United States Patent [19]

Bonami

[11] **3,806,979**

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[54] **RAIL CLEANING SYSTEM**

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[73] Assignee: **Swift & Company,** Chicago, Ill.

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[52] **U.S. Cl.** ..... **15/21 R,** 15/21 E, 15/77, 15/312 R

[51] **Int. Cl.** **Eo1h 8/00**

[58] **Field of Search** ..... 15/21 R, 21 E, 77, 88, 15/312 R

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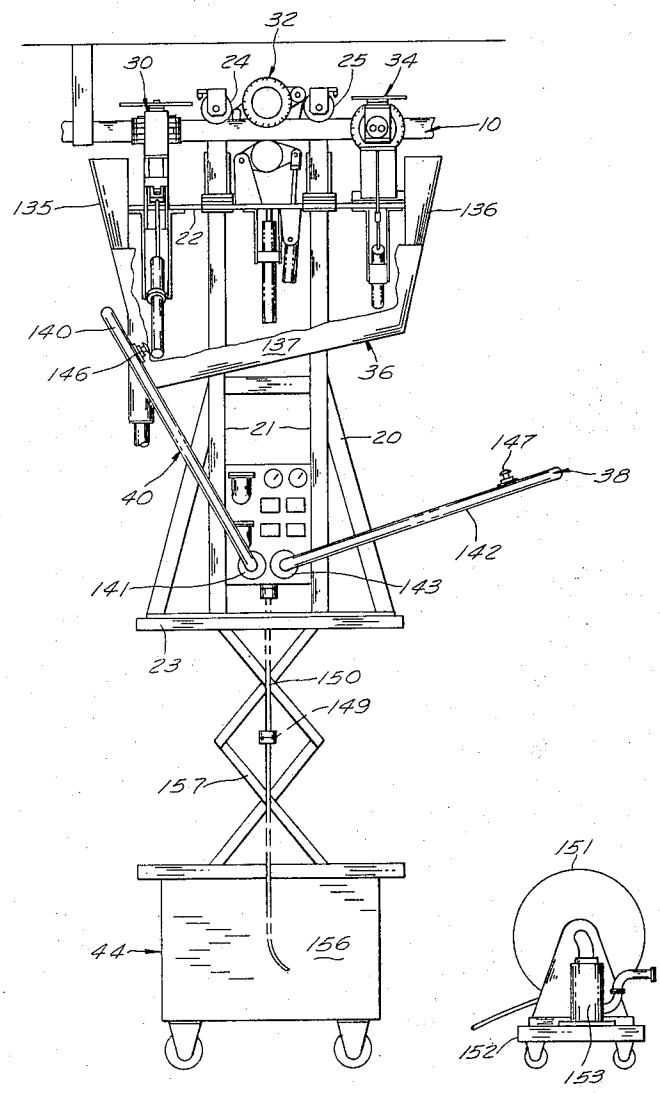
Primary Examiner—Edward L. Roberts

Attorney, Agent, or Firm—Edward T. McCabe; Charles E. Bouton; W. C. Davis

[57] **ABSTRACT**

A self-propelled and reversible apparatus for cleaning all surfaces of an overhead rail system wherein all of the operative brushing elements are movable between positions in contact with the rail and inoperative positions beneath the rail.

