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(54) **Coating material dispensing system.**

(57) A system for coating targets, e.g. automobile bodies (18) on a conveyor, with a coating material chosen from multiple coating materials of various colors and types. The deposition of the coating material on the targets is aided by electrical forces established between an electrode which surrounds a rotating atomizing device (10,12,14,20,22,24,28, 30,32) to which a stream of the selected coating material is supplied for atomization. A cylindrical sleeve (102) surrounds the rotating atomizing device (10,12,14,20,22,24,28,30,32) and lies between the electrode (116), which is in the shape of a ring (116), and the rotating atomizing device (10,12,14,20,22,24,28,30,32). The atomizing device (10,12,14,20,22,24,28,30,32) extends from an opening at one end of the sleeve (102), and the structure which supports the atomizing device (10,12,14,20,22,24,28,30,32) adjacent the conveyor extends from the other end of the sleeve (102). The ring (116) lies approximately equidistant from the two ends of the sleeve (102) to reduce the likelihood of electrical discharge between the electrode (116) and the atomizing device (10,12,14,20,22,24,28,30,32) or its supporting structure. The atomizing device (10,12,14,20,22,24,28,30,32) is maintained at ground potential. A power supply (100) is provided for maintaining an electrical potential between the ring (116) and the target (34); with the electrical potential being of a sufficiently high magnitude to charge the atomized coating material particles by discharge from the ring

(114), and to maintain a potential difference between the atomized and charged particles and the target (34). Electrical forces repel the charged particles away from the ring (116) and propel them toward the target (34) to insure suitable deposition efficiency of the atomized coating material on the target (34).

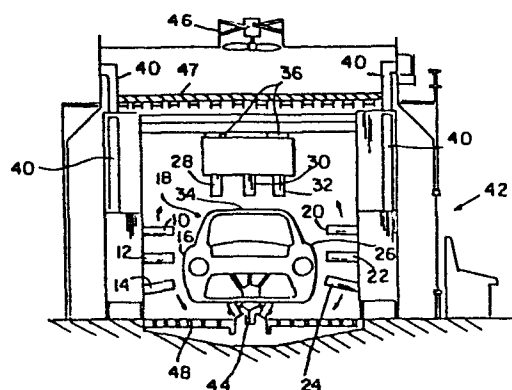


FIG. 1

- 1 -

COATING MATERIAL DISPENSING SYSTEM

This invention relates to coating material application systems, and more particularly to systems in which the deposition of atomized coating material particles on a target to be coated is aided by an electric charge created on the atomized coating material particles.

A major thrust of research in the coating material manufacturing and application industries during the past several years has been the reduction of environmental pollution. Many of the major industrialized nations have established stringent requirements for the coating material application industry in terms of the emission amounts of various contaminants into the atmosphere. Industrial spray paint dispensing operations in which coating materials are borne by organic vehicles and thinned with organic thinners are significant sources of solvent emissions. As these organic-based coating materials are applied to articles and as they dry, the organic vehicles and solvents are released. Special precautions must be taken to insure the capture of these organic vehicles and solvents to the greatest possible extent. This requires capital expenditures for pollution control equipment to remove these organic solvents and vehicles from the air recovered from the paint spray booth.

In recent times, equipment which charges the atomized paint particles at some point during their generation has become increasingly popular as a technique for increasing the deposition efficiency of coating material on targets. This has become popular

- 2 -

because it is recognized that the greater the percentage of generated coating material particles deposited on the target, the less coating material is used. Two benefits accrue immediately. First, less of these typically
5 costly coating materials is used. Second, since less coating material is used, the potential amounts of emitted solvents and vehicles are also reduced.

Another approach to reduce organic solvents and vehicles emissions from industrial painting processes is
10 the use of water-based coating materials. While these materials contain small amounts of solvents other than water, such as, for example, alcohols, the major component that is released into the atmosphere as these materials are applied and dried is water, and the
15 problem of solvent emissions is reduced significantly. However, these materials are expensive, and so there is considerable interest in maintaining the amount of coating material atomized at as low a level as possible, so the high deposition efficiencies available by
20 charging the coating material particles as these water-based coating materials are atomized is still of considerable interest. A significant problem with such an application is that the vehicle/solvent, water, is highly electrically conductive.

