

[54] **AUTOMATIC CARWASH APPARATUS**  
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Oakland, Calif.  
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[21] Appl. No.: **786,591**

[52] U.S. Cl. ....**134/58 R**, 118/73, 118/323,  
134/56 R, 134/95, 134/100, 134/123, 134/181  
[51] Int. Cl. ....**B60s 3/04**  
[58] Field of Search ..... 134/45, 123; 15/312 A, DIG. 2

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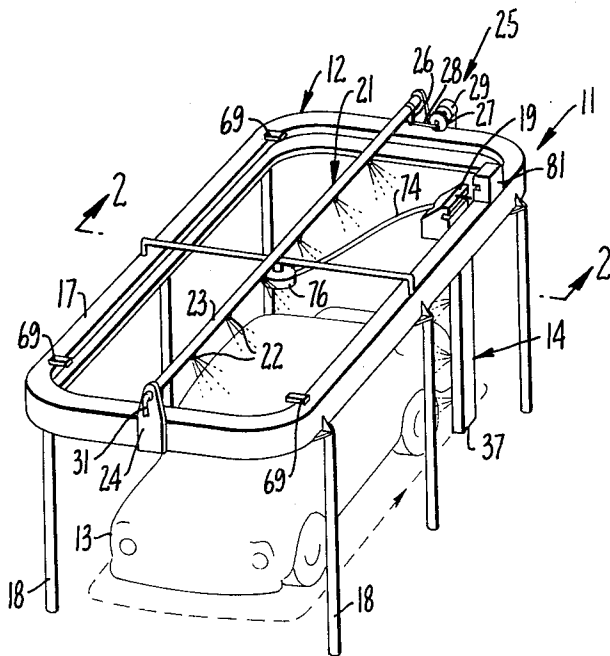
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Primary Examiner—Daniel Blum  
Attorney—Schapp and Hatch

[57] **ABSTRACT**

An automatic carwash apparatus of the type having a spray carriage moving around the vehicle on an oblong overhead track, with part or all of the spray onto the car being applied from a spray manifold attached to the carriage. All forms of the invention apply the spray in varying spray volume according to the particular surface portion of the vehicle being sprayed, and all are adapted to change from one spray fluid to another as the carriage circumnavigates the vehicle, for such steps as pre-wetting, soaping, rinsing and waxing. In a number of the embodiments, the spray means used for the top portions of the vehicle is independent of the spray means used for the sides and ends, with one such form having a reciprocal pivoting motion, another having a separate carriage reciprocating along a second track, and then having a second carriage moving along the same track as the first, and still another having spray arms rotating in a horizontal plane about a fixed point. In still another form, a single spray manifold is used, attached to the spray carriage and extending in a straight line in a plane generally normal to the path of the portion of the track being traversed. In the single straight line manifold form, the manifold may be horizontal, vertical, slanted, or swingable between vertical and horizontal positions. The straight line manifold is adapted in all forms of the invention to be pivoted for swinging reciprocation about its longitudinal axis to produce a swashing action of the spray against the car.

18 Claims, 22 Drawing Figures



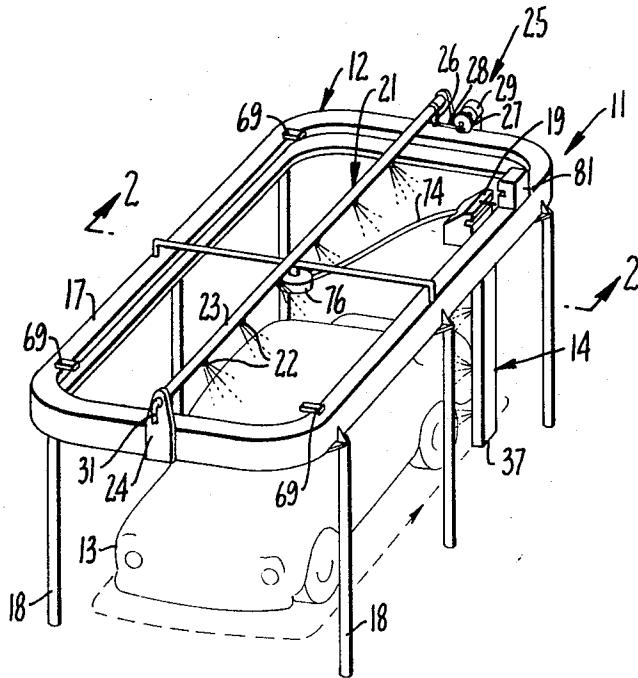


FIG. 1.

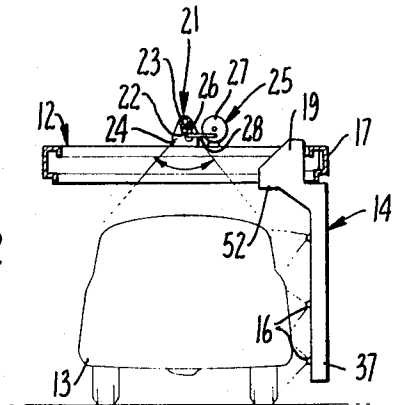


FIG. 2.

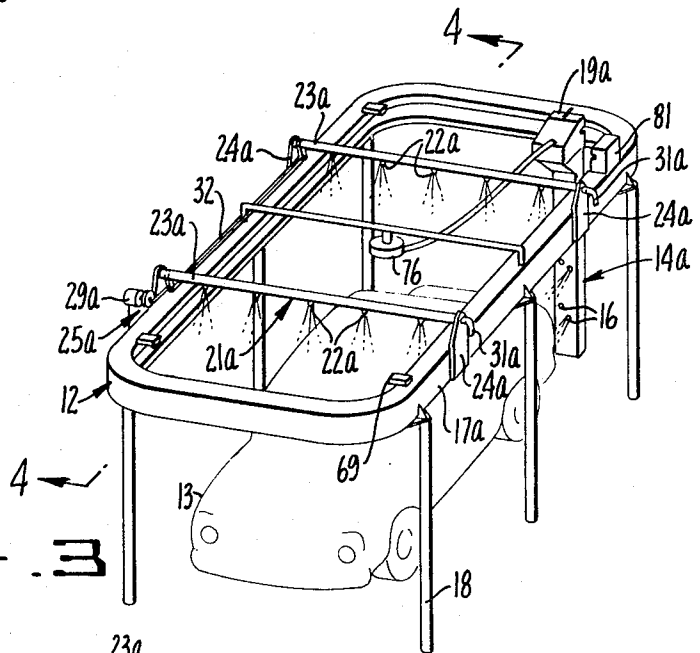


FIG. 3

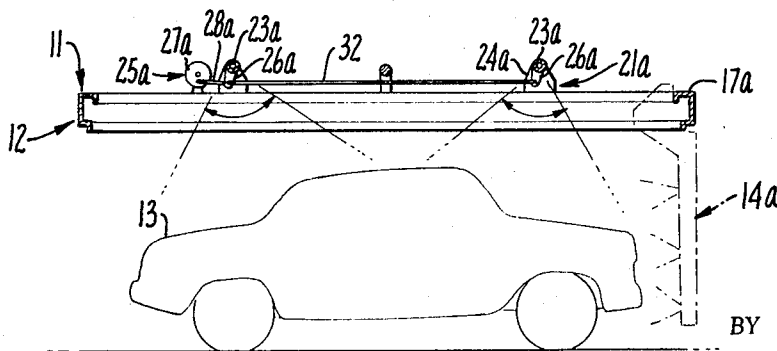


FIG. 4.

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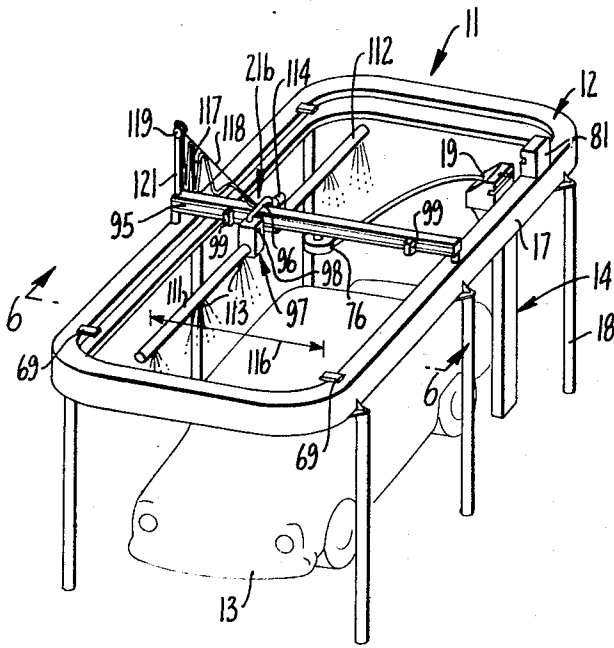


FIG. 5.

