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3,461,889

APPARATUS FOR WASHING RAILWAY BOXCAR INTERIORS

Filed May 23, 1967

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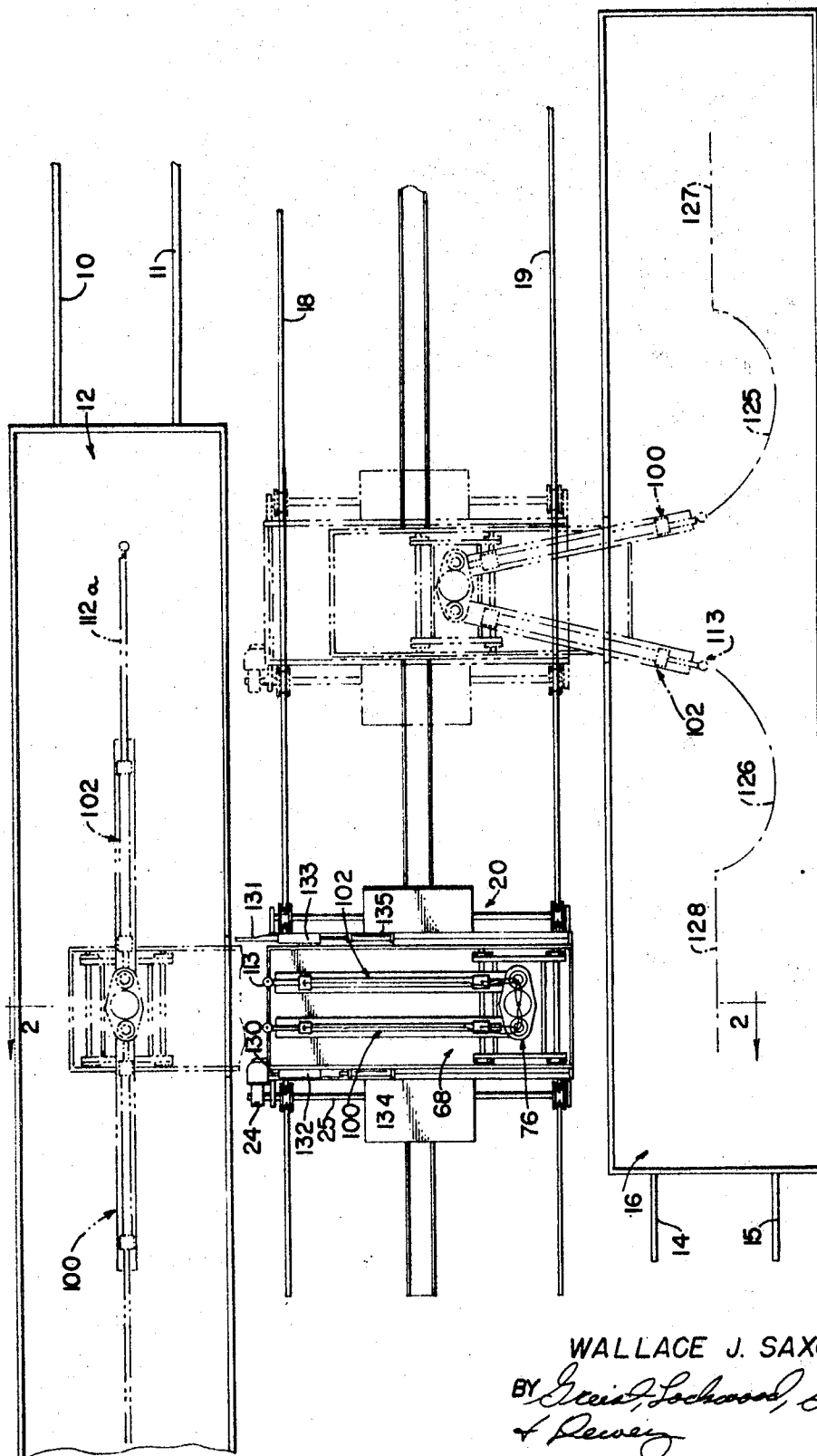


