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(71) Applicant: **Bellinato, Giambattista**
86030 San Giacomo Degli Schiavoni,
Campobasso (IT)

(72) Inventor: **Bellinato, Giambattista**
86030 San Giacomo Degli Schiavoni,
Campobasso (IT)

(74) Representative: **Porsia, Attilio, Dr. et al**
c/o Succ. Ing. Fischetti & Weber
Via Caffaro 3/2
16124 Genova (IT)

(54) **Method and machine for restoring worn windscreens of motor vehicles to their original transparency**

(57) There is traversed over the outer surface of the windscreen (P), beginning at the bottom on one side, a head (T) fitted with one or more rotating brushes (42) of felt or other material, while a solution in liquid phase with cerium oxide or other material suitable for fine lapping and polishing of optical glasses is fed to the portion of windscreen on which the brushes are working. At the end of each traverse, the head with the brushes is raised by a precise amount, so as essentially to scan

the entire surface of the windscreen. A small gutter (1) is fixed to the perimeter of the windscreen, except along its upper edge, to collect the polishing solution and return it via a lower pipe (2) to the tank (57) from which it was taken. At the end of the process the outer surface of the windscreen is washed down with a jet of water that carries away any residues of said lapping and polishing solution.

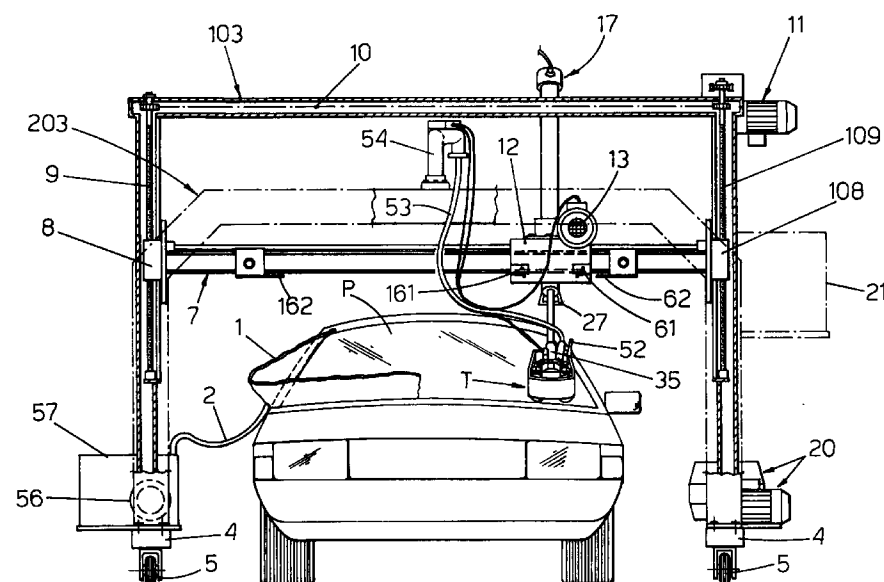


Fig. 1

EP 0 767 030 A1

Description

The invention relates to a method and a machine capable quickly, and relatively inexpensively, of restoring, to their original transparency, car windscreens that have become spoiled through long use and which, by restricting the driver's vision, can cause dangerous accidents. According to the invention, there is traversed over the outer surface of the windscreen of the car, beginning at the bottom on one side of this windscreen, a head fitted with one or more rotating brushes of felt and/or other suitable material, while the portion of windscreen on which the brushes are progressively working is irrigated with a solution in liquid phase with abrasive micropowders, for example with cerium oxide, which gives very fine lapping and thorough cleaning and polishing of the optical surface being treated. At the end of each traverse, the head with the brushes is incrementally raised by a precise amount, so as essentially to scan the entire surface of the windscreen. A small gutter made of flexible material is fixed to the perimeter of the windscreen, except along its upper edge, to collect the polishing solution and return it via a lower pipe to the tank from which it was taken. The solution that progressively runs down from the head keeps the previously polished surface wet and prevents traces of cerium from drying on it. At the end of the cycle, the surface of the windscreen is washed down with a jet of water that carries away any small residues of said solution.

Other features of the invention, and the advantages which it affords, will become clear in the following description of a preferred embodiment thereof, illustrated purely by way of a non-restrictive example in the Figures of the three attached plates of drawings, in which:

- Figs. 1 and 2 are front and side elevations, respectively, with parts in section, of the machine as it begins its work cycle on a car;
- Fig. 3 is a top view of the head with the rotating brushes and the dispenser of the solution with the cerium oxide; and
- Fig. 4 illustrates details of one of the spindles carrying the brushes of the head, partly in cross-section down the axis of rotation.