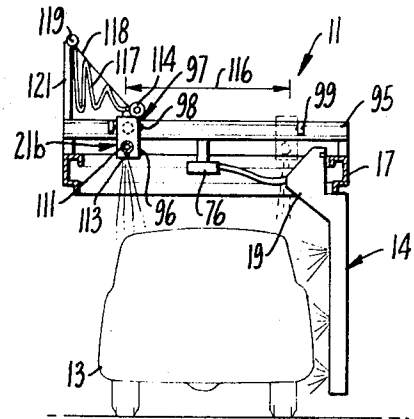


FIG. 6.

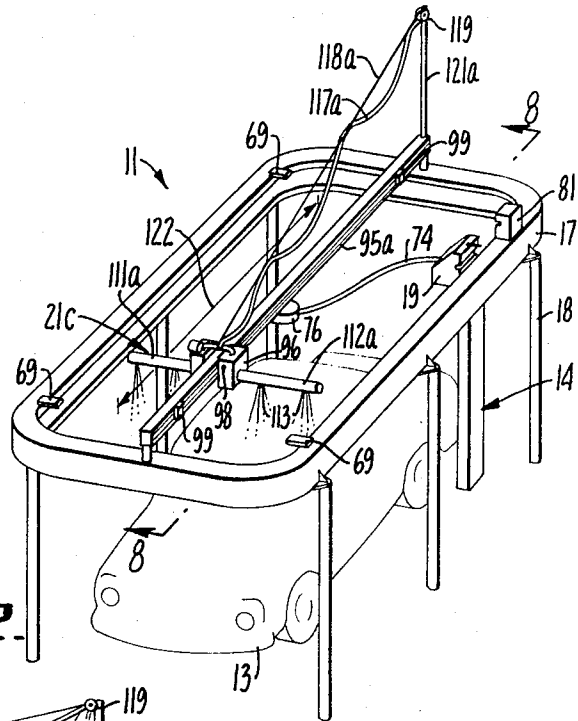


FIG. 7.

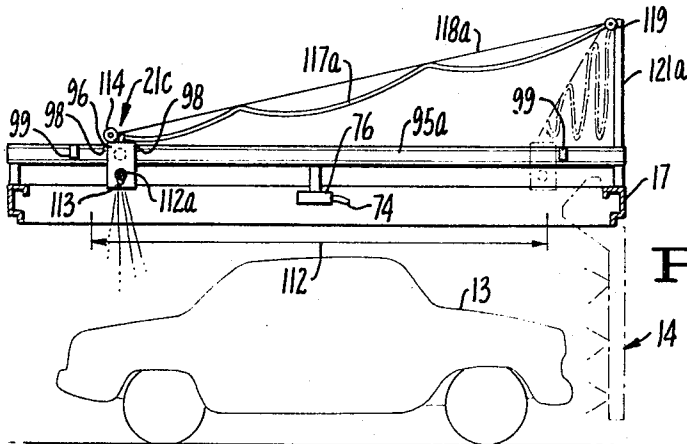


FIG. 8.

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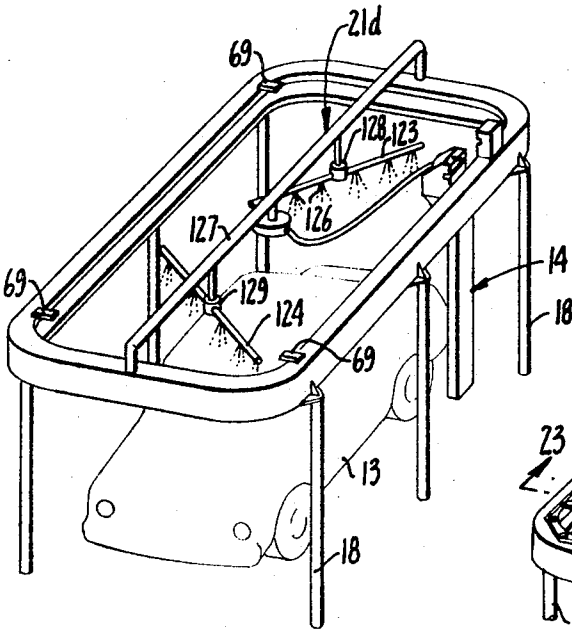


FIG. 9.

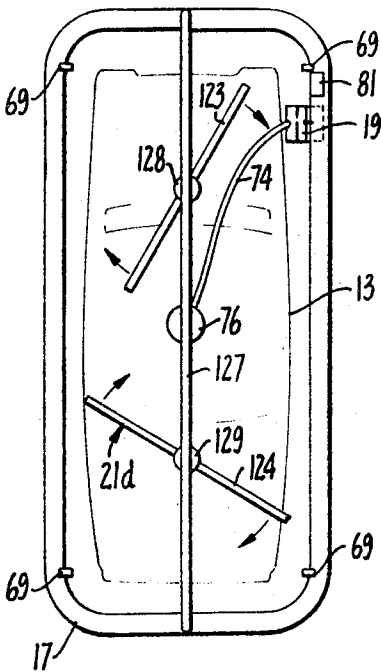


FIG. 10.

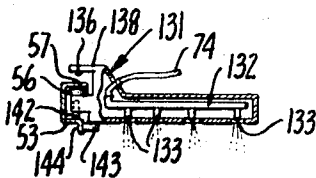


FIG. 23.

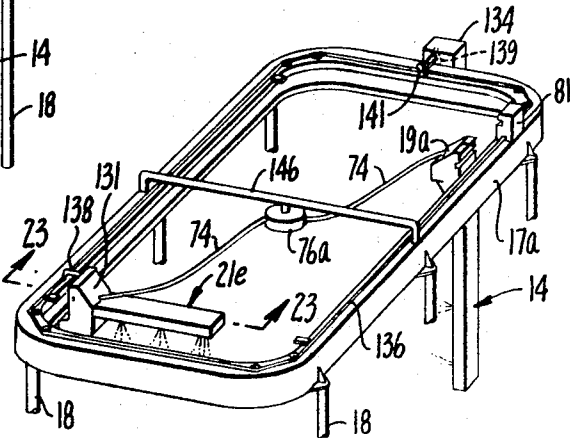


FIG. 11.

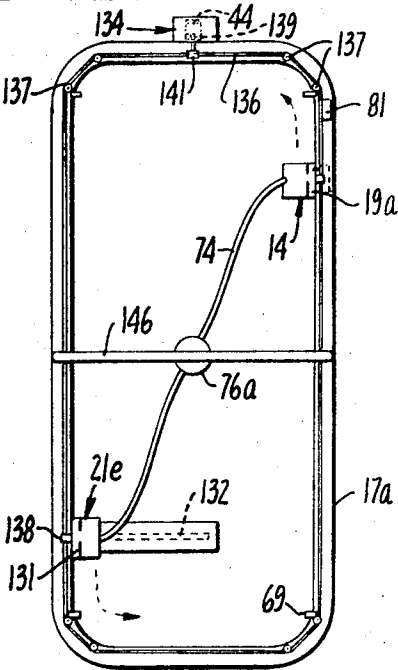


FIG. 12.

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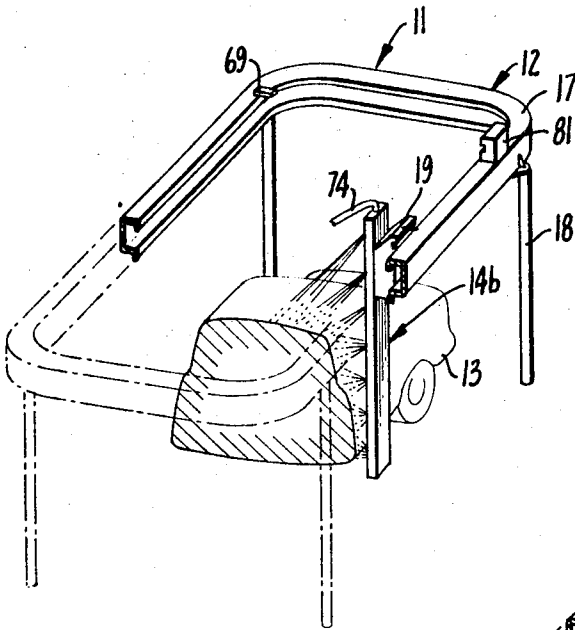


FIG. 13.