10 Claims, 8 Drawing Figures



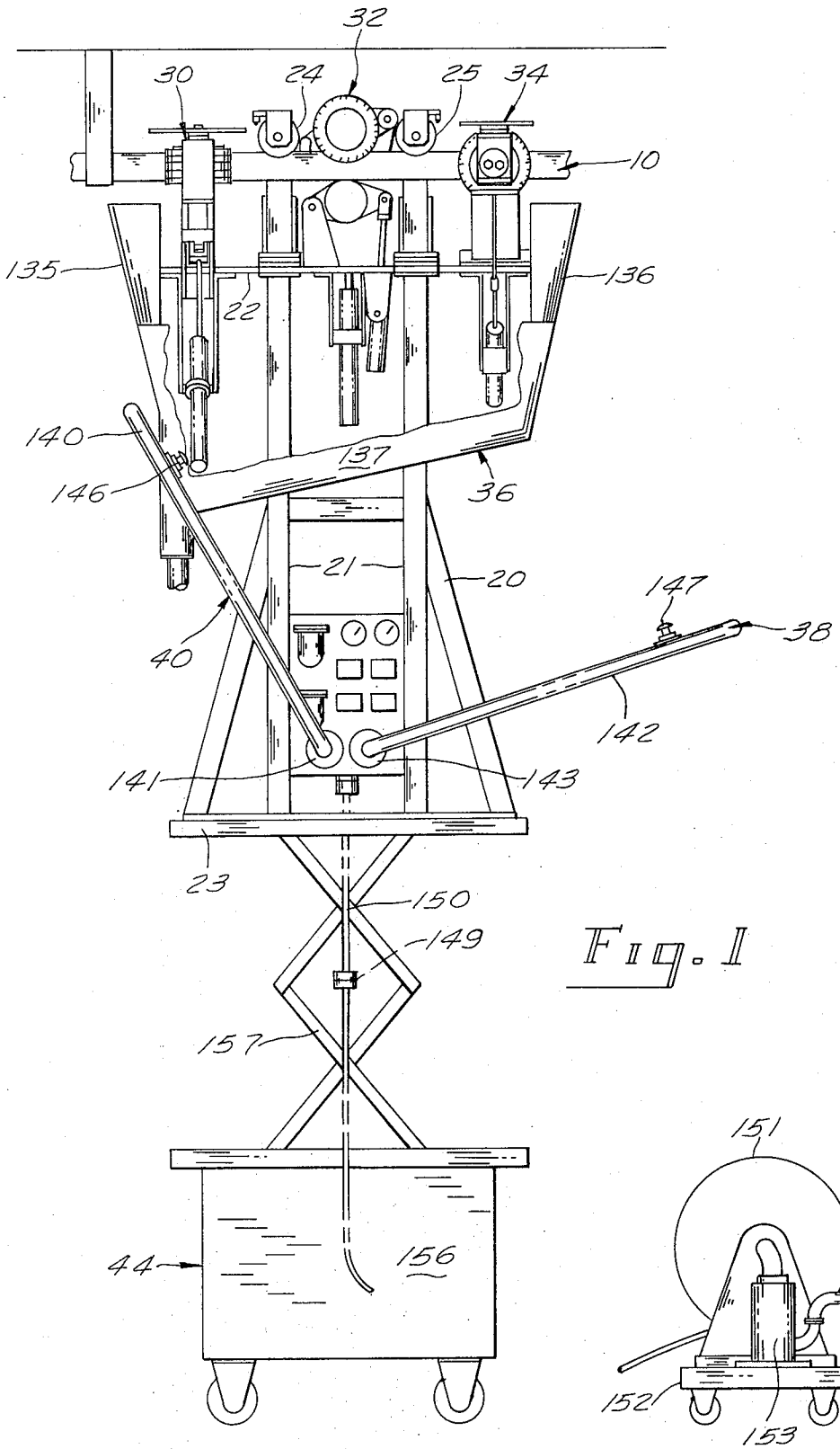

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Fig. 1

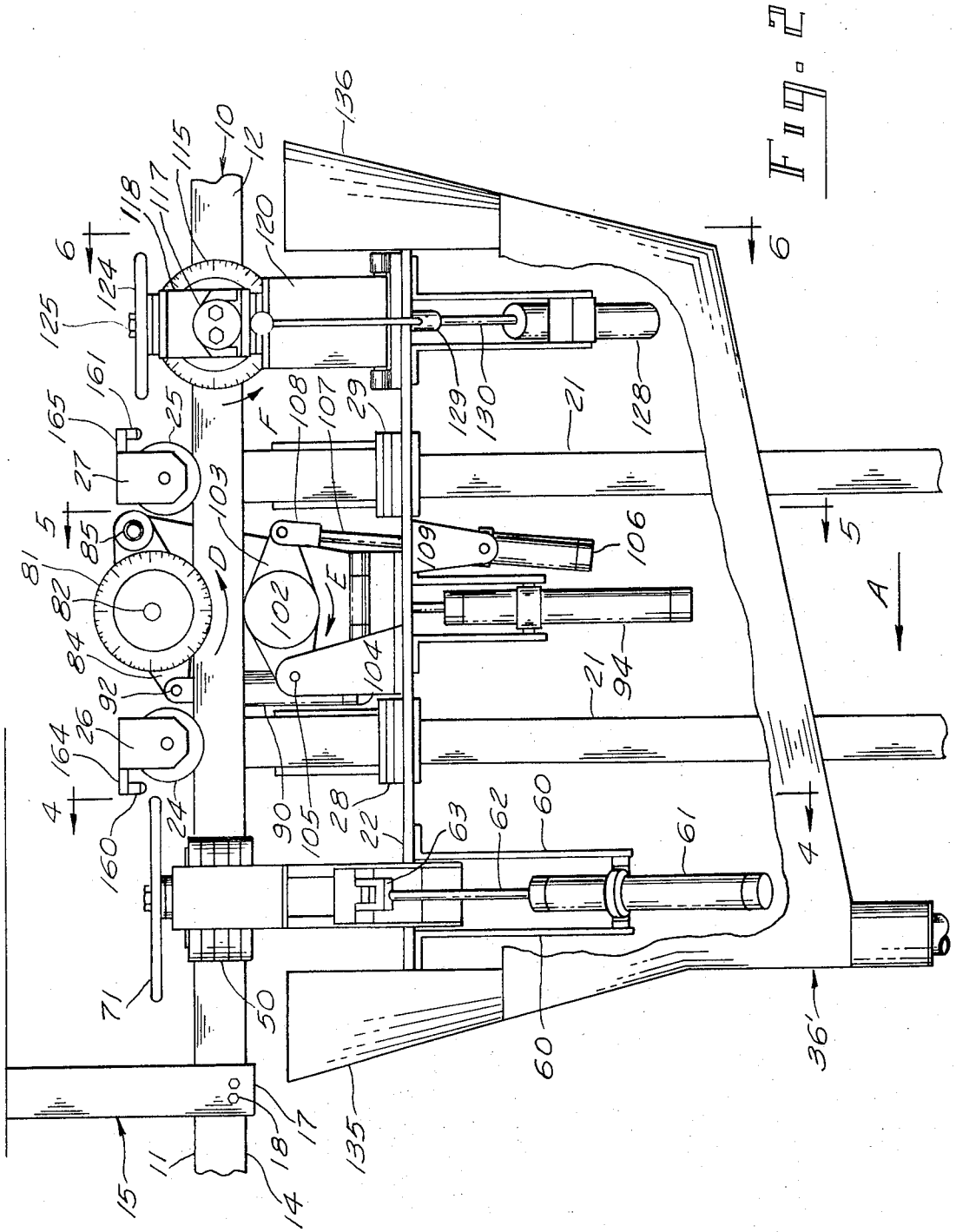

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FIG. 2

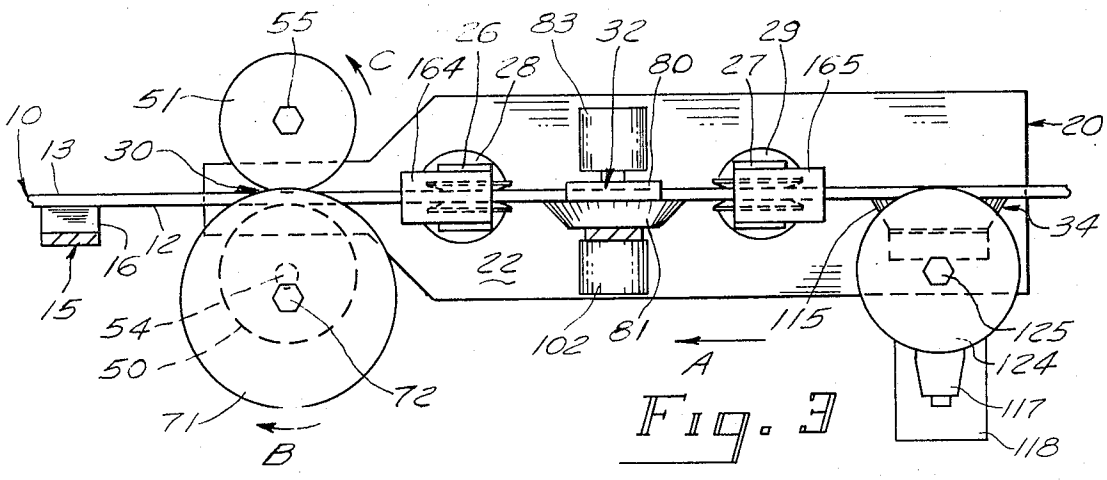

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Fig. 3

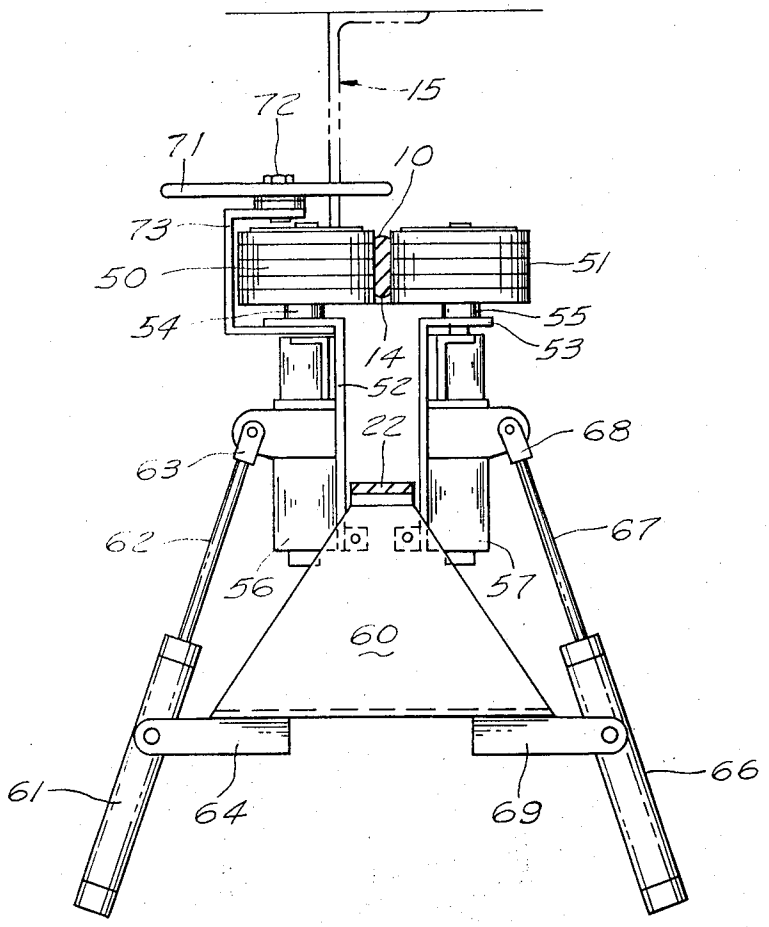

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Fig. 4

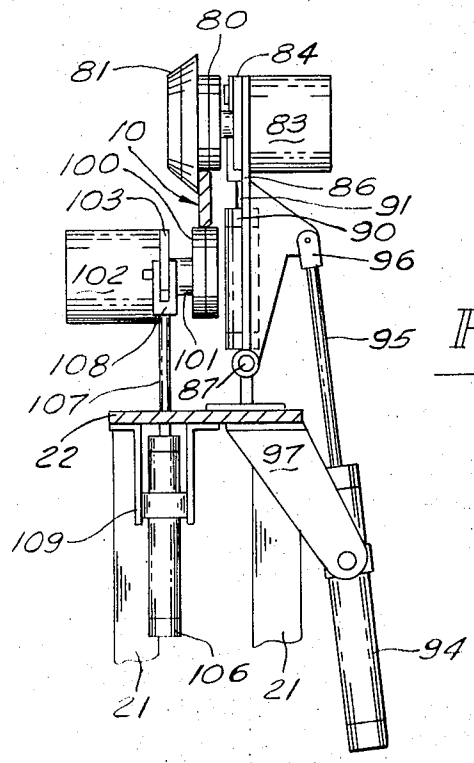

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Fig. 5

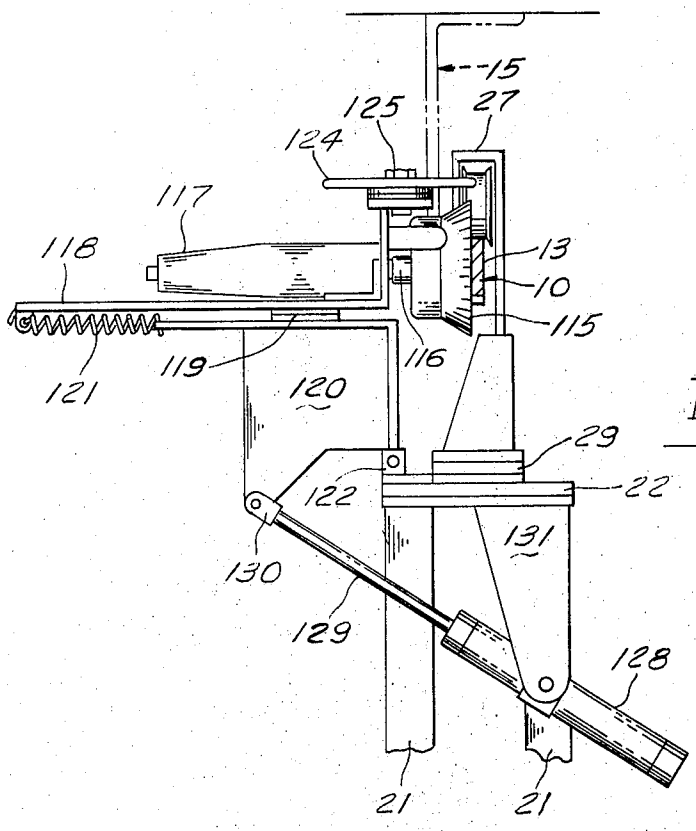

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Fig. 6

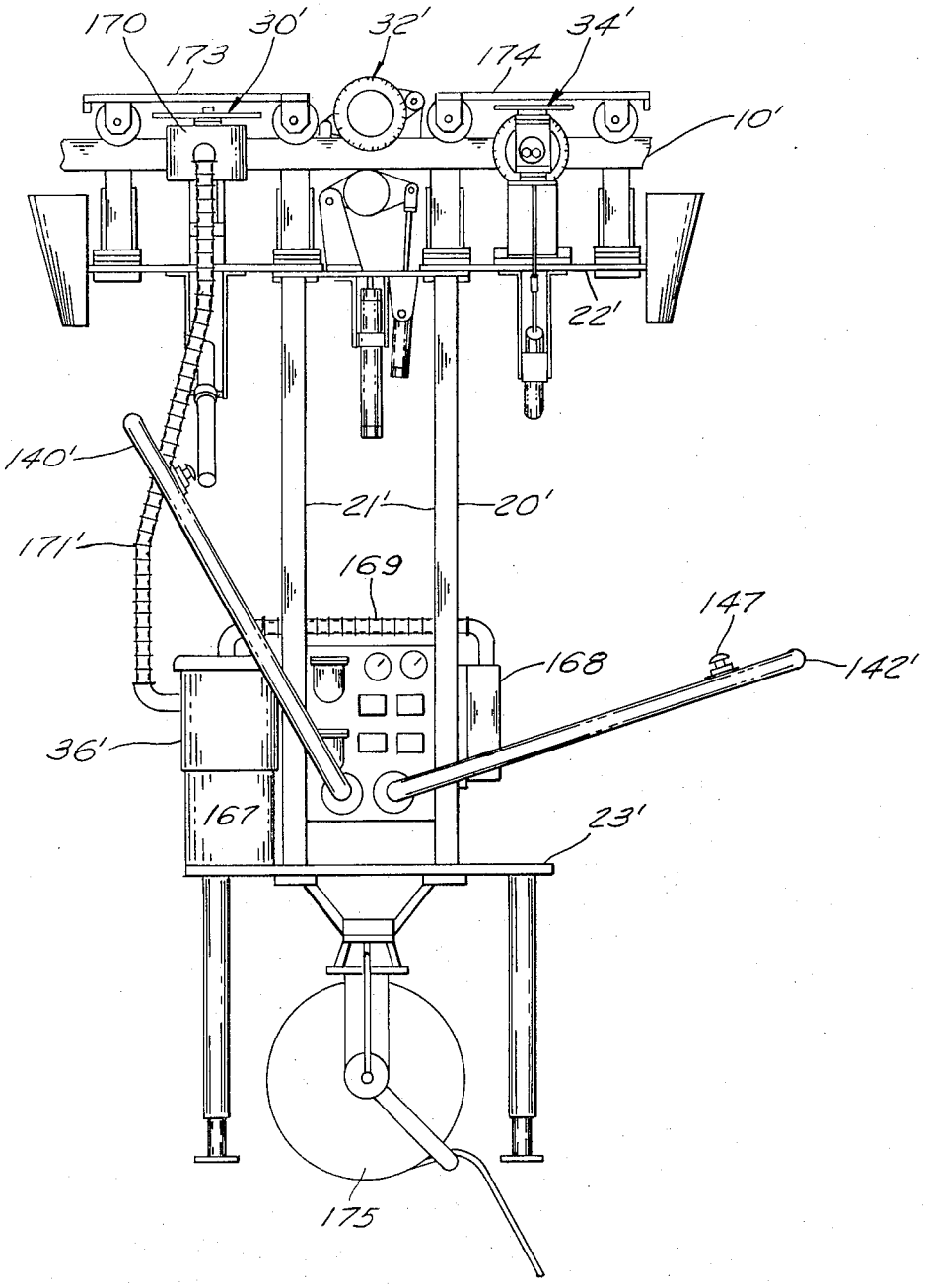

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Fig. 7

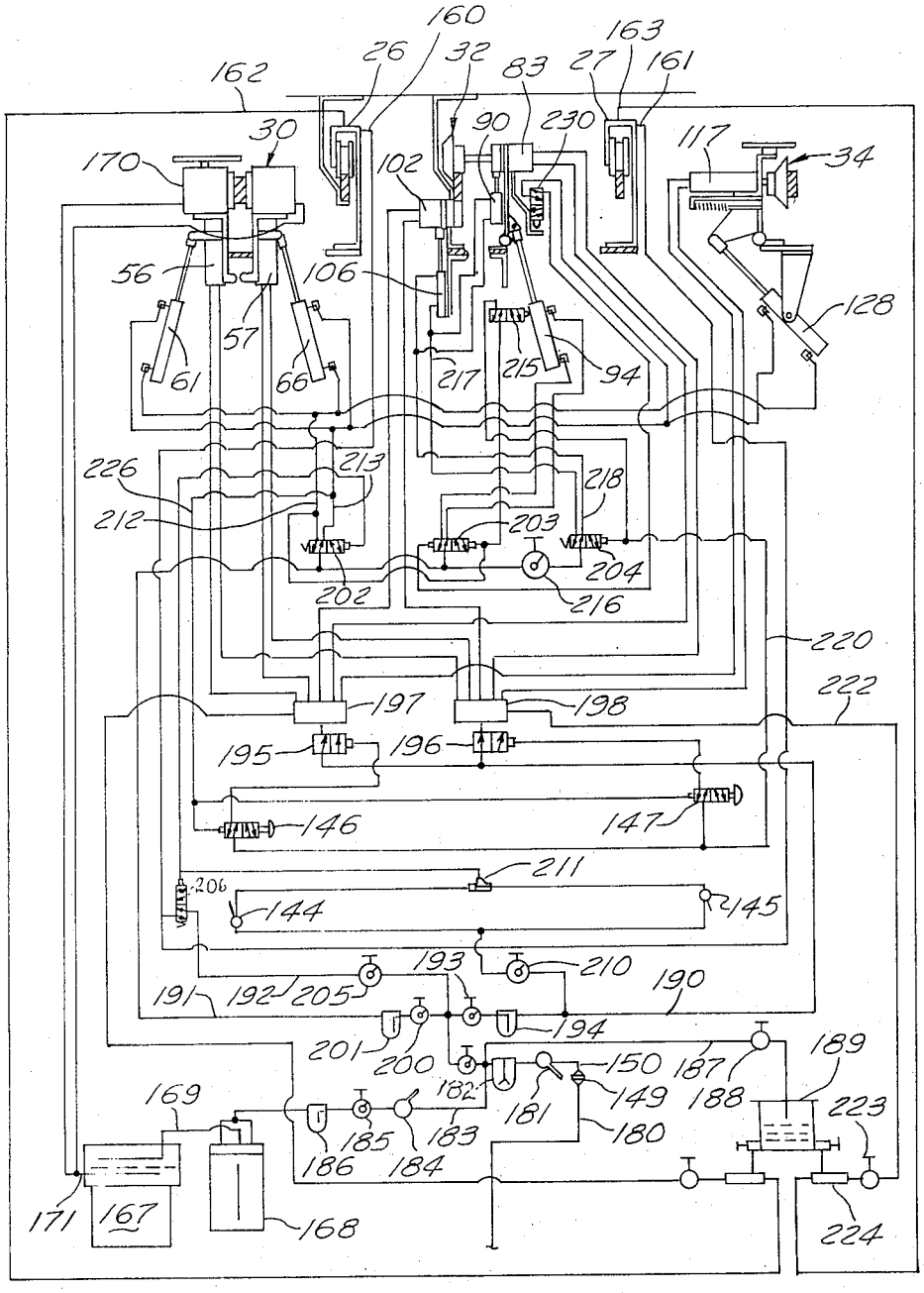

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Fig. 8

RAIL CLEANING SYSTEM

This invention relates to an apparatus for cleaning overhead rails upon which trolleys are moved. More specifically the present invention relates to a self-propelled and reversible apparatus for cleaning all of the surfaces of an overhead rail and the immediately adjacent portions of the hangers supporting the rail.

Many production and/or storage facilities include systems of overhead rails which are utilized to support movable trolleys from which supplies and/or products and the like are carried. Often the system of rails are suspended near the ceiling of the facility at a height that makes them difficult to inspect and service. Indeed, in some facilities the rails may be found at one or more common elevations of 8, 11, and 13 feet above the floor. However, for purpose of plant cleanliness it is