



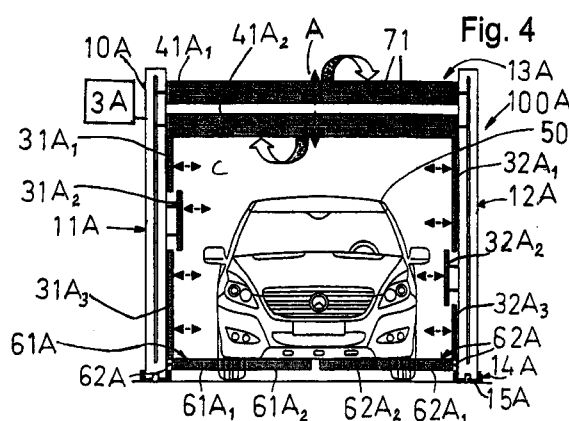
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(54) **Title:** DEVICE FOR THE SURFACE TREATMENT OF OBJECTS

(57) **Abstract:** The present invention relates to a device (100A) for surface treatment of an object (50), having a number of irradiation elements (70A, 71) and a control unit (3A) for the control of the irradiation of the object (50). A support frame structure (10A) adjacent to the object (50) is movable along the object and surrounds the same on at least two sides, and comprises two side sections (12A, 12B), and an upper, intermediate section (13A). The object is contained between the side sections and under the upper section (13A). Each side section comprises one movable, adjustable panel (31A₁, 31A₂, 31A₃, 32A₁, 32A₂, 32A₃). On the upper intermediate section, one movable panel (41A₁, 41A₂; 41B₁, 41B₂) is arranged. UV light sources (70A, 71) are arranged on said panels. Sensor elements (75) are arranged to sense the position and/or direction of the object, and are connected with a control unit (3A), which can control position and/or angular setting of at least a number of the panels and/or the irradiation elements.

DEVICE FOR THE SURFACE TREATMENT OF OBJECTS

TECHNICAL FIELD

The present invention concerns a device for the surface
5 treatment and/or for the use in connection with surface
treatment of an object, for example a vehicle, arranged on a
workstation surface, having the features defined in the first
part of claim 1. The invention also concerns the use of such a
device in connection with surface treatment of a vehicle.

10 Particularly, the invention concerns a device to be used in the
repair treatment of a vehicle, in particular in jobs using UV
curing products.

BACKGROUND

15 Many different methods are known to be used in the painting cars
or greater or smaller body parts or something else. A particular
field concerns so-called repair treatment, which may consist of
hammering, puttying, general touch-up works, clear varnish
painting.

20 Painted vehicles or vehicle parts have to be cured and dry. A
much used method consists of transferring heat, for example by
convection, to the vehicle, or the part to be treated. It mostly
comprises generating a flow having a high temperature, which is
25 directed toward the vehicle/part. Known devices comprise a
drying oven or a booth in which the vehicle/part is placed.
Disadvantages of such proceedings are that they are very energy-
and time-consuming. Drying and curing, respectively, may in
principle occur in room temperature, but may then take up to a
30 day. The drying procedure and the curing procedure,
respectively, can be speeded up by allowing drying to occur in a

plant as described above, at a temperature of approx. 60°, and the drying time can then be reduced to maybe between half an hour and one hour. But also this is to be considered as a very long time in the context and involves high costs because the throughput time for a vehicle or a vehicle part becomes very long and a large area is blocked.

In order to avoid the complex of problems of time and blocked area, it has become common, where possible, to carry out surface treatment of body parts or minor damage by IR irradiation to accelerate the drying. In doing so, a basecoat has first been applied, airing has been effected, after which a clear varnish has been applied, which has been allowed to dry under IR irradiation for 20-25 min. Also this involves relatively long drying/curing times.

It has also been proposed to, for particular materials, carry out the curing in two steps, a first with radiation curing by UV light, and then at a temperature of between 130°-200°, alternatively in room temperature (EP-A-0 000 407).

EP-A-0 826 431 suggests a proceeding wherein, after short drying or curing of a basecoat layer either for 3-10 min at a temperature of 40°-80° or by IR drying for 3-6 min, a clear varnish layer is applied, which is dried by pulsed high-energy UV irradiation with a high-energy UV flash lamp.

Also this proceeding is time-consuming and intended for the treatment of minor damage or small parts.

It should be noted that plastic components, e.g. bumpers, may be deformed if too high temperatures are used. Plastic may be deformed at temperatures of above approx. 75°.

5 US 2010/0088921 discloses a device for drying a painted vehicle, which comprises panels at a workstation or a booth with IR radiation sources emitting IR radiation and having two different emission spectra, which among other things is achieved by blowing a mixture of compressed air and oxygen toward a
10 catalytic panel.

US 4 416 068 discloses a device consisting of a repair booth to hasten drying and/or curing in connection with touching up a car. IR sources and heat radiating elements are arranged in such
15 a way that their positions and orientation can be selected in a suitable way. In spots difficult to access, reflectors are utilized. The IR sources are arranged in horizontal or vertical groups or rows of a ceiling mounted structure moving reciprocally above the car. A uniform temperature distribution
20 is aimed at, wherein the drying time can be reduced. However, this device does not work optimally neither what concerns speed or quality of the processing nor the working environment. In addition, the energy consumption becomes high since IR as well as heat irradiation are utilized. Another disadvantage consists
25 of the entire plant shaking when moving along railings in the ceiling. Again another disadvantage then arises, since all painting work is highly susceptible to dust and dirt, and the ceiling mounting makes that dust, etc. easily is accumulated in nooks and the like above the object, and may fall down onto the
30 object, to an even greater extent as a fan is utilized to blow air toward the reflectors.

Generally, the curing, when using traditional clear varnish, takes approx. 30-60 min. After curing, the clear varnish is very sensitive for a couple of days and which requires careful
5 handling.

The requirements of speed and homogeneous curing and drying are particularly high what concerns the use of substances having lower content of solvent or water-based substances cured by UV
10 light. Thus, no one of the devices known hitherto works fully satisfactory neither what concerns speed, energy consumption, quality, simplicity, environment-friendliness nor result of the work.

15 SUMMARY OF THE INVENTION

Therefore, it is a goal of the present invention to provide a device by which one or more of the above-mentioned problems are solved. Particularly, it is a goal of the invention to define a
20 device for the surface treatment, particularly drying and/or curing, of an object, for example a car, by which the access across the entire object becomes extraordinarily good and even, which is quick, and which gives a very good result.

Even more particularly, it is a goal to define a device by which it becomes highly advantageous and is facilitated to use substances with a smaller amount of solvents, particularly UV curing substances such as UV sanding sealer, UV putty, UV clear varnish. Particular goals of the invention are to define a
25 device by which surface treatment can be made in an environmental-friendly way, which allows less discharge of
30

hazardous substances in total and also less discharge locally of substances harmful to the staff working at the plant, and which in addition is environmental-friendly and inexpensive in operation in that the energy consumption is low.

5

It is a goal to define a device, which in various ways facilitates the use of substances more harmless to the environment, which is quick, allows a simple logistics, short durations of treatment, and is simple and safe to handle.

10 Another goal is to provide a device, which is flexible, simple to install and maintain, by which in addition the material consumption, i.e., regarding surface-acting agents, can be held low and be reduced in relation to methods used today.

15 It is also a goal to define a device and a proceeding, respectively whereby an object after curing is not as sensitive as in known treatments, but in a quicker or easier way can be handled, recoated, etc. without risking damage to the object.

20 It is also a goal of the invention to define a use of the device and a proceeding, respectively, whereby one or more of the above-mentioned goals can be achieved.

Therefore, a device is provided as initially has been indicated
25 having the features defined in the characterizing part of claim 1.

There is also provided a use, which comprises the features defined in claim 21.

30

Advantageous embodiments are defined by the features defined in the dependent claims.

It is an advantage of the invention that there is provided a
5 device which makes possible a quick surface treatment of
objects, particularly cars, in particular in repair jobs, but
which also can be applied in jobs included in a production chain
and then allows a high rate of production. In repair jobs, it
will in many cases be possible to completely take care of most
10 damage in approx. 30-40 min and a high rate of production can be
maintained. It is also an advantage that the energy consumption
can be essentially reduced, particularly by up to approx. 40 %.
By the quick treatment, optimum use of products having a low
content of solvent is made possible, which also results in the
15 emission of harmful substances decreasing and can in
advantageous cases be reduced by as much as up to 70 %.

Another advantage is that there is provided a device which
easily can be integrated in a plant in which different types of
20 jobs can be carried out.

It is also an advantage that there is defined a device which is
clean and which decreases the risk of contamination and dust
spreading, which is of utmost importance in order to obtain a
25 good result in different types of surface treatments. Another
advantage is that there is defined a device which particularly
is advantageous in the use of UV curing products, but which
gives significant advantages as discussed above also when using
more conventional products.

It is an advantage that the energy consumption as well as the consumption of material can be essentially reduced, as well as that new substances more harmless to the environment, for instance varnishes, which nevertheless are particularly sensitive upon curing and normally require longer curing time, can be treated quickly, accurately, and efficiently.