Fig. 1

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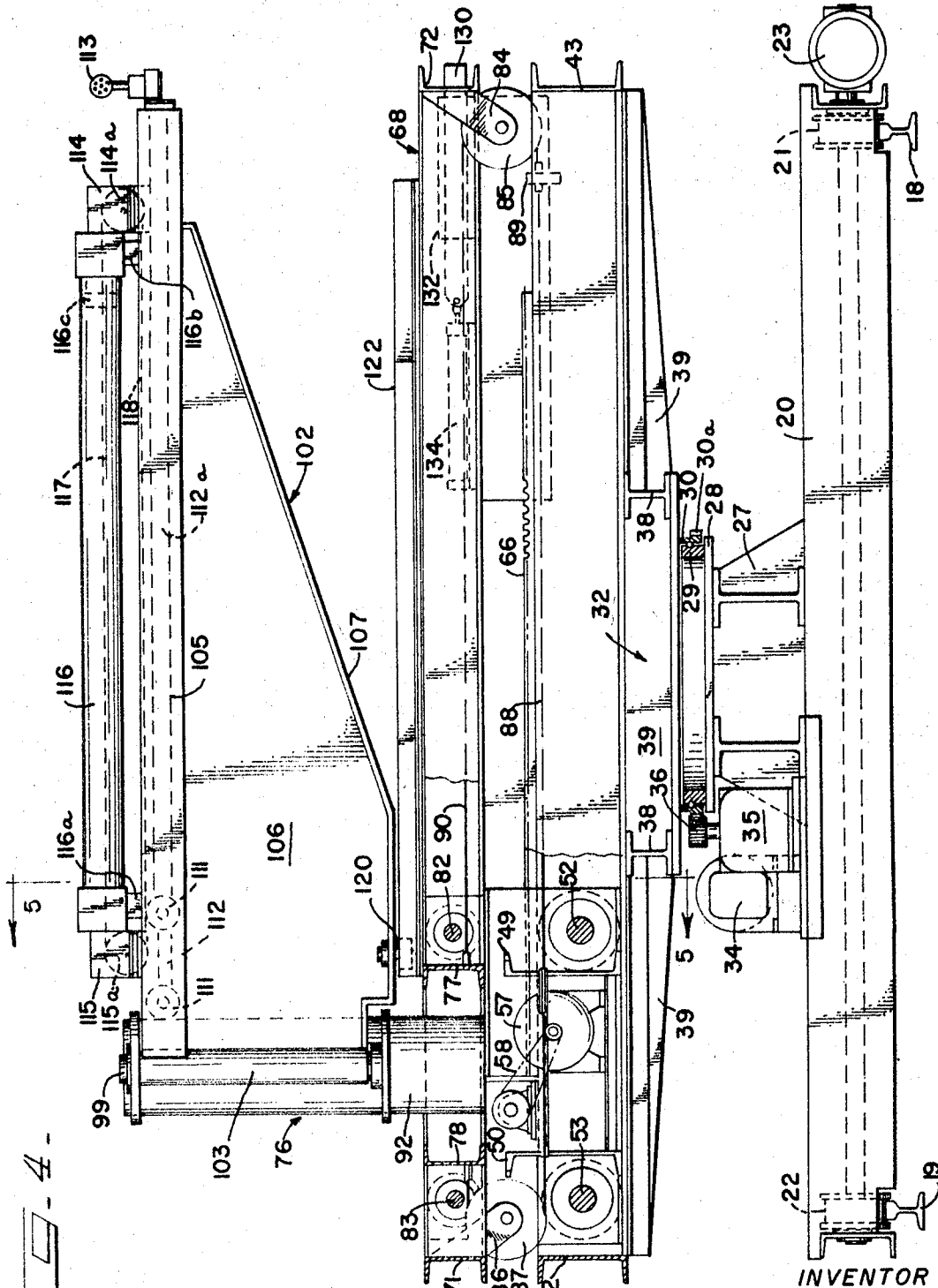
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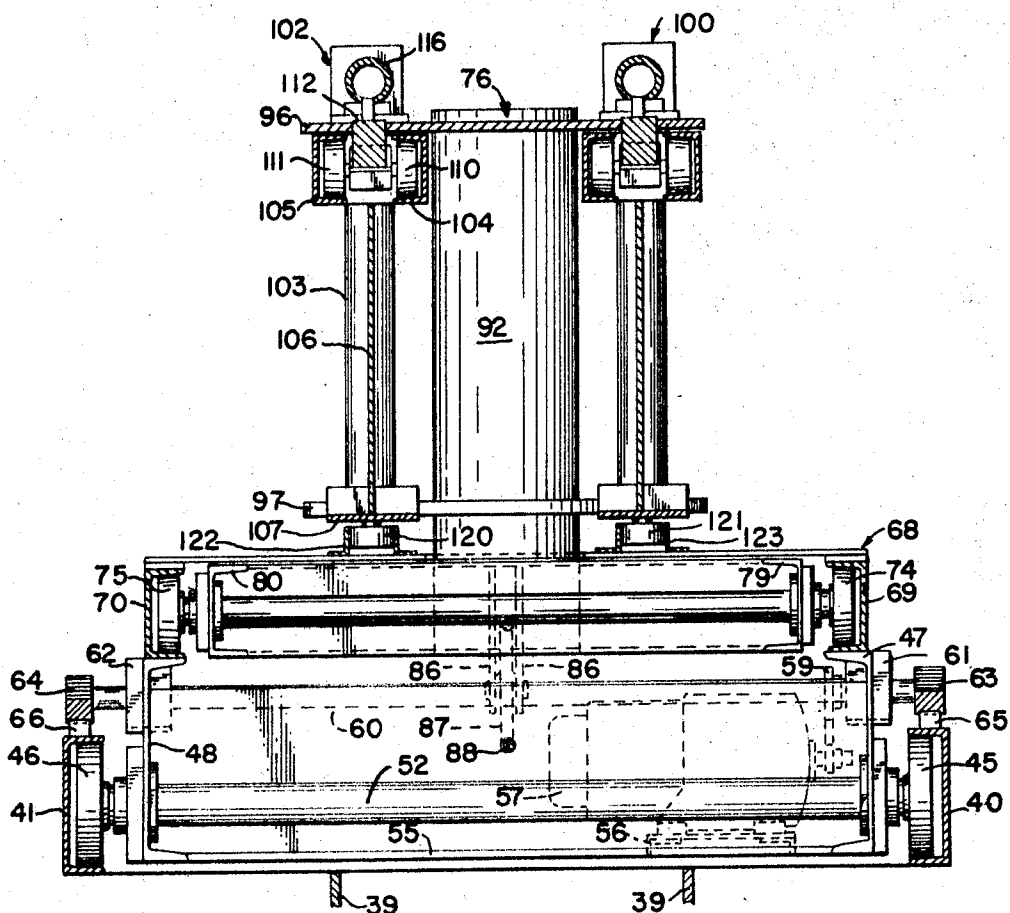