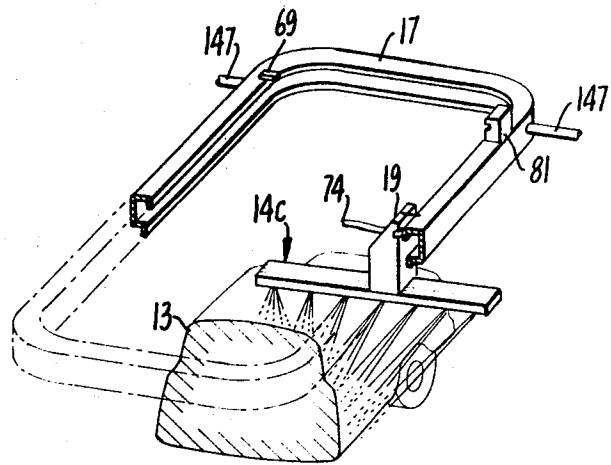


FIG. 14.

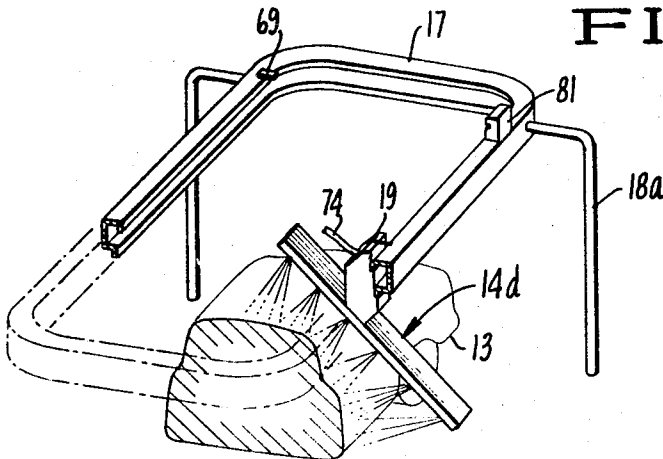


FIG. 15.

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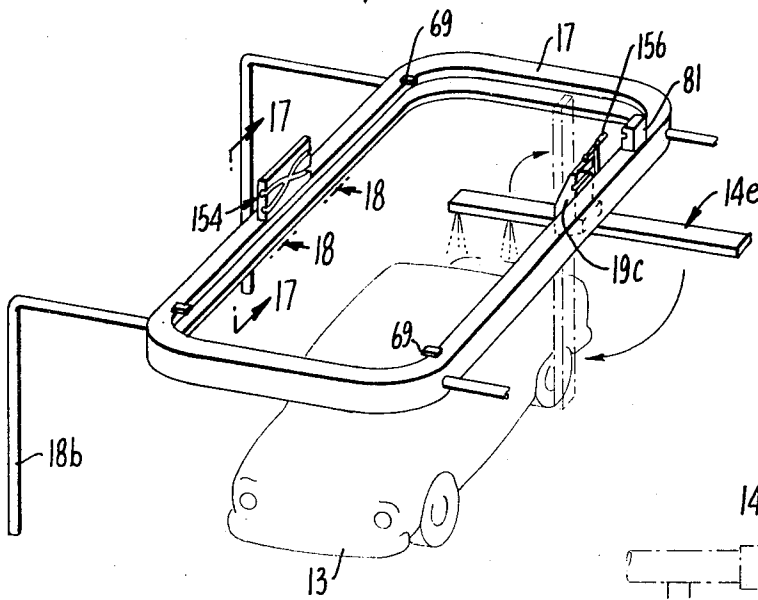


FIG. 16

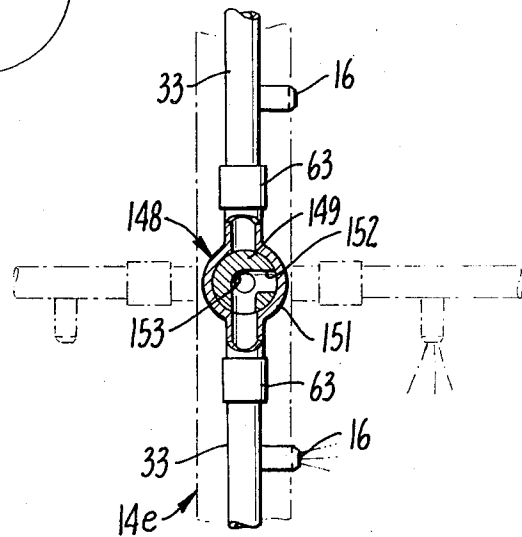


FIG. 19.

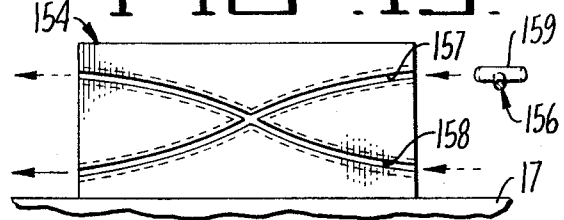


FIG. 18.

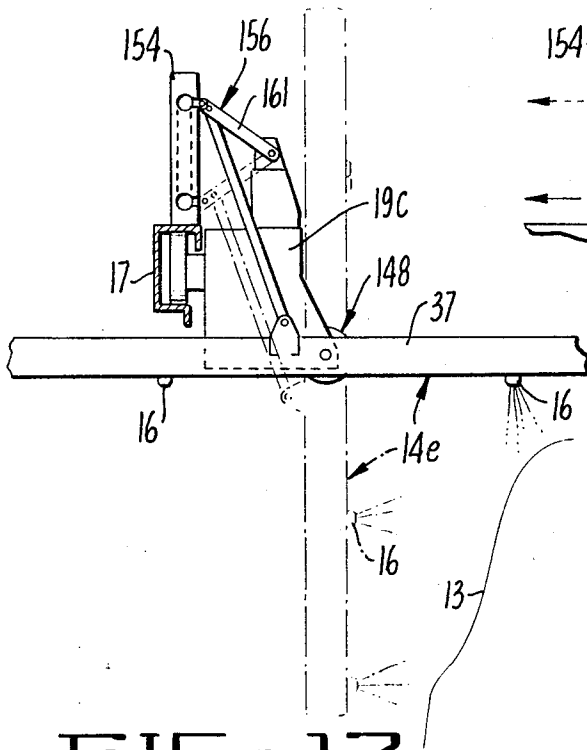


FIG. 17.

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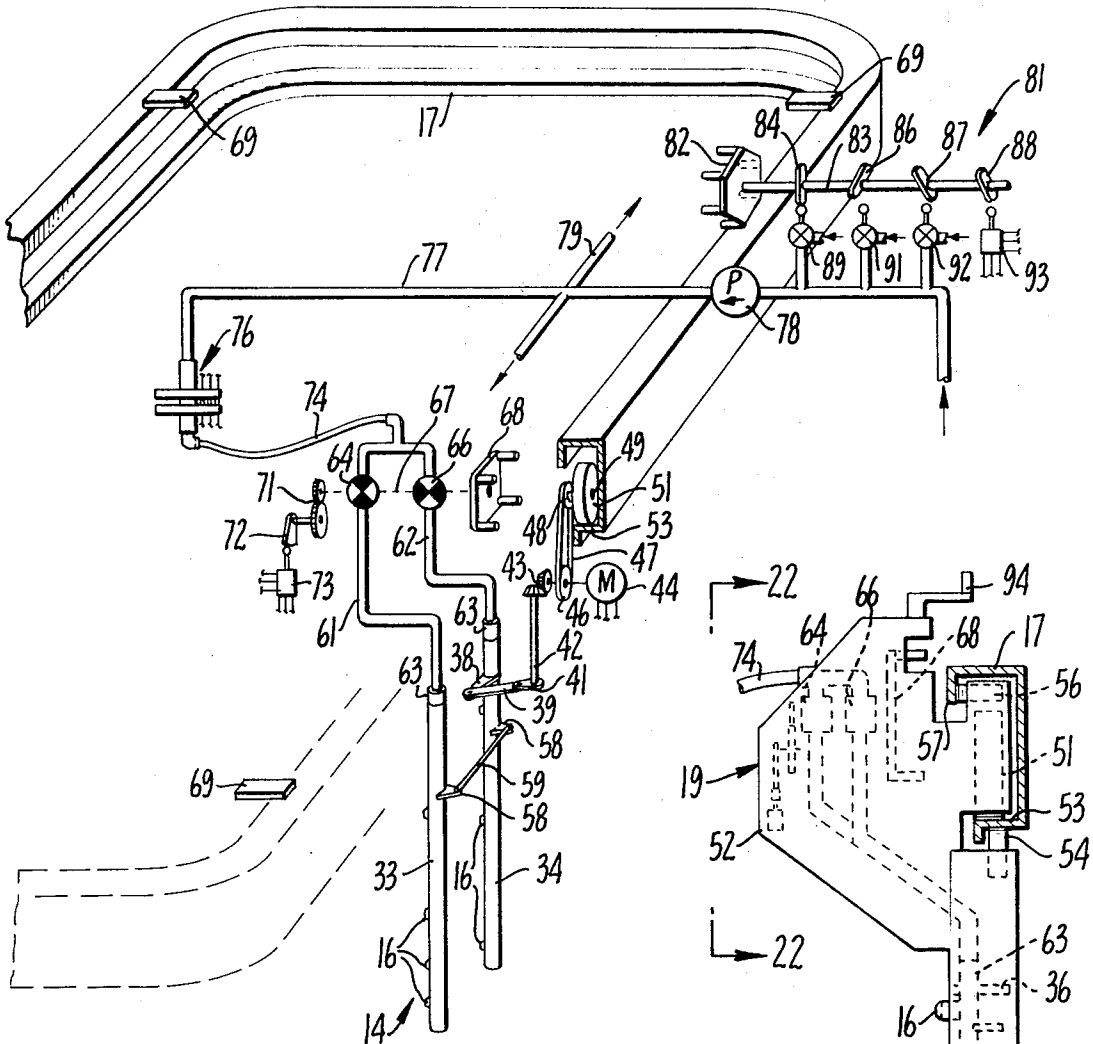