25 Since the coating material must be supplied to the atomizing device from a supply an electrical path exists back to the supply whenever coating material is being supplied from it to the atomizing device. Therefore, charging the particles of coating material as
30 they are atomized is not simply a matter of attaching a

- 3 -

high-voltage electrical supply to the atomizing device and turning it on. The existence of this path from the high-voltage supply back to the coating material source whenever coating material is flowing to the atomizing device establishes a low resistance path between the terminals of the high-voltage supply.

Typically, the high-voltage supplies used for these applications are not designed to maintain high voltages across their terminals under conditions of heavy current load, for reasons of safety. Therefore, it is virtually impossible with such high-voltage supplies to maintain an acceptable potential on the atomizing device to insure an adequate charge on the atomized coating material particles to achieve the highest possible transfer efficiency of coating material between the atomizing device and the target.

To solve this problem with water-based paints, that portion of the coating material handling system which is connected to the atomizer has to be isolated from ground potential. If a single source of coating material, for example, a single coating material color, is to be dispensed, it is ordinarily possible to isolate the paint supply electrically from ground potential.

One technique which has been used to solve this problem is the so-called "voltage block", an intermediate reservoir between a high-volume coating material supply and the coating material dispensing device. The voltage block is refilled either intermittently or continuously from the supply, which can be maintained at ground potential. The intermediate

- 4 -

reservoir itself is insulated from ground and typically resides at an intermediate potential or at the same potential as the dispensing device to which it is coupled. Steps are taken to see that no current flows
5 from the intermediate reservoir back to the high-volume supply. Voltage blocks of various types are known from, for example, Fortin U.S. Patent 1,655,262; Silsby, Jr. U.S. Patent 2,673,232; Peterson U.S. Patent 3,098,890; Uline et al U.S. Patent 3,291,889; Van Loo et al U.S.
10 Patent 3,360,035; Wiggins U.S. Patent 4,020,866; Beck et al U.S. Patent 3,122,320; Rokadia U.S. Patent 3,893,620; Wiggins U.S. U.S. Patent 3,933,285; Tamny U.S. Patent 3,934,055; and Spanjersberg et al U.S. 4,275,834.

The much more difficult problem arises when
15 water-based coating materials of different types, for example, different colors, are to be dispensed, as, for example, on an automotive coating application line. Isolation of a single coating material supply from ground is not particularly complex technically.
20 However, isolation of the 20 or more colors which may be applied on an automotive coating application line requires a considerable amount of coating material handling equipment, which must be isolated from ground. While voltage blocks for single color coating material
25 applications are relatively low-cost, simple and safe, voltage blocks for multiple color applications at high production rates with fast color change from target to target, as is required in a large automotive coating application line, are quite complex.

30 Illustrative of the complexity of a multiple voltage block system for the dispensing of multiple

- 5 -

coating materials on an application line is Dalton U.S. Patent 4,085,892. The system illustrated there is only a five-color system, which is considerably simpler than systems which would be required to dispense the typical number of colors used on an automotive coating material application line.

One suggestion has been the use of a single voltage block for the dispensing of multiple colors. This has proven undesirable because, in the very short amount of time during which a color change must be executed on a high-rate coating material application line, it is extremely difficult, if not impossible, to purge all of the remaining pre-change color of coating material from the intermediate reservoir, and fill the intermediate reservoir with new color. Contamination of the new color with the old inevitably occurs in these systems when the user seeks to effect color change in the brief interval between targets.

According to the invention an apparatus and method are provided for spraying water-base paints, and other electrically highly conductive paints, such as metallic paints and paints in other highly-conductive vehicles and solvents. The invention is also useful with the recently developed solvent-based high-solids coating materials in which solvents of extremely high polarity and electrical conductivity are used. The method and apparatus permit the high color-change speeds and broad color selection required by, for example, automotive coating material application lines, without the need for voltage blocks or similar types of equipment.