It is an advantage that there is provided a device/a proceeding which makes that, for instance, a cured object, e.g. a car, or one or more parts of a car, does not become as sensitive as in conventional treatments, and can essentially immediately be handled, recoated, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention will be described, in a non-limiting way, and with reference to accompanying figures, in which:

Fig. 1 schematically shows a side view of a device according to a first embodiment of the invention,

Fig. 2 is a schematic view of the device in Fig. 1 from the front with an upper intermediate section in a first position above an object,

Fig. 3 is a view of the device as in Fig. 2, but with the upper intermediate section in another position upon treatment of an object,

Fig. 4 shows an alternative, second, embodiment of a device in a view from the front with an object in treatment position,

5 Fig. 5 shows the device in Fig. 4 as seen from above,

Fig. 6 shows a side section of the device in Fig. 4 as seen from inside according to one embodiment,

10 Fig. 7A schematically illustrates an embodiment of a side section of the device in Fig. 4 as seen from outside,

Fig. 7B is a view from outside of an alternative embodiment of a side section,

15

Fig. 8 is a view from the front, which schematically shows a third embodiment of a device according to the invention,

20 Fig.9 schematically shows yet another variant of a device according to the invention,

Fig.10A is a schematic view from the side of an example of a side section that may be included in the device in Fig. 8,

25

Fig.10B shows the device in Fig. 10A in a somewhat different position and with an object under treatment,

30 Fig. 11 is a schematic side view of a side section according to a fourth embodiment, and

Fig. 12 shows very schematically an example of a treatment plant comprising a device according to the invention.

DETAILED DESCRIPTION

5 Fig. 1 shows a first embodiment of a device 100 for the use for the surface treatment of, here, a car 50. The proper surface treatment may be of different types but consists particularly of drying/curing in connection with car painting, particularly in repair jobs and, in advantageous embodiments when, for instance,
10 so-called UV clear varnish, UV sanding sealer, or UV putty is used, i.e., compounds wherein the amount of solvent is reduced, in certain cases by up to 50-70 %.

The device comprises a support frame structure 10, where the
15 entire structure is movably arranged, at least in a direction in relation to the object 50 (see dashed arrow B in Fig. 3).

The support frame structure 10 comprises two parallel side or leg sections 11, 12, which are fixedly or detachably, but
20 movably, arranged at or in a workstation surface 110, or more generally on a floor surface, which either may be considered to be included in the device or on which the device is placed, and which is formed with tracks or rails or the like for the device 10 to be movable in accordance with the arrow B as described
25 above.

In alternative embodiments, not shown here, the support arm structure 10 may be formed so that the side sections 11, 12 can be movable also in a direction perpendicular to the arrow B in
30 order to be placeable in a limited number of different positions so as to, in such a way, be able to control the width or

distance between the side sections 11, 12 for adaptation to different object sizes. On that occasion, also co-operating structure, tracks or the like in the floor or the workstation surface have to be adapted thereto.

5

In an advantageous embodiment, the side sections are connected with a transverse upper, intermediate section 13. If the side sections 11, 12 should be adjustable or movable also in, for example, a direction transversal, i.e., perpendicular to the
10 arrow B, or any other suitable direction, in order to be settable in different job positions, the upper intermediate section has to be either adjustable longitudinally, extensible, or replaceable so that different sections can be used depending on the distances to be used between the side sections or be
15 connected only with one of the side sections.

The upper intermediate section 13 is arranged to be vertically adjustable according to arrow A in Figs. 1 and 2, which can be achieved in various ways, for instance it may be mounted on a
20 side section, for example by means of a running chain or in another suitable way. The side sections 11, 12 as well as the upper section 13 are provided with the respective panels 31, 32, and 41, respectively, in such a way that the panels 31, 32 essentially face each other and the object to be treated, while
25 the upper panel 41 is rotatably or turnably arranged on a shaft included in the upper section 13 so that the panel during movement of the support frame structure along the object 50 can turn so that it constantly is essentially perpendicularly positioned to the part of the object to which it is closest
30 situated.

Sensor elements 40 are arranged on different spots to sense where the closest surface of the object is situated during the movement of the support frame structure 10 along and surrounding the object so that the panels always will be situated at a
5 desired distance from the object or within certain prescribed limits. Preferably, said distance is between 15 and 20 cm or even smaller. It may be set, for example, via a control unit to which also the sensors are or can be coupled (not shown in Fig. 1).

10 The panels 31, 32, 41 are provided with a number of irradiation elements 70A, 71, which only are schematically illustrated in the figure. Said irradiation elements 70A, 71 consist of UV lamps. In certain cases, a part of the irradiation elements
15 (e.g. the irradiation elements 70A) may consist of IR lamps. Preferably, then the number of UV lamps exceeds the number of IR lamps. By a combination of UV as well as IR lamps, an extraordinarily good curing and drying effect is achieved, which gives an even homogeneous effect with a good luminous flux and
20 distribution from different angles.

Certain of the irradiation elements 70A, 71; the UV lamps, but also the IR lamps if such are used, may be rotary, and can be angled, or turn. Reflectors may be arranged inside the lamp so
25 that the reflectors distribute and angle the light in desired manner. Particularly, this may be adapted to the particular object that is to be treated. The reflectors or the angulation of lamps may, for instance, be controlled by signals from the sensor elements to control unit, which can control setting of
30 lamps and/or reflectors depending on the structure of the object in the present position of one or more of the lamps, distances,

even surfaces or small irregular surfaces, angle in relation to the sensor or in relation to adjacent surfaces, etc. may constitute decision basis of the control system what concerns lamp direction, or reflector setting. In particular embodiments, it can also be controlled which lamps should be activated, i.e., which should be on or off upon treatment of a particular object. Via the control unit, automatically or manually, for instance by a touch screen or in another suitable way, it can be controlled which lamps should be activated, and for how long time, so that different lamps are active during different time intervals depending on where or which parts of the object should be treated, and in certain embodiments, it can also be controlled in which order different parts of an object should be irradiated.

Thus, on different spots, lamps may be arranged more open or closer, or with different power or direction, with or without reflectors and so on. Particularly, it may in certain cases be desirable with a higher power where there are many nooks, however this is not necessary. The arrangement of lamps and control of these may be varied in many different ways within the scope of the invention. This applies to embodiments having only UV lamps, as well as embodiments having UV as well as IR lamps.

In certain embodiments, lamps may be arranged on different distances from each other on different panels or within one and the same panel. Lamps of different power may also be used, on different places in the device, e.g. within panels or between panels.

However, in other embodiments, the same type of lamps is used of the same power everywhere, and/or of the same type, and/or on the same distance from each other.

- 5 In one embodiment example, the power of the UV lamps is approx. 100 W at approx. 3 cm distance. The better the contour of the object can be followed at an even, desired short distance, the better the effect will be. In an advantageous example, UV flash lamps are utilized, which makes that the drying/curing process
10 can be made very quick and come down to maybe 2 min if so-called UV products are used. It should be appreciated that the invention is not limited to any particular power, but 100 W is given only for exemplifying purposes.
- 15 The UV lamps (and where appropriate also the IR lamps) may be arranged in different ways, for instance alternately or with a certain periodicity on different spots. If UV lamps as well as IR lamps are used, they may be arranged, for example, in different rows so that after a row of UV lamps, a row of IR
20 lamps follows and so on. For instance, exclusively UV lamps may be used where more even surfaces are to be treated that do not change direction fast or where there are smaller/less nooks and so on, and IR lamps, or more IR lamps where the surfaces vary more, where there are many nooks, many and/or large direction
25 changes, etc. since the IR lamps have a higher temperature, which makes that the access is further improved. The heat produced by the use of the IR lamps in addition to the UV irradiation also generally contributes to an improved curing/drying. Many different variants are possible here. In
30 several variants, no IR lamps are used, but exclusively UV lamps.

The arch (the side sections and the intermediate section), may, but does not have to be, be made of aluminium or sheet-metal and be provided with reflectors for UV lamps/fluorescent tubes. (Also
5 IR lamps may, where appropriate, be provided with reflectors.)

In one embodiment, an object is cured to approx. 75°, for approx. 5 min. It should be appreciated that these indications only are given with an exemplifying and not limiting purpose.

10 The panels 31, 32, 41 are advantageously controlled by the control unit 3 (only schematically shown in Fig. 5 as coupled to the wall sections as well as to the intermediate section, and panel, respectively, which should indicate that it registers
15 signals from individual sensor elements, controls lamps, panels, and the different sections via one or more motors). Hence, the control unit registers signals from the sensor elements and controls the panels depending on these signals when the support frame structure 10 as here can be said to consist of an arch
20 moving to and fro along the object 50. The control unit is programmed for the respective type of object, or individual object, for instance, different passenger cars, and is coupled to said sensors, which sense obstacles and distance to the object, respectively. During movements to and fro along the car
25 (arrow B), the upper section 13 is raised and lowered with the panel 41 according to arrow A at the same time as the panel 41 (alternatively the upper section 13) can be turned and rotated so that the side of the panel, which is equipped with at least UV lamps can be rotated at least 90° or plus minus 50-60° during
30 movement along the arrow B.

The panel 41 may, of course, be formed in various ways, it could also be formed as a cylinder, which surrounds a shaft forming the upper intermediate section 13, which is provided with irradiation elements across the entire surface or it may be
5 semicircular, elliptical, or in principle assume any suitable shape on the assumption that the irradiation elements or the panel on which they are mounted can be turned and rotated so that they are constantly directed toward the closest surface of the object where they/it are/is situated. Preferably, also the
10 side panels 31, 32 are arranged so that they can move, turn, toward the object 50 in the panel position in question in relation to an object during the movement along the object.

