May 20, 1969 C. N. SMITH, JR., ET AL 3,445,286

CARWASH PROCESS

Original Filed Oct. 5, 1964 Sheet 1 of 5

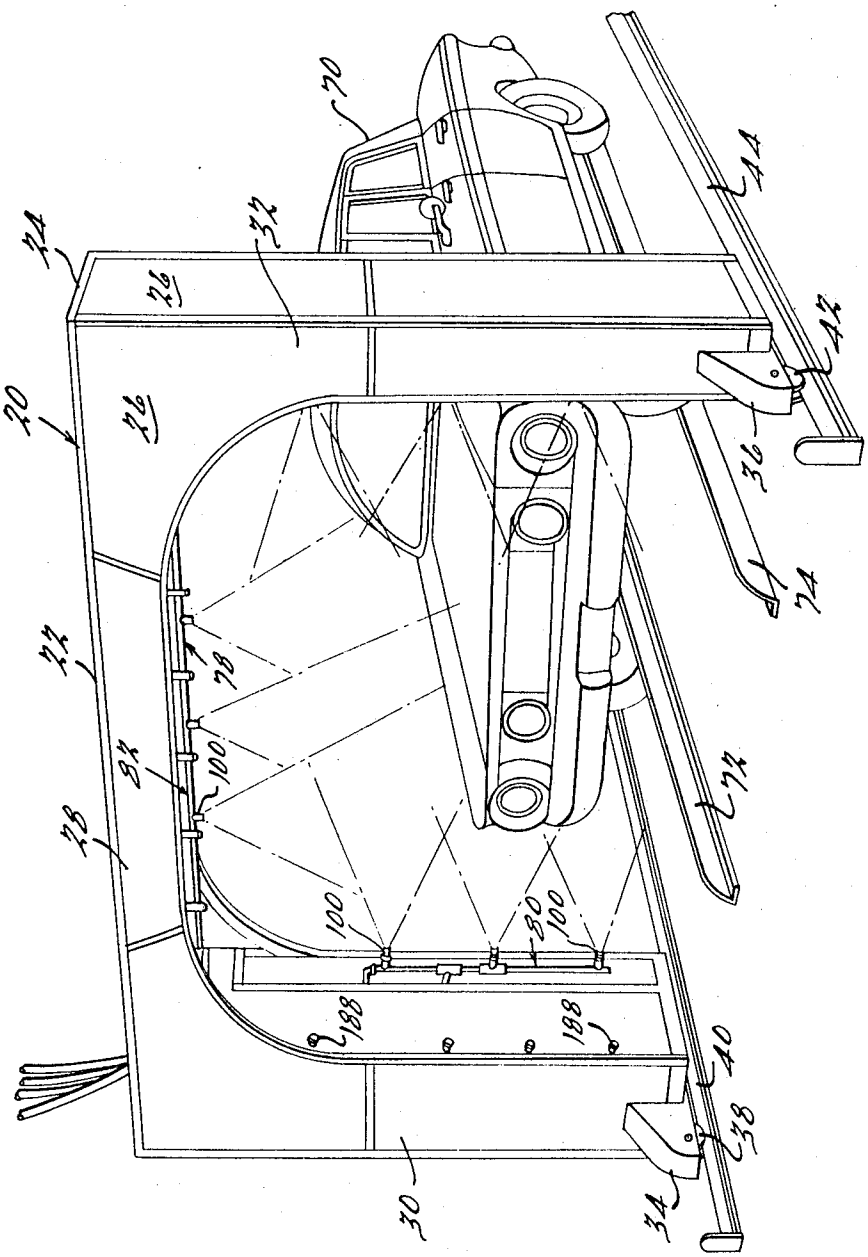


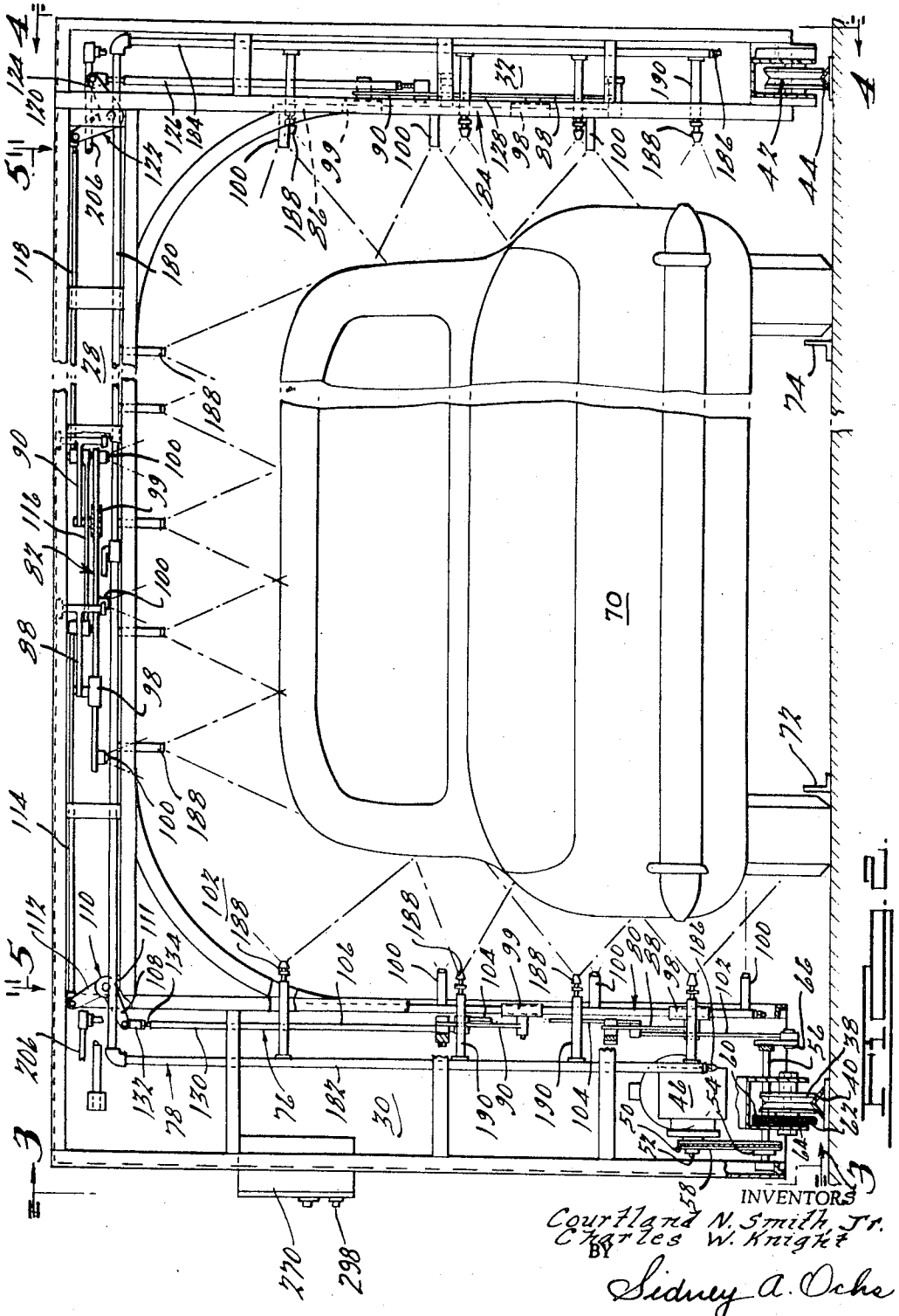
Fig. 1.