- 6 -

According to the invention, a system for coating a target with coating material in which a potential difference is maintained between the target and particles of coating material which are dispensed to coat the target includes a dispensing device for finely dividing a stream of coating material to form the coating material particles. The system further includes means for coupling the device to a source of coating material, a partition, an electrode located on the side of the partition opposite the side on which the dispensing device is located, and a power supply for maintaining between the target and the electrode an electrical potential of a sufficiently high magnitude to create and maintain a potential difference between the finely divided particles of coating material and the target. This gives rise to the electrical forces of repulsion between the electrode and the particles, and electrical forces of attraction between the particles and the target which increase the deposition efficiency, the percentage of the coating material dispensed by the dispensing device which actually contributes to the coating of the target. The partition is constructed at least partly from a material having a relatively higher dielectric strength than the environment surrounding the dispensing device to reduce the likelihood of electrical discharge between the dispensing device and the electrode.

Illustratively, the partition is constructed at least partly from a resinous material.

According to the illustrative embodiment, means are provided for maintaining the dispensing device substantially at a neutral, or ground, potential.

- 7 -

Additionally, according to an illustrative embodiment, the partition is generally cylindrical and surrounds the dispensing device. The cylindrical partition is open at one end through which the
5 dispensing device dispenses the finely divided coating material particles, and at the other end through which support means support the dispensing device in spaced orientation to the target. In an illustrative embodiment, the electrode comprises means providing an
10 electrically conductive ring extending around an outside surface of the cylindrical partition.

Further, according to an illustrative embodiment, the electrode comprises one or more electrically conductive discharge points extending from
15 the ring generally toward the target.

According to an illustrative embodiment, the forward-most surface, the forward termination, of the ring faces in a first direction toward the target and the rearward termination of the ring faces rearward in a
20 second and opposite direction away from the target. The cylindrical partition has a forward termination closer to the target than the forward termination of the ring in the first direction, and a rearward termination further from the target than the rearward termination of
25 the ring in the second direction. The distance from the forward termination of the ring to the forward termination of the partition is substantially the same as the distance from the rearward termination of the ring to the rearward termination of the partition.

30 According to an illustrative embodiment, this distance is substantially greater than the distance from

the forward termination of the ring to the rearward termination of the ring.

According to an illustrative embodiment, the dispensing device comprises a rotary atomizer and means
5 for spinning the rotary atomizer at a rate sufficient to generate the finely divided coating material particles.

Additionally, according to the invention, the generally cylindrical partition surrounding the rotary atomizer has an axis extending generally parallel to the
10 axis of rotation of the rotary atomizer, and the ring is substantially coaxial with the axis of rotation of the rotary atomizer.

Illustratively, the generally cylindrical partition, or sleeve, has a generally circular
15 cross-section perpendicular to its axis, and the ring has a generally circular cross-section perpendicular to the sleeve axis. Further, according to an illustrative embodiment, the ring has generally circular cross-sections generally parallel to the sleeve axis.

According to an illustrative embodiment, means
20 are provided for feeding additional streams of multiple different selected coating materials to the rotary atomizer, and for selectively controlling which of the different coating materials is flowing to the rotary
25 atomizer at a given time.

In the method for coating a target with coating material, a stream of coating material is finely divided to form coating material particles, a partition is provided, an electrode is provided on the side of the
30 partition opposite the side on which the coating

- 9 -

material is finely divided, and a potential difference is maintained between a target to be coated and the electrode. The potential difference is sufficiently high in magnitude to establish and maintain a potential difference between the finely divided particles of coating material and the target, so that electrical forces of repulsion exist between the electrode and the finely divided particles and electrical forces of attraction exist between the finely divided particles and the target. According to the method, the partition is constructed from a material having a relatively higher dielectric strength than the environment surrounding the dispensing device to reduce the likelihood of electrical discharge between the dispensing device and the electrode.