FIG. 20.

FIG. 21.

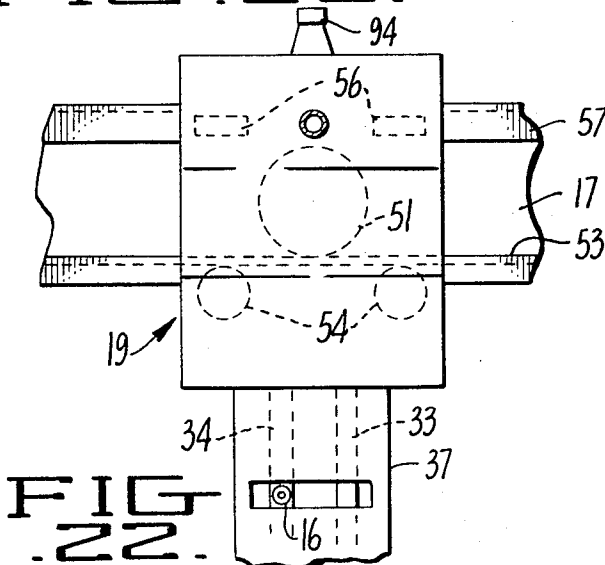


FIG. 22.

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## AUTOMATIC CARWASH APPARATUS

## CROSS-REFERENCES TO RELATED APPLICATIONS.

This application is related to my co-pending application Ser. No. 720,767, filed Apr. 12, 1968, now U.S. Pat. No. 3,595,250, issued July 27, 1971, and entitled AUTOMATIC CARWASH APPARATUS, and the inventor hereby claims all benefits of the disclosure of said earlier application granted by 35 U.S.C. 120.

## BACKGROUND OF THE INVENTION.

This invention relates to improvements in AUTOMATIC CARWASH APPARATUS, and more particularly to carwash apparatus wherein cleaning is effected by impinging sprays of cleaning liquids and rinsing liquids against the vehicle from a spray carriage traversing an oblong track generally surrounding the vehicle.

Apparatus for washing automotive vehicles is ordinarily classified into manually and automatically operated types. Until comparatively recently, the automatic types generally have involved moving the vehicle through a wash tunnel where it was sprayed with cleaning liquid, passed between revolving brushes to scrub off dirt, rinsed off and at least partially dried in a blast of heated air. Manually operated carwashes, on the other hand, have involved spraying a cleaning liquid onto the vehicle, scrubbing the vehicle surface with a hand mitt, sponge or the like, spraying the vehicle with a rinse liquid and wiping off most of the liquid with a chamois or towel.

Recently, improved detergent cleaning compounds and water conditioners have become available which make it possible to eliminate the scrubbing step, and which allow the car to dry naturally without spotting, eliminating the drying step. With the scrubbing and drying steps eliminated, a carwash apparatus can be provided which cleans the car solely by the spraying of cleaning and rinsing liquids against the surfaces to be cleaned, with the vehicle drying with or without air blast. A greatly simplified automatic apparatus for unattended operation with decreased labor cost and turnaround time results.

Known spray-type car wash devices usually consist of a spray arch which passes longitudinally over the vehicle, see Fisher U.S. Pat. No. 2,699,792 or a spray carriage which moves along an oblong track positioned in surrounding relation to the vehicle, see Tompkins U.S. Pat. No. 2,896,857. In either type of apparatus, problems are encountered in achieving effective cleaning action on the more difficult to clean portions of the car without wasting too much liquid on the more easily cleaned areas.

A further problem with prior art devices which swing the spray from side to side lies in the complexity of mechanisms for providing the oscillation of the spray devices, with some devices using linkages to individually pivoted nozzles, and others oscillating the entire manifold, flexible sections of manifold being used to join portions of the manifold lying along different paths. Both linkages and flexible sections pose maintenance and reliability problems.

## SUMMARY OF THE INVENTION.

The automatic carwash apparatus of the present invention utilizes a spray manifold which lies in a straight line and oscillates about that line as an axis. The oscillation produces a swashing action for greatly increased cleaning power of the sprays, and the straight line manifold reduces the complexity of the apparatus required to oscillate the manifold.

The present invention also provides differing spray volume on selected areas of the car, by having greater nozzle spacing configuration for the nozzles impinging on the top areas of the car in the single, straight-line manifold embodiment and by providing separate manifolds in the multiple manifold form. With the multiple manifold form of the invention, the manifold covering the more difficult to clean areas of the vehicle may be constructed to deliver a greater volume of spray

against those areas than delivered by the manifold covering the more easily cleaned areas. Also, the manifold for the more difficult areas may be given a more vigorous mechanical action than that of the manifold or manifolds for the easier areas. Thus the fluid volume and the mechanical action are concentrated on the most needful portions of the car.

In the single manifold forms of the invention, still further simplicity and reliability of apparatus is achieved by providing a single reciprocation mechanism and at the same time eliminating the need for flexible portions in the manifold, as would be required if the manifold were L-shaped and reciprocating. For a further improvement in cleaning action, in one form of the single-manifold type, the manifold is pivoted about an axis generally parallel to the track portion being traversed, to bring the sprays closer to the portion of the car to be cleaned.

Accordingly, it is a principal object of the present invention to provide a carwash apparatus of the character described which is capable of cleansing and rinsing the exterior surface of a vehicle automatically and in a rapid and efficient manner.

It is a further principal advantage of the present invention to provide a carwash apparatus of the character described capable of applying a greater total volume of wash fluid against the more difficult to clean areas of the vehicle than against the easier areas.

Another object of the present invention is to provide carwash apparatus of the character described having varying degrees of mechanical action of the liquid against the car surface on different portions of the surface of the car.

A further object of the present invention is to provide carwash apparatus of the character described having a straight linear array of spray nozzles to eliminate the use of flexible torsion sections in the manifold.

Yet another object of the present invention is to provide carwash apparatus of the character described which is responsive to relative movement of the spray means and the vehicle to provide more effective cleansing action on desired areas.

A still further object of the present invention is to provide carwash apparatus of the character described which is responsive to movement of the spray means along the track to selectively change the type of fluid (detergent, rinse, wax) applied to the car.

Another object of the present invention is to provide a carwash apparatus of the character described having simplicity, reliability and economy of mechanism.

Further objects and advantages of the present invention will appear as the specification proceeds, and the new and useful features of the automatic carwash apparatus will be fully defined in the claims attached hereto.

