03-05-2006
		WO 2005011878 A2	10-02-2005
EP 1488857 A	22-12-2004	DE 20309327 U1	18-09-2003
		EP 2047913 A1	15-04-2009
WO 02095311 A	28-11-2002	IT BO20010311 A1	18-11-2002
EP 0851193 A	01-07-1998	AT 252716 T	15-11-2003
		DE 69725686 D1	27-11-2003
DE 19915059 A1	19-10-2000	AU 4291500 A	23-10-2000
		WO 0060295 A1	12-10-2000
		EP 1166023 A1	02-01-2002
		JP 2002540926 T	03-12-2002
		US 6940081 B1	06-09-2005
EP 1867941 A	19-12-2007	NONE	

EPO FORM P0459

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