From Figures 1 and 2 it can be seen that before the windscreen of the car A undergoes the treatment according to the invention, a double-sided adhesive strip and/or other suitable means are used to fix a strip of flexible plastic material 1 to the perimeter of the windscreen P, except along the upper edge, to form a small gutter as a means of collecting the solution as it escapes under gravity from the lapping head, this gutter being fitted at at least one end, at a low point, with a drain-pipe 2 of which more later. It will be understood that other means suitable for the purpose and designed to be fitted quickly to many different kinds of car can be used instead of the abovementioned structure 1. Once

the car A, suitably positioned and immobilized, has been prepared as described above, a portal structure 3 is positioned transversely over the car and centred by means of suitable reference guides, not shown. This structure 3 stands on two parallel side members 4 fitted at their ends with wheels 5 partly of swivelling type and, between these, with legs 6, which are actuated by respective servo controls and, once the structure 3 is in position over the car, are let down to immobilize the structure 3 in the correct position in which it has been placed with reference to the car. It should be understood that the procedure of positioning the portal structure 3 relative to the car can be different from the above account, it not being ruled out that said structure be fixed and that the car be mounted on a parallel-chain conveyor with crossbeams and guides for containing the wheels, of the same type as is used in current carwash tunnels.

The structure 3 comprises a first portal 103 with uprights that slope to form an acute angle with the horizontal in the direction in which the car enters: these are designed to guide the ends of a crossbeam 7, the ends having internally threaded blocks 8, 108 engaged by long screws 9, 109 located longitudinally inside said uprights where they are supported rotatably by their ends. These screws are connected to each other at the top by a rigid drive transmission 10, which may be of sprocket and chain type, housed in the overhead member of the portal 103, and one of said screws is connected to a geared motor 11 with two directions of rotation fixed to said overhead member. A carriage 12 travels along the crossbeam 7, which is horizontal and parallel with the overhead member of the portal 103, and means are provided for causing said carriage to travel in response to a command along said crossbeam with reciprocating movements of precise length. For this purpose the carriage 12 may, for example, be fitted with a small geared motor 13 with two directions of rotation, to the slow shaft of which is keyed a pinion 14 that engages with a rack or with a chain 15 fixed longitudinally along said crossbeam 7. The length of the reciprocating stroke of the carriage 12 and the reversal of the rotation of the geared motor 13 are controlled by microswitches 61, 161 on board the carriage itself, these microswitches interacting with end-of-travel markers 62, 162 mounted adjustably on the crossbeam 7. The distance between the end-of-travel markers 62, 162 is suited to the width of the windscreen to be treated and can be fixed as in the example shown in Figure 1 or may be varied by hand or automatically as the height of the operating head working on the windscreen changes (see below).

Hinged to the carriage 12 at 16, parallel with the crossbeam 7, is the end of the body of a double-acting cylinder-and-piston unit 17 operated by fluid pressure, or some equivalent means formed for example by a screw-and-nut assembly with its own geared drive motor. The unit 17 is positioned so that its longitudinal axis is on an imaginary vertical plane intersecting said

crossbeam 7 at right angles, its rod pointing downwards, towards the front of the car A. The angle of pitch of the cylinder 17 can be controlled by an optional cylinder-and-piston unit 18, with optional damping and/or compensating functions (see below), which at one end is hinged to said cylinder 17 and at the other is hinged to the carriage 12. The cylinders 17 and 18 are connected to an actuating solenoid valve unit and to other means of control housed in a small box 19 mounted on the side of one of the uprights of the portal 103 and connected to a hydraulic power unit 20 mounted on the adjacent side member 4. The box 19 is connected to a controlling and monitoring box 21 that also controls the geared motors 11, 13 and all the electromechanical components mentioned above and is mounted on one of the uprights of another portal 203, of which more later. It will be understood that, in a different embodiment, the hydraulic power unit 20 may be integrated in the cylinder 17, much like the modern actuators used for opening and closing gates, so that the unit 17 only needs an electrical power supply.

With reference also to Figure 3, it will be seen that the outer end of the rod of the cylinder 17 is connected, with the possibility of relative rotation of sufficient amplitude, to a bush 22, the end of which in turn is hinged by a cylindrical hinge 23, perpendicular to said rod, to the centre of a polygonal plate 24, which forms the body of the working head T of the present apparatus and which is provided with a protective casing 25 around its perimeter. At the end facing in the direction of the cylinder 17, the plate 24 carries integrally a small perpendicular wall 125 which is directed downwards and fixed to the end of a rod 26 that extends towards said cylinder 17 and that passes with suitable play through a guide 27 fastened to the bottom end of the body of said cylinder 17. The shaft 26 keeps the head T correctly positioned towards the car A, while simultaneously giving it adequate freedom of rotation both in the longitudinal direction, about the axis of the bush 22, and in the transverse direction, about the hinge 23. Located on the plate 24 and aligned in two rows equidistant from the central longitudinal axis of said plate, partly parallel with and partly converging towards each other, are a number of holes 28 containing flanged bushes 29 in each of which there spins, in bearings 30, an axially hollow shaft 31, part of which projects upwards from said bush and is made fast to a pulley 32. By means of belts 33 passing around them, not necessarily in the manner illustrated, the pulleys 32 are connected to each other and to other pulleys 34 made fast to the slow shaft of a small geared motor 35 mounted on top of the plate 24. The hollow shaft 31 also projects a precise distance from the bottom end of each bush 29 and there is made fast to it, with the possibility of axial sliding, a disc 36 pushed axially against the bottom edge of the bush 29 by a spring 37 held in position by a cap 38 and by a seeger 39. The disc 36 is provided with a coaxial collar 136 directed downwards and on which there is leaktightly fixed the end of a concertina boot 40 whose other end is fixed leaktightly to the cylin-

