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

(11) EP 1 120 168 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.08.2001 Bulletin 2001/31

(51) Int Cl.[7]: **B05B 15/12**

(21) Application number: **00300690.5**

(22) Date of filing: **28.01.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant: **Smart Car Centres Ltd.**
Leighton Buzzard, Bedfordshire LU7 8EQ (GB)

(72) Inventor: **Williams, Mike**
c/o Spraybooth Techn.Ltd.
Sudbury Suffolk C010 6DX (GB)

(74) Representative:
Brown, Fraser Gregory James et al
fJ Cleveland
40-43 Chancery Lane
London WC2A 1JQ (GB)

(54) Vehicle painting enclosure

(57) The present invention relates to field of motor vehicle repair, and in particular to the repair of minor damage to paintwork. According one aspect of the present invention there is provided apparatus providing an enclosure (10) in which to paint a vehicle, comprising a generally upstanding wall portion, a ceiling portion (13) and a floor portion (11), in one of which portions is formed an airflow input surface and in another of which portions is formed an airflow extract surface, wherein the input surface is provided by a panel (24) comprising a diffusing medium for providing a substantially uniform airflow from the surface of the panel into the enclosure and wherein the extract surface is provided by a panel comprising filter means (16) for airborne paint spray, wherein an air duct external of the enclosure communicates between rear sides of the input and extract panels, which air duct is provided with airflow generation means (18) for driving air through the input panel and drawing air from the extract panel, thereby to provide a recirculating flow of air in the enclosure (10), the rate and extent of the flowing air being arranged to provide, in use, a substantially laminar airflow around a vehicle in the enclosure.

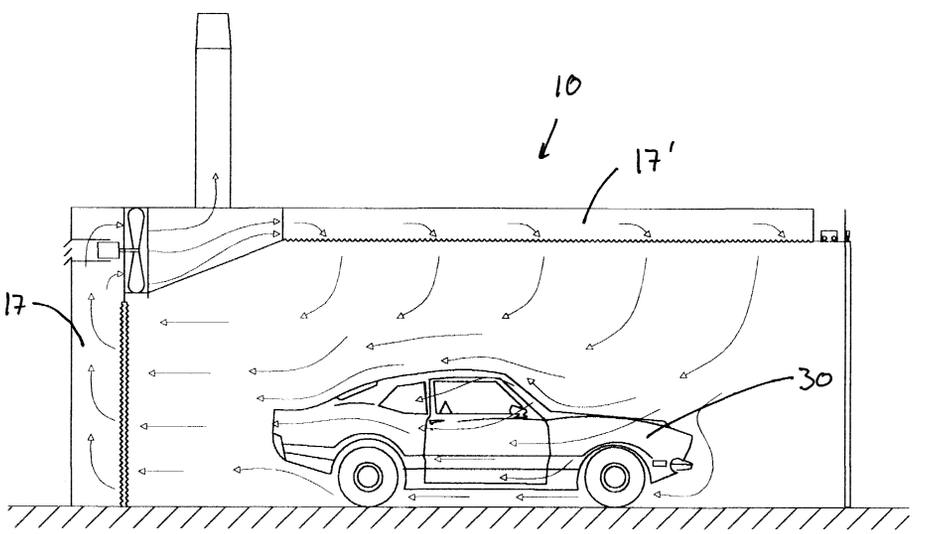

fig 2

EP 1 120 168 A1

Description

[0001] The present invention relates to field of motor vehicle repair, and in particular to the repair of minor damage to paintwork.

[0002] Accident damage to motor vehicles frequently results in damage to vehicle body panels and paintwork. These are routinely repaired by replacement of the panel and painting of the replacement panel in a colour matched to the overall vehicle colour. Frequently however the damage is very minor, as for example caused by stone chips thrown up from the road or small scratches. Damage of this nature is not severe enough to justify the replacement of a panel, or repainting of a whole panel, yet has a detrimental affect on the appearance of the motor vehicle. So-called touch up paints are available to deal with these defects. These come in small quantities in pots for application by brush, or in aerosol can form for application as a spray. Typically these are applied by the owner of the vehicle rather than a paint specialist. Results from these home-repairs are usually fairly poor unless the person applying the paint is experienced. Even so it is very difficult to match the paint work with the applied paint, because the paint comes premixed and cannot take into account fading or local variations during manufacture.