The invention may best be understood by referring to the following description and accompanying drawings which illustrate the invention. In the drawings:

Fig. 1 illustrates an exit end view of a coating booth for automotive vehicle bodies; and Fig. 2 illustrates enlarged details of the booth of Fig. 1.

An exit end view of a typical paint booth for applying a selected color of coating material from a number of available coating materials to an automobile body is illustrated in Fig. 1. Three atomizing and dispensing devices 10, 12, 14, which may be generally of the type described in U.S. Patent 4,275,838, are assigned primary responsibility for dispensing coating

- 10 -

material onto the right side 16 of a vehicle body 18, three devices 20, 22, 24 are assigned primary responsibility for dispensing coating material onto the left side 26 of the vehicle body 18, and three devices 5 28, 30, 32 are assigned primary responsibility for dispensing coating material onto the top 34 of the vehicle 18. Typically, devices 28, 30, 32 are mounted on reciprocators 36 so that the devices 28, 30, 32 follow the contours of the top 34 of the vehicle 18. 10 Additionally, all of the atomizing devices 10, 12, 14, 20, 22, 24, 28, 30, 32, reciprocators 36 and associated fluid, pneumatic and electrical connections are housed in enclosures 40 inside of a coating booth 42 through which a conveyor 44 extends. Generally, the enclosure 15 42 is an elongated tunnel-like booth having an entry end into which the conveyor 44 conveys the articles to be coated, here vehicle bodies, and an exit end, illustrated in Fig. 1, from which the conveyor 44 conveys the coated vehicle bodies. Provisions, 20 including ceiling fans 46, filters 47, and a floor grate 48 are made for circulating air through the coating booth 42 to pull down undeposited coating material which has been atomized and dispensed by the dispensing devices 10, 12, 14, 20, 22, 24, 28, 30, 32. This 25 overspray may be removed through a water wash trough beneath grate 48.

Turning now to Fig. 2, which is an enlarged view of a detail of the installation of Fig. 1, dispensing device 10 and some of the related electrical, 30 liquid and pneumatic equipment for its operation are

- 11 -

illustrated. Dispensing device 10 is mounted from one end of a horizontal support 50, the other end of which can be pivotally or otherwise movably mounted within enclosure 40 to permit some vertical movement of dispensing device 10 as it dispenses coating material onto the vehicle body 18 passing before it. Dispensing device 10 and horizontal support 50 are connected to ground so that they are maintained at ground potential.

The system further includes a color manifold 58, illustrated fragmentarily. Color manifold 58 includes a plurality of illustratively air-operated color valves, six, 60-65 of which are shown. These color valves 60-65 control the flows of various selected colors of coating material from individual supplies into the color manifold 58. A solvent valve 82 is located at the head 84 of color manifold 58. A supply line 86, which is also maintained at ground potential, extends from the lower most portion 88 of color manifold 58 to a triggering valve 90 mounted adjacent dispensing device 10. A feed tube 92 is attached to the output port of triggering valve 90. Feed tube 92 feeds a coating material flowing through a selected one of color valve 60-65 and manifold 58 into supply line 86 and into the interior of dispensing device 10. High-speed rotation of device 10 atomizes this selected color of coating material.

For purposes of cleaning certain portions of the interior of device 10 during the color change cycle which typically follows the application of coating material to each vehicle body 18 conveyed along the

- 12 -

conveyor 44, a line 97 extends from a pressurized source (not shown) of solvent through a valve 93 and a tube 95 to device 10. Tube 95 feeds solvent into device 10 to remove any remaining amounts of the last color therefrom before dispensing of the next color begins.

The atomized coating material dispensed by device 10 moves toward a vehicle body 18 moving along the grounded conveyor 44 due, in part, to electric forces on the atomized particles of the coating material. To impart charge to the atomized particles of coating material and permit advantage to be taken of these forces, a high-potential electrical supply 100 is provided. Supply 100 may be of the type illustrated in, for example, U.S. Patent 3,875,892; U.S. Patent 3,851,618; U.S. Patent 3,894,272; U.S. Patent 4,075,677; U.S. Patent 4,187,527; or Woodruff U.S. Patent Application Serial No. 369,365, filed April 19, 1982, titled FOLD-BACK POWER SUPPLY, and assigned to the same assignee as this application.