drical body 41, which is the brush holder and is fitted irremovably underneath with the discoidal brush 42, in felt and/or other suitable material, that forms the actual brush. The body 41 contains an axial blind conical seat 43 which is open at the top and houses the lower end of a shaft 44, suitably rounded and having a transverse slot 45 whose extremities are suitably flared: a pin 46 passes through this to diametrically engage the brush body 41 to which it is fixed in some suitable manner. In this embodiment, the brush is secured to the shaft 44 with the possibility of spherical movement. At an intermediate point, the shaft 44 has a transverse dowel 47 whose ends fit into slots 48 formed longitudinally in the hollow shaft 31, to which said shaft 44 is thus made fast but able to move axially a sufficient amount in opposition to the action of a spring 49 housed in the same hollow shaft 31 and retained here by a plug 50. It will be clear that in each spindle holding a brush, the axial seal 36 and the concertina boot 40 prevent any infiltration of the cleaning solution towards the bearings 30. It will also be clear that since each brush 42 can be secured with spherical movement to its drive shaft, and since it is also able to perform axial movements in opposition to the spring 49, each brush 42 will be able to have perfect contact with surfaces even if they are not flat but relatively convex, like those of car windscreens (see below).

On the underside of the plate 24 of the working head T there is fixed a small bar 51 designed to deliver jets of the polishing solution in the direction of each brush 42. One end of the bar 51 passes through a hole in the plate 24 to project from the upper part of the latter, where it connects via a cock 52 (Fig. 2) with the end of a hose 53, of appropriate length, connected at the other end to a rigid tube 54 which in turn projects out from the overhead member of the portal 203 standing on the same side members 4 mentioned earlier and on which the control box 21 is mounted. Pipes 55 fixed to the portal 203 connect said tube 54 to an electrically powered pump 56 which sucks the polishing solution from a tank 57, these latter components being mounted on one of the side members 4. On the delivery line of the electrically powered pump 56 is a branch 58 with a flow-control cock 59, which discharges into the bottom of the tank 57 in order to keep the polishing solution well mixed. A cock 60 is also provided on the delivery line of the pump 56 which supplies the pipes 55, 54, 52 and the bar 51.

The operation of the machine constructed in this way is simple and obvious. At the beginning of each work cycle, the cylinder 17 is in the position of maximum extension of its rod and the crossbeam 7 is in its highest position. After the gutter 1 has been positioned around the windscreen P of the car and the portal structure 3 has been correctly positioned with reference to this car A, the legs 6 are operated to immobilize said structure 3, after which instructions are given through the control box 21 to move the crossbeam 7 down by the required amount until the working head T is positioned against the bottom edge of the windscreen P. This operation can

be performed under the control of the operator, or can easily be automated using a processor which runs a program correlated with the different kinds of car on the market to control the operation of the geared motor 11, which motor is suitable for electronic control of speed and phase. When activating the geared motor 13 by a manual control, the head T is positioned correctly on one side of the windscreen, after which said geared motor is stopped and the end-of-travel markers 62, 162 are positioned on the crossbeam 7, so that one of these touches the corresponding microswitch 61 or 161 and so that the end-of-travel markers are separated by a distance corresponding to the width of the windscreen. In the example shown in Figure 1, the end-of-travel markers 62, 162 are set at a fixed distance corresponding to the length of the top edge (which is shorter) of the windscreen. It will be understood that, in contrast to the illustration, the end-of-travel markers 62, 162 can be controlled by systems of self-centring movement and by servo controls that progressively modify their distance apart as the position of the head T on the windscreen varies (see below), so that the head can automatically adjust its working stroke to the different widths of the windscreen at different heights. Instead of the microswitches 61, 161, suitable sensors can be mounted differently on the head T and interact with reference points fixed on the sloping sides of the windscreen.

If the cylinder 18 is adopted, this is preferably in such a way that said operations of preparing the head T at the beginning of the operating cycle take place with the head not touching the windscreen. Once the head T is in position over the windscreen P, the cylinder 18 is operated so that the brushes 42 of the head T touch the windscreen, with a suitable degree of compression of the springs 49 of the spindles. The head T tends to rest on the windscreen under gravity and if its weight proves to be excessive, this can be compensated for by means of said cylinder 18 which can be supplied with an appropriate amount of pressure. Once the head T is in position in a bottom corner of the windscreen, and after the drain tube 2 leading from the gutter 1 to the tank 57 (Fig. 2) that contains the solution of water and cerium oxide, has been inserted, the electrically powered pump 56 is turned on. This mixes said solution and sends a suitable amount to the bar 51 (Fig. 3) which dispenses it evenly to the brushes 42 of the head T. At this point the working cycle of the machine is started. The geared motor 35 comes on and the brushes 42 begin to rotate, thereby finally lapping and polishing the windscreen P with the solution supplied by the electrically powered pump 56. At the right moment the geared motor 13 is turned on and slowly traverses the head T towards the opposite side of the windscreen, where one of the microswitches 61 or 161 interacts with the corresponding end-of-travel marker 62, 162 and triggers a precise raising of the head by means of the cylinder 17 and also causes the rotation of the geared motor 13 to reverse. This cycle is repeated so that the brushes of the head T work on the windscreen in a uniform manner, both across the width

and along the height. Thanks to the joints 16, 22, 23, the brushes 42 have perfect contact with every point of the windscreen. Because of their special coupling with radial play relative to the shaft 44 (Fig. 4), the brushes 42 perform a slightly eccentric rotation, as it were epicyclic, which greatly improves their lapping and polishing action on the windscreen.