This can be achieved if the panels are arranged at, or connected
15 with, the side sections 12, 13 in such a way that they can be pushed out and in, for instance by means of piston type cylinders or the like.

In an advantageous embodiment, they may also be vertically
20 adjustable and may, for instance, be angled in one or two directions orthogonal to the direction of extension along arrow B. This is not shown in Fig. 1 or 2, but can be achieved in various ways. In the figure, neither it is shown that the side panels 31, 32 can individually be divided and, for instance,
25 comprise separate upper and lower panels or consist of a number of panel elements, either only vertically or vertically as well as laterally.

According to an advantageous embodiment, the treatment may take
30 place in such a way that the support frame structure 10 moves slowly forward while the panels are activated and the upper

panel 41 is lowered, either separately or also the entire upper section 13, in order to follow the contour of the car 50 to, for instance, cure applied clear varnish.

5 A motor 5 (schematically shown in Fig. 5), which drives the upper section may be an electric motor but driving may also be pneumatically effected or by hydraulics. Either a common motor may be used for driving the entire support frame structure as well as sections and/or the panels. Alternatively, more than one
10 motor may be used, for example different motors for different functions. According to different examples, the support frame structure is driven on railings or in tracks in the floor surface or the workstation surface. Driving may be effected by means of a linked chain in the floor according to one
15 embodiment. In certain preferred embodiments, the side sections are formed in such a way that desired shape, amount, size of panels can be adapted and exchanged, i.e., panels can be exchanged, added, or removed depending on needs, but it is advantageous that they are replaceable also for other reasons,
20 for instance if one or more panels would break down. In this adaptability, it is then preferably also included that it would be possible to easily vary the illumination with UV (or in certain cases with UV and IR) by replacing a panel with a certain arrangement of the UV lamps; distances between them,
25 reflectors, e.g. certain or all with or without reflectors, different types of reflectors, or, if in addition IR lamps should be used, by replacing a panel having, for instance, only or many UV lamps by a panel having some or more IR lamps or vice versa, or altering how different panels and/or lamps are
30 arranged in relation to each other or depending on objects. Many variants are possible. The sensors may advantageously be built-

in into the respective sections to sense the distance to the object as well as obstacles. Many variants are possible.

Preferably, the upper panel, or panels, can be raised, lowered, turned, and rotated, for instance 90°. The panel or the panels may either be vertically adjustable, or the entire intermediate section to which it or they is/are mounted.

Fig. 2 shows the device 100 with the upper intermediate section 13 in lowered position after the support frame structure has been moved forward along the object. In an alternative embodiment, not shown, the support frame structure could be fixedly arranged, for instance in a floor surface, while a platform on which the object is placed moves forward and the upper intermediate section or the panels move as has been previously described in respect of turning and rotation, respectively, as well as the side panels of the side sections.

Fig. 3 shows the device 100 as seen exteriorly from the outside of side section 12. The arrow B shows how the side section 12 moves, here by means of wheels 14.

Fig. 4 shows an alternative embodiment of a device 100A of the invention, comprising a support frame structure 10A having a first side section 11A, and a second side section 12A, and an upper intermediate section 13A. In the embodiment example that has been described with reference to Figs. 1-3, the support frame structure is movable in the longitudinal direction along an object 50 placed on a floor surface or on a workstation surface along the arrow B in Fig. 3. It can move on railings or in any suitable way. In the example shown, it is guided and held

in place by parallel, longitudinal railings 15A, 15A and is rolling on wheels 14A, 14A, which are arranged in pairs at the outer ends of the lower part of the respective side section or in another suitable way along these.

5

In the example shown in Fig. 4, three panels 31A₁, 31A₂, 31A₃ are arranged at the first side section 11A in such a way that panel 31A₁ is arranged at the top of the side section, panel 31A₂ is arranged underneath the uppermost panel 31A₁, and the lowermost
10 panel is arranged at the lower half of the first side section 11A. Correspondingly, three panels 32A₁, 32A₂, 32A₃ are arranged at the second side section 12A.

The respective panels may be arranged at the respective side
15 sections, for instance, by driven pistons or the like, which may be driven by a motor, for example be driven electrically, hydraulically, or mechanically depending on signals from sensor elements, which show or give indication of nearness to the object to be treated during the movement of the support frame
20 structure 10A along the object as described above.

Preferably, the movements of the respective panels are driven entirely separately from each other. In advantageous
embodiments, the panels may also be angled, which, for instance,
25 may be achieved by they being provided with pistons or other control members that can be controlled separately so that, for instance, the panels shown in Fig. 4, which are arranged on a level with the object where the same has sloping sides, can be adapted according to these respective slopes so that the
30 distance to the object becomes essentially the same during the

movement of the support frame structure in relation to the object, or vice versa.

Alternatively, or as another alternative, there may also be arranged separate lateral members, e.g. pistons, formed to make possible angulation in various ways in the direction of movement of the support arm structure in order to, in such a way, be able to ensure adaptation to the contours of the object.

Panels may be arranged in many different ways, several panels vertically and/or several panels beside each other at the same or different heights from the floor surface or the workstation surface. Alternatively, or in addition, only certain panels are insertable and projectable and/or angleable in one or more directions.

In the example shown, the upper section 13A is provided with two panels 41A₁, 41A₂, which, for instance, but not necessarily, in addition to the same being lowerable with the upper section 13A, i.e., can be raised and lowered depending on where the upper section is situated in relation to the upper surface of the object to be treated during its movement along the vehicle, which is shown as A in Fig. 4, also can be raised/lowered in relation to the object. The panels can be rotated 90° or at another suitable angle, as schematically illustrated in the figure, so that, depending on position, the one or the other panel gets closest to the upper surface of the object. The panels may also be rotatably journalled to the upper section in a suitable way, and the upper section may be brought to rotate on a shaft as well as on a centre axis of the upper section 13A.

As previously described, the upper section 13A be may formed in various ways, the panels may be mounted in various ways and there may also be more than two panels, there may also be two or more panels arranged beside each other, i.e., each panel 41A₁,
5 41A₂ may be divided into one or more panel elements.

Even if the UV lamps are shown as if they would have the same size, this is for certain possible, but not necessary in any way, but they may have different sizes. Also mutually, different
10 UV lamps may have different sizes as well as, where appropriate, different IR lamps may mutually have different sizes, all determined by needs, size, shape, presence of nooks, etc. on the spot that is to be treated by the respective lamp. It is also preferably possible to replace lamps, type as well as size,
15 possibly reflectors, etc.

At the bottom, the two side sections 11A, 12A are provided with arms, which are rotatably journalled to the same via connection elements 62A and which are mounted in such a way that the arms
20 61A₁, 62A₁ can be turned inward toward the respective side section element to assume a position in which they are not active, and be turned out to assume another position in order to, for instance, irradiate an object (a car) from below, on one hand between front and rear wheels, and on the other hand in
25 front of front wheels and behind rear wheels, respectively. Preferably, the movement between the two outer positions may take place variably, so that in principle any desired position can be assumed. Alternatively, the position setting can be such that only a number of discrete positions can be assumed.

Preferably, the arms are split and individually comprise outer and inner arm elements 61A₁, 62A₁ so that an inner arm element is connected with the respective side section and in the opposite end connected with each a respective outer arm element 62A₁, 62A₂. Preferably, also these connections between inner and outer arm elements are articulated so that an outer arm element can be folded toward an inner arm element and accordingly be folded inward toward the respective side section and be brought to make a movement under the car that is adapted according to where radiation should take place and also further improve the access and give an extended reach so that areas can be reached also behind, for instance, wheels on the surfaces bordering to the inside thereof. The arms may alternatively comprise more than two arm elements.

Preferably, also the arms are provided with sensors even if this is not always necessary. The arms are equipped with UV lamps or in certain cases with UV lamps as well as IR lamps.

Compared with on panels bordering to larger regular surfaces, according to certain embodiments, the number of IR lamps, if such also are used, in relation to the number of UV lamps is greater on the arm sections than on other sections or panels considering that under cars, the surfaces are often more irregular and have more nooks and so on. In other embodiments, the arms have less distance between the UV lamps, or these have higher power. However, this only indicates examples, and the number and distance may be the same as on other sections or panels, or fewer or have lower power.

The driving of panels and sections and of arms/arm sections, respectively, may effected via a common motor or by means of different motors in various ways. The movement of panels and of arms, arm sections and arm elements, respectively, is controlled
5 by sensors and signals to one or more control units, which in turn control the motor or the respective motors.

Fig. 5 shows the device 100A in Fig. 4 as seen from above with an object (a car) 50 placed between the side sections and under
10 the upper section 13A when the support arm structure 10A is situated above the rear part of the car. The panels $41A_1$, $41A_2$ included in the upper section 13A are here situated in a position beside each other, i.e., they are not rotated. Arm 62A having inner and outer arm elements $62A_1$, $62A_2$ is journaled to
15 side section 12A and partly angled outward so that the outer arm section or arm element $62A_2$ thereof is situated under the car, between front and rear wheels on one of the sides. The side sections of the support frame structure are running in railings 15A. Sensors may be particularly implemented as floodlight
20 sensors 75, which are arranged along the panels (in Fig. 5 schematically shown on the arm sections $62A_1$, $62A_2$). It should however be appreciated that floodlight sensors also are correspondingly implemented along the panels of the side sections. The sensors detect distance to the object, e.g. where
25 the arch is situated, and sense obstacles, for example wing or side mirrors, and deliver signals to the control unit, which, via one or more motors, controls the position, direction, etc. of the panels in relation to the object, and ensure that obstacles, such as projecting objects, can be avoided.