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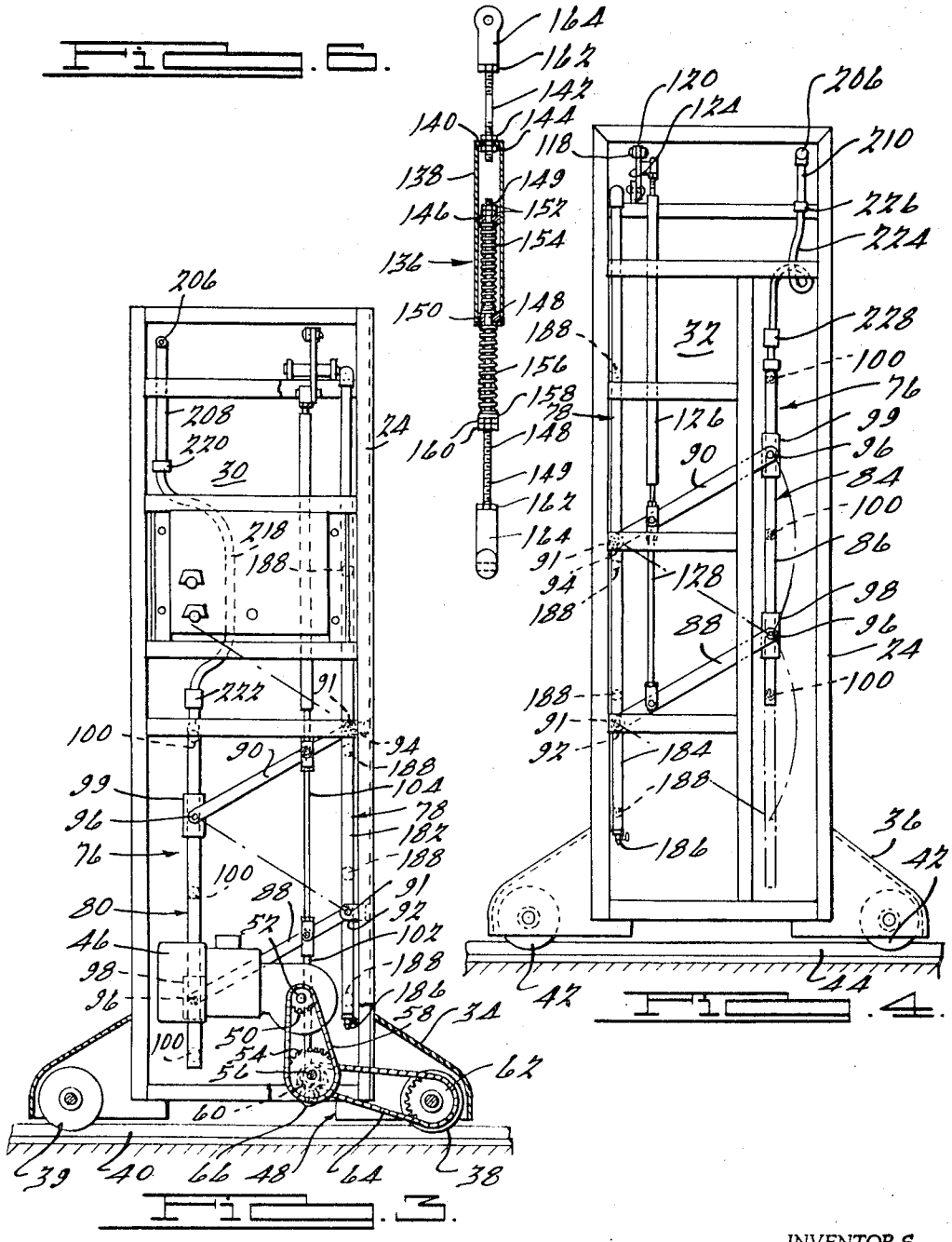
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CARWASH PROCESS