[0003] Hence there is a need for a specialist paint repairing method and apparatus which is capable of producing high standard repairs, without the expense of complete panel spraying.

[0004] According one aspect of the present invention there is provided apparatus providing an enclosure in which to paint a vehicle, comprising a generally upstanding wall portion, a ceiling portion and a floor portion, in one of which portions is formed an air flow input surface and in another of which portions is formed an airflow extract surface, wherein the input surface is provided by a panel comprising a diffusing medium for providing a substantially uniform airflow from the surface of the panel into the enclosure and wherein the extract surface is provided by a panel comprising filter means for airborne paint spray, wherein an air duct external of the enclosure communicates between rear sides of the input and extract panels, which air duct is provided with airflow generation means for driving air through the input panel and drawing air from the extract panel, thereby to provide a recirculating flow of air in the enclosure, the rate and extent of the flowing air being arranged to provide, in use, a substantially laminar airflow around a vehicle in the enclosure.

[0005] Preferably a minor proportion of the air recirculated through the duct is vented to atmosphere thereby to remove paint solvent from the recirculating air. Typically, the proportion of air vented to atmosphere may be 10 to 30% of the air passing through the duct.

[0006] Preferably the proportion of air vented to atmosphere is 15 to 25% of the air passing through the duct.

[0007] According to a preferred arrangement the apparatus is adapted so that the airflow through the input panel is slightly less than the airflow through the extract panel, thereby to maintain a negative air pressure within the enclosure with respect to atmosphere.

[0008] In order to form an enclosure, one or more retractable depending curtain(s) may be provided to form wall(s) of the enclosure, the curtain(s) permitting access of a motor vehicle to the enclosure.

[0009] For good airflow uniformity, the input panel may comprise a layer of a filter medium. In a preferred arrangement, the input panel is formed in the ceiling portion of the enclosure. As a guide, the input panel may have a similar area to the plan area of a four-door saloon car. This ensures airflow over the entire vehicle upper surface.

[0010] Preferably, the extract panel comprises a layer of relatively coarse filter medium laid upon a layer of relatively fine filter medium, the coarse layer forming the enclosure side of the panel. The extract panel may be formed in a wall portion of the enclosure. In an embodiment the panel occupies substantially an entire wall area.

[0011] In another aspect of the invention the input panel is located in a ceiling portion of the enclosure and the extract panel is located in a rear wall of the enclosure, and a front wall of the enclosure is openable to permit vehicle entry.

[0012] In yet another aspect of the invention the input panel is located in a ceiling portion of the enclosure and the extract panel is located in a sidewall of the enclosure, front and rear walls of the enclosure being openable to permit drive through entry and exit of a vehicle from the enclosure.

[0013] The apparatus is preferably provided with spray painting equipment suitable for painting of minor portions of vehicle body panels.

[0014] The spray paint equipment should be adapted to deliver paint quantities of less than 100 ml during painting, over a small area, preferably less than 100 mm diameter spray area at the optimum painting distance.

[0015] According to another aspect of the invention there is provided a method of repairing minor paint work damage to a motor land vehicle, comprising providing apparatus according to any preceding claim, matching a quantity of paint to the vehicle paint, delivering the paint onto the damage site while maintaining a laminar airflow over the vehicle which removes waste airborne paint from the damage site.

[0016] Typically, the quantity of paint delivered is less than 100 ml and preferably less than 50 ml.

[0017] The air flow rate in the enclosure should be sufficient to carry away unwanted stray paint droplets suspended in the air, whilst permitting spraying-on of the paint onto the vehicle. A flow rate of 0.5 m/s to 1 m/s has been found effective, although a preferred range is 0.6 m/s to 0.8 m/s.