FIG. 5

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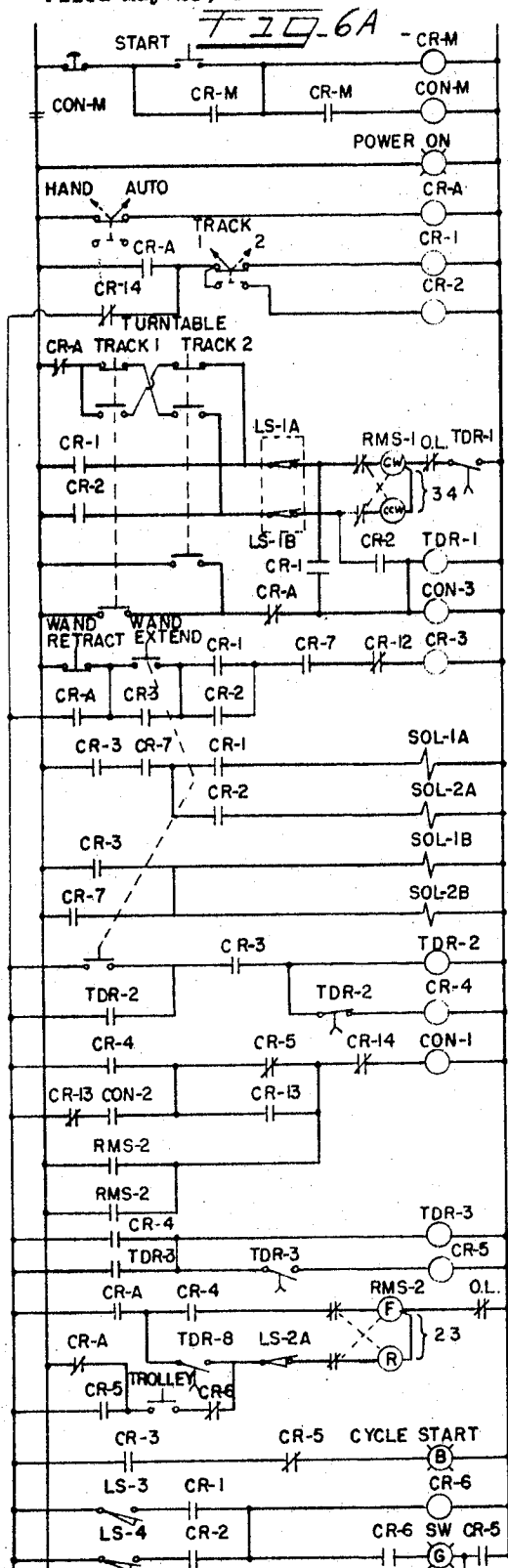
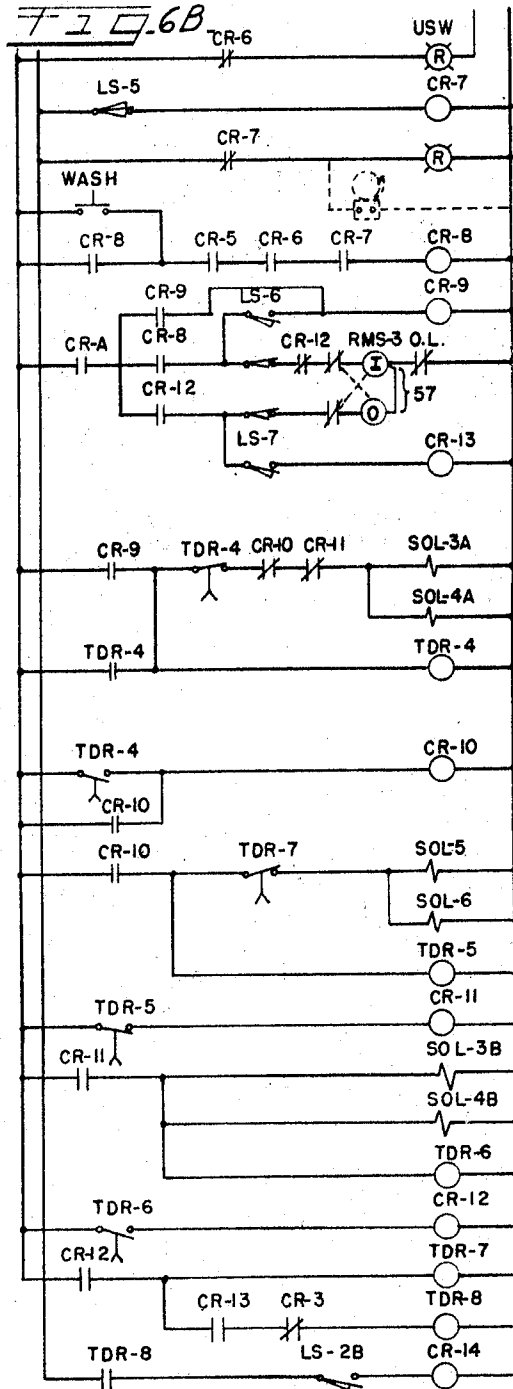
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APPARATUS FOR WASHING RAILWAY BOXCAR INTERIORS