## BRIEF DESCRIPTION OF THE DRAWINGS

The preferred forms of the present invention is illustrated in the accompanying drawings forming part of this specification, in which:

FIG. 1 is a perspective view of an automatic carwash apparatus constructed in accordance with the present invention;

FIG. 2 is a cross-sectional view taken substantially on the plane of line 2—2 of FIG. 1;

FIG. 3 is a perspective view of the carwash of FIG. 1, with the upper spray means in a different configuration;

FIG. 4 is a cross-sectional view taken approximately along the plane of lines 4—4 of FIG. 3;

FIG. 5 is a perspective view of another version of the automatic carwash apparatus of the present invention;

FIG. 6 is a cross-sectional view taken approximately along the plane of lines 6—6 of FIG. 5;

FIG. 7 is a perspective view of the carwash of FIG. 5, with the upper spray means in a different configuration;

FIG. 8 is a cross-sectional view taken approximately along the plane of lines 8—8 of FIG. 7;

FIG. 9 is a perspective view of another embodiment of the automatic carwash apparatus of the present invention;

FIG. 10 is a top plan view of the embodiment of FIG. 9;

FIG. 11 is a perspective view of a further embodiment of the automatic carwash apparatus of the present invention;

FIG. 12 is a top plan view of the apparatus of FIG. 11;

FIG. 13 is a perspective view of another embodiment of the automatic carwash apparatus of the present invention with parts broken away for clarity;

FIG. 14 is a perspective view of the carwash of FIG. 13, with the spray means in a different alignment and with parts broken away for clarity;

FIG. 15 is a perspective view similar to FIG. 14 with the spray means in a different alignment and with parts broken away for clarity;

FIG. 16 is a perspective view of the carwash of FIG. 13, with the spray means movable between different alignments and with parts broken away for clarity;

FIG. 17 is a fragmentary cross-sectional view on an enlarged scale taken approximately along the plane of lines 17-17 of FIG. 16;

FIG. 18 is a fragmentary view on an enlarged scale taken approximately along the plane of lines 18-18 of FIG. 16;

FIG. 19 is a schematic cross-sectional view on an enlarged scale corresponding generally to the central portion of FIG. 17;

FIG. 20 is a perspective view, partially schematic with parts broken away for clarity of a typical fluid supply and oscillating system constructed in accordance with the present invention;

FIG. 21 is a side elevational view on an enlarged scale of a typical carriage and spray manifold constructed in accordance with the present invention;

FIG. 22 is an enlarged fragmentary view taken approximately along the plane of lines 22-22 of FIG. 21; and

FIG. 23 is a cross-sectional view on an enlarged scale, taken approximately along the plane of lines 23-23 of FIG. 11.

While only the preferred forms of the present invention have been shown, it should be understood that various changes or modifications may be made within the spirit of the claims attached hereto without departing from the spirit of the invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT.

Referring to the drawings in detail, it will be seen that the automatic carwash apparatus 11 of the present invention includes a guide means 12 formed in a closed loop continuously circumscribing a car 13 and a spray means 14 mounted for traversing movement along the guide means 12 to circumnavigate the car 13 and formed for directing a spray of liquid against the car 13. The spray means 14 has a plurality of spray nozzles 16 arrayed thereon in a substantially straight line.

The guide means 12 includes a track 17, preferably supported above the car 13 on standards 18, and the first spray means 14 is mounted on a powered carriage 19 which rides along the track 17. In the forms of the invention shown in FIGS. 1 through 10, a second spray means 21 is suspended above the vehicle 13 for washing the top portions of the vehicle.

It may be seen that the spray nozzles 16 on the first spray means 14 lie substantially within a plane parallel to the plane defined by the spray means 14 and the portion of the track 17 being traversed. In the forms of the invention shown in FIGS. 1 through 12, the spray nozzles 16 of the first spray means 14 are thus disposed within a substantially vertical plane, and describe a series of substantially vertical planes during the movement of the first spray means 14 around the car 13.

In the forms of the invention shown in FIGS. 5 through 12, spray nozzles 113, which are attached to the second spray means 21b-e, describe a substantially horizontal plane as they are moved through space during the washing process. Due to the planar movement described, the spray nozzles are generally disposed substantially within planes generally substantially parallel to the vehicle surface against which the spray from the nozzle projects.

The spray nozzles 113 on the second spray means 21b-e are likewise arranged in a substantially straight line along an elon-

gated manifold. In the form shown in FIGS. 1 through 4, the manifold 23 is journaled for pivotal motion about its longitudinal axis in brackets 24 mounted on the track 17. A mechanism 25 is formed for changing the angle at which the spray is directed against the vehicle 13 in a reciprocating fashion and includes a crank arm 26 attached to the manifold 23 near one end and coupled to an eccentric 27 by a connecting rod 28. The eccentric 27, in turn, is mounted on the drive shaft of electric motor 29 for rotation thereby, to impart the reciprocating motion to the manifold 23. The reciprocating motion serves a dual function by providing the desirable swashing action for improved cleaning effectiveness, while at the same time ensuring that the entire upper surface of the vehicle is covered during one cycle of its oscillation. Fluid is admitted to the manifold 23 through a flexible connection 31.

In FIGS. 3 and 4, a different configuration of the second spray means 21 is shown, with parts of similar function to those of FIGS. 1 and 2 having corresponding numbers with a letter "a" suffix. The two parallel spray manifolds 23a of FIGS. 3 and 4 are linked for joint reciprocation by an additional connecting rod 32. It should be appreciated that while only two manifolds 23a are here shown, a greater number could also be utilized, either separately reciprocated or linked by additional connecting rods in the fashion of connecting rod 32. In the form here shown, the coverage of the spray pattern from each manifold 23a is sufficient to cover approximately half of the top area of the car, including its hood and trunk top areas, while in the form of FIGS. 1 and 2, the coverage and oscillatory range of the manifold 23 is sufficient for one manifold to cover the entire upper surface of the car 13.

Within the first spray means 14, as shown in FIGS. 20, 21 and 22, the spray nozzles 16 are mounted on a pair of elongated spray fluid manifolds 33 and 34. The manifolds are formed in a substantially straight line and are journaled for pivotal motion about their longitudinal axes in brackets 36 mounted within the housing 37 which surrounds the lower portion of the spray means 14. A crank arm 38 is attached to one of the manifolds 34 and pivotally attached to a link 39 which is in turn pivotally attached to another crank arm 41 mounted on a shaft 42.

The shaft 42 is connected through a pair of bevel gears 43 to the drive shaft of an electric motor 44. Also mounted on the drive shaft of the motor 44 is a pulley 46 driving a belt 47 which in turn drives another pulley 48. The pulley 48 is mounted on a shaft 49 journaled in the housing 52 of the carriage 19. A drive wheel 51 is mounted on the shaft 49 and bears against a horizontal flange 53 on the lower portion of the track 17 to drive the powered carriage 19 along the track 17. A pair of guide rollers 54 bear against the underside of the flange 53, and another pair of guide rollers 56 bear laterally against a flange 57 which depends from the upper portion of the track 17, to hold the carriage 19 in alignment on the track 17.

The manifolds 33 and 34 are linked for joint reciprocation by brackets 58 fastened to each of the manifolds and pivotally connected to a connecting link 59. The manifolds 33 and 34 are connected to the respective conduits 61 and 62 by sliding seal joints 63, which permit the reciprocatory motion of the manifolds 33 and 34. The sliding seal joints 63 may be of any suitable type permitting rotary motion about the axis of the manifold, known in the plumbing art.

As may be noted from FIG. 20, the manifold 33 has more nozzles 16 near its lower end than does the manifold 34, so that a greater portion of fluid is discharged against the lower portion of the vehicle 13 when manifold 33 is used than when manifold 34 is used. This provides greater cleaning action for the ends of the car, which tend to be more grimy than the sides. A pair of valves 64 and 66 in the lines 61 and 62 respectively control the fluid flow to the manifolds 33 and 34, respectively. The valves 64 and 66 are of the continuous rotation spherical plug type analogous to stopcocks, and are ganged on a common shaft schematically indicated by the dotted line 67. A four-point starwheel 68 is also mounted on

the common shaft indicated by 67 and positioned to be intercepted and rotated a quarter turn by each of the actuating elements 69 located adjacent the corners of the track 17.

The valves 64 and 66 are arranged 90° out of phase with each other, so that each quarter turn of the starwheel 68 turns one of the valves on and the other off. In the position of the spray means 14 shown in FIG. 20, the side of the car 13 is being sprayed by manifold 34, whose valve 66, is open. When the spray means 14, which is traveling to the right and away as seen in FIG. 20, reaches the far right hand corner of the track 17, the starwheel 68 will be intercepted by the actuating element 69 and rotated a quarter turn to close the valve 66 and open the valve 64. The manifold 33 will then be supplied with fluid to spray the end of the vehicle, concentrating the spray on the lower portion of the end for more efficient cleaning action and to avoid waste of fluid. As the spray means 14 continues counterclockwise around the track 17, it reaches the upper left hand corner as seen in FIG. 20, and the starwheel 68 encounters another actuating element 69, which rotates it a quarter turn to shut valve 64 and open valve 66, so that manifold 34 sprays the side of the car 13. The process is repeated at the near end of the track.