The control unit 5 is placed outside the proper box, on or adjacent to the outside of a side section or in any suitable location; it may also be arranged remotely from the proper box in an operator position or any other suitable spot. In Fig. 5, it is shown how it is coupled to a common motor 3, which controls the respective panels. Alternatively, separate motors may control one or more panels and/or sections. The control unit may comprise an operator's console unit for programming what The UV (UV/IR) device should do, for instance, cure the left front door, boot cover, etc. It may, for instance, comprise a touch panel where different parts may be indicated.

In the example shown, reference designation 71 indicates UV lamps, which here are arranged on panel 41A₁, and UV (in certain cases IR) lamps 70A are arranged on panel 41A₂.

In embodiments having different types of lamps, they may be arranged in other ways, for instance in groups on one and the same panel, in different rows within one and the same panel, every second lamp may be an IR lamp, every third or every fourth lamp may be an IR lamp, or in any desired way. By type, reference is made not only to UV/IR lamps, but may be UV lamps of different type, power, with different reflectors, with/without reflectors, direction, etc. In Fig. 5, UV lamps 71 and lamps 70A are alternately arranged on the arm sections. If the lamps 70A are IR lamps, there is preferably somewhat more IR lamps than UV lamps owing to there being many nooks under the car.

Fig. 6 shows a side view of the section element 11A as seen from inside, i.e., from the object side and shows an example of here eight separate panels on which UV lamps 71, 70A are arranged

(the lamps 70A may possibly be IR lamps). The arm 62 is angled out in a direction so that it is located essentially parallel to railing 15A and the outer arm section 62A₂ is visible. The inner arm section is concealed by the lower part of the side section 11A. In the figures, it is schematically shown how the two panels 41A₂, 41A₁ are arranged in relation to each other in a section on a level with the inner side of the side section 11A.

Fig. 7A shows side section 12A as seen from the outside in an embodiment corresponding to the one shown in Fig. 6 with eight panels. In the figure, it is schematically shown how the upper section 13A with the panels (or in an alternative embodiment of the panels separately arranged) is driven by means of the respective linked chains 133A₁, 133A₂ by means of which the vertical location of the panels and their turning can be controlled. As previously mentioned, they may be driven pneumatically, hydraulically, or by an electric motor. It should be evident that the number of panels on the side sections as well as on the upper section may be varied. Preferably, between two and six panels are used on the upper section.

Fig. 7B shows a side section 12B according to an alternative embodiment of a device 100B, which in other respects may be formed as previously described. A common chain 133B is used to drive the upper panels by driving the upper section 13B. In other respects, this corresponds to the embodiment example that, for instance, has been described with reference to Fig. 4.

Fig. 8 shows once again another alternative embodiment of a device 100C according to the invention. Here, the support frame structure 10C comprises an arch consisting of two parallel side

sections 11C, 12C, at which side panels 31C and 32C, respectively, are arranged in such a way that they can be displaced inward toward and away from an object, particularly also be angled in relation to, for instance, a car 50 as previously described, in the direction of the arrows X. The upper intermediate section 13C is also provided with an upper panel 41C (which like earlier embodiment may be divided into one or more panels), which can be turned and/or rotated and also be lowered and raised in accordance with the arrows in the figure.

However, this embodiment differs in that the support frame structure 10C is rotatably journalled to a bottom surface or a floor surface, see Figs. 10A, 10B wherein it is shown in two different positions, and of illustrative reasons with a car being treated (Fig. 10B), and that it can be angled down and turned around the centre of rotation of a shaft, which in the example shown is indicated by a wheel shaft 14C on which the support frame structure 10C is journalled. In a particular embodiment, the arch forming the support frame structure may also be moved to and fro in the direction of the arrow A. But by the fact that the entire arch can be turned down, the movement may not/does not need to be so long. In other respects, the device functions in such a way that has been previously described and may be varied correspondingly what concerns driving, arrangement of sensor elements, control unit, motor, and arms, etc.

Fig.9 schematically shows another alternative embodiment of a device 100E according to the invention. In this embodiment, there are shown panels 31E₁, 31E₂, 41E₁, 41E₂ arranged on side sections 11E, 12E as well as upper section 13E, which are curved or bent for further improving the access to, for instance, the

vehicle being treated in different angles for irradiation elements (not shown) arranged on these panels, which elements may be arranged in the ways, and be of the type or types, that are described with reference to the other embodiment examples.

5 It should be appreciated that alternatively only one or some of the shown panels may be curved or bent, one or more of the other may be formed (essentially flat) as has been described with reference to other embodiment examples shown. They may also be curved, or have angles of curvature, which are different for
10 different panels, be more or less concave or convex, have cylindrical surfaces, have greater or smaller angle of curvature. They may also be arranged in the corners between a side section and an upper section, connected with either or both of essentially orthogonally arranged sections and so on. One or
15 more of said panels may be adjustably arranged in relation to the section with which it/they is/are connected and accordingly be displaceable, automatically, motor driven, pneumatically or hydraulically driven, or manually driven, so that they can be set, e.g., according to the arrows A in Fig.9. In an
20 advantageous example, the upper panels 41E₁, 41E₂ are adjustable, in addition to perpendicular to the extension plane of the upper section (arrows A), also laterally (arrows B), i.e., parallel to the extension plane of the section, in desired direction. Also the panels 31E₁, 31E₂ could be adjustable in the plane of the
25 side sections (not shown).

Fig. 11 shows very schematically a further alternative embodiment wherein, on each side section 11B (here only one side section shown), outer edge sections 11B₁, 11B₂ are turnably
30 journaled by, for instance, hinges and provided with panels, which may be formed in various ways and be angled inward toward

an object. Particularly, the lamps (UV or UV and IR) may be arranged as light panel cells, which can be pushed in/out in a suitable way. The side sections may also be provided with UV or UV/IR panels 41B₁, 41B₂, which may be arranged so that they can
5 be displaced up and down along the side section, as well as be turnably and rotatably journalled. Like in previous embodiments, one or more upper panels are vertically adjustable and rotatably journalled, respectively, at an upper section. An advantage of this embodiment may be suitable in the treatment of buses, vans,
10 or the like having high, long side walls.

Finally, Fig. 12 shows very schematically what a plant comprising a device according to the invention could look like. The arrows in Fig. 11 indicate, for example, cars. In contrast
15 to known plants, where corresponding jobs are carried out, the objects, which consist of cars in the described example, are moved constantly forward in one direction and pass from station to station (here, for instance, from workstations 510 to painting boxes 520 and then to curing ovens 530), which differs
20 from previously known plants, and which is extremely advantageous since a higher rate of production can be achieved at the same time as less area or space is required and waiting times for the objects can be minimized, organization and logistics be facilitated. Cars are standing lengthwise instead
25 of crosswise as in known devices, and cars do not have to be moved several times, which is a significant advantage.

CLAIMS

1. Device (100;100A;100B;100C;100D) for the surface treatment
5 and/or for the use in connection with surface treatment of an
object (50), e.g. a vehicle or the like, particularly a car,
arranged on a workstation surface, comprising
a support frame structure (10;10A;10B;10C) arranged to be
movable in at least one direction in relation to the object
10 (50),
a number of irradiation elements (70A,71) arranged adjacent to
said support frame structure, a control unit (3;3A;3B;3C)
coupled to the irradiation elements for controlling the same so
that the irradiation of the object (50) or parts of the object
15 can be controlled,
c h a r a c t e r i z e d i n
that the support frame structure (10;10A;10B;10C) comprises an
arch-like structure, which is movably arranged at a floor
surface adjacent to or comprising the workstation surface on
20 which the object (50) is situated, and movable in at least one
direction along the object surrounding the same on at least two
sides, and comprises two essentially parallel side or leg
sections (11,12;11A,12A;11B,12B;11C,12C;11D), which are fixedly
or detachably, movably, arranged at the working surface or the
25 floor surface, and an upper, intermediate section
(13;13A;13B;13C) connected with at least one of the side
sections, that the side sections are formed to be able to be
arranged at such a distance from each other that the object, in
at least one direction, is contained between the side sections
30 and under the upper, intermediate section (13;13A;13B;13C), that
on each side section, at least one movable, adjustable panel

(31,32;31A₁,31A₂,32A₁,32A₂;31B₁,31B₂,32B₁,32B₂;31C₁,31C₂,32C₁,32C₂) is arranged, that on the upper intermediate section, at least one movable panel (41;41A₁,41A₂;41B₁,41B₂;41C;41D₁,41D₂) is arranged, and that the irradiation elements are arranged on said
5 panels,

that the irradiation elements comprise UV light sources (70A,71), and that sensor elements (75) are arranged in a plurality of positions to detect positional and/or directional information of the object in said positions, for example sense
10 absolute or relative position and/or how the object or part of the object is angled in the respective position, the sensor elements being arranged to be in communication with and deliver said information to the control unit (3;3A;3B;3C), and that the control unit by using this information is arranged to control
15 the irradiation of the object by controlling the setting of position and/or angular setting of the panels and/or the side sections, intermediate section(s), and/or the irradiation elements (70A,71) in relation to the object in the respective positions.