A partition 102 in the form of a right circular cylindrical sleeve, the axis of which is coaxial with the axis of rotation of dispensing device 10 extends from adjacent the surface of the enclosure 40 to almost the forward atomizing edge 104 of the dispensing device 10. The forward and rearward ends 106, 108, respectively of sleeve 102 are open to accommodate dispensing device 10 and horizontal support 50, respectively. The inside wall 110 of sleeve 102 is provided with mounting posts 111. The outside wall 112 of sleeve 102 is smooth and uninterrupted, with the

- 13 -

exception that a plurality of standoffs 114 extend radially outward from the outer wall 112 and support from the outer wall 112 an electrode 116 in the form of a conductive ring. The standoffs 114 support the wing 5 116 substantially equidistantly from the outside wall 112 of sleeve 102 at all points, so that the ring 116 is also coaxial with the axis of rotation of dispensing device 10. The ring 116 is positioned at substantially the longitudinal center of sleeve 102 that is, 10 substantially the same distance from forward end 106 and rearward end 108. However, multiple equally spaced needle electrodes are mounted on the forward face of ring 116 and extend forward therefrom toward the forward end 106 of sleeve 102. A high voltage cable 120 couples 15 one terminal of the high potential supply 100 to ring 116. The remaining output terminal of high potential supply 100 is coupled to ground.

Energization of the high potential supply 100 causes a continuous electrical discharge from the needle 20 electrodes 118, and to a lesser extent generally from the ring 116. The sleeve 102, which is constructed from a material having a relatively higher dielectric strength than the air surrounding the dispensing device 10, reduces the likelihood that this electrical 25 discharge will find its way to ground through the grounded dispensing device 10, its associated support 50, or the grounded coating material and pneumatic supply lines connected to dispensing device 10. Illustratively, sleeve 102 can be constructed from some 30 resinous, i.e., plastic, material with an acceptably high dielectric strength.

- 14 -

In operation, as the atomized coating material particles are dispensed from the atomizing edge 104 of device 10, they are projected generally radially outwardly from the axis of rotation of device 10. They are shielded from the electric field which is established and maintained between ring 116 and particularly needle electrodes 118 and the vehicle body 18 by the presence of the sleeve 102. However, after the particles pass radially outwardly beyond the open forward end 106 of sleeve 102, they are exposed to the electric field, and to the electrical discharge from the ring electrode 116 and particularly the needle electrodes 118. This electrical discharge causes charging of the atomized coating material particles. These particles, once charged by this discharge, accelerate through the field due to the repulsive electrical forces existing between the like-charged particles and electrode 116, and the attractive electrical forces owing to the ground available at the vehicle body 18. The shielding effect of the higher dielectric strength sleeve 102 reduces substantially the likelihood of electrical discharge between the ring 116 with its needle electrodes 118 and any of the grounded components, such as device 10, support 50 and the various coating material and pneumatic connections to device 10. The shielding effect of the higher dielectric strength sleeve 102 also permits the ring 116 to be made of a substantially smaller size, because of the reduced likelihood of electrical discharge between the ring and the device 10. This reduction in the size

- 15 -

of the ring 116 permits the devices 10 to be spaced very close together, as is frequently necessary for installations of the type including dispensing devices 28, 30, 32 in Fig. 1. The smaller size of the rings 116 permits close spacing of such dispensing devices without interference between the ring associated with one dispensing device and the adjacent dispensing devices.

The fact that the dispensing device 10 is grounded permits spraying closer to the surface of the vehicle body 18, since there is no danger of sparking between device 10 and body 18. Spraying from closer increases transfer efficiency and permits increased spray pattern control which enhances coating thickness uniformity and quality.