necessary to periodically clean dust and debris from the rails. In some installations the rails are subject to corrosive conditions and it is necessary to remove corrosion and/or the agents that may cause such corrosion. The need for these services is accentuated where the materials carried or transported beneath the rails may be adversely affected by debris knocked from and falling from the rails by the trolleys traversing same. Food processing and storage facilities, such as meat packing plants for which the hereinafter described invention was devised, are in particular need for this service.

Also systems of overhead rails may periodically require the application of a lubricant fluid or other preservative material in conjunction with cleaning; and it has been found to effectively clean such rails a variety of techniques may need to be employed. Usually vigorous brushing is sufficient; however, a jet of air or another fluid, possibly containing a cleaning agent, may be required.

Furthermore such rail systems, particlarly where utilized to store material, as in the cooler area of a meat packing plant, often include a layout of a plurality of closely spaced spur rails that are connected at each end by switches to common delivery and discharge rail lines which may be made available for cleaning and servicing one or a few at a time. These rail systems seldom comprise a closed loop or circuit. In such layouts it is important that the servicing apparatus be compact, self-propelled and capable of being supported on the rail itself. However, it is practically impossible to turn equipment that is suspended from the rail from one spur on to another spur. That is to conveniently ride onto another spur the equipment must be either reversible (operate equally well regardless of direction of movement) or it must be manually lifted from the rail and turned 180° and then returned to the rail.

Such rail systems are often also associated with parallel endless conveyors spaced closely above the rails for pushing trolleys therealong. In those installations it is important that the servicing equipment be sufficiently compact so as to not interfere with the endless conveyors, and thus limited to extend not more than about three inches above the rail. Also most rail systems include switches which will not permit servicing equipment to traverse the rail in an operative position. Hence the servicing equipment must also be capable of being adjustable to an inoperative position below the bottom of the rails while still being supported from the rail.

Unfortunately the apparatus heretofore known for servicing overhead rails has been either nonreversible or incapable of effectively cleaning all of the surfaces of the rails and immediately adjacent supports, or the operative parts have not been movable to positions below the rail, or it has been large and cumbersome and not supported directly on the rail itself.

Accordingly it is a principal object of the present invention to provide an improved compact, self-propelled, rail supported apparatus for cleaning and servicing overhead rails.

It is another object of the present invention to provide an improved self-propelled, rail supported apparatus for cleaning and servicing overhead rails that is reversible and capable of efficient performance when operated in either direction on such a rail.