[0018] Following is a description by way of example

only and with reference to the accompanying drawings of one method of putting the present invention into effect.

[0019] Figure 1 shows a sectional side view of an enclosure for painting vehicles according to the present invention.

[0020] Figure 2 shows the same enclosure, with a motor vehicle in place.

[0021] In figure 1 a generally rectilinear enclosure 10 is shown erected on a hard-standing surface 11. The enclosure comprises an upstanding rear wall 12, a horizontal roof 13 and a front wall comprising a retractable metal curtain 14. A inner rear false wall 15 of the enclosure is formed from a filter 16. The filter is supported by a metal framework (not shown). The filter is a duplex medium, comprising a relatively coarse filter on an enclosure side of the filter, juxtaposed a relatively fine filter medium on the rear wall side of the filter. The filter medium comprises an unwoven fibre felt, the coarse and fine progression providing a graduated filter capability for efficiently removing air-entrained paint droplets without unduly restricting airflow through the medium airflow. The rear false wall is spaced apart form the rear wall 12 in order to create a vertically extending recirculation duct 17.

[0022] An electrically driven air fan 18 is mounted at a top end region of the rear wall. The blades 19 of the fan are accommodated in a top portion of the duct. A fresh air bleed vent 20 is provided in a body portion 21 of the fan. The vent communicates with the outside of the enclosure. The fan is oriented so that the plane of rotation of the fan is parallel to the back wall. A rigid ceiling portion 22 of the enclosure is a sloping planar member. The rigid ceiling portion extends upwardly and frontwardly in the enclosure, from a lower portion of the fan up to a planar ceiling filter 24. The filter is a planar fibrous felt filter medium supported by a metal framework (not shown). The filter extends across substantially the entire width of the enclosure, and forms about 80% of the ceiling area. The space between the roof and ceiling of the enclosure forms a horizontal continuation of the recirculation duct 17'.

[0023] A vertically extending extract duct 25 communicates with a portion of the recirculation duct which is formed adjacent the tapering ceiling portion. The duct provides an extract path for venting recirculating air to atmosphere. An upper portion 26 of the duct functions a chimney to disperse air-entrained agents into the atmosphere. A filter may be placed in the chimney if desired to remove solvents and other undesirable agents.

[0024] One side wall of the enclosure is a solid wall. Another side wall of the enclosure may preferably be provided by a flexible curtain, permitting compartmentalisation of a larger hall to form a painting enclosure.

[0025] The flow path of air circulating within the chamber during use is shown by the arrows in figure 1. The fan sucks air in the enclosure through the vertical rear wall filter 16. The air enters the recirculation duct and travels upwards to the top end of the duct. The duct turns a right angle and accommodates the fan blades. Downstream of the fan blades air is funnelled in between the tapering ceiling portion and the roof. A proportion of the air, in practice about 1,500 to 2,000 cubic feet per minute, is vented to atmosphere through the extract duct. The quantity of air recirculating is totals about 12,000 cubic feet per minute.

[0026] The air is ducted over the tope surface of the ceiling filter, and driven through the filter medium into the enclosure. The filter medium is relatively fine and provides a uniform input of air into the chamber over substantially the whole ceiling area. Air flow rates in the chamber are adjusted to be about 0.5 m/s to 1.0 m/s. A preferred range is about 0.6 to 0.8 m/s.

[0027] Figure 2 shows the same chamber in use with a motor vehicle 30. A substantially non-turbulent laminar flow of air is created over the upper surface of the vehicle. Painting is typically effected by an acrylic or isocyanate paint mixture. The paint is mixed to match the vehicle colour and sprayed by means of a spray gun applicator. The spray is directed onto the blemished or damaged area. Extraneous paint which is entrained in the air is carried away by the air, and maintained out of contact of the vehicle body surface by the laminar flow. The paint particles are carried as far as the rear wall filter where they are removed by the duplex filter medium. The air is then re-circulated, with a proportion of fresh air bled into the system and a proportion bled to atmosphere. The atmosphere bleed prevents the build-up of agents such as solvents which are not removed by the applied filter. The flow of air ensures that harmful fumes are carried away during painting. It is possible to omit the normal protective clothing and breathing masks required in typical paint shops, particularly where paint volumes applied are very low. This means that a very rapid and convenient painting process may be carried out for the repair of vehicles in a while-you-wait time frame.