2. Device according to claim 1,
c h a r a c t e r i z e d i n
that said upper at least one section (13;13A;13B;13C) or upper
panels or panels (41;41A₁,41A₂;41B₁,41B₂;41C) are rotatably
25 journaled to or adjacent to the side sections
(11,12;11A,12A;11B,12B;11C,12C), and that they, depending on signals received from the sensor elements (75), via the control unit (3;3A;3B;3C), can be brought to make rotatory and/or translation motions to be able to optimally irradiate the object
30 (50) at a desired distance and/or under a given direction and/or by a given radiation.

3. Device according to claim 1,
c h a r a c t e r i z e d i n
that the side panels

5 (31,32;31A₁,31A₂,32A₁,32A₂;31B₁,31B₂,32B₁,32B₂;31C₁,31C₂,32C₁,32C₂)
are arranged at the side sections (11,12;
11A,12A;11B,12B;11C,12C;12D) by setting members, e.g. pistons,
so that they at least can be moved toward/from the object
essentially perpendicularly or at a given angle in relation to a
10 plane in which the respective side section extends.

4. Device according to claim 2 or 3,
c h a r a c t e r i z e d i n
that the side panels

15 (31,32;31A₁,31A₂,32A₁,32A₂;31B₁,31B₂,32B₁,32B₂;31C₁,31C₂,32C₁,32C₂)
are turnably arranged at the respective side section
(11,12;11A,12A;11B,12B;11C,12C) so that, depending on signals
delivered to the control unit from the relevant sensor elements,
these are formed to be able to be rotated so that desired
20 irradiation angle is set.

5. Device according to any one of claims 1-4,
c h a r a c t e r i z e d i n
that the side sections are provided with arms (61A,62A;61B,62B),
25 that the arms are provided with irradiation elements, and that
the arms are rotatably journaled to the side sections to be
able to be turned out from the side section at which they are
arranged in order to irradiate the object from below.

30 6. Device according to claim 5,
c h a r a c t e r i z e d i n

that it comprises at least two arms, which are arranged on opposite side sections and individually consist of two or more telescopic arm sections (61A₁, 61A₂, 62A₁, 62A₂, 62B₁, 62B₂) and/or arm sections articulated to each other.

5

7. Device according to any one of the preceding claims,
c h a r a c t e r i z e d i n
that the panels

(31, 32; 31A₁, 31A₂, 32A₁, 32A₂; 31B₁, 31B₂, 32B₁, 32B₂; 31C₁, 31C₂, 32C₁, 32C₂; 4
10 1; 41A₁, 41A₂; 41B₁, 41B₂; 41C) are provided with UV sources, arranged
in rows or columns, or uniformly or non-uniformly distributed in
another suitable way, or with different periodicity of different
sections or panels or segments thereof, or that different UV
sources have different power or are directed or arranged in
15 various ways, or that at least certain of the UV irradiation
elements are provided with reflectors.

8. Device according to any one of the preceding claims,
c h a r a c t e r i z e d i n

20 that flash technology is used for at least certain of the UV
irradiation elements.

9. Device according to any one of the preceding claims,
c h a r a c t e r i z e d i n

25 that the side sections (11, 12; 11A, 12A; 11B, 12B; 11C, 12C) are
mounted and driven on rails or railings arranged on the floor
surface or the workstation surface.

10. Device according to claim 9,

30 c h a r a c t e r i z e d i n

that the support frame structure, e.g. the arch, is formed to be drivable, and/or that the side sections (11,12;11A,12A;11B,12B;11C,12C) are formed to be drivable simultaneously in movement as an arch, manually or
5 hydraulically, pneumatically or electrically, e.g. by means of a motor (5;80), and belts, chains, etc.

11. Device according to any one of the preceding claims,
c h a r a c t e r i z e d i n

10 that a separate motor is arranged to drive the side sections, or that a common motor is arranged, which is controlled by the control unit receiving signals from the sensors, so that panel movements and/or panel rotations and possibly the movement of the side sections along the object is controlled depending on
15 detection information from the sensor elements (75).

12. Device (100C) according to any one of claims 1-10,
c h a r a c t e r i z e d i n

that the side sections (11C,12C) are turnably/foldably
20 journaled in fulcrums of mounting elements (14C,14C) at the floor surface/workstation surface so that the entire arch can be turned or folded down toward the floor about the fulcrums wherein the lowering in the respective direction is determined by angles of rotation (α_1 , α_2) that are formed with the normal to
25 the floor surface in the respective fulcrum, wherein lowering and longitudinal movement, on rails or the like, are controlled by the sensors, which are connected with a motor for the rotation/movement of the arch.

30 13. Device according to any one of the preceding claims,
c h a r a c t e r i z e d i n

that the UV sources have a power of approx. 100 W at a distance of approx. 3 cm from the object.

14. Device according to any one of the preceding claims,

5 c h a r a c t e r i z e d i n

that one or more of the panels (31E₁, 31E₂, 41E₁, 41E₂) are bent or curved, and/or arranged to be displaceable or movable, automatically driven, controlled remotely or manually in at least one direction in relation to, perpendicular to and/or
10 parallel to, the section on which it or they are arranged.

15. Device according to any one of the preceding claims,

c h a r a c t e r i z e d i n

that the upper section (13A; 13B) comprises two panels

15 (41A₁, 41A₂; 41B₁, 41B₂), which are arranged on each a shaft, that they are turnable at a given angle, for instance, approx. $\pm 50^\circ$ on the respective shaft, and that said shafts are vertically adjustable.

20 16. Device according to any one of the preceding claims,

c h a r a c t e r i z e d i n

that the upper section comprises or is connected to two or more panels.

25 17. Device according to claim 15 or 16,

c h a r a c t e r i z e d i n

that the shafts are journaled at a given distance from each other and can be brought to make a rotary motion about a common fulcrum halfway between the fulcrums of the shafts, and that the
30 panels are turned during the rotation so that the irradiation

elements are essentially continuously directed toward the object.

18. Device according to any one of the preceding claims,
5 c h a r a c t e r i z e d i n
that at least two side panels are arranged at each side section on different height and, via pistons or the like forming said setting members, can be moved essentially perpendicularly, or under a given angle, toward/from the object.

10

19. Device according to any one of the preceding claims,
c h a r a c t e r i z e d i n
that each side section is provided with between 2 and 14 panels.

15

20. Device according to any one of the preceding claims,
c h a r a c t e r i z e d i n
that at least one or some of the panels have a width of approx. 1/2-1 m.

20

21. Use of a device according to any one of the preceding claims in car painting, particularly for curing, clear varnish painting, grinding by so-called UV curing products, e.g. varnish, putty.