Original Filed Oct. 5, 1964 Sheet 3 of 5

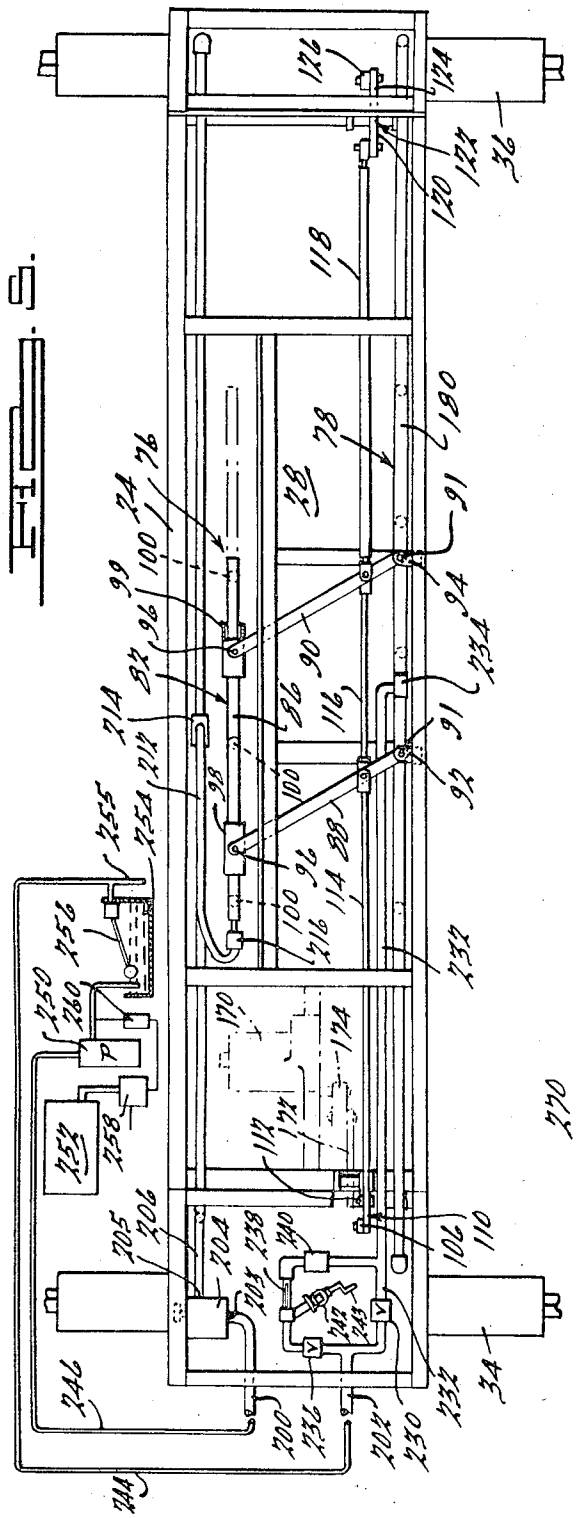


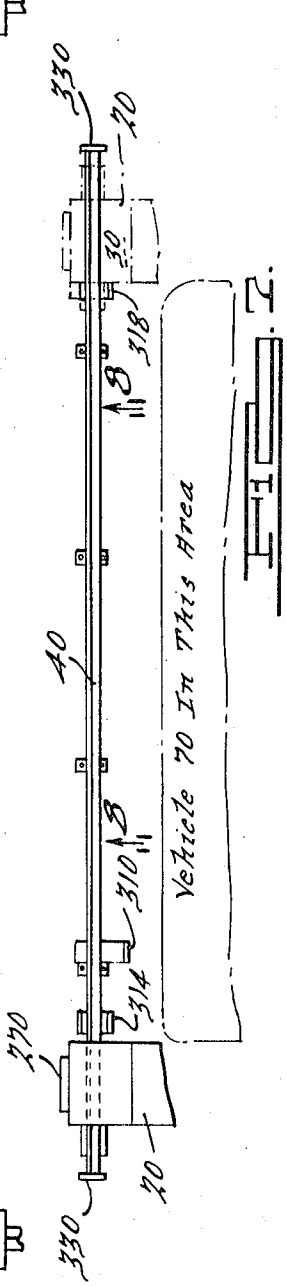
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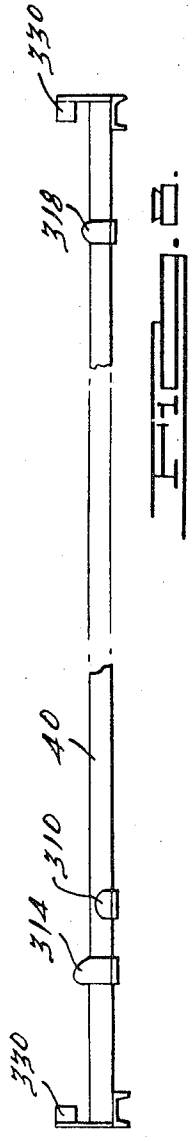
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CARWASH PROCESS

Original Filed Oct. 5, 1964 Sheet 4 of 5







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CARWASH PROCESS.

Original Filed Oct. 5, 1964 Sheet 5 of 5

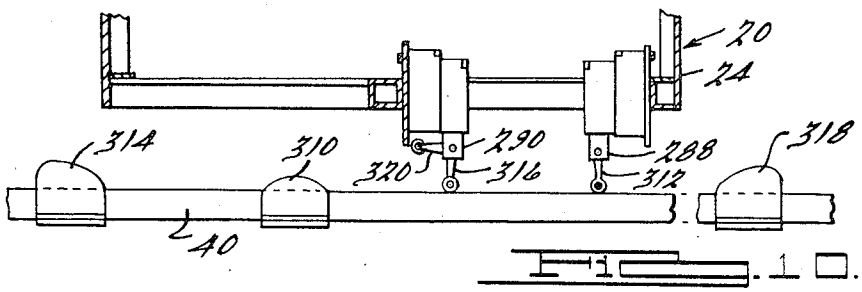


Fig. 10.