It is yet another object of the present invention to provide an improved overhead rail cleaning apparatus that is reversible in operation, effective to service all surfaces of the rail and immediately adjacent supporting structure, and is adaptable to supply a variety of treatments to the rail.

It is still another object of the present invention to provide an improved overhead rail cleaning apparatus that, while supported on the rail, does not extend more than a few inches above the rail and includes operative elements that are movable to inoperative positions below the bottom of the rail.

Basically the present invention includes a carriage, supported from a pair of trolleys, that carries rotary brushes contactable with both sides, top, and bottom surfaces of the rail, and with the adjacent portion of the supporting hangers. The brushes are reversibly driven independently of one another and are movable from positions beneath and clear of the rail into position where each brush is held against the rail with a force calculated to assist in maintaining the carriage supported thereon and to urge the carriage to move therealong when the brush is rotated. Additionally, the brushes are driven in synchronized direction to provide the force to propel the carriage along the rail. The carriage also may support jet nozzles at opposite ends thereof that may be utilized for directing fluid against the top surface of the rail before or after the major brushing thereof, or both, with respect to the direction of movement of the carriage.

Further objects and advantages will become apparent upon reading the following detailed description of the invention in conjunction with the drawings wherein:

FIG. 1 is an overall side elevation view of a preferred embodiment of the present invention;

FIG. 2 is a partial side elevation of the apparatus shown in FIG. 1;

FIG. 3 is a plan view of the apparatus shown in FIG. 2;

FIG. 4 is a partial section view of the apparatus, taken at lines 4—4 in FIG. 2;

FIG. 5 is a partial section view of the apparatus taken at lines 5—5 in FIG. 2;

FIG. 6 is a partial section view of the apparatus, taken at lines 6—6 in FIG. 2;

FIG. 7 is an overall side elevation of a modified embodiment of the apparatus of the present invention; and

FIG. 8 is a schematic diagram of a pneumatic control circuit for the apparatus.

Referring to FIGS. 1 through 6 it will be seen that the present apparatus is designed to ride upon and clean an overhead rail generally 10 which comprises a metal bar, or the like, having an unobstructed upper surface 11, a hanger side 12, a free side 13, and a bottom surface 14. The rail generally 10 is suspended by a plurality of hangers generally 15 which are normally secured to the ceiling structure and extend downwardly through a curved web 16 to a depending flange 17 to which the rail 10 is secured by bolts 18 or the like.

The preferred apparatus of the present invention comprises a carriage generally 20 having a plurality of vertical members 21 (four vertical members of the embodiment illustrated) which terminate at upper plate 22 and lower plate 23. The carriage generally 20 is suspended from a pair of trolley wheels 24, 25 which ride upon the overhead rail generally 10. Each trolley wheel 24, 25 is journaled in a suspension strap 26, 27 which is fastened to a turntable mounting 28, 29 secured to the upper plate 22.

Ranged above the upper plate 22 so as to be contactable with the surfaces of the overhead rail generally 10, are a plurality of cleaning brushes. Included are a side brush unit generally 30; a companion top and bottom brush unit generally 32; and a crevice brush unit generally 34. Each of the aforementioned brush units are independently driven by separate power means; and each of the brush units are removably held against the respective rail services by independent pressure means, subsequently explained.

The carriage, generally 20, also supports a debris collector, generally 36, and forward and reverse control handles generally 38, 40. The forward and reverse control handles generally 38, 40, are alternately operable at the selection of an attendant to connect the multiple pressure means and power means to a power supply subsequently explained. The plural power means, which are reversible, are caused to be energized in a direction that will cause each of the respective brush units to be rotated in a sense that will tend to urge the carriage generally 20 to be propelled along the overhead rail generally 10 in a direction opposite the respective control handle 38 or 40. Thus the attendant will normally face and walk with the apparatus in the direction that it will tend to move itself upon the overhead rail generally 10.

The preferred apparatus is also provided with a separate dolly and lifting means generally 44 which is used to raise and lower the carriage, generally 20, with respect to an overhead rail generally 10 regardless of elevation above the floor; and can be utilized to store and transport the apparatus within a plant facility independently of the rail system.

As may be best seen in FIGS. 2, 3 and 4, the side brush unit generally 30 consists of a pair of cylindrical brushes 50, 51 which are disposed along the hanger side 12, and free side 13 of the rail 10, respectively. Each of the cylindrical brushes 50, 51 are mounted on frames 52, 53, respectively, which are pivotable in a vertical plane toward and away from the overhead rail generally 10. The respective brushes 50, 51 are secured to separate drive shafts 54, 55, which are journaled in the frames 52, 53 and connected directly to the respective power means which are also secured to and carried by the pivotable frames 52, 53. It is preferred that the power means are air motors 56, 57, which are energized by pressurized air and are quickly reversible by alternating two access ports between a supply of pressurized air and an exhaust line.

Each of the pivotable frames 52, 53 are pivotally secured to a narrow extension of the upper plate 22 by means of truncated mounting brackets 60 which depend vertically therefrom. Pressure means are connected to each of the pivotable frames 52, 53 to optionally urge the respective cylindrical brushes 50, 51 against the rail generally 10 at a given pressure; or to withdraw the brushes 50, 51 completely free of the rail. Preferably the cylindrical brush 50 is urged against the hanger side 12 of the rail generally 10 by means of a pneumatic cylinder 61 acting through a piston rod 62 which has a clevis 63 pivotally fastened to the frame 52. The pneumatic cylinder 61 is, in turn, pivotally supported on a mount 64 extending from the truncated mounting brackets 60. Similarly the cylindrical brush 51 is normally urged agianst the free side 13 of the overhead rail generally 10 by means of a pneumatic cylinder 66 through a piston rod 67 having a clevis 68 pivotally connected to the frame 53. In turn the pneumatic cylinder 66 is pivotally supported on a mount 69 fastened to the bottom and opposite side of the truncated mounting brackets 60. When pressurized air is introduced to the rear end of pneumatic cylinders 61, 66, the cylindrical brushes 50, 51 will be urged against the rail 10 with a known pressure dependent upon the size of the respective pneumatic cylinders and the magnitude of the air pressure introduced therein. In operation it has been found preferable to urge the brushes against the rail with a force of approximately 15–20 pounds. In the preferred equipment this is accomplished with air at a pressure of about 35 psi by selecting appropriately sized cylinders, giving attention to the angle at which the cylinders will work toward the rail.

It will be understood that as the carriage generally 20 travels along the overhead rail generally 10, the cylindrical brush 50 on the hanger side 12 of the rail will come into contact with the hangers generally 15 supporting the rail. Provision is made to allow the brush 50 to be withdrawn so as to pass about the ouside of each hanger generally 15. This is accomplished by a circular cam 71 above the brush which is rotatably mounted by a stub shaft 72 journaled in the upper portion of a U-shaped bracket 73 that encompasses the outward portion of the brush 50 and is fastened to the uppermost part of the pivotable frame 52. The cam 71 is outwardly offset from the shaft 54 of brush 50 and is of a diameter slightly larger than the diameter of the brush 50. Thus the cam 71 will contact a hanger 15 at a level above the rail 10 and slightly before the circular brush 50 reaches the hanger. As movement along the rail continues the circular cam 71 will cause the pivotable frame 52 to tilt outwardly away from the rail 10 even against the pressure exerted by the pneumatic cylinder 61. Thus the cylindrical brush 50 will be tilted and withdrawn slightly so as to clean the under portion of the curved web 16 of each hanger 15. Small crevices adjacent the hanger 15 to either side of the mounting flange 17 will not normally be cleaned by the cylindrical brush 50 and those areas are separately cleaned by the crevice brush unit generally 34 which will subsequently be more fully described.