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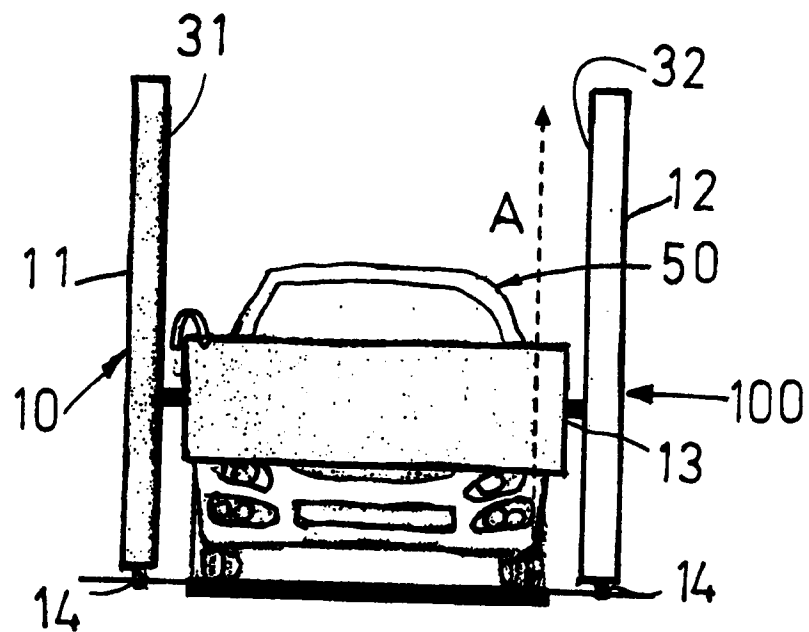
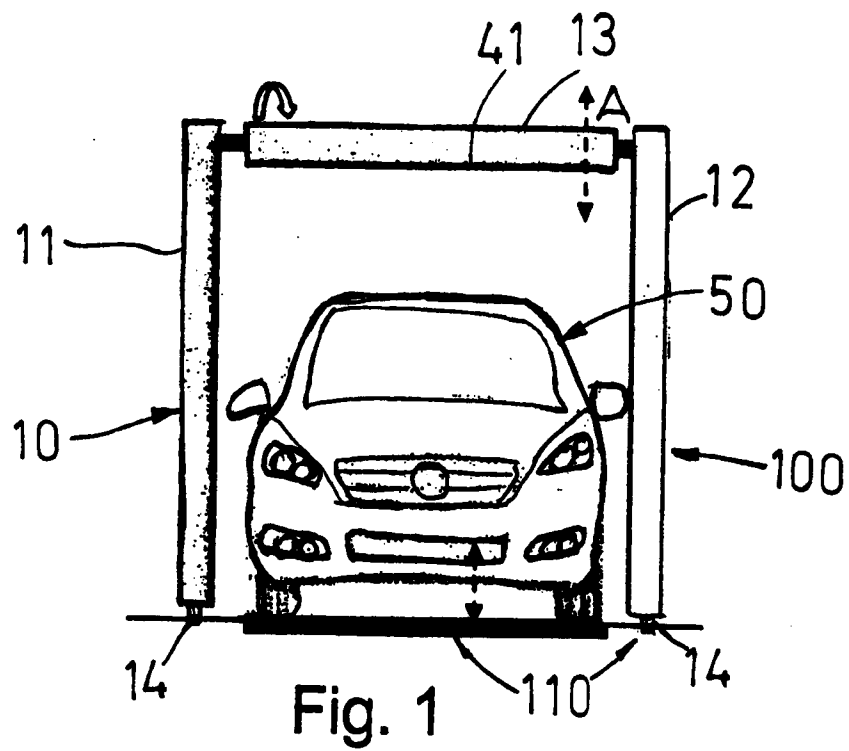
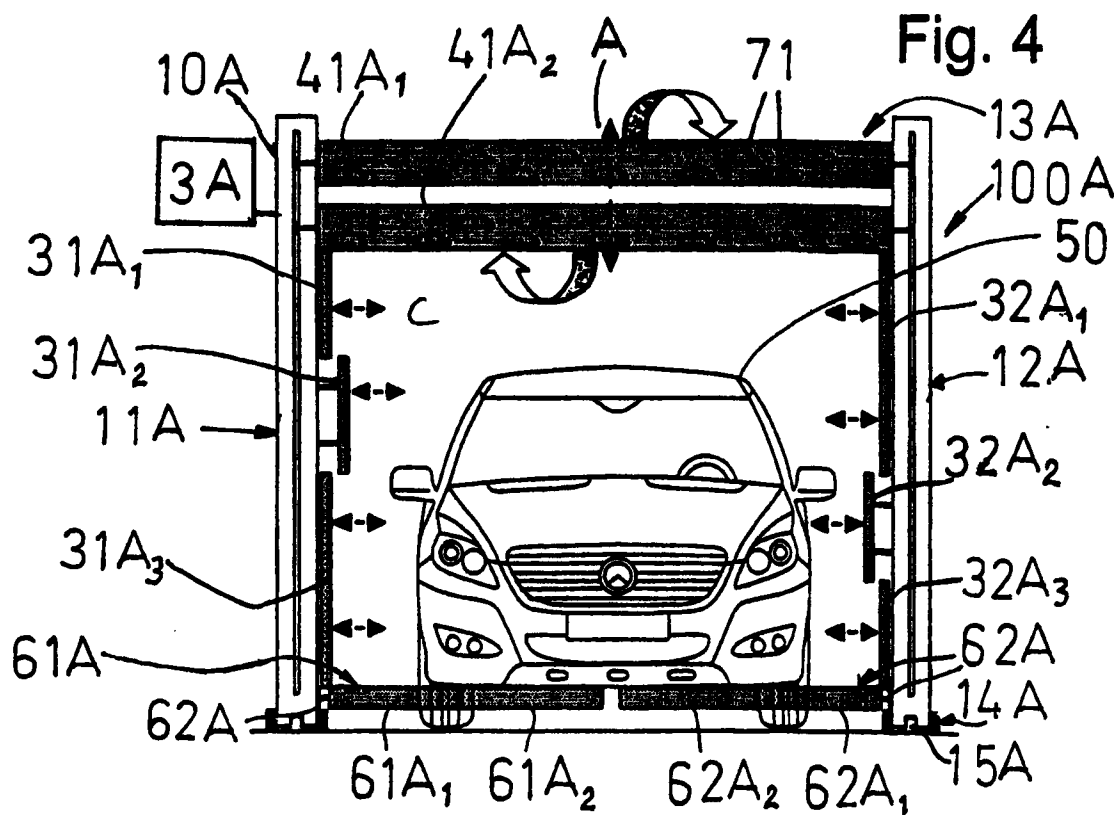
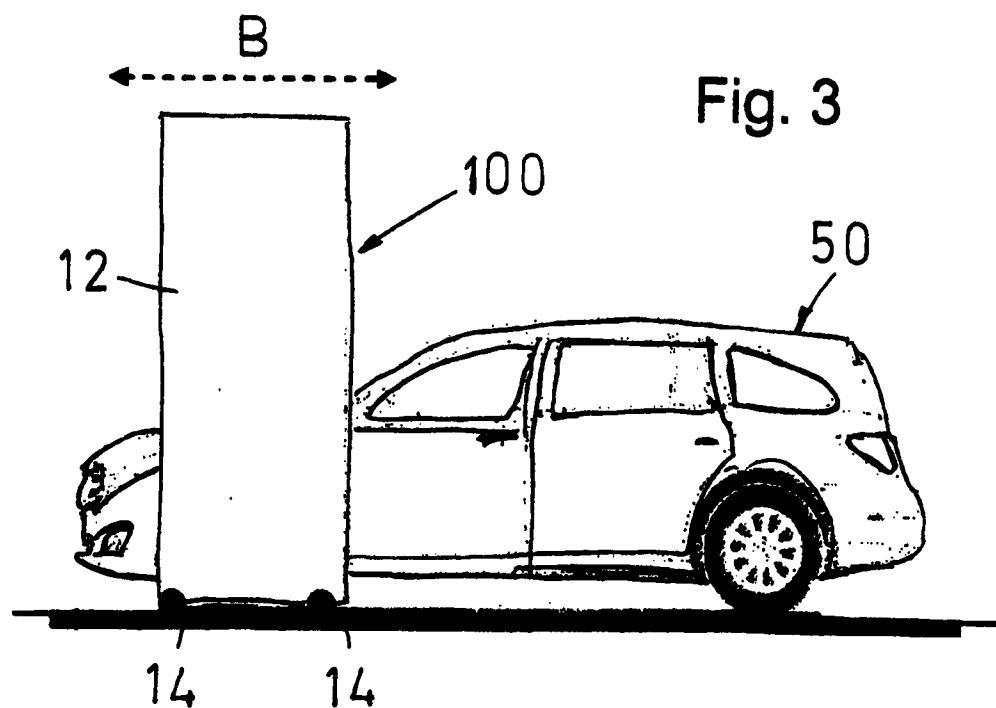


Fig. 2

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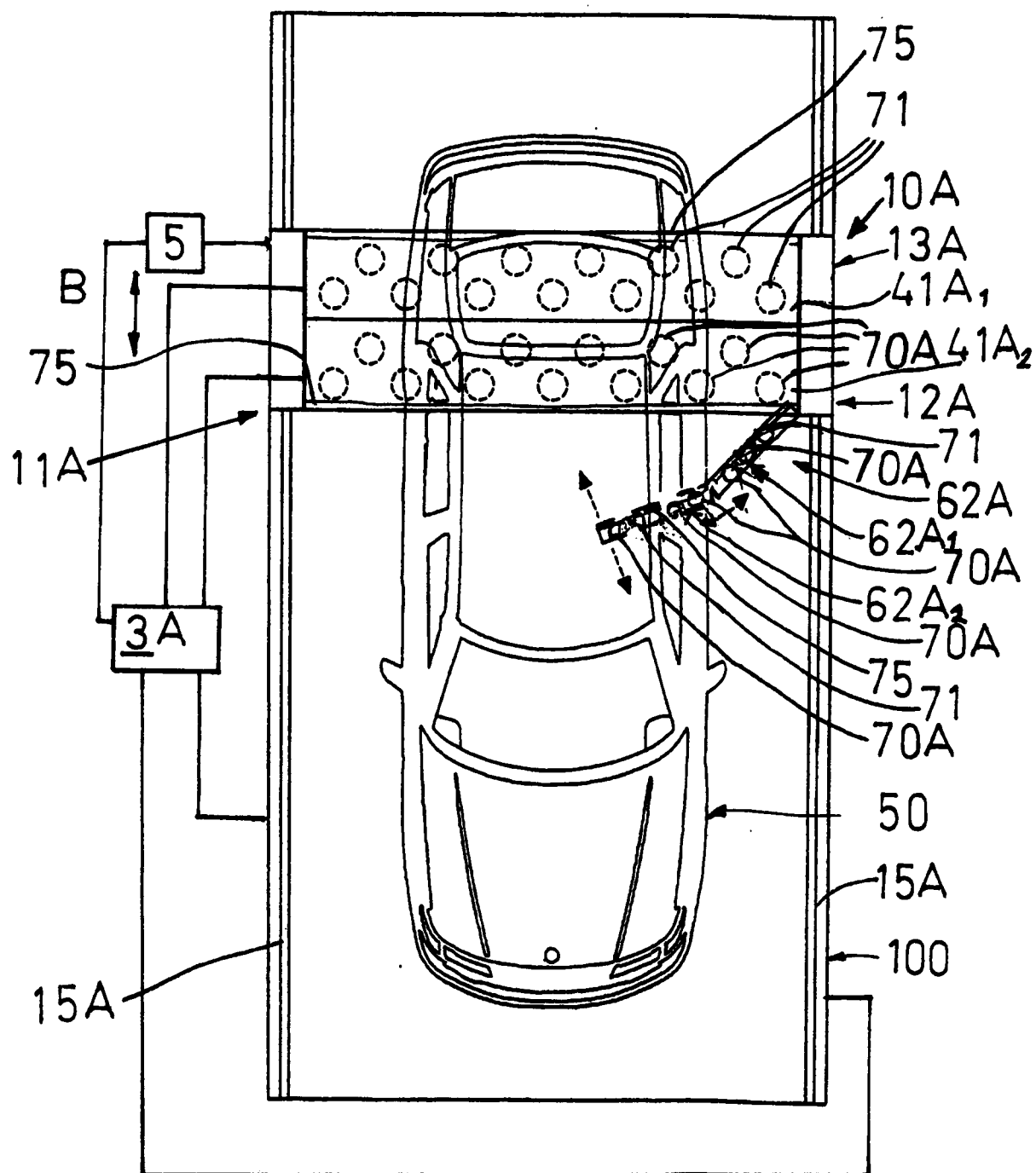