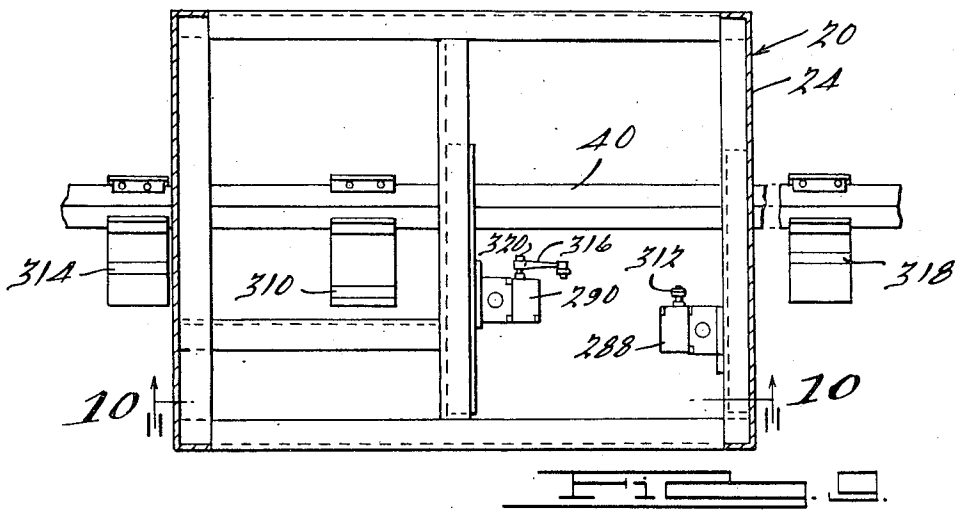
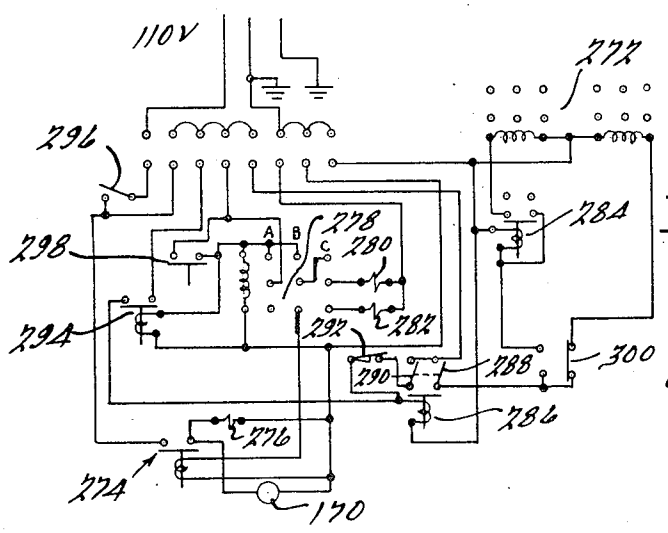


Fig. 11.



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CARWASH PROCESS

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Original application Oct. 5, 1964, Ser. No. 401,434, now Patent No. 3,288,109, dated Nov. 29, 1966. Divided and this application Sept. 26, 1966, Ser. No. 581,828
Int. Cl. B08b 3/02
U.S. Cl. 134—32 8 Claims

This application is a division of our copending application Ser. No. 401,434, filed Oct. 5, 1964, now Patent No. 3,288,109, dated Nov. 29, 1966.

This invention relates generally to improvements in vehicle washing processing of the kind shown in the patent to Vani et al., 2,987,067, which cleans a vehicle in successive applications of detergent solution and water during successive movements along the vehicle.

In said prior apparatus two fixed U-shaped conduits are provided, each having a plurality of inwardly directed spray nozzles. One conduit constituting a washing unit is fed with an air emulsified water detergent mixture produced by water and air, each under a pressure of about 125 lbs. per square inch which have commingled and discharge with them against the vehicle a liquid detergent drawn from a supply tank. The second conduit constituting a rinse unit is fed with water at the same pressure from the same source for rinsing the vehicle before and after washing with detergent. The change over from rinse to wash and the reverse is accomplished manually by an operator operable three way selector valve capable of directing flow to one unit or the other or to close off flow to both.

Although such a device performs in a generally satisfactory manner it has certain disadvantages. It is found expedient to start the operation with a rinse step and then after the detergent application to rub or mitt the vehicle manually to loosen any dirt not already removed by the detergent. The latter steps require shutting down of the device and moving it clear of the vehicle. Moreover, timing of the spray steps is entirely dependent upon visual determination and upon manual manipulation of the control valve. Furthermore because the spray nozzles are fixed they apply a straight band of liquid concentrating the greatest pressure on a line within this band.

A primary object of the invention is to provide a new and improved process employing a roll over vehicle washing device or apparatus which eliminates or minimizes the above noted disadvantages.

A more specific object is to provide an improved process employing a rollover vehicle washing apparatus which cleans an automotive vehicle by successive applications of detergent solution and water and in which the rapidity of the wash and rinse cycles and the change from one to the other are automatically and time controlled.

Another object is to provide an improved process employing a rollover vehicle washing apparatus in the operation of which detergent solution is applied against the vehicle by spray nozzles at high pressure, for example in the order of 600 lbs. per sq. in. during the wash cycle and water at a lesser pressure, usually city line pressure of between 20 to 50 lbs. per sq. in., is applied during the rinse cycle.

A further and important object is to provide a process employing a rollover apparatus as in the preceding object in which the detergent is applied against the vehicle in a plurality of fan-like jet streams that overlap each other at the vehicle surface and which reciprocate so that the central zone of the streams traverse a substantial zone of the vehicle surface as distinguishable from a

straight line with each spray nozzle in the wash cycle applying its detergent in a wave and lengthwise of the vehicle.

Still another object is to provide a process employing a rollover apparatus having a detergent solution wash section in which a group or bank of spaced detergent applying nozzles oscillate in a generally vertical plane at each side of the vehicle as the unit traverses the vehicle and a further group oscillates on a generally horizontal plane over the top side of the vehicle.

An additional object is to provide a process employing a rollover unit as in the preceding objects which is automatically controlled to provide a plurality of successive wash cycles followed by a plurality of successive rinse cycles each cycle corresponding to a complete pass of the apparatus over the vehicle.

A further specific object is to provide a process employing a rollover device including a wash conduit or section comprising a plurality of drivingly interconnected oscillating banks of spray nozzles which direct detergent solution against the vehicle surface, there being at least one bank of three nozzles at each side of the vehicle being washed operable in a generally vertical plane and at least one bank of three nozzles above the vehicle operable in a generally horizontal plane and a rinse conduit or section comprising a plurality of fixed banks of spaced nozzles of greater number than that in the oscillating banks which fixed banks are similarly arranged to the oscillating banks and adjacent thereto.

Still a further object is to provide a processing employing a rollover apparatus as in the preceding object wherein the oscillating banks of nozzles are driven from the same power source that drivingly effects reciprocation of the unit over a vehicle.