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11 Claims

ABSTRACT OF THE DISCLOSURE

The apparatus includes a trolley mounted for movement between two track sections. The trolley supports a base for rotation about a vertical axis. This base mounts a platform for reciprocal movement relative thereto. The trolley and base are positioned such that one end of the platform is extended into the boxcar through the open side door thereof. A carriage is mounted on the platform for reciprocal movement relative thereto along a path parallel with the direction of movement of the platform relative to the base. The carriage mounts a pair of booms for endwise movement into the boxcar through the open side door thereof along with movement of the carriage. Cam means causes spreading of the booms during movement of the carriage into the boxcar such that when the carriage is fully inserted the booms are extended oppositely of each other in general alignment with the longitudinal centerline of the car. Each boom carries an extension mounting a nozzle on the end thereof.

OBJECTS OF THE INVENTION

A primary object of the present invention is the provision of an apparatus for washing the interior of a railway boxcar in an expeditious manner.

Another object is to provide a pair of nozzles each adapted to spray a washing liquid on the ceiling, floor and walls of a railway boxcar and to provide mechanism for inserting such nozzles therefrom such that the entire interior of the car is washed.

Still another object of the present invention is the provision of a washing apparatus of the type described adapted alternately to wash cars on two adjacent track sections.

Another object of the present invention is the provision of a washing apparatus of the type described including a platform movably mounted by a base, a carriage movably mounted with respect to the platform and carrying a pair of booms having cams engaged with cam followers on the platform for spreading the booms upon entry of the carriage into the car through the open side door thereof, such booms mounting nozzles for spraying the interior surfaces of the car.

Still another object of the present invention is the provision of a washing apparatus of the type described which is adapted for semiautomatic operation.

A further object is to provide a washing apparatus of the type under consideration which includes sensing means insertable in the open side door of a boxcar, wherein such sensing means prevents operation of the washing apparatus unless the former is contacted by a side edge of the door opening.

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These and other objects and advantages of the invention will become apparent from the following specification disclosing a preferred embodiment in the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the apparatus of this invention showing the same in a typical installation for washing the interiors of boxcars arranged on two sections of parallel track;

FIG. 2 is an enlarged section taken along the line 2—2 of FIG. 1;

FIG. 3 is a section taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged section similar to FIG. 2 and having certain parts broken away for better illustration of the carriage and platform mounting means;

FIG. 5 is a section taken along the line 5—5 of FIG. 4;

FIGS. 6A and 6B together constitute a schematic diagram of the electrical system for achieving semi-automatic operation of the car washing apparatus, it being understood that FIG. 6B is a continuation of FIG. 6A. In these figures the spaced parallel lines represent normally open switches, the spaced parallel lines with an oblique line thereacross represent normally closed switches, and the circles represent relays, except as noted.

DESCRIPTION OF THE INVENTION

Referring now primarily to FIG. 1, a track section consisting of rails 10 and 11 supports one or more railway boxcars 12. A parallel track section including rails 14 and 15 supports one or more railway boxcars 16. It will be understood that such boxcars are of the type having closed tops and having side doors on both sides intermediate the ends of the car. As such boxcars are well known and are in widespread use at the present time, they need not be and will not be described in detail herein.

A length of special track including rails 18 and 19 is mounted between the aforementioned track sections in parallel relation with the same. A mobile support or trolley 20 (FIG. 2) includes pairs of rail wheels 21 and 22 in rolling engagement with the rails 18 and 19, respectively, thereby mounting the trolley for movement in either direction along these rails. The trolley is preferably self-powered and includes a reversible electric motor 23 suitably mounted at one end of the trolley and engaged with a gear box 24 for driving axle 25 which mounts a pair of the rail wheels 21, 22.

Centrally disposed on the trolley 20 is a framework 27 mounting a circular plate 28 in a horizontally disposed manner. Plate 28 supports a ring member 29 rotatably supporting another ring member 30 by means of a suitable ball-bearing structure, which bearing structure is also adapted to carry vertical loads thereby rotatably supporting the base 32 of the washing apparatus. Ring 30, which is connected to the base 32, includes an annular series of gear teeth 30a. The trolley 20 mounts a reversible electric motor 34 powering a gear box 35 having an upwardly extending shaft carrying a gear 36 in meshing engagement with the teeth 30a thereby to rotate the base 32 with respect to the trolley 20 about a vertical axis.