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- 16 -

C L A I M S

1. A system for coating a target with coating material in which a potential difference is maintained between the target and the particles of coating material which are dispensed to coat it, the system comprising a
5 dispensing device for finely dividing a stream of coating material to form the coating material particles, means for coupling the device to a source of coating material, a partition, an electrode located on the side of the partition opposite the side on which the dispensing device
10 is located, and a power supply for maintaining between the target and the electrode an electrical potential of a sufficiently high magnitude to maintain a potential difference between the finely divided particles of coating material and the target, the partition being constructed
15 from a material having a relatively higher dielectric strength than the environment surrounding the dispensing device.

2. A system for coating a target with coating material in which a potential difference is maintained
20 between the target and the particles of coating material which are dispensed to coat it, the system comprising a device for finely dividing a stream of coating material to form the coating material particles, means for coupling the device to a source of coating material, a partition,
25 an electrode located on the side of the partition opposite the side on which the dispensing device is located, a power supply for maintaining between the target and the electrode an electrical potential of sufficiently high magnitude to maintain a potential difference between the
30 finely divided particles of coating material and the

- 17 -

target, and means for maintaining the dispensing device at substantially neutral potential, the partition constructed from a material having a relatively higher dielectric strength than the environment surrounding the dispensing
5 device.

3. The system of claim 1 or 2, wherein the dispensing device comprises a rotary atomizer and means for spinning the rotary atomizer at a rate sufficient to generate the finely divided coating material particles,
10 and the means for coupling the device to a source of coating material particles comprises means for feeding a stream of coating material to the rotary atomizer.

4. The system of any one of claims 1 to 3, wherein the partition is constructed at least partially
15 from a resinous material.

5. The system of any one of claims 1 to 4, and further comprising means for maintaining the dispensing device substantially at ground potential.

6. The system of any one of claims 1 to 5,
20 wherein the partition is generally cylindrical and surrounds the dispensing device and the electrode comprises means providing a ring extending around an outside surface of the cylinder.

7. The system of any one of claims 1 to 5,
25 wherein the partition comprises a generally cylindrical sleeve surrounding the rotary atomizer and the means for spinning it, the axis of the sleeve extending generally parallel to the axis of rotation of the rotary atomizer, and the electrode comprises means providing a ring
30 extending around the outside of the sleeve.

8. The system of either of claims 6 and 7, wherein the electrode further comprises multiple spaced discharge points extending from the ring generally toward the target.

- 18 -

9. The system of any one of claims 6 to 8, wherein the ring has a forward termination in a first direction toward the target and a rearward termination in a second and opposite direction, the sleeve has a forward
5 termination closer to the target than the forward termination of the ring in the first direction and a rearward termination further from the target than the rearward termination of the ring in the second direction, and the distances from the forward termination of the ring
10 to the forward termination of the sleeve and from the rearward termination of the ring to the rearward termination of the sleeve are substantially the same.

10. The system of claim 9, wherein the distance is substantially greater than the distance from the
15 forward termination of the ring to the rearward termination of the ring.

11. The system of either of claims 6 and 7, wherein the electrode further comprises a discharge point extending from the ring generally toward the target.

20 12. A system for coating a target with coating material in which a potential difference is maintained between the target and the particles of coating material which are dispensed to coat it, the system comprising a rotary atomizer, means for feeding a stream of coating
25 material to the rotary atomizer, means for spinning the atomizer at a rate sufficient to generate the finely divided coating material, a generally cylindrical sleeve surrounding the rotary atomizer and the means for spinning the rotary atomizer, the sleeve axis extending generally
30 parallel to the rotation axis of the rotary atomizer, an electrode ring surrounding the sleeve and positioned generally the same distance from the end of the sleeve through which the atomizer projects and the opposite end of the sleeve, a power supply for maintaining between the
35 electrode and the target an electrical potential of

- 19 -

sufficiently high magnitude to maintain a potential difference between the finely divided particles of coating material and the target, and means for maintaining the rotary atomizer substantially at neutral potential, the
5 sleeve constructed from a material having a relatively higher dielectric strength than the environment surrounding the rotary atomizer.