At the end of the working cycle, the head stops in one of the top corners of the windscreen, the brushes 42 stop rotating, the electrically powered pump 56 is turned off, the immobilizing legs 6 are raised and, if necessary, the cylinder 18 is activated to withdraw the head from the windscreen. The portal structure 3 is then removed and the windscreen washed down with a jet of water in order to remove any trace of the polishing solution, after which the gutter 1 is taken off.

The entire work cycle described may take about twenty minutes, and at the end, even a windscreen that was initially very scratched, such as the windscreen of a car that has done a hundred thousand kilometres, will have been restored to its original transparency.

Claims

1. Method for restoring the worn windscreen of a car or other motor vehicle to its original condition of transparency, characterized in that it comprises a stage of very fine lapping and thorough polishing of the outer surface of the windscreen, using one or more rotating brushes of felt and/or other material and with simultaneous irrigation of that portion of the surface on which the brush or brushes are working by a suitable solution, in liquid phase, composed of, for example, water and cerium oxide and/or other suitable micropowders normally used in the polishing of optical glasses, which stage begins at the bottom of the windscreen, covers the entire or almost the entire width of the latter and works slowly upwards so as to cover the entire or almost the entire height of said windscreen, while the polishing solution that runs down from the polishing unit keeps the polished surface wet and prevents any hardening of the residues of said solution, the method including a stage of collecting and draining the solution from the windscreen as it escapes from the polishing area so that it is not lost, and, at the end of the cycle, a stage of cleaning the windscreen with copious amounts of clean water and/or other suitable means in order to remove any residue of said solution.
2. Method according to Claim 1, in which the rotating polishing brush or brushes are guided in a horizontal reciprocating traversing movement, with an adequate rise at the end of each traverse, so as to treat the windscreen uniformly for all or almost all of its transverse dimension and for all or almost all its height.

3. Machine for restoring a worn windscreen of a car or other motor vehicle to its original transparency, in particular for implementing the method of the previous claims, characterized in that it comprises:

- at least one working head (T) equipped with one or more brushes (42) of felt or other suitable material, which are kept by suitable means in uniform contact with the windscreen and are pushed down onto it independently of each other by a suitable elastic mode in the axial direction, in order to contact said windscreen uniformly, and which are rotated at an appropriate speed by other means;
- means (51) located on said working head (T) or in its vicinity, for distributing to the portion of windscreen on which the brushes are progressively working, an appropriate quantity of solution suitable for the windscreen lapping-polishing stage, this solution being held in a fixed tank (57) from which it is taken by suitable means that send it in suitable quantities to said distributing means, while other means provide for keeping said solution stirred and mixed in said tank;
- means (13, 17) for guiding said working head in the scanning movement which is necessary to ensure that it treats essentially the entire width and entire height of the windscreen;
- means (1, 2) for collecting and conveying back to said tank (57) the solution that escapes from the working head and has flowed over the windscreen so as to prevent it from being lost and fouling the bodywork of the car;
- means (3, 4, 5) for establishing the correct relative positions between the working head and the car with the windscreen to be treated, and which at the end of the operation enable said head to be withdrawn rapidly from the car, or vice versa in order to allow careful cleaning off of the windscreen with a jet of running water and/or other suitable means.

4. Machine according to Claim 3, in which the working head (T) comprises at least two rows of brushes (42) orientated in the direction of the height of the windscreen, each brush-holding body (41) being secured with the possibility of spherical movement on the lower end of a shaft (44) that passes through a hollow shaft (31) that has at least one longitudinal slot (48) engaged by the end of a dowel (47) located transversely in said brush-holding shaft which is pushed down by a spring (49) retained by a plug (50) in said hollow shaft which is supported rotatably in bearings (30) inside a bush (29) having a flange on a suitable supporting plate that forms the flat body of the working head, mounted on which is a geared motor (35) which, by means of belts and pulleys, transmits the necessary rotation

to the various hollow shafts of the brush-holding spindles and under which are the working brushes, the end of which hollow shaft projects downwards from the bush in order to support means (36) in leaktight axial engagement with the bush itself and to which is fastened the end of a concertina boot (40) which surrounds said brush-holding shaft while its other end is secured leaktightly to the brush-holding body (41), this being done in such a way as to prevent the abrasive solution from infiltrating towards the bearings.