A gear train 71 having a 3:1 reduction ratio is also driven by the shaft indicated by 67 to operate a cam 72 having a 120° dwell period. The cam 72 actuates a switch 73 during one circuit of the carriage 19 about the track 17, and releases the switch 73 for the next two circuits. The switch 73 controls the speed of the electric motor 44, to provide a slower motion of the carriage 19 during one circuit, the washing circuit, of the carriage about the track 17, for improved washing action and faster rinsing action on the remaining two circuits, as set out in my copending application, cited above.

The two valves 64 and 66 have their inlet sides connected in common to a flexible conduit 74 leading to a swivel structure 76. The swivel structure 76 includes a rotary sliding seal joint similar to joints 63 in the manifolds 33 and 34, and is here shown only schematically, including brush and ring rotary electrical contacts. A suitable structure for the swivel structure 76 is shown in FIG. 16 of my above-cited co-pending application. A conduit 77 leads from the swivel structure 76 to a pump 78 which supplies fluid under pressure to be sprayed on the car 13. Branch conduits 79 lead from the conduit 77 to the flexible connections 31 in the second spray means 21 in these embodiments having a second spray means 21.

A control means 81 is mounted on the track 17 and actuated by the passage of the carriage 19 along the track 17 to selectively valve the fluid supply to the spray means 14 and the second spray means 21 where a second spray means is used. A succession of different spray fluids, such as detergent solution, rinse water, and liquid wax, may thus be applied to the car 13 on successive circuits of the spray means 14 about the car 13. The control means 81 includes a six-point starwheel 82 mounted on a shaft schematically indicated as 83, and cams 84, 86, 87 and 88 mounted on the shaft 83. The cams 84, 86 and 87 each have two diametrically opposed approximately 60 degree dwell surfaces, and are arranged 60° out of phase with each other, to actuate valves 89, 91, and 92 on successive circuits of the carriage 19 about the track 17 to change the additive supplied to the spray fluid.

An actuating element 94 is mounted on the carriage 19 to intercept the starwheel 82 once on each circuit of the carriage. Since the starwheel 82 has six points, it will be rotated 1/6 turn by each passage of the carriage 19, to bring another of the cams 84, 86 and 87 into contact with its respective valve 89, 91 or 92 to change the nature of the fluid additive. At the end of three circuits of the carriage 19, the cam 88, which has two diametrically opposed short dwell actuating areas, actuates a normally closed switch 93. The opening of switch 93 by cam 88 shuts off power to the electric motor 44 and the pump 78 to halt operation of the carwash 11. While three valves and three actuating cams corresponding to them have been described, it should be appreciated that any number of cams and valves, having the appropriate dwell times and dwell rela-

tion to each other may be used to supply as many additives as desired. The starwheel 82 should be changed accordingly if the number of cams and valves is changed.

Turning now to FIGS. 5 and 6, the track 17 and the first spray means 14 are essentially the same as in the embodiment of FIGS. 1 through 4, but the second spray means 21b is of a different form, and as here shown includes a second track 95 having a substantially straight-line path and a second carriage 96 mounted for traversing motion to and fro along the second track 95. A reversing mechanism 97 reverses the direction of motion of the second carriage 96 at each end of the second track 95.

The reversing mechanism 97 includes a reversing switch 98 mounted on the second carriage 96 and actuating stops 99 mounted on the second track 95 and positioned to intercept and actuate the switch 98. The switch 98 may be any of several types well known in the art. For instance, the switch 98 may have a mechanical linkage to an X-type DPDT reversing switch operative to throw the DPDT switch from one pole to the other upon contact of the protruding button shown at 98 with one of the stops 99. Alternatively, the switch 98 may include a microswitch operated by the protruding button 98 and in turn actuating a relay-type reversing switch.

Mounted on the second carriage 96 and extending transversely to the track 95 are a pair of spray manifolds 111 and 112, extending parallel to the longitudinal axis of the vehicle 13 and each equipped with spray nozzles 113 for spraying the top areas of the car 13, such as the roof, top of the hood, and trunk lid. The carriage 96 is driven along the track 95 by an electric motor 114 so that it reciprocates as indicated by the arrows 116. The motor 114 may be coupled to a drive wheel (not shown) similar to drive wheel 51 of FIGS. 21 and 22, with the drive wheel bearing against an appropriate portion of the track 95. Suitable guide wheels (not shown) corresponding generally to guide wheels 54 and 56 in FIGS. 21 and 22 may also be provided.

The manifolds 111 and 112 are connected in common to flexible conduit 117, and the flexible conduit 117 is in turn connected to a source of fluid to be sprayed, such as one of the branch conduits 79 shown in FIG. 20. The flexible conduit 117 is suspended together with an electrical supply cable for the motor 114 from a support cable 118. The support cable 118 is held under tension by being wound on a spring-loaded reel 119 at the top of a mast 121. The swivel structure 76 may also be suspended from the second track 95, with the manifolds 111 and 112 being spaced apart to pass on either side of the swivel structure 76.

If desired, the manifolds 111 and 112 may be constructed to oscillate about their longitudinal axis, as do the manifolds 23, 33, and 34 of the form shown in FIGS. 1 through 4, to produce a similar swashing action of the spray. If so, the manifolds 111 and 112 may be joined to the carriage 96 and the conduit 117 by rotary slip joints (not shown) similar to the joints 63 of FIG. 20 and provided with a reciprocation mechanism similar to the mechanism 25 shown in FIG. 1. However, unless the automobiles being cleaned are extremely grimy, the need for the swashing action in the second spraying means is less than in the first spray means 14, and the apparatus may be simplified as here shown.

The electrical cable (not shown) which accompanies the flexible conduit 117 to supply the motor 114 with current is supplied from the same source as the motor 44 of the first spray means 14, so that the two spray means are operated in conjunction to clean the car, stopping and starting at the same time. The reversing switch 98, however, is in circuit only with the motor 114, so that only the second carriage 96 is reversed. Fewer nozzles 113 may be used on the manifolds 111 and 112 than on the manifolds 33 and 34, with wider spray areas for each nozzle, as the upper parts of a car are generally less difficult to clean.

In FIGS. 7 and 8 a different configuration of the second spray means 21c is shown. The second spray means 21c reciprocates lengthwise of the car 13, as shown by the arrows

122 in FIG. 8 rather than transversely as shown in FIGS. 5 and 6, and the manifolds 111a and 112a extend substantially transversely to the longitudinal axis of the vehicle 13. As here shown, the manifolds 111a and 112a are shorter than their counterparts in the form of FIGS. 5 and 6, and the nozzles 113 are consequently more closely spaced. For the same degree of washing action, then, the nozzles 113 may be made smaller to discharge less fluid, or, preferably, the motor 114 may be constructed to drive the carriage 96 faster along the track 95a. In the remaining aspects of the operation of this form of the invention, the mode is the same as with the form of FIGS. 5 and 6, with the same numbers being applied to the sample parts and numbers bearing a letter suffix to similar parts analogous to the corresponding parts in the FIG. 5 and 6 form. As in the FIG. 5 and 6 form, the manifolds 111a and 112a extend transversely to the track 95a.

The embodiment shown in FIGS. 9 and 10 also has essentially the same track 17 and first spray means 14 as the embodiment of FIG. 1, with a differing form of the second spray means 21d. As here shown, the second spray means 21d includes a pair of elongated manifolds 123 and 124 suspended above the vehicle 13 for freedom of rotation about a substantially vertical axis. The manifolds 123 and 124 bear spray nozzles 126 supplied with fluid to be sprayed from the manifolds 123 and 124. A support member 127 is mounted above the track 17 and bears a pair of rotary slip joints 128 and 129, as well as the swivel structure 76. The slip joints 128 and 129 may be constructed similarly to the joints 63 of FIG. 20, or to that of the swivel structure 76 with the electrical contacts omitted. The support member 127 also acts as a conduit for supplying fluid to the swivel structure 76 and the slip joints 128 and 129.

One or more of the spray nozzles 126 on each manifold 123, 124 may be canted from a vertical axis to provide the thrust to rotate the manifold. As here shown, the manifolds 123 and 124 and their corresponding joints 128 and 129 are spaced far enough apart along the support member 127 so that the rotation of the manifolds does not bring them into collision with the swivel structure 76. The area of the car not lying directly beneath the path of rotation of the manifolds is still sprayed, however, as a result of the cone shape of the spray discharged from the manifold.