The base 32 includes an understructure consisting of cross I-beams 38 and web plates 39 mounting a horizontally disposed, horizontal framework consisting of side channels 40, 41 and end channels 42, 43.

As noted in FIGS. 4 and 5, the inwardly extending flanges of the channels 40, 41 serve as guideways for pairs of rollers 45, 46, which rollers mount a dolly consisting of short side channels 47, 48, cross channels 49, 50, all connected together as a unit along with appropriate reinforcing web plates. The channels 47, 48 mount axles 52, 53 supporting the rollers 45, 46.

The aforementioned dolly consisting primarily of the channels 47-50 includes a floor plate 55 mounting a bracket 56 which in turn supports an electric motor 57. The motor 57 drives a chain 58 which in turn drives a gear 59 mounted on a cross-shaft 60, opposite ends of this shaft being journaled in assemblies 61, 62 mounted in apertures in respective channels 47, 48. This cross-shaft mounts gear 63, 64 on its respective opposite ends, which gears are in meshing engagement with respective racks 65, 66 mounted on the top flanges of channels 40, 41, respectively. It will be apparent that energization of the motor 57, which is of the reversible type, will produce movement of the dolly in either direction lengthwise of the base 32 depending on the direction of rotation of the motor.

A horizontally disposed, rectangular platform, generally designated 68, consists of side channels 69, 70, end channels 71, 72 and is cantilever mounted from the aforesaid dolly consisting of the channels 47-50. In other words, the platform 68 is supported by the dolly and is moved lengthwise of the base 32 upon energizing of the motor 57. Referring to FIG. 2, it will be understood that the platform 68 is movable relative to the base 32 back and forth between the solid and broken line positions shown.

The inwardly extending flanges of channels 69, 70 of the platform 68 serve as guideways mounting first and second pairs of rollers 74, 75 which in turn mount a carriage generally designated 76. This carriage includes a square base consisting of cross channels 77, 78 and side channels 79, 80, the latter including appropriate journals supporting axles 82, 83 on which the rollers 74, 75 are mounted. It will be appreciated that the carriage 76 is mounted for reciprocal movement relative to the platform 68 by rolling engagement of the rollers 74, 75 in respective channels 69, 70 of the platform.

Platform 68 mounts a pair of bracket plates 84 at one end thereof; these plates mount a sheave 85. The other end of the platform mounts a corresponding pair of bracket plates 86 supporting therebetween another sheave 87. A first cable 88 has one end thereof connected to the carriage, by means of a suitable member mounted to cross channel 78, and the other end thereof fixed to a plate 89 which is fixed to the base 32. Another cable 90 has one of its ends connected to the bracket plate 89 and the other of its ends connected to the carriage at the cross channel 77 thereof. The cable 88 is trained around the sheave 87, and the cable 90 is trained around the sheave 85. It should be apparent that upon movement of the platform 68 relative to the base 32, this cable and sheave arrangement will cause movement of the carriage 76 relative to the platform 68. Or in other words, the carriage 76 moves relative to the base 32 an amount which is twice the movement of the platform 68 relative to the base 32.

The carriage 76 includes a centrally disposed mast 92. The platform 68 includes a deck plate 93 having a central, longitudinally extending cutout 93a to accommodate the mast 92 during movement of the carriage relative to the platform. The mast 92 mounts horizontally disposed, upper and lower wing plates 96, 97 which in turn mount a pair of spaced, vertically extending pivot pins 98, 99. The pivot pins 98, 99 support a pair of boom assemblies, generally designated 100, 102. As these boom assemblies are of identical construction, only one such assembly, namely boom assembly 102, will be described in detail.

Referring now to FIGS. 4 and 5, the boom assembly 102 includes a tubular support member 103 journaled on

the pin 99. The tubular member 103 mounts a pair of channels 104, 105 mounted in parallel spaced relation by suitable supporting structure. The channels 104, 105 are braced or mounted in a cantilever fashion from the tube 103 by a web plate 106 which includes a bottom flange plate 107. Channels 104, 105 have inwardly extending flanges which serve as guideways mounting pairs of rollers 110, 111 supporting a dolly 112 which mounts, in the manner of a cantilever, a boom extension arm 112a; this arm carries a nozzle assembly 113 on the outer end thereof.

A pair of spaced parallel bracket plates 114 are mounted to the extension arm 112a adjacent the outer end thereof; these bracket plates support a sheave 114a. A similar pair of bracket plates 115 are supported from the channels 104, 105 and mount a sheave 115a. A pneumatic cylinder 116 is mounted on the upper surfaces of the channels 104, 105 as by means of brackets 116a, 116b. This cylinder includes a piston 116c. A cable 117 is connected to one face of the piston, trained around the sheave 115a and connected to the dolly 112. Another cable 118 is connected to the other face of the piston 116c, trained around the sheave 114a, and also connected to the dolly 112. It should be apparent that air admitted to the cylinder 116 adjacent the end thereof supported by the bracket plates 116b will result in movement of the piston 116c from right to left (FIG. 4) for extending the arm 112a. This arm is of course retracted by admitting air to the other end of the pneumatic cylinder 116.