5. Machine according to Claim 3, in which the working head (T) is connected in the middle of the upper face of its body (24), by an interposed cylindrical hinge (23) allowing swivelling on a transverse axis and an interposed bush (22) for longitudinal pivoting, to the end of the rod of a double-acting cylinder-and-piston unit (17) operated by fluid pressure, or to an equivalent means, for example a screw-nut unit driven by a geared motor, orientated in the direction of the length of said working head and which is connected by the lower end of its body, through an interposed cylindrical pivot (16) parallel to the abovementioned transverse pivot, to means that move the complete head in a horizontal movement across the car (A) for a length corresponding to the width of the windscreen being treated; said cylinder (17) being connected to a suitable hydraulic power unit (20) and means being provided to ensure that at the end of each traversing stroke of the head, the rod of this cylinder is raised by the small amount necessary to ensure that the brushes of the head, in their next traversing stroke, treat different portions of the surface of the windscreen.
6. Machine according to Claim 5, in which the body of the cylinder (17) or equivalent means that provides for the cyclical raising of the working head at the end of each traversing stroke, carries on the end near the transverse pivot hinge (16) an integral guide (27) extending downwards and through which there passes, with play, a rod (26) fixed at one end to an opposing centred portion of the body of the head (T), all in such a way as to form a limiter of the swivelling of the head about the axes of the hinges (22, 23) to which said head is connected.
7. Machine according to Claim 5, in which the cylindrical transverse pivot hinge (16) of the cylinder-and-piston unit (17) or equivalent means for the cyclical raising of the working head is mounted on a carriage (12) that travels along a horizontal guide (7) arranged transversely to the car and connected at each end to means for adjusting its height according to the type of car to be treated, so that at the start of each working cycle of the machine, when the rod of said cylinder (17) is fully extended, the head (T) is positioned against the bottom edge of

the windscreen to be treated, means being provided to ensure that said carriage moves on command along said guiding crossbeam (7) with a reciprocating movement whose amplitude corresponds to the width of the windscreen to be treated.

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8. Machine according to Claim 7, in which the carriage (12) on which the working head is mounted, carries the associated geared reciprocating-drive motor (13), which engages via a pinion (14) with a chain or rack (15) fixed longitudinally to the crossbeam along which said carriage travels, while the opposing ends of this carriage carry microswitches (61, 161) which reverse the direction of rotation of said geared motor when thrown by end-of-travel markers (62, 162) positioned on said guiding crossbeam (7), whose positions are adjustable and dependent on the dimensions of the windscreen of the car to be treated.

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9. Machine according to Claim 8, in which the end-of-travel markers (62, 162) are connected to self-centring positioning means such as screw-and-nut units or to the opposite sides of a conveyer and these means are connected in turn to a centralized control of manual and/or servocontrolled type, which, in accordance with the characteristics of the windscreen being treated, enables the distance between said end-of-travel markers to be progressively reduced in phase with the raising of the working head.

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10. Machine according to Claim 7, in which the guiding crossbeam (7), on which the carriage (12) travels back and forth with the working head, travels via its ends on the uprights of a portal structure (103), on which uprights said crossbeam is connected to synchronized raising and lowering means, for example screw-and-nut units (8, 108, 9, 109) synchronized by a positive pinion-and-chain drive (10) connected to a small geared motor (11) fixed to said portal structure, means being provided to ensure that at the start of each cycle, the cylinder (17) or equivalent means for supporting the working head has its rod fully extended, for the lowest position of the head, while said crossbeam (7), which initially was raised, is lowered so that said head positions itself against the bottom edge of the windscreen to be treated.

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11. Machine according to Claim 10, in which said portal structure (103) is fixed and carrier means are provided for correctly positioning the car that is to be treated with respect to said structure, and for removing it afterwards at the end of the working cycle.

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12. Machine according to Claim 10, in which said portal structure (3) is mounted on lower side members (4)

which have wheels (5) to allow it to move and immobilizing means (6), all in such a way that it is possible to position the machine over the car to be treated and then withdraw the machine at the end of the working cycle.

13. Machine according to Claim 10, in which there is provided, on the side members (4) that carry the portal structure (103) with the working head, another portal structure (203), in the middle of whose overhead member there is fixed a projecting tubular arm (54) that forms part of the pipe through which the treatment solution is fed to said working head and that supports the electrical power and control cables for the geared motors (35, 13) for rotating the brushes of said head and for traversing said head, while the side members of the resulting portal structure (3) carry the tank (57) with said treatment solution and with the electrically powered pump (56) for the suction and delivery of said solution, which is partly returned to the tank under pressure in order to keep said solution stirred.

14. Machine according to the previous claims, in which a flexible strip (1) is fixed by means of a double-sided band to the oblique edges and bottom edge of the windscreen to form a gutter in which to collect the polishing solution as it descends from the working head, with a tube (2) fitted in at least one bottom lateral point on this gutter to carry away the collected solution and return it by gravity to the tank (57) from which it was taken.

15. Machine according to the previous claims, in which there is fixed to one of the uprights of the portal structure (203), that supports the supply pipe and circuits of the working head, the electrical control box (21), while fixed to one upright of the other portal (103) is the box (19) with the electrically operated valves and means for controlling the cylinder (17) on which said working head is supported, this box being connected to a hydraulic power unit (20) mounted on one of the side members supporting said portal structures.