13. The system of claim 12, wherein the sleeve has a generally circular cross section perpendicular to
10 its axis and the ring has a generally circular cross section perpendicular to the sleeve axis.

14. The system of claim 13, wherein the ring has generally circular cross sections generally parallel to the sleeve axis.

15 15. The system of claim 13 or 14, and further comprising means for feeding additional streams of multiple different coating materials to the rotary atomizer and means for selectively controlling which of the different coating materials is flowing to the rotary
20 atomizer at a given time.

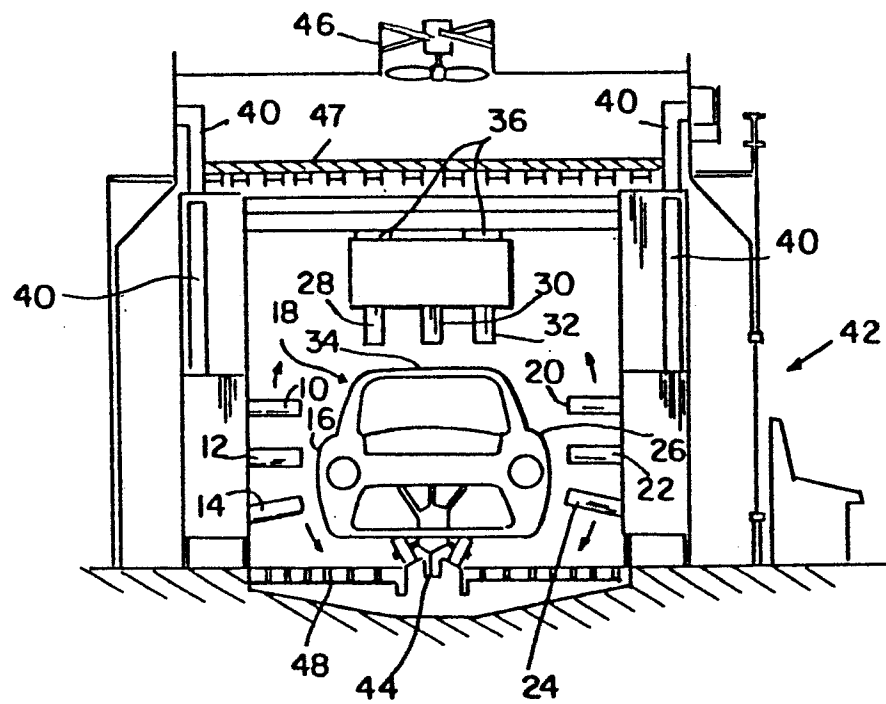


FIG. 1

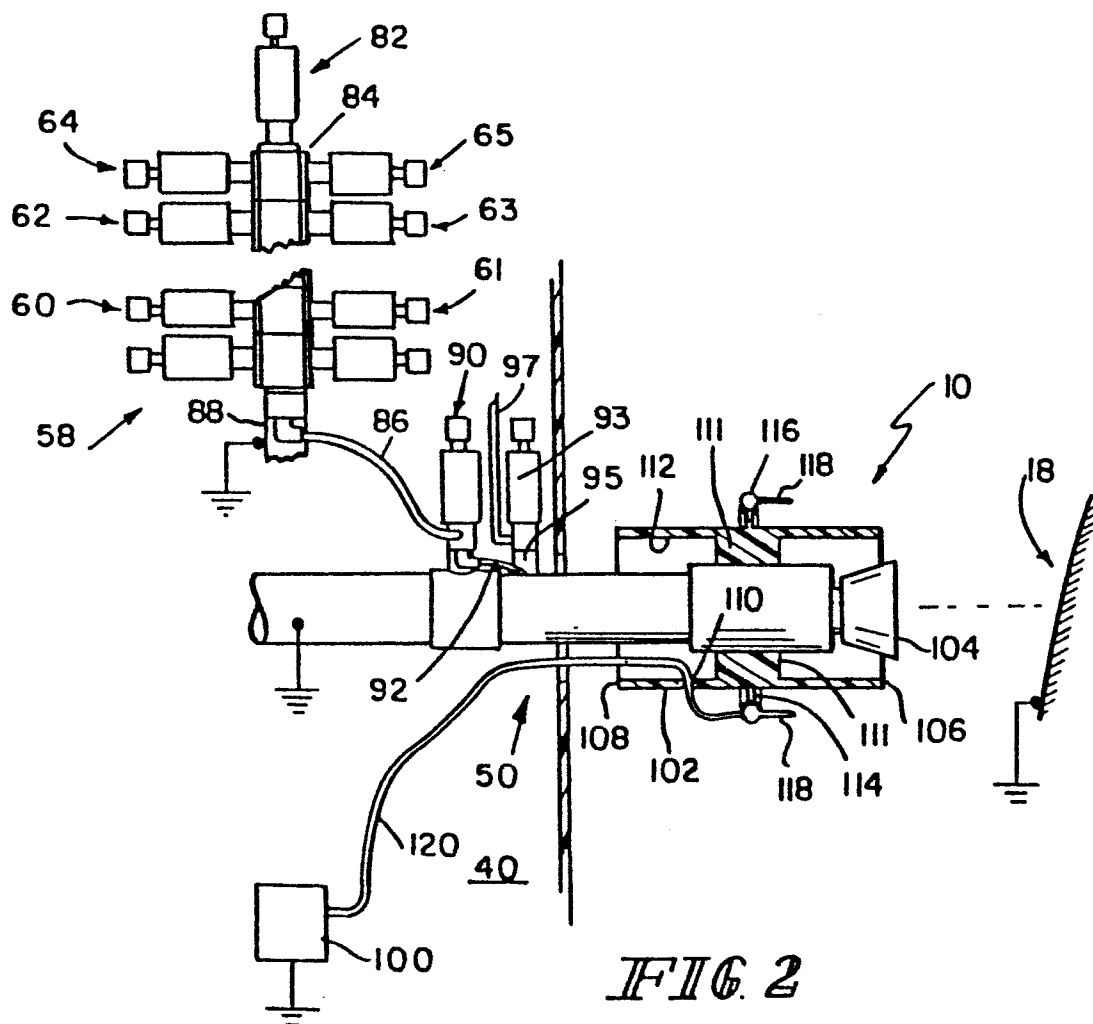


FIG. 2



European Patent
Office

EUROPEAN SEARCH REPORT

0178746

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 85303610.1
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US - A - 3 279 421 (TILNEY & CAMP-BELL) * Totality *	1,12	B 05 B 5/08
A	DE - A - 2 149 170 (TUNZINI) * Claims; fig. *	1,12	
A	US - A - 3 408 985 (SEDLACSIK) * Totality *	1,12	
A	GB - A - 1 558 900 (ONODA) * Claims; fig. *	1,12	
A	US - A - 3 393 662 (BLACKWELL) * Claims; fig. *	1,12	
D,A	US - A - 3 934 055 (TAMNY) * Claims; fig. *		
D,A	US - A - 3 893 620 (ROKADIA) * Claims; fig. *		
D,A	US - A - 3 122 320 (BECK) * Totality *		
D,A	US - A - 4 020 866 (WIGGINS) * Claims; fig. *		
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 16-01-1986	Examiner SCHÜTZ
CATEGORY OF CITED DOCUMENTS		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	
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			



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EUROPEAN SEARCH REPORT

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,A	<u>US - A - 4 275 834 (SPANJERSBERG)</u> * Claims; fig. * --		
D,A	<u>US - A - 4 187 527 (BENTLEY)</u> * Claims; fig. * --		
D,A	<u>US - A - 4 275 838 (FANGMEYER)</u> * Claims; fig. * --		
D,A	<u>US - A - 4 085 892 (DALTON)</u> * Totality * ----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
Place of search VIENNA		Date of completion of the search 16-01-1986	Examiner SCHÜTZ
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			