Fig. 5

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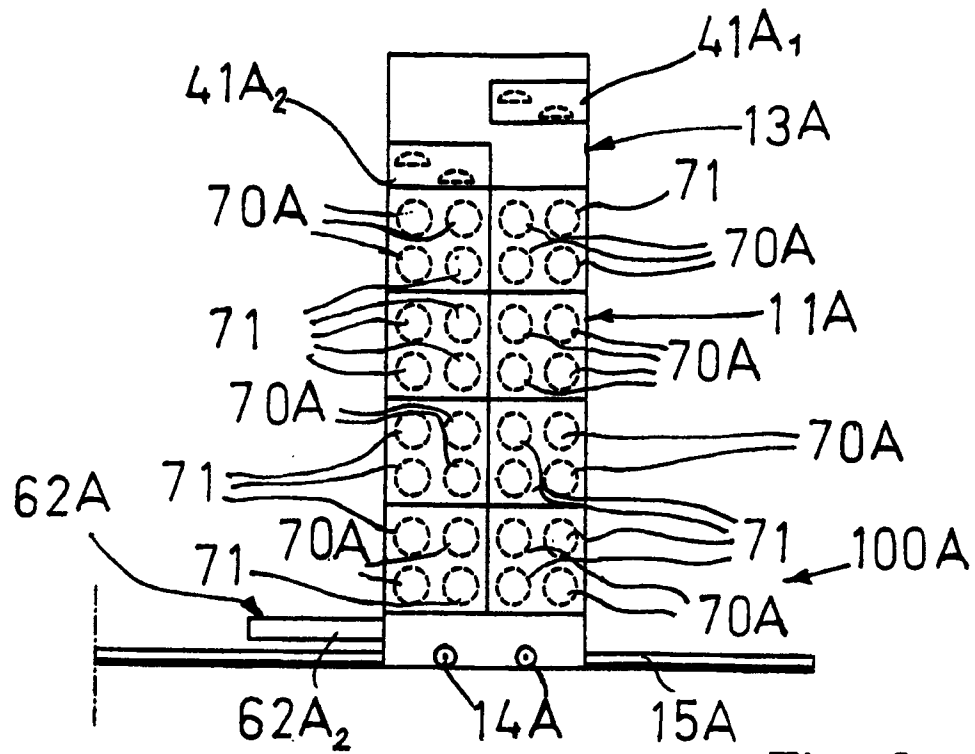


Fig. 6

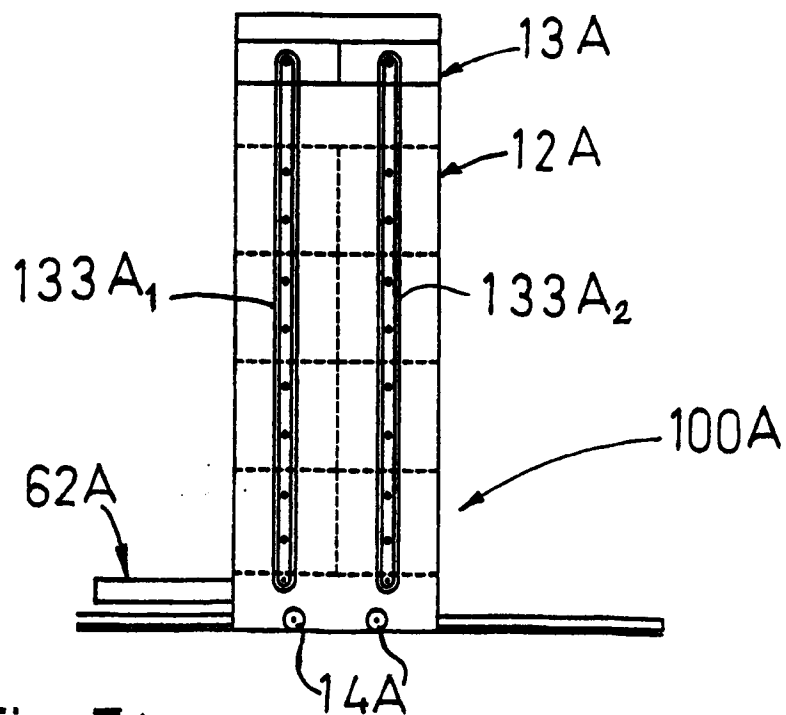
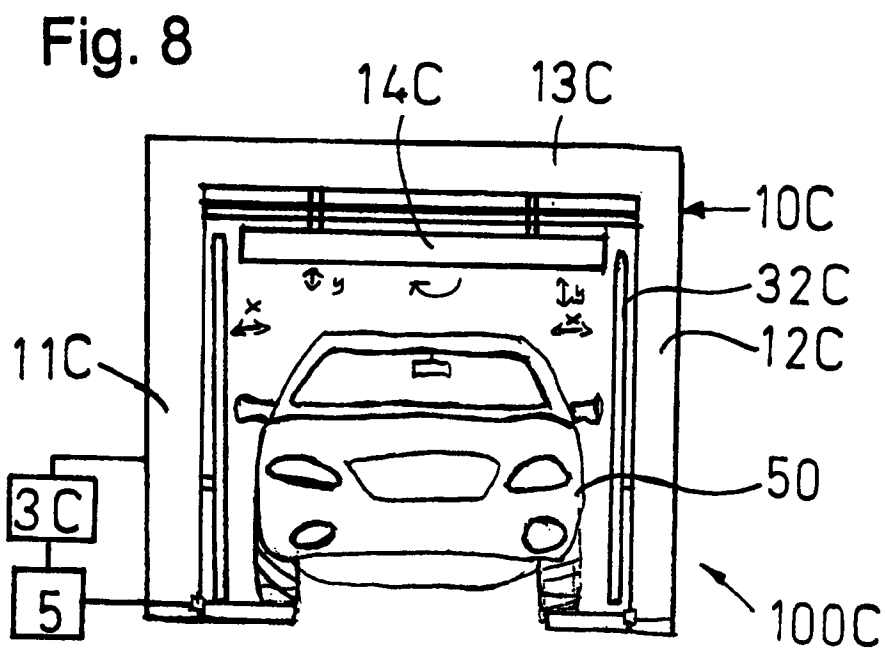
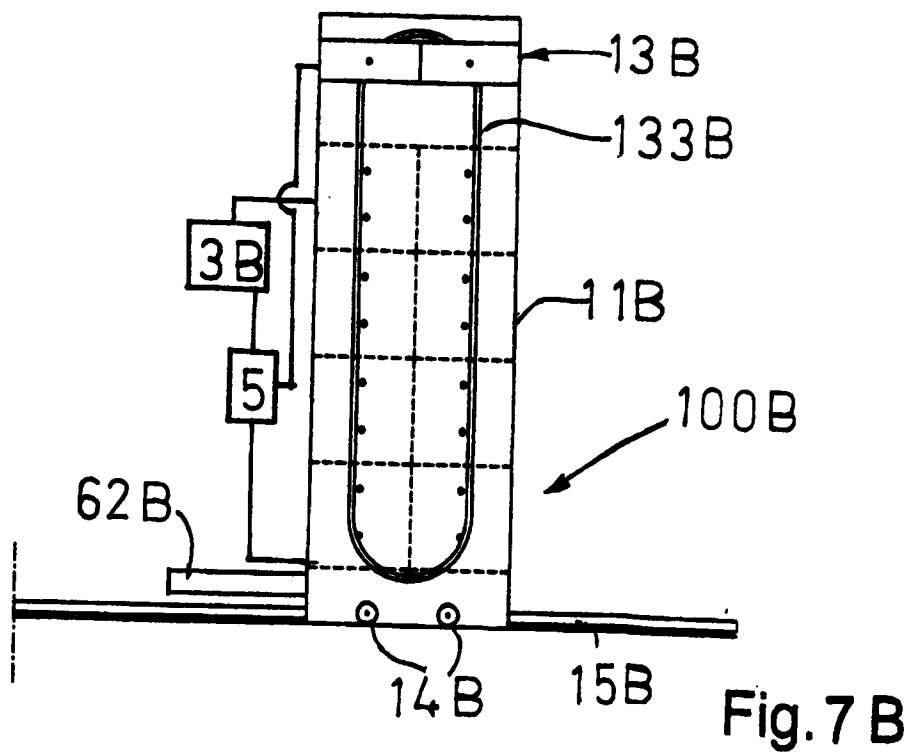