16. Machine according to the previous claims, in which there may be hinged to the carriage (12) that carries the working head a small fluid-pressure cylinder-and-piston unit (18), which in turn pivots on the body of the cylinder (17) or equivalent means for raising and lowering said head, in such a way as to move this head (T) away from the windscreen at the end of the process and, if necessary, to partly counterbalance the weight with which said head presses down on the windscreen during the working stage.

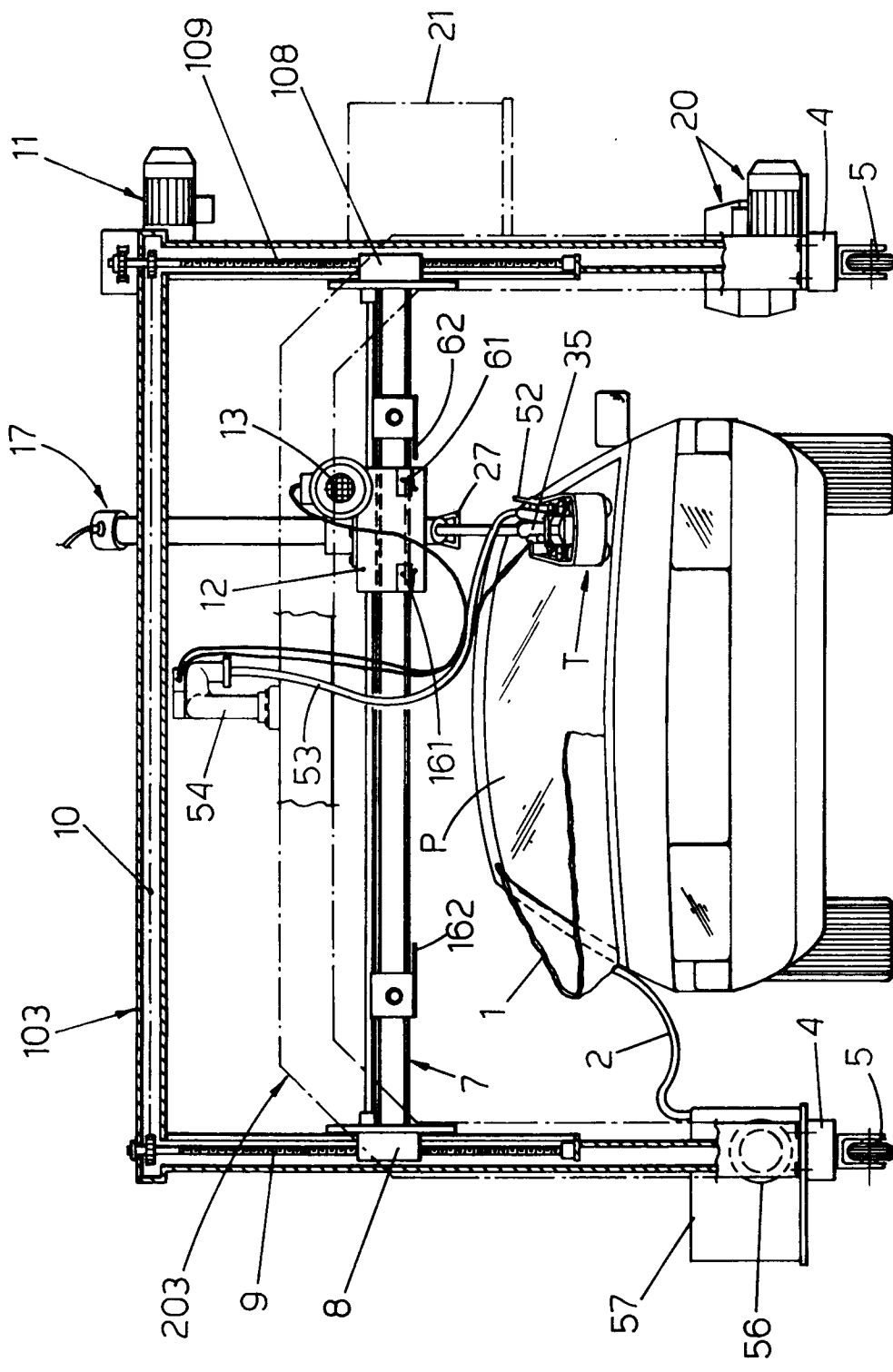


Fig. 1

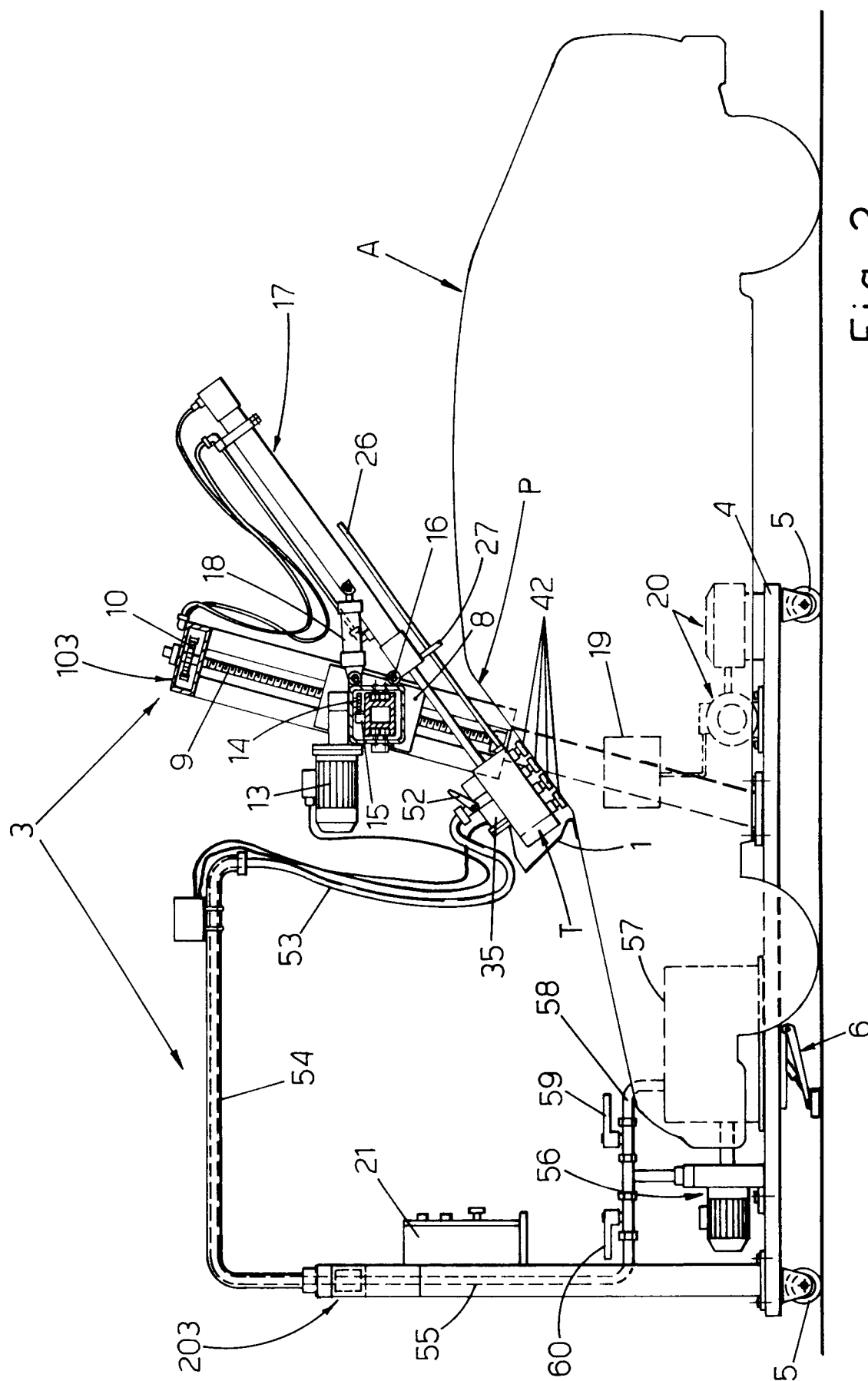


Fig. 2

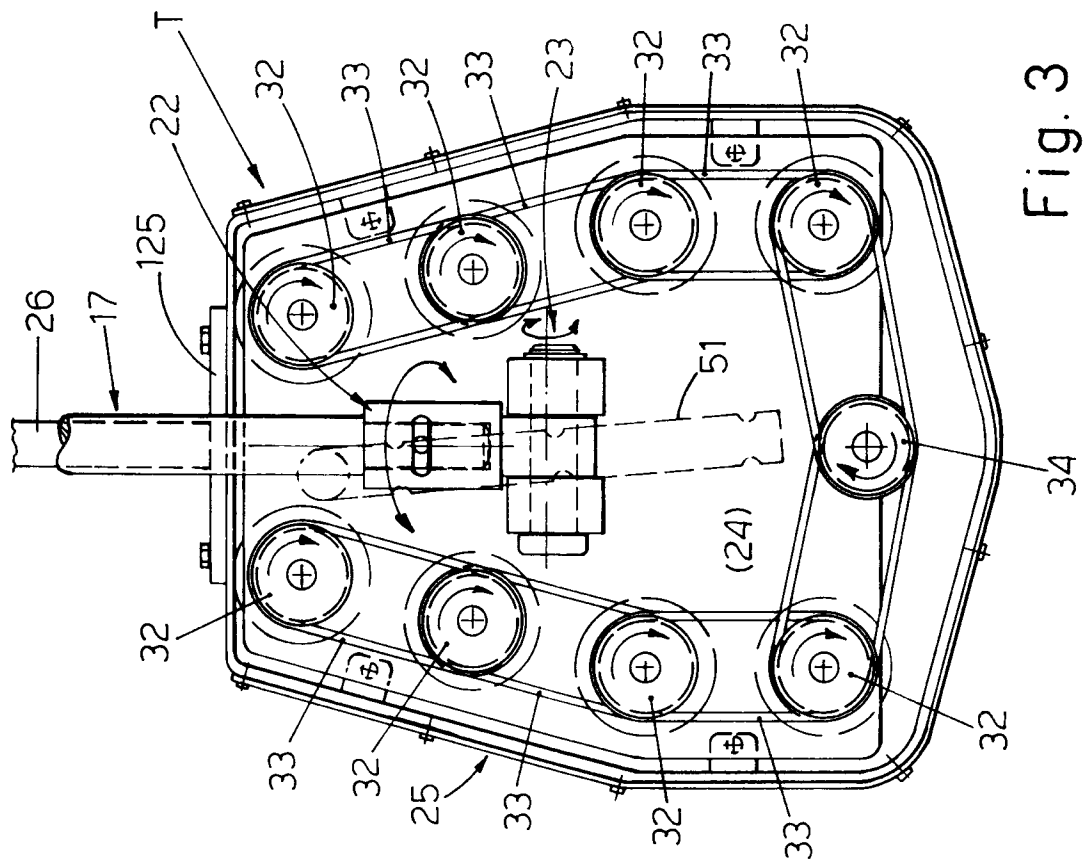


Fig. 3

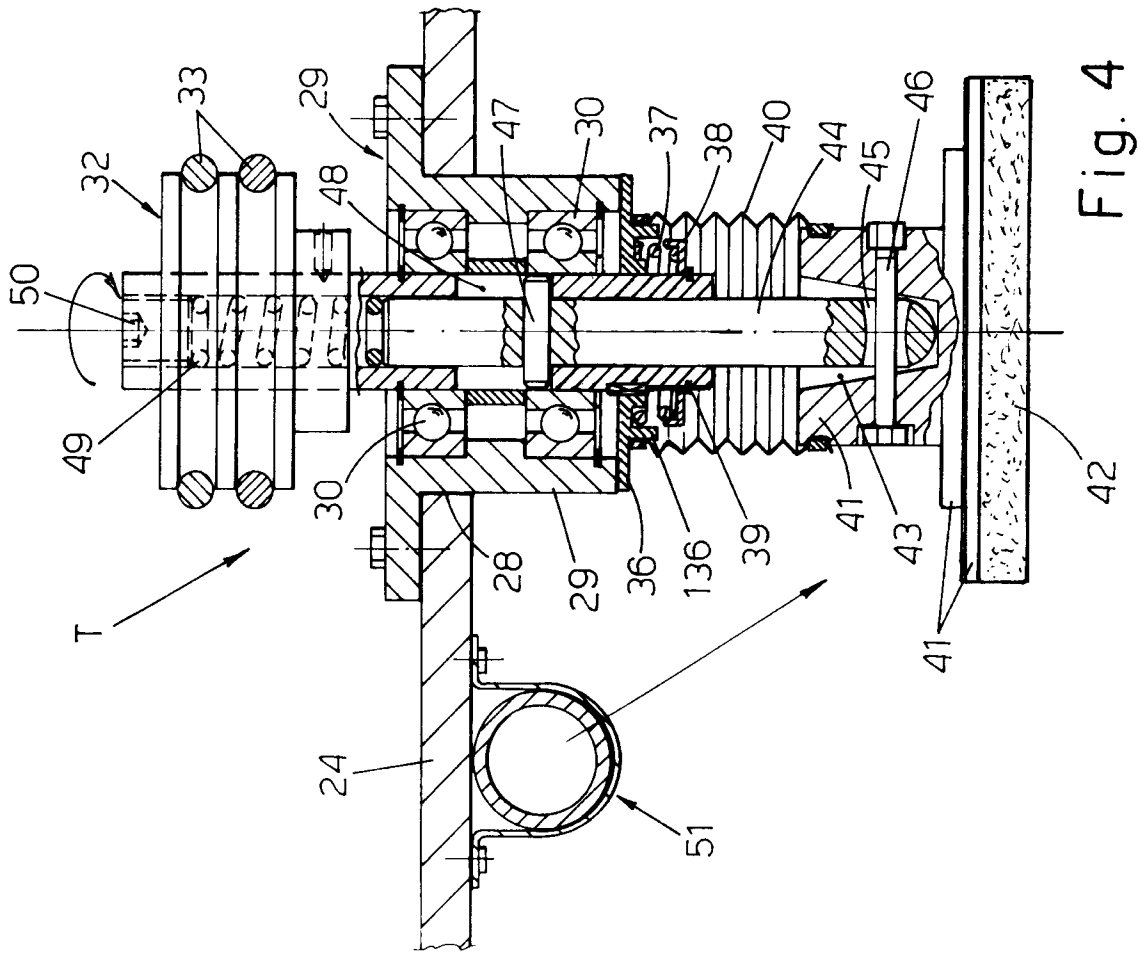


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 96 11 5281

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP-A-0 325 424 (YACHIYO MICRO SCIENCE INC ET AL.) 26 July 1989 * column 4, line 53 - column 5, line 27; figures *	1-3	B24B13/015 B24B19/26
Y	US-A-4 907 371 (SHODA ET AL.) 13 March 1990 * abstract; figures *	1-3	
A	FR-A-2 635 038 (INOCAR) 9 February 1990 * page 2, line 19 - page 3, line 34; figures *	4	
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 490 (M-779), 21 December 1988 & JP-A-63 212463 (TAKAYUKI NAKAJIMA), 5 September 1988, * abstract *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B24B B08B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13 January 1997	Examiner Garella, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)