[0028] The illustrated embodiment has a single vehicle access at the front of the enclosure. This allows the enclosure to be formed in pre-existing garages and other buildings with minimal modification. However, in a second embodiment, not shown, the enclosure has openable front and rear walls, formed for example from metal shutters or flame retardant curtains. An upstanding side wall of the enclosure has formed in a surface thereof the extract duplex filter medium. In this way a recirculation of air in a direction transverse of the vehicle is obtained. The vehicle is able to drive into the enclosure through one end and then depart through the other end, providing a drive through painting facility.

Claims

1. Apparatus providing an enclosure in which to paint a vehicle, comprising a generally upstanding wall

portion, a ceiling portion and a floor portion, in one of which portions is formed an air flow input surface and in another of which portions is formed an airflow extract surface, wherein the input surface is provided by a panel comprising a diffusing medium for providing a susbtantially uniform airflow from the surface of the panel into the enclosure and wherein the extract surface is provided by a panel comprising filter means for airborne paint spray, wherein an air duct external of the enclosure communicates between rear sides of the input and extract panels, which air duct is provided with airflow generation means for driving air through the input panel and drawing air from the extract panel, thereby to provide a recirculating flow of air in the enclosure, the rate and extent of the flowing air being arranged to provide, in use, a substantially laminar airflow around a vehicle in the enclosure.

2. Apparatus as claimed in claim 1 wherein a minor proportion of the air recirculated through the duct is vented to atmosphere thereby to remove paint solvent from the recirculating air.

3. Apparatus as claimed in claim 2 wherein the proportion of air vented to atmosphere is 10 to 30% of the air passing through the duct.

4. Apparatus as claimed in claim 2 or claim 3 wherein the proportion of air vented to atmosphere is 15 to 25% of the air passing through the duct.

5. Apparatus as claimed in any preceding claim and adapted so that the airflow through the input panel is slightly less than the airflow through the extract panel, thereby to maintain a negative air pressure within the enclosure with respect to atmosphere.

6. Apparatus as claimed in any preceding claim wherein one or more retractable depending curtain (s) is/are provided to form wall(s) of the enclosure, the curtain(s) permitting access of a motor vehicle to the enclosure.

7. Apparatus as claimed in any preceding claim wherein the input panel comprises a layer of a filter medium.

8. Apparatus as claimed in any preceding claim wherein the input panel is formed in the ceiling portion of the enclosure.

9. Apparatus as claimed in claim 8 wherein the input panel is of similar area to the plan area of a four-door saloon car.

10. Apparatus as claimed in any preceding claim wherein the extract panel comprises a layer of relatively coarse filter medium laid upon a layer of relatively fine filter medium, the coarse layer forming the enclosure side of the panel.

11. Apparatus as claimed in any preceding claim wherein the extract panel is formed in a wall portion of the enclosure.

12. Apparatus as claimed in claim 11 wherein the panel occupies substantially an entire wall area.

13. Apparatus as claimed in any preceding claim wherein the input panel is located in a ceiling portion of the enclosure and the extract panel is located in a rear wall of the enclosure, and a front wall of the enclosure is openable to permit vehicle entry.

14. Apparatus as claimed in any of claims 1 to 12 wherein the input panel is located in a ceiling portion of the enclosure and the extract panel is located in a sidewall of the enclosure, front and rear walls of the enclosure being openable to permit drive through entry and exit of a vehicle from the enclosure.