Fig. 7A

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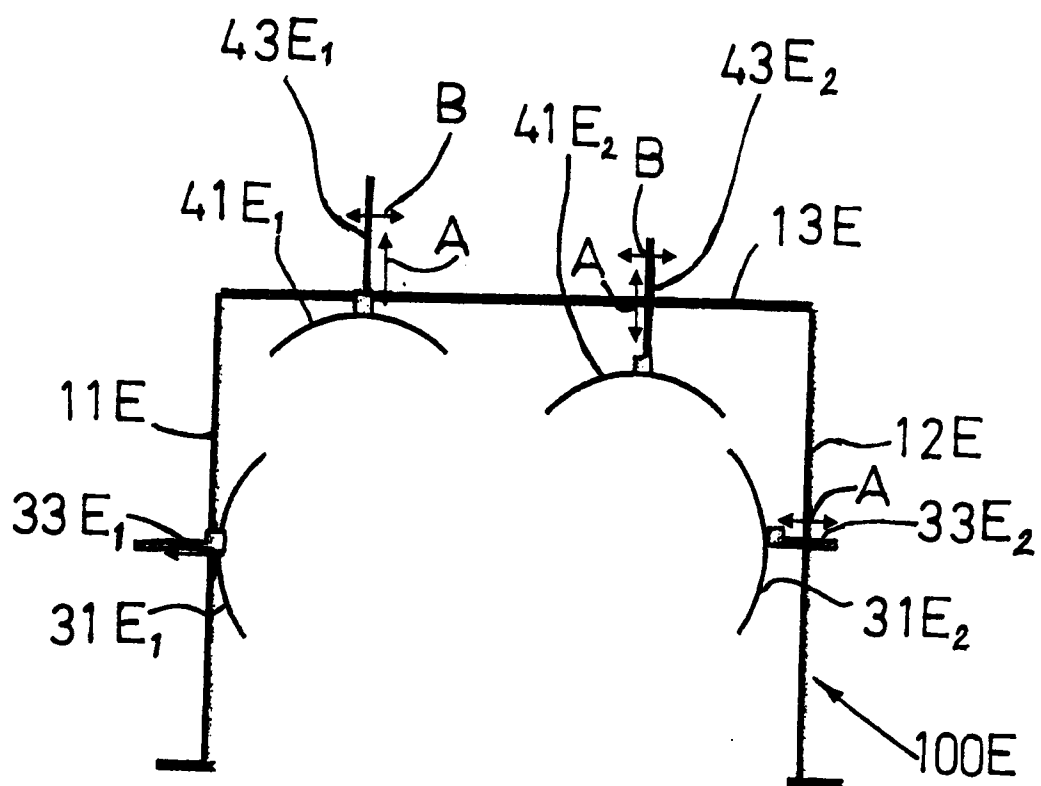


Fig. 9

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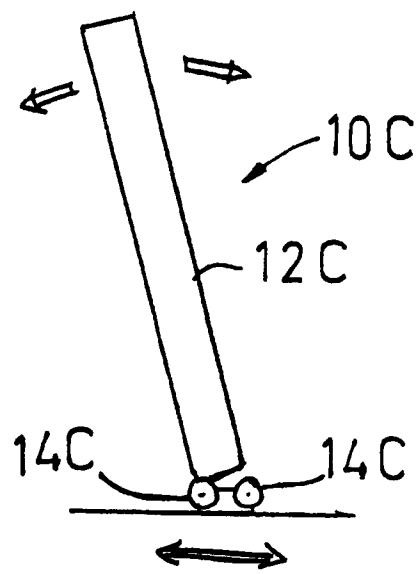


Fig. 10A

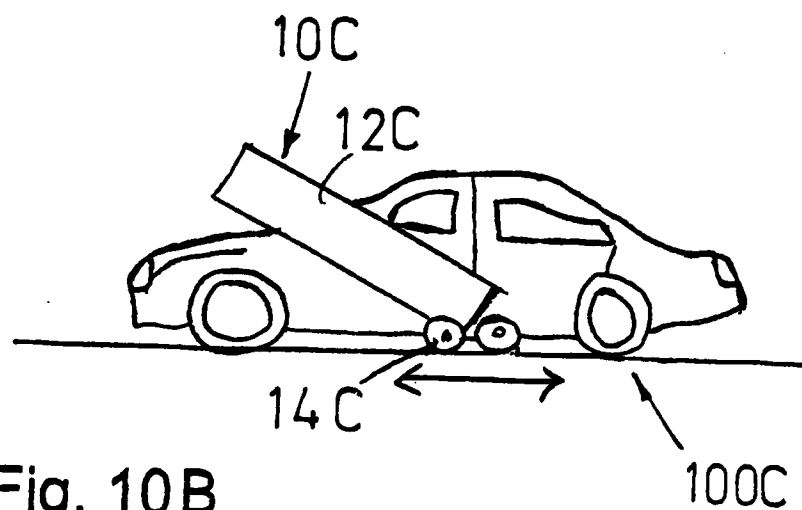


Fig. 10B

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Fig. 11

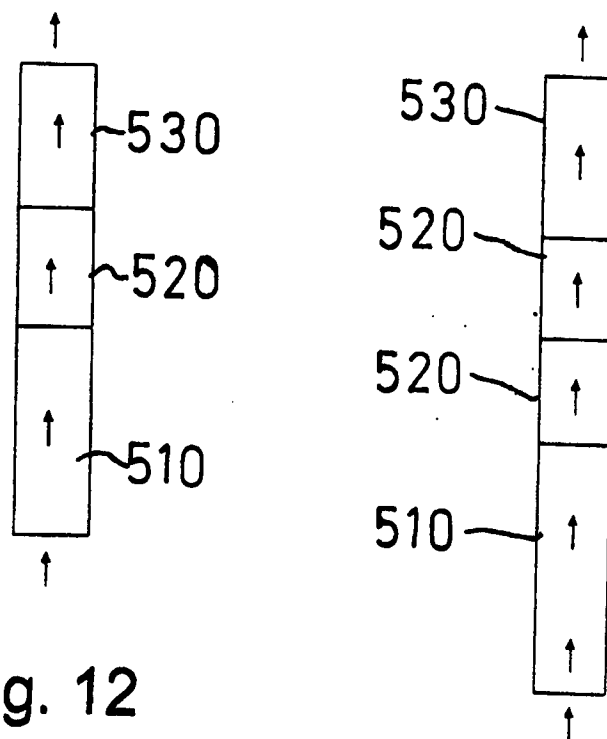
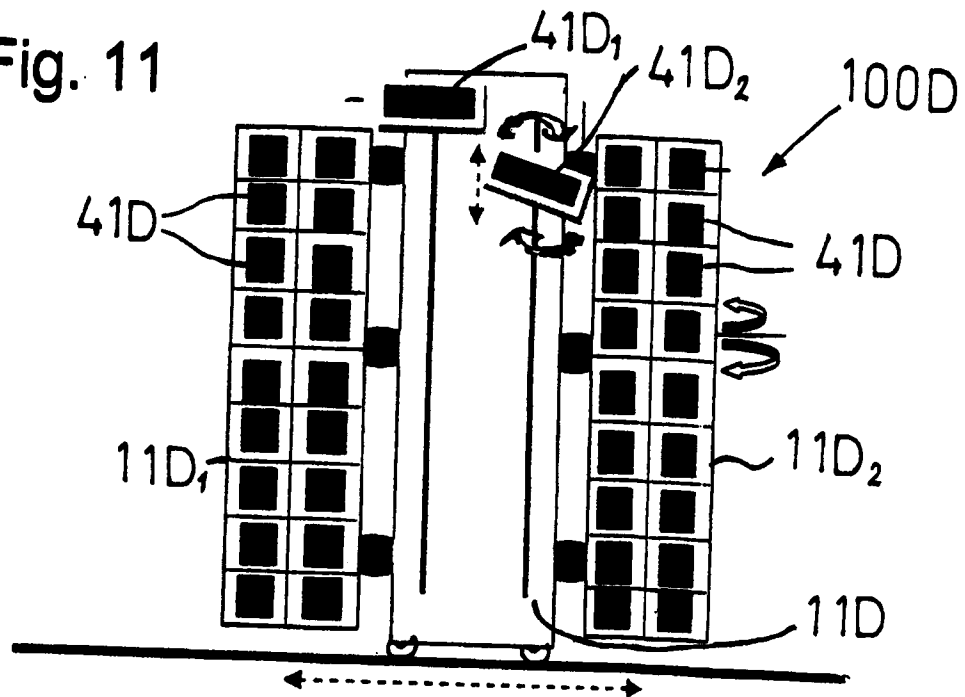


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2014/050683

A. CLASSIFICATION OF SUBJECT MATTER														
IPC: see extra sheet														
According to International Patent Classification (IPC) or to both national classification and IPC														
B. FIELDS SEARCHED														
Minimum documentation searched (classification system followed by classification symbols)														
IPC: B05D, F26B														
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched														
SE, DK, FI, NO classes as above														
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)														
EPO-Internal, PAJ, WPI data														
C. DOCUMENTS CONSIDERED TO BE RELEVANT														
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.												
P, X	WO 2013095274 A1 (PIVAB AB), 27 June 2013 (2013-06-27); page 4, line 23 - page 5, line 13; figures	1												
A	--	2-21												
A	US 4662086 A (HENNECKE UDO ET AL), 5 May 1987 (1987-05-05); whole document	1-21												
A	WO 2006010301 A1 (HE ENLONG), 2 February 2006 (2006-02-02); abstract; figures	1-11												
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.														
<table border="0"> <tr> <td>* Special categories of cited documents:</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"&" document member of the same patent family</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means		"P" document published prior to the international filing date but later than the priority date claimed	
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention													
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone													
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art													
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family													
"O" document referring to an oral disclosure, use, exhibition or other means														
"P" document published prior to the international filing date but later than the priority date claimed														
Date of the actual completion of the international search		Date of mailing of the international search report												
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International Patent Classification (IPC)

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