Other objects and advantages of the invention will appear from the following description and from the drawings wherein:

FIGURE 1 is a perspective view of the rollover automotive vehicle washing apparatus or unit embodying the features of the invention and showing a vehicle undergoing a wash cycle as the device traverses the tracks over which it is driven;

FIGURE 2 is an elevational view of the rollover device of FIGURE 1 with the front panels removed, showing the wash and rinse sections and the power drive for the device and for the spray wash section, the vehicle in this figure being shown reversed relative to that of FIGURE 1 to indicate that the device is operable regardless of positioning of the vehicle;

FIGURE 3 is an elevational view looking in the direction of the arrows 3—3 in FIGURE 2 showing the wash and rinse banks of nozzles in the left leg of the unit in this FIGURE 2 and the drive means for the detergent wash banks and the traction unit;

FIGURE 4 is an elevational view looking in the direction of the arrows 4—4 in FIGURE 2 showing the wash and rinse banks of nozzles in the left leg of the unit in FIGURE 2;

FIGURE 5 is a plan view looking in the direction of the arrows 5—5 in FIGURE 2 showing the wash and rinse banks of nozzles in the top or cross chamber of the unit in FIGURE 2, and water detergent solution supply sources and controls and showing in phantom an independent power drive for the oscillating banks of nozzles comprising the wash unit;

FIGURE 6 is an elevational view of a spring loaded resilient link for use in lieu of the rigid link between the drive crank and first oscillating arm of the wash section in FIGURE 3 and optionally in lieu of one or more of the rigid links between the pairs of oscillating arms of each bank especially that in FIGURE 4 of the wash sec-

tion for the purpose of cushioning the linkage and banks of nozzles when changing direction of movement;

FIGURE 7 is a plan view of the left hand track in FIGURES 1 and 2 over which the rollover unit in these figures is driven by the means seen in FIGURE 3 and showing the location of the reversing and stop cams for actuating the control limit switches for reversing the direction of movement of the vehicle at the end of its movement in one direction and for stopping the unit after completing the wash and rinse cycles, the drive portion of the rollover unit being shown in its forward position and in phantom in its rear position;

FIGURE 8 is an elevational view of the track and cams of FIGURE 7 looking in the direction of the arrows 8—8 in FIGURE 7;

FIGURE 9 is an enlarged plan view of the track, cams and rollover drive leg of FIGURE 7 showing the location of the limit control switches for reversing and stopping the movement of the unit;

FIGURE 10 is a sectional elevational view taken at 10—10 of FIGURE 9 showing the limit switches carried by the drive leg of the device in elevation relative to the fixed cams; and

FIGURE 11 is the electrical control diagram for the device.

Referring to the drawings wherein similar numerals designate corresponding parts of the structure of the invention, the numeral 20 designates an automotive vehicle washing device or unit comprising an inverted substantially U-shaped housing 22 generally constructed of an angle iron framing 24 and sheet steel covering 26 and which includes a top section 28 and two opposed side sections 30, 32. The unit is supported upon a pair of trucks 34, 36 which may be formed of sheet metal.

The truck 34 is provided with a pair of wheels 38, 39 which engage a track member 40 and are movable therealong. In a similar manner the truck 36 has a pair of wheels 42 which engage and are movable along a track member 44. To provide power traction for the unit 20 the wheel 38 is drivingly connected to a reversing type electric motor 46 suitably mounted in the leg 30 of the unit 20 to the frame 24. Drive is obtained through a reduction chain and sprocket drive generally designated by the numeral 48 and comprising a drive sprocket 50 on the output shaft 52 of the motor, a driven sprocket 54 on a countershaft 56, a chain 58 connecting the sprockets 54, 56, and a further drive sprocket 60 on the countershaft driving a driven sprocket 62 drivingly connected with the wheel 38, the sprockets 60, 62 being connected by a chain 64. Also on the countershaft at the inner end thereof is a crank 66, for a purpose to be described. For convenience FIGURE 1 shows a passenger vehicle 70 in stationary position straddling the floor guide rails 72, 74 and be subjected to detergent solution wash by the unit 20.

The vehicle washing apparatus of the unit 20 comprises a movable detergent wash conduit section generally designated by the numeral 76 in FIGURE 3 and a stationary rinse conduit section generally designated by the numeral 78 in FIGURE 3. The wash section 76 comprises a plurality of high pressure spray banks generally designated by the numerals 80, 82, 84, three being shown (see FIGURES 3, 4, and 5), preferably operatively connected in series for oscillating movement, each bank being suitably mounted to the frame 24.

Since each bank 80, 82, 84 is of the same construction only one will be described. Thus the bank 80 comprises a fluid carrying pipe 86 supported through a pair of parallel arms or levers 88, 90, each pivotally connected at their inner ends as at 91 to brackets 92, 94 on the frame 24. The outer ends respectively of the arms 88, 90 are pivotally connected by pins 96 to spaced sleeves 98, 99, respectively, on the pipe 86 and spaced inwardly from the ends thereof. The pins 96 are fixed to the sleeves 98, 99 and the latter may be fixed to the pipe 86. It is preferred, however, in order to prevent binding in the pivotal connections during operation of the banks that the sleeve 98 be fixed to the pipe 86 to provide the main support for the pipe 86 and that the sleeve 99 be fully slideable on the pipe 86 to provide support and guidance and to adjust itself on the pipe 86 to a proper distance relative to the fixed sleeve 98 to prevent said binding in said pivots. The pipe 86 carries a plurality of high pressure nozzles 100, three being shown, each facing inwardly of the archway 102 straddling the vehicle being washed. This number is found sufficient to cover the entire side surface of the vehicle with a high pressure spray of detergent solution during their vertical oscillating movement as the arms 88, 90 swing the pipe 86 in a substantially straight line from the position shown in full lines in FIGURE 3 to that shown in phantom in this figure. The operation of the nozzle bank 84 is similar to that of the bank 80 except that when the latter is in its down position the bank 84 is in its up position. The bank 82 operates in a similar manner but in a horizontal plane and has its nozzles pointed down. Since the nozzles of the bank 80 in the leg 30 are shown in their lowermost position in FIGURE 2 and those of the bank 82 in the leg 32 in their uppermost it will be evident that in their sweep each bank covers the entire side of the body and wheels of the vehicle and that the spray patterns of the nozzles 100 as seen in the right hand side of FIGURE 2 are made to overlap each other. The spray of the bank 82 also moves to cover the top surface of the vehicle. It will be evident that since the nozzles move relative to the vehicle surface the high pressure stream is not fixed on a given area but shifts while either a portion of its pattern or that of an adjacent nozzle still covers the area being cleaned. Moreover the nozzles of the banks 80, 82, 84 whether pointed sideways or down all move in substantially the same vertical plane.