The first spray means 14 depicted in FIGS. 11 and 12, is essentially the same as shown in the preceding forms of the invention (FIGS. 1 through 10), except for the elimination of the electric motor 44 from the carriage 19, and its relocation to a fixed point along the track 17. As here shown, the second spray means 21e includes a second carriage 131 mounted on the track 17 to traverse the track and circumnavigate the vehicle 13 in a fashion similar to the movement of the first spray means 14 and its carriage 19a. An elongated manifold 132 is mounted on the carriage 131 and extends outwardly over the vehicle 13. Spray nozzles 133 are arrayed along the manifold 132 in communication with the manifold to impinge a spray of liquid against the vehicle 13.

The second carriage 131 is spaced halfway around the track 17 from the first carriage 19a, and both carriages are moved along the track 17 by a drive means 134. The drive means 134 includes an electric drive motor 44, and a flexible loop member 136 driven by the motor 44 and disposed along the track 17. The first carriage 19a and the second carriage 131 are attached to the loop member 136, so that both carriages are moved around the track 17 by the movement of the loop member 136. Thus the spacing of the two carriages and their spray means is kept constant and their movement synchronized.

The flexible loop member 136 may be a stranded cable or roller chain, or any similar band member capable of transmitting the driving force from the motor 44 to simultaneously advance the spray means 14 and 21e and their respective carriages 19a and 131 along the track 17. The loop member 136 is guided along the path of the track 17 by a plurality of guide rollers 137 disposed at appropriate locations along the track

17. As may be seen from FIG. 23, the carriage 131 is attached to the loop member 136 through a bracket 138 attached to the body of the carriage 131. The attachment to the carriage 19 may be similarly made.

The electric motor 44 is mounted adjacent the track 17 and transmits power through a belt 138 to a drum 141 mounted on the track 17 and journaled for rotation. The loop member 136 is driven by friction against the drum 141, with a spring loaded idler pressing the loop member 136 against the drum 141.

With the modified form 19a of the carriage here shown, the oscillatory or "swashing" action of the manifolds 33 and 34 is produced in the same manner as in the preceding forms of the invention, except that the drive wheel 51 is driven by its frictional engagement with the track 17 to reciprocate the manifolds, rather than driving against the track 17 to advance the carriage 19 as before. Although a drive means 134 separate from the carriage 19a is here shown, it should also be appreciated that the carriage 19a could be formed with the motor 44 inside as in the previous forms, and the first spray means 14 would then operate to tow the second spray means 21e along by means of the loop member 136.

As here shown, the manifold 132 of the second spray means 21e is similar to, but considerably simplified over the manifold structure of the first spray means 14. As the upper and more horizontal areas of the vehicle are generally more easily cleaned, the swashing action of the first spray means 14 may be dispensed with, allowing elimination of the oscillatory apparatus shown by numbers 38 through 43 in the first spray means 14 in FIG. 20. The valving apparatus represented by numbers 64 through 68 in that figure is also eliminated from the second spray means in the present form, as the need to shift spray pattern when moving from the sides to the ends of the car is less for the upper areas of the car. However, it should be appreciated that should it be found necessary, as with extremely grimy vehicles, to apply both the concentrated spraying action and the swashing action to the second spray means 21e, the second spray means 21e may be constructed with the valving mechanism and oscillating mechanism essentially the same as in the first spray means 14.

The second carriage 131 rolls along the track 17 on guide rollers 56 essentially the same as the guide rollers 56 in the first spray means 14, guide rollers 142, and guide rollers 143. The guide rollers 142 may be a pair of rollers oriented similarly to the drive wheel 51 of FIGS. 21 and 22, and replacing that drive wheel in supporting the vertically downward forces imposed by the second spray means 21e. The guide rollers 143 are used in place of the guide rollers 54 of FIGS. 21 and 22, and bear instead against the side of a vertical lip 144 which depends from the flange 53, to bear the side thrust created by the weight of the outstretched portion of the second spray means 21e.

A modified form 76a of the swivel 76, shown in the preceding forms of the invention, is used to supply liquid through a pair of flexible conduits 74 to the first spray means 14 and the second spray means 21e. The swivel 76a is suitably changed to supply two fluid outlets, and is suspended from a beam 146 which bridges the track 17 at sufficient height to clear the tops of the carriages 19a and 131. Since the circumference of the path of those nozzles along the manifold 132 which are closer to the track 17 is greater than the circumference of the path of those which are farther from the track, the nozzles may be more closely spaced near the track end of the manifold, as shown in FIG. 23.

The second spray means 21 may be eliminated altogether for greater simplicity of apparatus, as shown in the embodiment depicted in FIGS. 13 through 19. In FIG. 13, the manifolds 33 and 34 and their housing 37 are attached to the carriage 19 at a point intermediate their ends, with nozzles 16 communicating with the manifolds 33 and 34 being arrayed along each of the manifolds on either side of the point of attachment of the manifold to the carriage 19. The nozzles 16 along the upper portion are angled downwardly with respect to the longitudinal axis of the manifold to direct their spray

against the upper and generally horizontal portions of the vehicle 13 at an angle more nearly normal to those portions of the vehicle. The valving mechanism and oscillatory mechanisms within the first spray means 14b may be essentially the same as those shown in FIGS. 20 and 21, modified to accommodate the upper portions of the manifolds 33 and 34 added in this form of the invention. The modification could be accomplished in a number of ways; for instance, the manifolds 33 and 34 and their housing 37 could be relocated as shown in FIG. 13 to the inner side of the carriage 19, with the incoming liquid from the conduit 74 being routed first to the valves 64 and 66 within the carriage 19 and thence through rotary sliding seals 63 located at the extreme top ends of the manifolds 33 and 34, as extended.

Advantage may be taken of the shift in spray pattern on changing from manifold 33 to manifold 34 to change the spray pattern for the upper portions of the vehicle as well. The spray nozzles 16 on the upper portion of the manifold 34, operative for the ends of the car, may be more sharply slanted downwardly than the nozzles 16 on the upper portion of the manifold 33, so as to reduce the horizontal distance the spray diverges away from the manifold when traversing the hood and trunk portions of the car. This increases the effective cleaning action of the spray on these areas, when operating, as here, with angled sprays, as the spray is not directed as far outwardly from the manifold, and the previously sprayed roof of the vehicle is not covered when the spray means 14b is traversing the ends of the vehicle 13.

Where the carwash apparatus 11 is to be located within another structure rather than freestanding, the spray means 14c may be oriented horizontally, instead of vertically, as shown in FIG. 14. Instead of the standards 18 which support the preceding embodiments, the track 17 in this version may be suspended from support members 147 attached to the surrounding structure (not shown). With the horizontal orientation, it is the nozzles 16 located at the outboard end of each of the manifolds 33 and 34 which are angled inwardly, toward the side of the vehicle. The oscillatory apparatus may be modified by elimination of the bevel gears 43, and the manifolds supplied with liquid through sliding rotary seals 63 at either the inboard or the outboard ends. Of course, the manifolds 33 and 34 could also be supplied at a point intermediate of their ends, such as near the point of their support by the carriage 19, by the expedient of providing two sliding rotary seals 63 for each manifold, in a tee configuration. Corresponding to the difference between the manifold 33 and the manifold 34 in FIG. 13, the nozzles 16 at the outboard end of the manifold 33 in FIG. 14 should be more sharply angled from the vertical, inwardly, than the outboard nozzles on the manifold 34, as the sides of the vehicle will be farther from the outboard end of the manifolds than the ends will.

As one compromise between the version of FIGS. 13 and 14, the manifolds 33 and 34 and their housing 37 may be disposed at an acute angle to the vertical, while remaining within a plane substantially normal to the alignment of that portion of the track 17 being traversed, as shown in FIG. 15. Here again, the spray means 14d is supported intermediate its ends upon the carriage 19, and the liquid may be supplied to the manifolds 33 and 34 by the same choice of techniques used with the versions of FIGS. 13 and 14 described above. The bevel gears 43 (shown in FIG. 20) may be used, as in FIG. 13, with the angle of the gears appropriately modified from 90°. In the present version the nozzles 16 at the upper, or inboard, end of the manifold 34 are more sharply angled downwardly than those at the corresponding end of the manifold 33, as in FIG. 13, while the nozzles on the lower, or outboard end of the manifold 33 are more sharply angled upward with respect to the axis of the manifold than the corresponding nozzles on the manifold 34, as in FIG. 14.

A different approach to the compromise between the FIG. 13 version is shown in FIGS. 1 through 19. Here, the spray means 14e is physically moved between the horizontal and vertical positions on successive circuits of the track 17. The

track 17 may be supported on outwardly extended standards 18b, as shown, to avoid interference between the outboard end of the spray means 14e and the standards, as was done with the standards 18a in FIG. 15, or the track 17 may be suspended from a surrounding structure (not shown) as done with the version of the apparatus shown in FIG. 14.