The top and bottom brush unit generally 32 is supported centrally above the upper plate 22 and is devised to clean the upper surface 11 and the bottom sur-

face 14 of the overhead rail generally 10. The upper surface 11 is contacted by a disc shaped brush 80 with radial bristles. Also, the upper surface of the curved web 16 of each hanger generally 15 and those portions of the hanger side 12 of the overhead rail 10 are cleaned by a trumcated conical shaped brush 81 with radial bristles. Both brushes 80 and 81 are mounted on a common drive shaft 82 extending from a power means. The drive shaft 82 is journaled through a first mounting lever 84 spaced from the free side 13 of rail 10, and the power means is preferably an air motor 83 fastened to the first mounting lever 84 opposite the brushes 80, 81. The first mounting lever is pivotally secured at one end by a pivot pin 85 extending from a hinged frame 86 that is pivotally secured by a hinge 87 to the central portion of the upper plate 22. The opposite and vertically movable end of the first mounting lever 84 is vertically reciprocable by a pressure means to optionally hold the disc brush 80 against the upper surface 11 of the overhead rail 10 at a given pressure, or to lift both brushes 80, 81 upwardly and clear of the overhead rail generally 10. The pressure means is preferably a pneumatic cylinder 90 having a piston rod 91 and clevis 92 which is pivotally secured to the movable end of the first mounting lever 84. In turn the pneumatic cylinder is pivotally fastened to the lower portion of the hinged frame 86. Preferably cylinder 90 is operated at a slightly lower presure, of about 15–20 psi, to reduce the force of brushes 80, 81 against the rail and thereby prolong the life of the brush bristles. A separate reciprocable means, preferably a pneumatic cylinder 94 (operable at the higher pressure of about 35 psi) is connected between the hinged frame 86 and the upper plate 22. This is accomplished by a piston rod 95 extending from the penumatic cylinder 94 to a clevis 96 which is fastened to the rear side of the hinged frame 86 beneath the air motor 83. In turn, the lower end of the pneumatic cylinder 94 is pivotally secured to a mounting bracket 97 extending outwardly and beneath the upper plate 22.

The bottom portion of the brush unit generally 32 comprises a disc shaped brush 100 with radial bristles positioned directly beneath the brush 80 and is rotatable by a drive shaft 101 extending from a power means, preferably an air motor 102, fastened to a second mounting lever 103, near the hanger side 12 of rail 10, through which the drive shaft 101 is journaled. Preferably the disc brush 100 is broad enough to contact both the bottom surface 14 of the overhead rail generally 10 and also the bottom of the hanger flange 17. The second mounting lever 103 is pivotally mounted, at one end, to a fixed bracket 104 by a pivot pin 105. The fixed bracket 104 is, in turn, rigidly fastened to the upper plate 22. The opposite, movable end of the second mounting lever 103 is movable vertically to optionally engage and withdraw the disc brush 100 with respect to the bottom surface 14 of overhead rail generally 10. Movement of the second mounting lever 103 is accomplished by a pressure means such as pneumatic cylinder 106 connected thereto by a piston rod 107 and clevis 108. The pneumatic cylinder 106 (similarly operated at the lower pressure of about 15–20 psi) is also pivotally connected to a mount 109 fastened to the upper plate 22. As may be seen in FIGS. 2 and 5 it is preferable, for economy of space, to secure the mounting 109 and pneumatic cylinder 106 beneath the upper plate 22, and to extend the piston rod 107 through an opening in the upper plate 22 upwardly to the movable end of the second mounting lever 103. The brush 100 thus may be urged upwardly against the bottom surface 14 of the overhead rail 10 at the desired pressure by introducing air under pressure to the lower end of the pneumatic cylinder 106. It is also possible, but not necessary, to provide a small cam to cause brush 100 to be moved slightly downwardly when passing beneath hangers 15 so as to reduce wear on the bristles.

The crevice brush unit generally 34 is best seen in FIGS. 2, 3 and 6. This unit preferably includes, as the operating member, a disc shaped brush 115 with axially flared bristles positioned on a drive shaft 116 so as to be contactable with the hanger side 12 of the overhead rail 10 with the brush bristles extending outwardly at an angle so as to reach the crevices between the hanger side 12 of the rail and the flange 17 of each hanger 15. The drive shaft 116 extends from a power means, preferably an air motor 117 fastened to a horizontally disposed pivotable frame 118. The latter is rotatably secured by a pivot pin 119 to a hinged frame 120; and the pivotable frame 118 is also connected to the hinged frame 120 by a tension spring 121 which serves to bias the former to a position orienting the drive shaft 116 to be substantially perpendicular to the overhead rail 10. The hinged frame 110 is pivotally secured to the upper plate 22 by a hinge 122 oriented to permit the hinge frame 120 to swing in a vertical plane away from the hanger side 12 and substantially perpendicular to the overhead rail 10. Thus, it will be seen that the flared brush 115 is movable away from and against the hanger side 12 of the overhead rail 10 and is also pivotable in a plane generally parallel to the rail. While the tension spring 121 tends to inhibit pivotal movement on the pin 119, a circular cam 124 mounted on an axis 125 above the brush drive shaft 116 will engage a hanger 15 as the carriage 20 is moved along the rail 10. This will allow the pivotable frame 118 with air motor 117 and flared brush 115 to be pivoted away from and behind the hanger 15. The circular cam 124 is of a diameter that permits the working ends of the outer brush bristles to reach the aforementioned crevice before the cam initially engages the hanger 15. Also as the crevice brush unit generally 34 moves past the hanger 15 the cam 124 will allow the pivotable frame 118 and flared brush 115 to be urged by the tension spring 121, toward its normal position at a point where the outer bristles will contact the opposite crevice.

The crevice brush unit generally 34 is also pivotable vertically away from the rail 10 and hanger 15 by reason of the hinged frame 120. The latter is normally urged upwardly to force the brush 115 against the rail 10 by a pressure means, preferably a pneumatic cylinder 128. The pneumatic cylinder 128 is connected to a web on the hinged frame 120 by a piston rod 129 and clevis 130. Also the pneumatic cylinder 128 is preferably pivotally secured to a mounting 131 extending beneath the upper plate 22. As with the previously described pressure means the pneumatic cylinder 128 may be chosen and/or regulated to urge the flared brush 115 against the overhead rail 10 with a known pressure by introducing air under pressure to the rear or lower end of the cylinder 128.

Also it will be understood that, as with each of the pressure means, the flared brush 115 may be withdrawn and pivoted completely away from the overhead

rail **10** by introducing pressurized air to the forward or upper end of the pneumatic cylinder **128** while connecting the lower end thereof to exhaust.

Normally when the carriage generally **20** is suspended from an overhead rail generally **10** all of the aforementioned brush units are moved to a rail engaging position by introducing pressurized air to the lower ends of each of the pneumatic cylinders **61, 66, 94, 106** and **128.** However, air is also introduced to the forward end of pneumatic cylinder **90** to pull the mounting lever **84** and the brushes **80, 81** downwardly onto the upper surface **11** of the rail generally **10.** It has been found that each of the brushes is most effective for purposes of cleaning and also for stabilizing and propelling the carriage generally **20** when held against the respective rail surfaces with a force of about 15-20 pounds.