The banks 80, 82, 84 are moved or oscillated through a series linkage actuated by the drive crank 66 referred to above on the shaft 56 of the motor drive for the unit 20. Thus the crank 66 connects by a vertical link 102 with the arm 88, a vertical link 104 connects the arms 88, 90 of the bank 80, a further vertical link 106 connects arm 90 with one arm 108 of a bell crank 110 (see FIGURES 2, 3, 5) pivotally mounted at 111 in the inner corner of the archway 102 to the frame 24. The bell crank 110 changes the direction of motion of the linkage to the horizontal plane, its arm 112 connecting through a horizontal link 114 with the arm 88 of the bank 82, the arm 88 connecting with the arm 90 through a link 116 and the arm 90 connecting by a horizontal link 118 with the arm 120 of a further bell crank 122 (see FIGURES 2, 4, 5) which again changes the motion of the linkage from the horizontal to the vertical plane. The arm 124 of the crank 122 connects by a link 126 with the arm 90 of the bank 84 and the arm 90 connects with arm 88 through a link 128 completing the series drive of the arms of all banks.

It will be understood that all connections between links and cranks or arms are of the swivel or pivotal type to facilitate easy transmission of the motion. Moreover, it will be evident that the arms 88, 90 of each bank will make a complete sweep in one direction during 180 degrees rotation of the drive crank 66 and reverse and sweep in the opposite direction during the next 180 degrees of rotation and so on.

The links 102, 104, 106, 114, 116, 118, 126 and 128 may all be rigid links preferably of tubular character adjustable for length by end eye portions threaded in the tubes 130 or swivel blocks 132 and provided with locking nuts 134 as seen for example in FIGURE 2. In certain cases it may be found desirable in order to cushion the inertia impact of the moving banks upon reversing their motion, to provide a spring type link or rod such as shown in FIGURE 6 and generally referred to by the numeral 136. This type of link may also be used between the arms 88, 90 of the bank 84 for

the same purpose and in fact between each set of arms 88, 90 of each bank for this purpose or to provide a further means of inhibiting binding in the pivotal joints, this spring link 130 not only providing cushioning but also being adjustable as to length.

Thus as seen in FIGURE 6 the spring link 136 comprises a tubular element 138 closed at the upper end to provide an end wall 140 pierced to receive a threaded rod 142 which is secured to the wall by opposite lock nuts 144. Slideably received in the tube 138 is a piston or spring collar 146 loosely fitting a piston rod 148 threaded at both ends and which extends through the bore of shouldered plug 150 secured in any suitable manner in the lower end of the tube 138. A pair of lock nuts 152 at the upper end adjustably locate the collar 146 and adjust the biasing force of a spring 154 positioned in the tube between the collar 146 and plug 150. A second balancing spring 156 is located on the rod 148 exteriorly of the tube 138 between the plug 150 and a washer 158 positioned by lock nuts 160. Also threadedly secured to the lower end of the rod 148 and upper end of rod 142 so as to be adjustable thereon and held by a lock nut 162 are typical eye or swivel blocks 164 by which to connect the spring link with the levers or crank of the operating linkage described above. The springs 154, 156 are made stiff enough to avoid additional compression, and act as a stiff link in moving the spray banks but cushion any inertia build up by the moving mass when the direction of movement of the linkage is reversed. Manifestly since the blocks 164 are adjustable on the rods 142, 148 the effective length of the assembly may be modified.

In some cases it may be desired to drive the linkage from a separate motor rather than from the unit traction motor 46. In such instances a motor 170 shown in phantom in FIGURE 5 may be mounted to the framing 24 in the head section 28 of the unit and connect with the arm 112 of bell crank 110 through a link 172 and crank 174.

The rinse conduit section 178 comprises an inverted U-shaped assembly stationarily fixed to the frame 24 in generally paralleling relationship to the wash section 76. The rinse section comprises a horizontal portion 180 and a pair of depending vertical portions 182, 184 terminating at their lower ends in drain cocks 186. The horizontal portion 180 is provided with downwardly pointed low pressure spray nozzles 188 connected by short pipe lengths 189 to this portion, five nozzles being shown which direct overlapping jets of rinse water or water and wax against the top surface of the vehicle as seen in FIGURE 2 to cover this surface. The vertical portions 182, 184 are provided with laterally directed similar nozzles 188 to cover the side portions of the vehicle which nozzles are connected by short pipe lengths 190, four nozzles being shown for this purpose which direct overlapping sprays as seen in FIGURE 2 for this purpose.

Hot detergent solution at a temperature of about 115 to 120 degrees F. and at a pressure of 600 p.s.i. is delivered to a stand pipe 200 on the frame 24 and rinse water at city line pressure of between 50 to 60 p.s.i. which water may also be prewarmed, is delivered to a stand pipe 202. A pressure of at least about 50 p.s.i. is desired and it may be necessary in certain locations to provide a pump for this purpose. The stand pipe 200 connects with the input side 203 of a solenoid operated high pressure valve 204 of the Asco type, the discharge side 205 of this valve connecting with a stationary feed line 206 which extends across the top of the frame as seen in FIGURES 2 and 5 and has depending portions 208, 210 in the legs 30, 32 respectively as seen in FIGURES 3 and 4. A flexible hose 212 of sufficient length to accommodate the oscillating movement of the nozzle bank 82 connects a T fitting 214 on the line 206 with the nozzle bank 82 through a fitting 216. A similar flexible hose 218 connects a fitting 220 on the depending feed line portion 208 with a fitting 222 on the vertical nozzle bank 80 of the leg 30 (see with the rinse feed conduit 232. The injector connects a fitting 226 on the depending feed line portion 210 with a fitting 228 on the vertical nozzle bank 84.

The stand pipe 202 delivers the low pressure water to a solenoid flow control valve 230 of the Hayes Electro Flow type which connects by a stationary feed conduit or pipe 232 with the horizontal portion 180 of the rinse section 78 at 234 as seen in FIGURE 5.