Boom assemblies 100, 102 mount cam rollers 120, 121 from their lower flanges. These cam rollers are received in respective cam tracks 122, 123 (FIG. 3) of identical, but opposite hand construction, and which are symmetrical with respect to the longitudinal centerline of the platform 68. When the carriage is in the position illustrated in FIGS. 2 through 4, the cam rollers 120 and 121 are disposed in their respective cam tracks in the positions illustrated in FIG. 3. When the carriage 76 is fully extended relative to the platform 68, i.e., to the broken line position shown in FIG. 2, the cam rollers occupy the positions indicated as 120', 121' in FIG. 3. This movement of the cam followers in the cam tracks causes movement of the boom assemblies 100, 102 from their parallel position shown in solid lines in FIG. 1 to the oppositely extending, coaxial positions shown in phantom lines in the upper portion of that figure. During this expanding or spreading movement of the boom assemblies, the nozzles 113 follow the curved paths indicated by phantom lines 125, 126. Actuation of the cylinders 116, after the boom assemblies have arrived at their oppositely extending relationship, causes movement of the nozzles 113 along the phantom lines designated 127, 128, which lines are generally collinear with the longitudinal centerline of the boxcar to be washed. It will be understood that the nozzles follow the same paths during withdrawal of the apparatus from the boxcar as will be explained hereinbelow.

For purposes to be explained hereinbelow, the platform 68 mounts sensing means on both sides of the end thereof which extends into the boxcar through the open side door thereof. Referring to FIGS. 2 and 4, a pair of sensing arms or wands 130, 131 are reciprocally mounted in respective supports 132, 133. Pneumatic cylinders 134, 135 mounted on the platform 68 have their piston rods connected to respective wands 130, 131 for reciprocating the latter between a first position clear of the car and a second position extending into the car through the open side door thereof.

Returning momentarily to FIG. 1, it will be understood that the boxcars on the track section including rails 10 and 11, hereinafter referred to as track No. 1, are preferably moved or progressed by a suitable mechanism which may be a cable driven robot of the axle-engaging type. Assume that car progression on track 1 is from left to right. Assume further that the boxcars on the track sec-

tion including rails 14 and 15, hereinafter referred to as track No. 2, are progressed from right to left by similar or identical car handling equipment. It will also be understood that the washing apparatus of this invention and all systems thereof are controlled from an operator's console (not shown) preferably located adjacent one end of the track defined by the rails 18 and 19. The washing apparatus may be used in the following manner.

If it is desired to wash car 12 on track section 1, the washing apparatus will be positioned near the left end of its supporting length of track with the base positioned for inserting the booms in the open side door of the car 12. As the car 12 passes the washing apparatus moving from left to right to the appropriate location for washing, the operator extends the sensing wand 130 into the open door whereby the trailing edge of the door will contact the sensing wand 130 and move the car washing apparatus along with the car 12 until both come to a stop, whereupon the washing apparatus will automatically go through a cycle of operation as will be explained with reference to FIGS. 6A and 6B illustrating schematically an electrical system for operating the various components of the washing apparatus.

Referring to the upper portion of FIG. 6A, the operator first closes the "START" switch thereby energizing relay CR-M for closing the switches of like identification. Relay COM-M will then be energized closing the same identified switch in the main line thereby illuminating the "POWER ON" light. As automatic operation is desired, the "HAND-AUTO" switch will be placed in the "AUTO" position for energizing relay CR-A and thereby actuating the switches of like identification, i.e., closing the normally open switches and opening the normally closed switches. The track selector switch will be in the "TRACK 1" position as the car 12 to be washed is located on that track section. This results in energizing of relay CR-1 for closing the switches of like identification.

At this time, it should be mentioned that the base 32 is mounted on the trolley 20 for movement through 180° in a counterclockwise direction from the solid line position shown in FIG. 1 to the broken line position shown in that figure. If the base is in the position shown in FIG. 1, the limit switch LS-1A will be open in which case the motor 34 will not be energized. However, had the base not been in the position just explained, the switch LS-1A would have been closed and the clockwise windings of the motor 34 would have been energized for energizing time delay relay TDR-1 and relay CON-3. Energizing of this last mentioned relay causes energizing of a locking solenoid (not shown) for releasing a lock pin (also not shown) to permit rotation of the base on the trolley 20. After a short time delay, the switch TDR-1 will close thereby energizing the clockwise windings of the motor 34 for rotating the base in a clockwise direction until the limit switch LS-1A is opened. When the base is properly positioned, the aforementioned locking solenoid is automatically reset.