The carriage generally **20** is propelled solely by the plurality of brushes working against their respective overhead rail surfaces in coordination. To illustrate it may be seen in FIGS. **2** and **3** that the carriage generally **20** may be propelled in the direction shown by arrow A by energizing the respective power means to rotate the respective brushes **50, 51, 80–81,** and **100** in the directions shown by arrows B, C, D, and E. When it is desired to reverse the travel of the carriage generally **20** it is necessary only to reverse operation of the above specified power means and the aforementioned brushes. It has been found that the important aspect of rotation of brush **115** is not to propel the carriage, but to direct debris downwardly toward the collector generally **37.** Hence it has been found that the leading portion of that brush should be driven downwardly (giving attention to the direction of motion of the carriage). Accordingly arrow F shows the correct rotation for brush **115** when the carriage is moving in direction A. Air motors are the preferred choice for power means as they may be easily and rapidly reversed by simply alternating the ports to which a source of pressurized air and an exhaust line to the atmosphere are connected.

When the apparatus is to hang inoperative from the overhead rail **10,** or when it is to be bodily removed from the rail, all of the aforementioned brush units are moved to disengage and withdraw from the rail generally **10.** This is accomplished by similarly reversing the connection of all the air cylinders to pressurized air and exhaust. Specifically air is introduced to the lower end of pneumatic cylinder **90** (upper end connected to exhaust) so as to lift brushes **80–81** from the upper surface **11** of the rail, and immediately thereafter connect the upper ends of each of the pneumatic cylinders **61, 66, 94, 106** and **128** (connecting the lower ends thereof to exhaust) to pivot the brushes fully away from the rail generally **10.**

Also it is desirable to provide stops to limit the upward thrust of each of the pressure means, or the operative positions of the various brushes, so as to prevent excessive wear of the brush bristles.

Control of the various power means is preferably associated with a pair of alternately employed left hand and right hand handles **140, 142** mounted to opposite sides of the lower plate **23** on carriage generally **20** by respective pivots **141** and **143.** The respective handles actuate trigger valves **144, 145** mounted on the lower plate **23** which serve to actutate the pressure means. Each handle **140** and **142** carries a control valve **146, 147,** respectively, which is operable to connect the source of pressurized air and exhaust lines to the appropriate ports on the various air motors to cause the carriage generally **20** to be propelled in the direction that will normally be faced by an attendant when gripping the control handle and facing the carriage **20.** The preferred pneumatic circuit to accomplish this and to actuate the various pressure means, preferably pneumatic cylinders, may be seen in FIG. **8,** subsequently described more fully.

Since a major function of the apparatus is to clean the overhead rails generally **10** it is desirable to provide a means **36** for collecting debris thrown from the various brush units. Normally the leading brush, in the direction of motion of carriage **20,** will remove the greatest quantity of debris as it will be the first to contact same. Hence, the cylindrical brushes **50, 51** and the flanged brush **115** at opposite ends of the upper plate **22** are preferably provided with conical or cylindrical shaped shields **135, 136,** respectively, which are positioned at an elevation and angled to the brush to catch debris thrown therefrom. Also a trough **137** is secured to the vertical members **21** of the carriage **20** and usually inclined to one side so as to funnel debris falling from the conical shields **135** and **136** into a collector bag or the like (not shown).

In the preferred form of apparatus shown in FIGS. **1** through **6** a single power line, preferably a pneumatic line **150,** is connected, preferably by a swivel connector **149** and hose, to a remotely located storage reel **151** for hose or the like. The reel **151** may be conveniently rotably supported on a wheeled truck **152.** Where the motor power is pressurized air and where the apparatus is to be used in cool or refrigerated areas it is highly advantageous to provide a small heater **153** to warm the pressurized air delivered to the unit. In FIG. **1** it may be seen that such a heater **153** is mounted on the wheeled truck **152.** The advantage of such a heater is that the air motors may be prewarmed by bleeding air to them prior to full operation.

Also in the preferred embodiment a wheeled dolly **156** with a vertically extendable scissors platform **157** may be provided to receive and support the carriage generally **20** and to lift the latter to and from an overhead rail generally **10.**

Optionally the aforedescribed apparatus may also be provided with one or more means to either or both blow debris from the overhead rail generally **10** and to apply a thin coating of oil or other preservative thereto. These functions may be performed by one or more pairs of jet nozzles **160, 161** and **162, 163** shown in the FIGURES (note particularly FIG. **8**) to be mounted on respective brackets **164** and **165** extending from the top of the respective straps **26, 27** above trolley wheels **24, 25.** Where it is desired to employ a jet or blast of air to assist in removing debris from the rail generally **10,** it is merely necessary to connect a source of air under pressure to the leading nozzle or both of pair **160** or **161** (in the direction of motion of the carriage generally **20**). Where it is desired to apply oil or other preservative to the rail it should preferably follow most of the rail cleaning efforts. Thus, where the carriage is moved in the direction shown by arrow A oil could be sprayed upon the rail **10** through jet nozzle **163;** and if the direction of movement is reversed oil may be sprayed through jet nozzle **162.** It will be apparent that

the appropriate nozzles can be operated concurrently to spray both a jet of air and oil.

A modified form of the present invention is shown in FIG. 7 wherein elements similar to those hereinbefore described are identified by similar reference characters bearing a prime notation. In the modified embodiment the debris collector generally **36'** is vacuum means comprising a vacuum cannister **167** supported between the vertical members **21'** of the carriage generally **20'**. A vacuum pump **168** and motor are connected to the cannister by a flexible conduit **169.** It is possible to utilize an air motor where the other power means are to be driven by air. Also, one or more vacuum shrouds **170** are positioned around one or more of the brush units (side brush units generally **30'** in FIG. 7) to attract debris and convey same through flexible conduits **171** to the cannister **167.** In this embodiment a modified suspension arrangement is shown to include left hand and right hand double trolleys **173** and **174** generally which are useful if the equipment is not to be transported across relatively small radius turns in an overhead rail system. Also, the modified embodiment of FIG. 7 is shown to carry a self-contained hose reel **175** which is advantageous if it is convenient to support the unit continuously from the overhead rail generally **10'**.