15. Apparatus as claimed in any preceding claim and provided with spray painting equipment suitable for painting of minor portions of vehicle body panels.

16. Apparatus as claimed in claim 15 wherein the spray paint equipment is adapted to deliver paint quantities of less than 100 ml during painting.

17. Apparatus as hereinbefore described with reference to figures 1 and 2 of the drawings.

18. Apparatus as hereinbefore described with reference to figure 3 of the drawings.

19. A method of repairing minor paint work damage to a motor land vehicle, comprising providing apparatus according to any preceding claim, matching a quantity of paint to the vehicle paint, delivering the paint onto the damage site while maintaining a laminar airflow over the vehicle which removes waste airborne paint from the damage site.

20. A method as claimed in claim 19 wherein the quantity of paint delivered is less than 100 ml and preferably less than 50 ml.

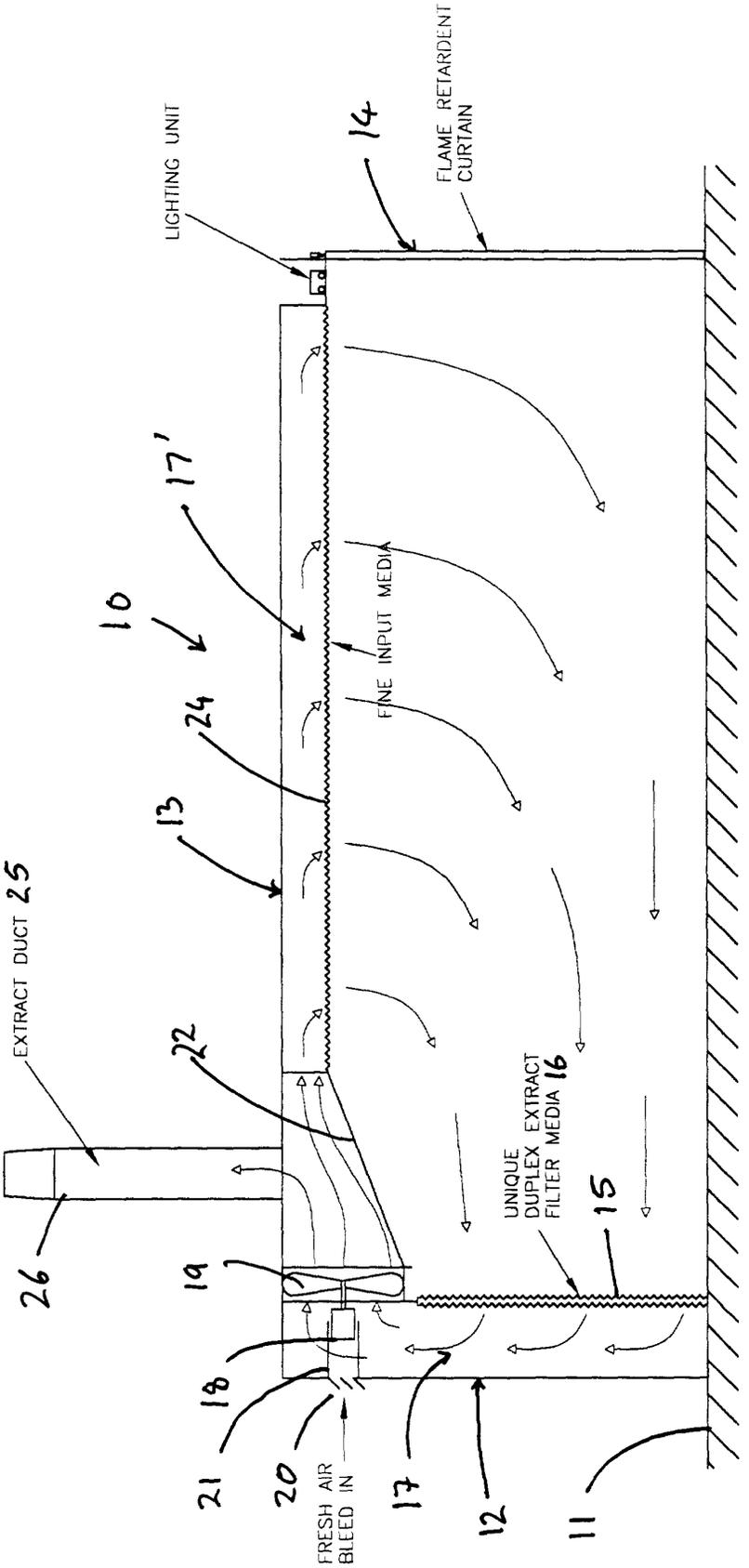
LIGHTING UNIT
14
FLAME RETARDENT CURTAIN
17'
10
FINE INPUT MEDIA
24
13
EXTRACT DUCT 25
22
UNIQUE DUPLEX EXTRACT FILTER MEDIA 16
15
26
19
18
21
20
FRESH AIR BLEED IN
17
12
11