As the open side door of the boxcar 12 passes the washing apparatus, the operator closes the "WAND EXTEND" switch, resulting in energizing of relay CR-3 and actuation of the switches of like identification. (CR-7 will be closed as its controlling relay of like identification [FIG. 6B] is energized so long as the forward limit switch for the trolley LS-5 is closed. It will be understood that this limit switch is positioned near the right end of the track consisting of the rails 18 and 19.) It will be apparent that solenoid SOL-1A will be energized. This causes admission of air to the cylinder 134 for extending the sensing wand 130. It will also be apparent that at the same instant the time delay relay TDR-2 will be energized and start timing. Relay CR-4 is simultaneously energized as switch TDR-2 is normally in the closed position. The "CYCLE START" light (FIG. 6A) will also be illuminated at this time. Energizing of the relay CR-4 causes simultaneous energizing of the relay CON-1 and the forward windings

on the trolley motor 23. Energizing of the relay CON-1 causes release of a trolley brake (not shown). Therefore, as the sensing wand 130 is extended, the trolley brake is released and the trolley motor energized for initiating movement of the washing apparatus along with movement of the boxcar 12.

Before the car and the washing apparatus come to a stop, the time delay relay TDR-2 causes opening of the switch of the like identification thereby de-energizing the relay CR-4. This will de-energize the trolley motor 23. However, the washing apparatus will not stop as it will be drug along with the car 12 by reason of the engagement between the sensing wand 130 and the trailing edge of the open car door. It will be apparent that de-energizing of relay CR-4 does not cause de-energizing of the trolley brake relay CON-1. When the car 12 and washing apparatus come to a halt, time delay relay TDR-3 times out causing closing of the switches of like identification thereby causing energizing of relay CR-5. This cause actuation of the switches of like identification. Therefore, relay CON-1 is de-energized which causes setting of the trolley brake. The "CYCLE START" light will be turned off upon energizing of the relay CR-5.

The sensing wands 130 and 131 carry respective switches LS-3 and LS-4 adapted for engagement by edges of the side door opening in the railway car. If the washing apparatus is properly positioned with respect to the open side door of the car, the limit switch on the extended sensing wand will be closed. In the illustration under consideration, if the washing apparatus is properly aligned with the open side door of the boxcar 12, the switch LS-3 will be closed thereby energizing the relay CR-6 actuating the switches of like designation for illuminating the "SAFE TO WASH" light, SW. If the apparatus is not properly positioned, LS-3 will be opened in which case the "UNSAFE TO WASH" light, USW, will be illuminated. In this last mentioned instance, the trolley may be backed up for closing the switch LS-3 by depressing the "TROLLEY" button which will result in energizing of the reverse windings of the motor 23 thereby to back the trolley to its proper position. LS-2A, the trolley reverse limit switch which is located adjacent the left end of the track consisting of the rails 18 and 19, will of course be closed.

Next, the "WASH" button is momentarily pressed resulting in energizing of the CR-8 relay for closing the switches of like identification. The "IN" windings of the motor 57 will be energized for advancing the platform 68 into the car. When the platform reaches its innermost position, it actuates limit switch LS-6 thereby de-energizing the motor 57 and simultaneously energizing the relay CR-9 which in turn causes closing of the switches of like identification.

Energizing of this last mentioned relay results in energization of the solenoids SOL-3A and SOL-4A causing admission of air into the pneumatic cylinders 116 adjacent their outer ends thereby to extend the boom arms 112a. Energizing of the relay CR-9 also causes energization of the time delay relay TDR-4. After a short period of time, the TDR-4 switch shown in the closed position is opened and the other switch of like designation which is shown opened is closed. Opening of the first mentioned TDR-4 switch de-energizes the solenoids SOL-3A and SOL-4A for turning off the supply of air to the cylinders 116—the booms will have been fully extended at this point. Closing of the other TDR-4 switch causes energizing of the relay CR-10 which opens water valves (not shown) for forcing water under pressure out through the nozzles 113 thereby to wash the interior of the car 12.

It will be noted that energizing of the relay CR-10 causes energizing of the time delay relay TDR-5. After a predetermined period of time, this relay will cause closing of the TDR-5 switch thereby energizing the solenoids SOL-3B and SOL-4B for admitting air to the other ends of the cylinders 116 thereby to retract the extended boom

arms 112a. The time delay relay TDR-6 is also energized at this time. After a predetermined period of time, the switch TDR-6 will be closed thereby energizing the relay CR-12 causing a current flow to the "OUT" windings of the motor 57 thereby to retract the platform 68. It will be noted that energizing of the relay CR-12 will cause de-energizing of the relay CR-3 for in turn de-energizing the solenoid SOL-1B, which last mentioned solenoid causes air to be admitted to the cylinder 132 for retracting the sensing wand 130. Therefore, during retraction of the platform 68 from the car, the sensing wand 130 is also retracted relative to the platform 68. After a predetermined period of time, the switch TDR-7 is opened thereby de-energizing the solenoids SOL-5 and SOL-6 for turning off the supply of water to the nozzles 113. When the platform 68 is fully retracted or withdrawn, the limit switches LS-7 are actuated thereby to de-energize the "OUT" windings of the motor 57 and also to energize the relay CR-13. Closing of the switch CR-13 (FIG. 6A) will cause energizing of the relay CON-1 for releasing the trolley brake.

The operator can now operate the washing apparatus for washing the car 16 on track 2, which car is progressing from right to left. Of course, it will be realized the operator has complete control over the washing apparatus and can either wash alternate cars on tracks 1 and 2 as just explained, or wash successive cars on either of the tracks, for example.