A pneumatic circuit is diagrammed in FIG. **8** which is suitable for adaptation to either embodiment of the apparatus. A hose **180** from a plant source of high pressure air (usually 90–100 psi) is connected by swivel joint **149** to the pneumatic line **150** on the apparatus. A hand valve **181** is located in the line **150** to permit an attendant to close down the machine. The air normally first passes through a filter **182** and is then distributed through a plurality of lines to pressure regulators (reducers) and the various parts of the apparatus. One optional line **183** leads to the vacuum pump and motor **168** through a hand control valve **184,** pressure regulator **185** and lubricator **186.** Another optional line **187** leads through a regulator **188** (typically set for **50** psi) to a vessel **189** to pressurize oil or other fluid to be sprayed on the rail through either nozzle **162** or **163.** Three necessary lines **190, 191,** and **192** function basically as follows: line **190** is supplied through a regulator **193** (preferably 50 psi) and lubricator **194** and leads to the clockwise and counterclockwise ports of the various air motors through two way pilot valves **195, 196** and distributor manifolds **197, 198** respectively; line **191** is supplied through a pressure regulator **200** (preferably 35 psi) and lubricator **201** and leads to the various pneumatic cylinders by way of three pilot actuated four way valves **202, 203** and **204;** and line **192** is supplied through a pressure regulator **205** (typically at **50** psi) and leads to the air jet nozzles **160** and **161** through a pilot actuated valve **206.**

The apparatus is started, assuming hand valve **181** is open, when either of the trigger valves **144** or **145** is opened by an attendant grasping and lowering the respective handle **140** or **142.** For purposes of this description assume that trigger valve **145** is opened (either trigger **144** or **145** will act in the same manner). Pressurized air will be taken off line **190** through a reducer **210** (typically 35 psi) and directed through a shuttle valve **211** to the pilot end of valve **206.** The latter is thereby moved to open the path for air in line **192** to the jet nozzles **160** and **161.** Air from reducer **210** and trigger valve **145** (or **144**) will also be directed to the pilot end of valve **202** thereby shifting the latter against a spring bias to direct **35** psi air from line **191** through a line **212** to the lower ends of cylinders **61, 66,** and **128** thereby raising the side brushes generally **30** and the crevice brush generally **34** to operative positions. In this position valve **202** connects a line **213** from the upper ends of the cylinders **61, 66** and **128** to atmosphere.

Simultaneously pressurized air from line **212** is connected to one pilot end of valve **203** thereby shifting that valve to introduce pressurized air from line **191** to the lower end of cylinder **94** (the upper end thereof is similarly connected to the atmosphere through valve **203**). Air from line **212** is also directed to a sequence valve **215,** which is opened when the cylinder **94** has been fully actuated to extend its piston rod **95,** and pivot upwardly, and thence to the pilot end of valve **204.** When the latter occurs valve **204** will shift and permit air from line **91** to pass through regulator **216,** which reduces the pressure to about 20 psi, and line **217** to the upper end of cylinder **90** and the lower end of cylinder **106.** This results in the top and bottom brushes generally **32** being pressed toward the rail **10.** (The top and bottom brushes are similarly retracted by exhausting the cylinders **90** and **106** through line **217** and valve **204** and introducing pressurized air to the opposite ends thereof through line **218.**)

The pressurized air that actuates the pilot of valve **204** is also connected through a line **220** to each of the left and right control valves **146, 147.** Since for purposes of description it is assumed that an attendant is operating the apparatus at handle **142** he will also manually open the control valve **147** and thereby connect the line **220** with the pilot end of two way valve **196.** That condition will cause valve **196** to shift and connect distributor **198** to the 50 psi air in line **190.** Distributor **198** is, in turn, connected by separate lines to counterclockwise ports on each of the air motors **56, 57, 83, 102** and **117** causing them to rotate in the proper direction. The 50 psi air delivered to the motors is selected to give a desired speed of about 500–600 r.p.m. in each motor.

Pressurized air from distributor **198** may also be directed through a line **222** to a reducer **223** and mixing valve **224** (connected to the vessel **189**) which act to send a liquid laden charge of air to nozzle **163.**

It will also be apparent that when the left control valve **146** is opened the pilot valve **195** will be similarly actuated to shift and deliver air from line **190** to the distributor **197** and hence to opposite clockwise ports on the air motors for operation in the opposite directions. Similarly a liquid laden charge of air may be delivered to the nozzle **162.**

When the apparatus is to be reversed or stopped the attendant will lift the appropriate handle and thereby close the open trigger valve **145** (or **144**). This will cause the pressure on the pilot end of valve **202** to be released, and that valve will return to its first position (being spring biased). The connections to lines **212** and **213** will be reversed placing pressurized air from line **191** through line **213** to the upper ends of cylinders **61, 66** and **128.** When this occurs the side brushes generally **30** and crevice brush generally **34** will be withdrawn. At the same time air from line **213** will be directed through a line **226** to the pilots on both control valves **146** and **147** thereby assuring that those valves are closed thereby collapsing the circuits to pilot valves

195, 196, and no pressurized air will reach either distributor 197 or 198 or the plurality of air motors. At the same time the pressure on the pilot of valve 204 will have been terminated, and that valve will shift back (spring biased) and the 20 psi air will be reversed to cylinders 90 and 106 to withdraw the top and bottom brushes generally 32. However the cylinder 94 will not immediately reverse until a brief time elapses for the brushes generally 32 to move free of the rail 10 due to the pilot valve 203 being reversed only by pressurized air from line 213 passing first through a sequence valve 230 held open when the cylinder 94 is in the up position.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and, therefore, only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. An improved overhead rail cleaning apparatus comprising: a carriage means; trolley means for suspending said carriage means from an overhead rail; a plurality of rotary brushes movably supported on said carriage means for contacting a plurality of the surfaces of said rail; pressure exerting means connected to each of said rotary brushes for moving said brushes from positions clear of said rail to operative positions where said brushes forcefully contact said surfaces of said rail; reversible power means connected to rotate each of said brushes; and means to drive each of said power means to concurrently impart to said brushes rotary movement tending to propel said carriage in a given direction upon said rail. whereby said carriage will be movable in said direction when said brushes forcefully contact said rail.

2. The apparatus of claim 1 wherein said pressure exerting means are fluid cylinders.

3. The apparatus of claim 1 wherein said reversible power means are fluid motors.

4. The apparatus of claim 1 wherein said pressure exerting means are air cylinders, and said reversiable power means are air motors, and said means to drive said power means includes a source of air under pressure and a system of valves for directing said air to selected ports on said air motors and to ports on said air cylinders.

5. The apparatus of claim 1 wherein said plurality of rotary brushes include a first pair of oppositely disposed cylindrically shaped brushes contactable with opposite sides of said rail, a disc shaped brush with flared bristles located a distance from said first pair of brushes and contactable with a first side of said rail to which rail hangers are secured, and top and bottom disc shaped brushes with radial bristles located between said pair and said disc shaped brushes, said top and bottom brushes being contactable with the top and bottom surfaces of said rail, respectively.

6. The apparatus of claim 5 wherein said top disc shaped brush has connected thereto a conically shaped brush which is contactable with the upper portion of said first side of said rail and with the adjacent portion of hangers secured to said first side.

7. The apparatus of claim 5 wherein said disc shaped brush with flared bristles and one of said first pair of brushes contactable with said first side of said rail each have cams associated therewith, said cams being contactable with said rail hangers to cause said associated brushes to be moved outwardly from contact with said rail whereby to pass around and brush said hangers as said carriage is moved along said rail.

8. The apparatus of claim 7 wherein said disc shaped brush with flared bristles has a drive shaft mounted to be pivotable in a plane generally parallel to said rail and said cam associated therewith causes said drive shaft to pivot in said plane.

9. The apparatus of claim 5 wherein each of said pair of brushes, said disc shaped brush and said top brush are rotatably supported on frames, each of said frames being mounted to be pivotable in a direction substantially perpendicular to and outwardly from said rail, and each of said frames having said pressure exerting means connected thereto.

10. The apparatus of claim 9 wherein each of said top and bottom brushes are journaled in mounting levers, said mounting levers being pivotable in a vertical plane and connected to said pressure means for movement toward and away from top and bottom surfaces of said rail.

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