fig 1

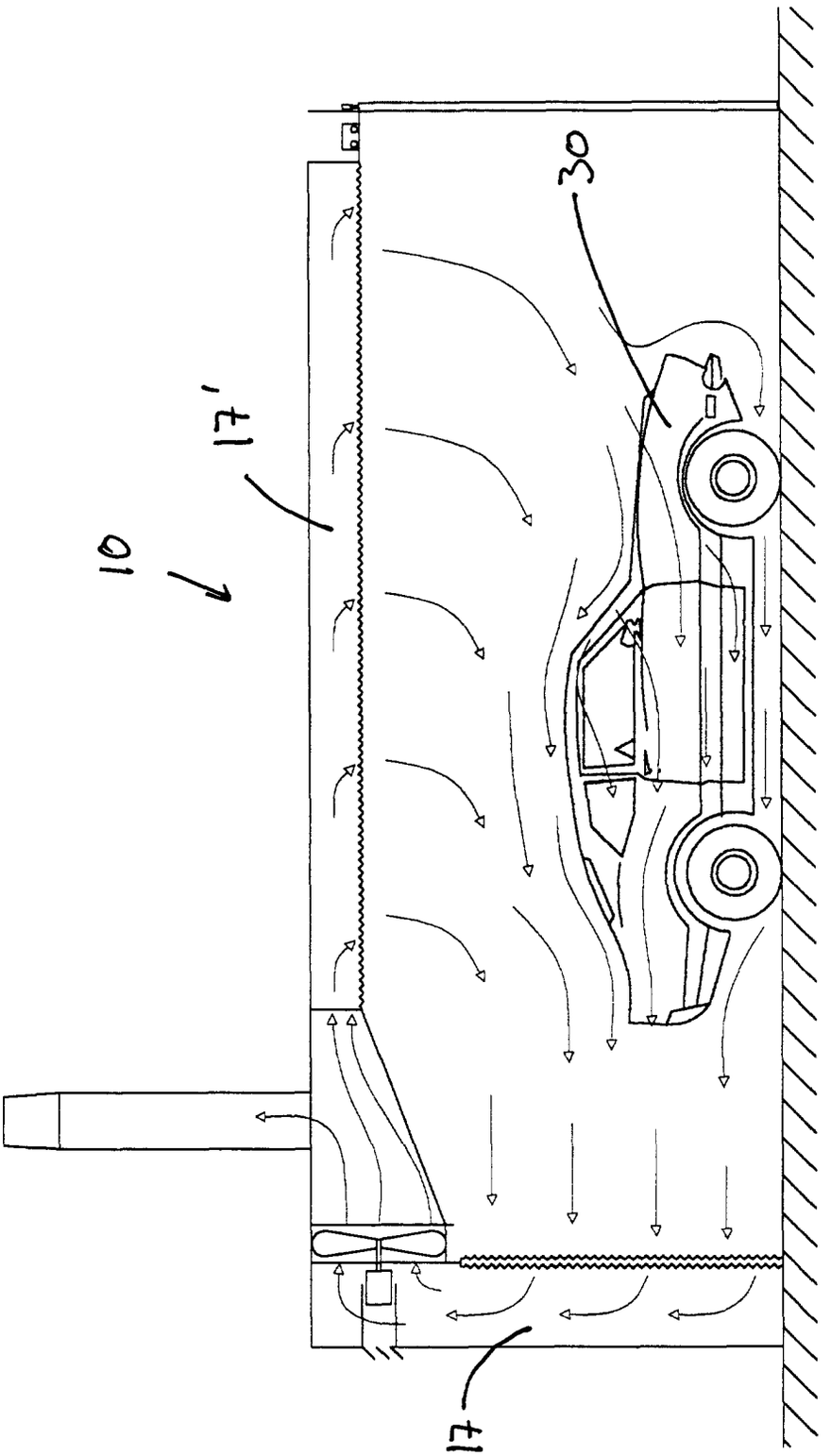

fig 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 0690

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.7)
X	GB 2 119 500 A (SPRAYBAKE LTD) 16 November 1983 (1983-11-16)	1,2,5, 7-9,13, 17,18	B05B15/12
A	* page 3, column 1, line 3 - column 2, line 103; figures 1-4 *	3,4,6	
X	US 4 237 780 A (TRUHAN ANDREW) 9 December 1980 (1980-12-09) * column 2, line 46 - line 57; figure 1 *	1,2,10	
A	US 5 063 835 A (ROCKX LUDWIG G) 12 November 1991 (1991-11-12) * column 2, line 58 - column 3, line 12 * * column 5, line 7 - line 34; figures 1,4,5 *	1,2,8,9, 11,14	
A	US 4 354 451 A (VOEHRINGER GERHARD F ET AL) 19 October 1982 (1982-10-19) * column 3, line 43 - column 4, line 8; figures 1,2 *	11,12	
A	US 5 296 029 A (NEIKTER KENNETH) 22 March 1994 (1994-03-22) * column 3, line 29 - line 47; figure 1 *	1,15,16	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B05B F26B
A	EP 0 568 179 A (ICI PLC) 3 November 1993 (1993-11-03) * claim 1; figures 1,2 *	19,20	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	6 June 2000	Jelercic, D

CATEGORY OF CITED DOCUMENTS

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

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