The manifolds 33 and 34 are pivotally attached to the carriage 19c at a point intermediate their ends as shown in FIGS. 17 and 19 for movement in a plane substantially normal to alignment of the portion of the track 17 that the carriage 19c is traversing. The attachment of the manifolds 33 and 34 to the carriage 19c is through a hub structure 148 which permits the pivotal portion and at the same time valves the fluid flow to the appropriate end of the manifolds 33 and 34. The hub structure 148 includes a central core member 149 fixed to the carriage 19c and a cylindrical shell 151 communicating with the manifolds 33 and 34 and journaled on the central core member 149 as shown in FIG. 19.

An L-shaped passage 152 in the central core member 149 receives liquid from an axial passage 153 and selectively directs it to different parts of the manifolds 33 and 34, so that the hub structure 148 acts as a valve means. Movement of the manifolds about the central core member 149 from the position shown in solid in FIG. 19 to the position shown in phantom thus alters the pattern of fluid spray from the lower or outboard portions of the manifolds 33 and 34 to the upper or inboard portions of the manifolds. Only one of the manifolds is shown in FIG. 19; the details of the pivotal connection are essentially the same for both manifolds. On either side of the cylindrical shell portion 151, rotary sliding seal joints 63 are interposed in the manifolds to permit the reciprocating swashing action.

The manifolds 33 and 34 within the spray means 14e are moved about the hub structure 148 by a cam means 154 mounted on the track 17 and a follower 156 mounted on the spray means 14e. The cam means 154 engages the follower 156 attached to the spray means 14e and thereby attached to the manifolds 33 and 34, to move the spray means 14e and its associated nozzles 16 about their point pivotal attachment to the carriage 19c, the hub structure 148 into close proximity with selected areas of the vehicle 13. As here shown, the cam means 154 includes a pair of intersecting undercut channels 157 and 158, dimensioned to accept and retain a cylindrical tracer member 159. The tracer member 159 is pivotally mounted on the end of a linkage 161 attached to both the carriage 19c and the housing 37 for the manifolds 33 and 34. The cylindrical shape of the tracer 159 keeps the follower mechanism 156 on the correct path as it passes through the intersection of the channels 157 and 158. As may be seen from FIGS. 17 and 18, the tracer 159 is diverted from an upper to a lower position, or from a lower to an upper position, once on each circuit of the carriage 19c about the track 17. Thus, after the spray means 14e has made one circuit in the horizontal position shown in solid lines in FIG. 17, the tracer 159 and linkage 161 will be deflected downward, as is shown about to happen in FIG. 18, to the position shown in phantom in FIG. 17, and the spray means 14e will make one circuit in vertical position. The hub structure 148 will direct the liquid to the lower portions of the manifolds when the manifolds are vertical, and to the inboard portions of the manifolds when the manifolds are horizontal.

As here shown, the manifolds of the spray means 14e are retained in the position to which they have been moved by the cam means 154 by the friction in the hub structure 148. However, it should be appreciated that the cam means 154 may be extended along the entire path of the track 17 to hold the tracer 159 in the desired upper or lower position. If the cam means 154 is so extended, the fluid type control means 81 might be located at the crossover point of the cam to prevent interference between the follower mechanism 156 and the actuator for the control means 81. Since the manifolds are moved pivotally about the hub structure 148, the reciprocating swashing motion could be provided more effectively in the

present form of the invention by a separate electric motor (not shown) mounted on the manifold housing 37 and connected through an eccentric and link motion (not shown) to the crank arm 38, as in FIG. 20. The electric motor 44 shown in FIG. 20 would then only serve to advance the carriage 19c, and the spray means 14e attached to it, along the track 17.

From the foregoing, it may be seen that the carwash apparatus of the present invention automatically cleans and rinses the surface of a car, in an efficient and effective manner, by directing the appropriate volume of fluid against the body of the car in accordance with the expected difficulty of cleaning the particular area, with corresponding variance in the degree of mechanical action of the fluid against the surface. As shown, the desired cleaning action is provided by linear arrays of nozzles, without resorting to flexible torsion sections in the fluid manifolds, so that the simplicity, reliability and economy of the apparatus is enhanced.

I claim:

1. Apparatus for washing motor vehicles, comprising an overhead closed loop track,  
a carriage traversing said track to circumnavigate the vehicle,  
a first spray means carried by said carriage and having a plurality of spray nozzles arrayed thereon in a substantially straight line for impingement of spray against the sides and ends of the vehicle, and  
a second spray means not carried by said carriage and separate from said first spray means, said second spray means being suspended above the vehicle and formed for traversing and washing the top portions of the vehicle.
2. Apparatus for washing motor vehicles as described in claim 1 and wherein said first spray means includes valve control means responsive to movement of said carriage along said track, and formed to cause said first spray means to discharge a greater amount of fluid against a portion of the vehicle during traverse of said carriage of one portion of said track than during traverse of said carriage of another portion of said track.
3. Apparatus for washing motor vehicles as described in claim 2 and wherein said valve control means is formed to cause said first spray means to discharge a greater amount of fluid against a desired portion of the vehicle during said traverse of one portion of said track than said second spray means discharges against said top portions of said car.
4. Apparatus for washing motor vehicles as described in claim 1 and wherein said plurality of nozzles on said first spray means are disposed within a substantially vertical plane, and said second spray means includes a plurality of nozzles arrayed thereon such that their array as translated through space during the washing operation describes a substantially horizontal plane.
5. Apparatus for washing motor vehicles as described in claim 1, and wherein said second spray means includes a plurality of spray nozzles all arrayed along a substantially straight line.
6. Apparatus for washing motor vehicles as described in claim 5 and wherein said second spray means includes a mechanism formed for changing the angle at which the spray is directed against the vehicle in a reciprocating fashion.
7. Apparatus for washing motor vehicles as described in claim 6 and wherein said second spray means includes an

elongated manifold supplied with fluid to be sprayed and having said nozzles arrayed therealong and communicating therewith, and said mechanism oscillates said nozzles about the longitudinal axis of said manifold for effecting said changing of the angle at which the spray is directed against the vehicle.

8. Apparatus for washing motor vehicles as described in claim 7 and wherein said manifold is mounted in a fixed but swingable position so that the spray therefrom impinges against the entire upper surface of the vehicle during one cycle of oscillation.

9. Apparatus for washing motor vehicles as described in claim 7 and wherein said second spray means includes a plurality of elongated manifolds oriented parallel to each other and having said nozzles arrayed therealong, said manifolds communicating with said nozzles to supply fluid thereto for spraying.

10. Apparatus for washing motor vehicles as described in claim 7 and wherein said second spray means includes a second track supported above the vehicle, said second track having a substantially straight line path, a second carriage mounted on said second track for traversing motion to and fro therealong, and reversing mechanism for reversing the direction of motion of said carriage at each end of said second track, said manifold being carried by said second carriage for movement therewith.

11. Apparatus for washing motor vehicles as described in claim 10 and wherein said manifold extends substantially transversely to said second track.

12. Apparatus for washing motor vehicles as described in claim 11 and wherein said manifold extends substantially parallel to the longitudinal axis of the vehicle.

13. Apparatus for washing motor vehicles as described in claim 11 and wherein said manifold extends substantially transverse to the longitudinal axis of the vehicle.

14. Apparatus for washing motor vehicles as described in claim 1 and wherein said spray means includes an elongated manifold suspended above the vehicle for freedom of rotation about a substantially vertical axis and bearing said spray thereon and communicating therewith.

15. Apparatus for washing motor vehicles as described in claim 14 and wherein said spray means includes a plurality of elongated manifolds each suspended above the vehicle and formed for rotation about a substantially vertical axis.

16. Apparatus for washing motor vehicles as described in claim 7 and wherein said second spray means includes a second carriage traversing said track to circumnavigate the vehicle, an elongated manifold carried by said second carriage and extending outwardly over said vehicle, and spray nozzles arrayed along said second manifold and communicating therewith to impinge a spray of liquid against the vehicle.

17. Apparatus for washing motor vehicles as described in claim 16 and wherein said second carriage is kept spaced substantially halfway around said track from said first carriage.

18. Apparatus for washing motor vehicles as described in claim 17 and wherein said apparatus includes a drive means for moving said first and second carriages along said track, said drive means comprising a drive motor and a flexible loop member driven by said motor and disposed along said track, said first and second carriages being attached to said loop member for simultaneous advancement thereby.

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