While the invention has been shown in but one form, it will be obvious to those skilled in the art it is not to be so limited. On the contrary, the invention is susceptible of various forms and modifications without departing from the spirit and scope of the appended claims.

I claim:

1. An apparatus for washing the interior of a railway boxcar of the type having a side door intermediate the ends of the car, said apparatus comprising, a base mounted adjacent and to one side of a track section supporting a car to be washed, a carriage mounted by said base for reciprocal movement back and forth between the base and a position within said car abeam the open side door thereof, a pair of horizontally disposed booms cantilever mounted at corresponding ends by said carriage for endwise movement into said car through the open side door thereof upon initial movement of said carriage toward said position, said booms also being mounted on said carriage for horizontal swinging movement about said ends thereof, actuating means supported by said base and engaged with said booms for spreading the latter upon continued movement of said carriage toward said position such that said booms extend oppositely of each other generally along the car centerline when said carriage is in said position, a nozzle on the other end of each of said booms and means for supplying a washing liquid to each nozzle.

2. The apparatus according to claim 1 further defined by, an elongated platform mounted on said base for endwise movement relative to the latter back and forth between a first location disposed over the base and clear of the car and a second location wherein one end of the platform extends into the car through the open side door thereof, said carriage being movably mounted on said platform and being adjacent said one end of the latter only when said platform is in its second location and said carriage is in said position thereof, said carriage being adjacent the other end of the platform only when the latter is in its first location, mechanism for moving said platform relative to said base and other mechanism for moving said carriage relative to said platform during movement of the latter relative to said base.

3. The mechanism according to claim 2 wherein said actuating means includes cam tracks on said platform and cam followers on said booms.

4. The apparatus according to claim 2 further defined by, sensing means carried by said platform adjacent said

one end thereof for extending into the open side door of said car for being contacted by one side edge of the door opening, means responsive to said sensing means for preventing operation of said mechanism except when said sensing means is contacted by said side edge.

5. An apparatus for washing the interior of a railway boxcar of the type having a side door intermediate the ends of the car, said apparatus comprising, a base mounted adjacent and to one side of a track section supporting a car to be washed, a platform mounted on said base for movement relative thereto back and forth between a first position wherein the platform is disposed over the base and clear of the car and a second position wherein one end of the platform extends into the car through the open side door thereof, mechanism carried by the base for moving said platform back and forth between said positions, a carriage mounted on said platform for reciprocal movement relative thereto along a path parallel with the path of movement of said platform, other mechanism engaged with said carriage for moving the latter along its said path during movement of said platform relative to said base such that the carriage is disposed adjacent said one end of the platform when the latter is in its second position and said carriage is disposed adjacent the other end of the platform when the latter is in its first position, a pair of horizontally disposed booms cantilever mounted at corresponding ends by said carriage for endwise movement into said car through the open side door thereof upon initial movement of said platform from its first to its second position, said booms also being mounted on said carriage for horizontal swinging movement about said ends thereof, interengaging means on said platform and each boom for spreading the latter upon continued movement of said platform toward its second position such that said booms extend oppositely of each other generally along the car centerline when said carriage is adjacent said one end of the platform, a nozzle on the other end of each of said booms and means for supplying a washing liquid to each nozzle.

6. The apparatus according to claim 5 wherein said interengaging means comprises a pair of cam tracks on said platform and a pair of cam followers on respective booms and engaged with respective cam tracks.

7. The apparatus according to claim 5 further defined by, said booms including extensible members the free ends of which support said nozzles, means for extending the booms during entry thereof into said car such that the extended booms extend for substantially the entire length of the car.

8. The apparatus according to claim 5 further defined by, sensing means carried by said platform adjacent said one end thereof for extending into the open side door of said car for contact by a side edge of the door opening, means responsive to said sensing means for preventing operation of said mechanism except when said sensing means is contacted by said side edge.

9. The apparatus according to claim 5 further defined by, a trolley supporting said base, said trolley including rail wheels and being supported on a length of track extending in parallel adjacent relation with the length of track supporting said car.

10. The apparatus according to claim 9 further defined by, means pivotally mounting said base on said trolley for rotation about a vertical axis.

11. An apparatus for washing the interior of a railway boxcar of the type having a door in one of its sides intermediate the ends of the car, wherein said car is supported on a superelevated track section such that the car is tilted toward said one side thereof, said apparatus comprising, a base mounted adjacent said one side of a boxcar on said track section, a carriage mounted by said base for reciprocal movement back and forth between a first position over the base and clear of the car and a second position within said car abeam the open side door thereof, a pair of horizontally disposed booms cantilever mounted at

corresponding ends thereof by said carriage for endwise movement into said car through the open side door thereof upon initial movement of said carriage toward said position, said booms also being mounted on said carriage for horizontal swinging movement about said ends thereof, actuating means supported by said base and engaged with said booms for spreading the latter upon continued movement of said carriage toward said position such that said booms extend oppositely of each other generally along the car centerline when said carriage is in said position,

a nozzle on the other end of each of said booms and means for supplying a washing liquid to each nozzle.

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DANIEL BLUM, Primary Examiner

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