A feature of the present invention is a spray wax application through the rinse section 78 of the unit 20 during the initial part of the rinse cycling. For this purpose the stand pipe 202 is connected as seen in FIGURE 5 to a second solenoid flow control valve 236 similar to the valve 230 which connects through a suitable injector 238 of the Penberthy No. 4 type and a check valve 240 with the rinse feed conduit 232. The injector connects a needle valve 242 and a suitable plastic hose 243 with a liquid wax coating supply tank on the unit 20 (not shown). With the described arrangement the rinse section 78 may be supplied with rinse water only by keeping the valve 236 closed and the valve 230 open or vice versa when rinse water and wax are desired. Both valves will be closed when no rinse water is required.

It will be understood that the stand pipes 200 and 202 will be connected to stationary sources of supply of detergent solution and water independent of the unit 20 by flexible hoses 244, 246 respectively, of sufficient length to facilitate the back and forth movement of the unit 20. They may for example be carried by an overhead roller track (not shown).

By having the detergent solution source separate from the unit it is possible to provide adequate quantities of heated detergent solution at a constant pressure of 600 p.s.i. to each washing outlet. This high pressure hard hitting cleaning stream delivered to the oscillating banks of nozzles 100 cuts through caked dirt, gummy residues and accumulated grime in seconds. Sticky bugs are also pried loose from the finish and bumpers, grilles and hubcaps are noticeably cleaner than by conventional methods.

The detergent solution is delivered to the nozzles 100 by a piston driven pump 250 delivering about 12 gallons a minute. The pump draws detergent solution from a tank 252 and hot water from a suitably heated tank 254 provided with a constant level of water from a city pressure line 255 under control of a float valve 256. A solenoid controlled valve 258 controls the flow of liquid detergent from the tank 252 and a measuring valve 260 proportions the amount of detergent mixed with the water from tank 254.

The tank 254 is preferably a fully automatic gas fired high volume open vessel type water heater which is directly fed with powdered detergent in measured amounts by a vibrating feed hopper and which heater delivers its output directly to three stage pump 250 which build up the required pressure. A bypass line recirculates any detergent solution not delivered by the pump 250.

A control panel box 270 (FIGURE 2) contains the electrical controls of FIGURE 11, comprising a forward and reversing magnetic starter 272 (Square D Class 8736 type AO4) for the traction motor 46, a relay 274 for the solenoid 276 of the valve 204 controlling the high pressure wash section 76 of the unit and the drive motor 170 for the linkage thereof when a separate motor is used for this purpose, a timing mechanism 278 (Hagen model 74) for controlling the relay 274 and controlling the solenoid 280 of the rinse valve 230 and solenoid 282 of the combined rinse and wax valve 236 to control the cycling and duration of the pressure wash and rinse section, a pneumatic relay 284 (Square D 9050 type Ag–1E) for the reversing starter 272, a relay 286 (Square D 8501 type CO2) controlled by the stop and forward and reversing limit switches 288, 290 (see FIGURE 10) and limit switch 292 (Honeywell Inc. 201 LS1), a relay

294 (Square D 8501 type CO1) associated with the timing means 278, a manually operable switch 296 (Square D 9001 with T51 operator), a further switch 298 and a switch 300 (Honeywell Inc. 206 LS1).

The timing controls function for example to have the power wash section 76 operate for about 1 minute and make 3 passes over the vehicle applying about 10 gallons per minute of detergent solution at a temperature of about 115 to 120 degrees F. and at a pressure of 600 p.s.i. through the oscillating nozzles 100 and to then cause the rinse section 78 to operate for about two minutes more to make 5 more passes (the valve 204 being then closed) delivering clear water at about 50 p.s.i. to the nozzles 188 of the rinse section with the wax being fed to the rinse section during the first minute of the rinse cycle.

FIGURES 7 and 8 show the rail 40 under the leg 30 of the unit 20 provided with a stop switch cam 310 for operating the roller arm 312 of the limit switch 288, a reversing cam (long) 314 adjacent the starting position of the unit for actuating the roller arm 316 of the limit switch 290 and a reversing cam (short) 318 for actuating the second roller arm 320 of the limit switch 290. The cams are located at different positions laterally of the rail 40 so that each operates only one roller arm of the limit switches carried on the frame 24 of the unit. Thus in moving from the right hand position to the left in FIGURE 7 if the roller arm 320 being then engaged with cam 318 will leave this cam and the roller arms 316 and 312 will pass by the cam 318 in that order in this movement. The roller arms 316, 320 will then pass the cam 310 which will act on the roller arm 312 after which the roller arm 320 will pass the cam 314 which will act on the roller arm 316 while the roller arm will have left the cam 310 behind. As seen in FIGURE 8 rubber bumper stops 330 are provided for the unit 20 at each end of the rail 40.

In operation of the apparatus, a vehicle to be washed will be driven astride the rails 72, 74 as in FIGURE 1 and stopped. It will remain in this position during all operation of the apparatus 30. With the pump 30 in operation and recirculating detergent solution back to the tank 254 while the valve 204 is closed, the push button switch 298 (FIGURE 11) on the electrical panel 270 (FIGURE 2) is held in by the operator for about three seconds to start the machine. This permits 110 volt current to flow to the coil of relay 294 and to the motor (not shown) of a three minute timer switch 278. As soon as the timer motor starts it rotates a shaft (not shown) therein which turns one revolution in three minutes. Adjustment cams (not shown) on the shaft operate the three separate switches A, B and C. Switch A holds the circuit to the coil of relay 294 for a maximum of three minutes, closing the circuit to coil of relay 286 which closes its contacts and sends current through reversing switch 300 in switch unit 290 which is operable by arm 320 and cam 318, to the magnetic motor starter 272.

Starter 272 then closes and drive motor 46 operates to propel the unit 20 automatically back and forth on its tracks 40, 44 starting from the left hand position in FIGURES 1 and 7. When the wash spray section 76 is also actuated by the motor 46 the banks of nozzles 100 will also start oscillating due to operation of the crank 66. When the unit 20 reaches the end of the track 40 the roller arm 320 actuates the switch 300 to reverse the direction of the drive motor 46. A time delay is then required in starting in the opposite direction and time delay relay 284 is used for this purpose. At the opposite end the switch 300 is actuated through roller arm 316 by cam 314 to again reverse the motor 46.