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 30 0690

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

06-06-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2119500 A	16-11-1983	CA 1197091 A	26-11-1985
		US 4515072 A	07-05-1985
US 4237780 A	09-12-1980	NONE	
US 5063835 A	12-11-1991	NONE	
US 4354451 A	19-10-1982	DE 3003158 A	04-03-1982
		AT 9280 T	15-09-1984
		DE 3069187 D	18-10-1984
		WO 8102117 A	06-08-1981
		EP 0044310 A	27-01-1982
		ES 498814 D	01-04-1982
		ES 8203646 A	16-07-1982
		IT 1170647 B	03-06-1987
		JP 57500229 T	12-02-1982
		JP 62001545 B	14-01-1987
US 5296029 A	22-03-1994	SE 465454 B	16-09-1991
		AU 7215191 A	21-08-1991
		EP 0591162 A	13-04-1994
		JP 5503464 T	10-06-1993
		PL 168021 B	30-12-1995
		SE 9000262 A	26-07-1991
		WO 9111267 A	08-08-1991
EP 0568179 A	03-11-1993	AT 131592 T	15-12-1995
		AU 3398593 A	04-11-1993
		BR 9301682 A	03-11-1993
		CA 2091383 A,C	31-10-1993
		DE 9312505 U	11-11-1993
		DE 69301001 D	25-01-1996
		DE 69301001 T	09-05-1996
		ES 2050649 T	01-06-1994
		JP 2813520 B	22-10-1998
		JP 6031221 A	08-02-1994
		MX 9302506 A	31-05-1994
		US 5397606 A	14-03-1995
		ZW 3593 A	02-03-1994

EPO FORM P0459

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