At the start of the three minute cycle, switch B on the timer 278, is also actuated by a cam (not shown) set for a period of 1½ minutes. Switch B sends current to the coil of relay 274 which closes its contacts and sends current to solenoid 276 of valve 204 which opens to allow the pump P to deliver hot detergent solution to flow to the nozzles. This circuit also starts the motor 170 to oscillate the bank of nozzles 100 when the wash section 76 is separately driven by this motor.

Thus as the unit 20 starts its travel detergent solution will be delivered to the nozzles 100 of the wash section 76 by the pump P at a pressure of about 600 p.s.i. and the three banks 80, 82, 84 of nozzle 100 will be oscillated to distribute the detergent so that the entire vehicle will be covered and its surface stripped of dirt. The location of the nine nozzles 100 is such as to even clean hard to get at corners and crevices. The application of the high pressure wash continues for about 1½ minutes during which the unit will make three complete passes over the vehicle.

At the end of this time the cam of the switch B on the timer 278 will open this switch and the circuit to relay 274 thus opening its contacts to open circuit the solenoid 276 of valve 204 to close this valve and to stop motor 170 when such is in use. At the same time the circuit through switch C of timer 278 is closed to energize the solenoid 280 of the rinse valve 230 (FIGURE 5) which is connected to the city water line to thus open this valve 230 and bring rinse water to the thirteen stationary nozzles 188 of the rinse section 78, these completely flushing the vehicle with clear rinse water as the unit continues to travel back and forth over the vehicle 70. Switch C of the timer 278 holds the rinse valve 230 open for approximately 22 seconds, which is sufficient time for one pass of the unit 20 over the vehicle. At the end of this time the switch C cam causes this switch to deenergize the solenoid 280 of valve 230 and close the same and immediately energize the solenoid 282 of the rinse-wax induction valve 236 to open this valve and permit city water to continue its flow to the nozzles 188 of the rinse section 78, but with the addition of a wax coating material which is added to the rinse water through the injector 238. After about 22 seconds of operation which is sufficient time for one complete pass of the unit 20 over the vehicle the cam of switch C causes it to deenergize the solenoid 282 to close the rinse-wax valve 236 and reenergize the solenoid 280 to reopen rinse valve 230, this valve then staying open until the three minute time runs out on the timer 278 and causing clear water to again be delivered to the nozzles 188 during this remaining time, the wash and rinse operation having now covered eight complete passes during the three minute cycle.

At the conclusion of the time cycle the solenoid 280 is deenergized to close rinse valve 230 and the contacts on the relay 294 are opened. The drive motor 46 continues to run through a circuit supplied by the stop switch 292 located in switch unit 288 which is normally closed. As the unit 20 approaches its starting position the switch 292 is opened by operation of the switch roller arm 312 which comes in contact with the cam 310. This action breaks the circuit to the drive motor 46 starter 272 and the unit comes to a stop at the original starting point.

From the foregoing description it will be evident that a novel and efficient washing apparatus has been provided that utilizes a minimum of mechanism and time to clean a vehicle. It will be understood that various changes and modifications will suggest themselves to those skilled in the art without departing from the spirit and intent of the invention. All such changes, modifications and equivalent construction and operations as may come within the scope of the appended claims are therefore contemplated.

We claim:

1. In the process of washing a vehicle the steps comprising directing a plurality of streams of heated detergent solution at relatively high pressure against the sides and top surfaces of the vehicle while effecting relative movement between said streams and vehicle longitudinally of the latter, each of said streams having a fixed direction generally normal to a plane generally paralleling the side or top of the vehicle containing the surface against which it is directed, during said relative movement substantially

simultaneously moving certain of said fixed streams in a bank up and down relative to the sides of the vehicle and other of said streams in a bank back and forth transversely across the longitudinal top surface of the vehicle; said streams in each bank being of generally fan-like section, and certain of said fan-like streams during said movement in a bank impinging on a vehicle side or top surface portion also treated by an adjacent fan-like stream in the same bank so as to effect an overlap of the said surface portion treated by adjacent streams, and the apparent points of intersection of said fan-like streams in effecting said overlap generally defining a substantially vertical plane.

2. The process as claimed in claim 1 including the step of automatically controlling said relative movement to effect a plurality of complete passes between said streams and vehicle and automatically controlling the duration and number of said passes.

3. The process as claimed in claim 2 comprising applying said detergent solution streams at a pressure in the order of about 600 p.s.i. and said rinse liquid streams at a pressure in the order of about 50 p.s.i.

4. The process as claimed in claim 1 including the step of subsequently directing a plurality of further streams comprising rinse liquid against the side and top surfaces of the vehicle while effecting relative movement between said streams and vehicle longitudinally of the latter.

5. The process as claimed in claim 4, including the step of automatically controlling said relative movement to effect a plurality of complete passes between said detergent solution streams and said vehicle and a plurality of complete passes between said rinse liquid streams and said vehicle.

6. The process as claimed in claim 4 comprising subjecting the vehicle a plurality of times to treatment by detergent solution streams and a plurality of times to treatment by rinse liquid streams.

7. The process as claimed in claim 6 including the step of injecting liquid wax coating composition into said rinse liquid before directing the same against the vehicle during at least a part of said rinse application.

8. In the process of washing a vehicle the steps comprising substantially simultaneously moving and directing a plurality of streams of heated detergent solution at high pressure back and forth over the lengthwise side and top surfaces of said vehicle to make a plurality of passes over said vehicle to clean the same, during said movement moving certain of said streams up and down relative to the sides of said vehicle and other streams back and forth transversely of the longitudinal top surface of said vehicle, and then moving and directing a plurality of further streams comprising rinse liquid back and forth over the lengthwise side and top surfaces of said vehicle to make a plurality of passes over said vehicle to rinse the same; each of said detergent streams being of generally fan-like section and having their trajectories fixed in direction, and adjacent fixed fan-like detergent streams in each of said up and down and back and forth movements overlapping at the vehicle side or top surface, and the apparent points of intersection of said overlapping fan-like streams generally defining a substantially vertical plane.

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