An apparatus for cleaning a meat-hanging rail R1, R2. The apparatus is mountable for movement along a meat-hanging rail and being provided with at least one rail-contacting surface 110 which allows movement of the apparatus along the rail, the apparatus comprising one or more rail cleaning device. The at least one rail contacting surface may comprise a wheel, roller or a low friction surface. The at least one rail cleaning device may comprise one or more nozzles 111, 112 for applying fluids or a device designed to remove debris from the rail such as a brush or a scraper. Also disclosed is a method of using the apparatus to clean a rail and an apparatus for inspecting a rail.
Apparatus and method for cleaning rails

BACKGROUND OF THE INVENTION

[0001] The present invention concerns the cleaning of meat-hanging rails. More particularly, but not exclusively, this invention concerns an apparatus for cleaning meat-hanging rails. The invention also concerns a method for cleaning meat-hanging rails.

[0002] Meat (such as beef) is typically transported around an abattoir on rails. Each quarter of beef is hung on a hook which is attached to a small carriage which is mounted to the rail. The carriage facilitates the quick and easy movement of the carcass around the abattoir. It is quite common for soiling of the meat to occur, for example, by debris dropping from the rail onto the carcass. When this occurs, an abattoir worker will often remove the debris by cutting meat away from the carcass, which is wasteful and leads to loss of valuable meat. The rails therefore periodically require cleaning. The cleaning of the rails typically involves an abattoir worker cleaning the rail using a hose or pressure washer, with the worker working from an elevated platform so that he or she can clean the rails effectively. This is time-consuming and requires the use of some form of elevated platform, such as a cherry picker.

[0003] The present invention seeks to mitigate one or more of the above-mentioned problems. Alternatively or additionally, the present invention seeks to provide an improved apparatus and method for cleaning meat-hanging rails.

SUMMARY OF THE INVENTION

[0004] In accordance with a first aspect of the present invention, there is provided an apparatus for cleaning a meat-hanging rail, the apparatus being mountable for movement along a meat-hanging rail and being provided with at least one rail-contacting surface which allows movement of the apparatus along the rail, the apparatus comprising one or more rail cleaning devices.
[0005] The apparatus of the first aspect of the present invention facilitates the quick and efficient cleaning of meat-hanging rails without the need, for example, to use a cherry picker or other means of elevating a cleaning operative.

[0006] Those skilled in the art will realise that the term “meat-hanging rail” indicates that the rails are used for hanging meat (such as meat carcasses or part thereof, such as sides or flanks of meat), live animals (typically hung in preparation for slaughter, for example, chickens) or dead whole animals (such as chicken) but are not so used when being cleaned using an apparatus according to the present invention. Meat which is typically hung on such rails include beef, pork, lamb and chicken, but particularly beef, pork and lamb.

[0007] The apparatus of the present invention will typically be arranged to be mountable for movement along one particular geometry of rail. For example, there are several cross-sectional geometries of rail that are used to hang meat, such as an I-beam, a round profile rail and an inverted U-shaped rail with inwardly projecting flanges which support the meat (this rail type often being known as a Furgocar rail). Such meat-hanging rails are typically elevated so that the carcass can hang below the rail without touching the ground.

[0008] The apparatus may be mountable for sliding movement along a rail. For example, the apparatus may comprise one or more rail-contacting skids, the skids having a low friction rail-contacting surface. The low friction, rail contacting-surface facilitates the sliding of the apparatus along the rail.

[0009] The apparatus may be provided with one or more rail-contacting wheels or rollers. The wheels or rollers will typically be mounted for rotation, thereby facilitating movement of the apparatus. The wheel(s) or roller(s) provide the rail-contacting surface which facilitates movement of the apparatus along a rail. The apparatus optionally comprises at least two wheels or rollers, each for contacting a respective rail. The wheel(s) optionally comprises plastics material; optionally, the rail-contacting surface of the wheel is provided by plastics material. This may help reduce wear caused by the wheels.

[0010] The apparatus may comprise more than one rail cleaning device. For example, the apparatus may comprise a device which contacts debris and removes it from a rail, and a
device which treats a rail surface so as to disinfect it. Therefore, at least one rail cleaning
device may be arranged to remove, or facilitate the removal of, debris. Alternatively or
additionally, at least one rail cleaning device may be arranged to treat a rail surface so as
to disinfect it. The term “disinfect” refers to the reduction in the number of pathogens
(such as bacteria, viruses and the like) on the rail surface. A rail cleaning device arranged
to treat a rail surface so as to disinfect it will typically not remove debris from a rail
surface. A rail cleaning device may, for example, comprise one or more outlets for the
egress of cleaning fluid onto a rail. Such cleaning fluid may itself remove debris or may
facilitate the removal of debris, for example, by loosening debris. Alternatively, the one
or more outlets for the egress of cleaning fluid may be arranged to deliver a disinfectant
fluid (such as a sterilising liquid) onto a rail surface.

[0011] The apparatus optionally comprises both one or more outlets for the egress of
cleaning fluid onto a rail and one or more cleaning surface for contacting debris and
removing it from a rail. Said outlets and cleaning surface may be provided by the same
cleaning device or by different devices. The cleaning fluid is typically a cleaning liquid,
such as water or an aqueous solution or suspension, but may be a cleaning gas or a
mixture of gas and liquid (such as steam). Alternatively, the apparatus optionally
comprises one or more outlets for the egress of cleaning fluid onto a rail, but no cleaning
surface for contacting debris and removing it from a rail. Alternatively, the apparatus is
not provided with one or more outlets for the egress of cleaning fluid onto a rail, but is
provided with one or more cleaning surface for contacting debris and removing it from a
rail.

[0012] The apparatus may comprise a plurality of outlets for the egress of cleaning fluid
onto a rail. The plurality of outlets may be provided by the same rail cleaning device, but
optionally one or more outlets may be provided by a first cleaning device and one or
more outlets may be provided by a second cleaning device. At least two of the plurality of
outlets may be arranged to direct cleaning fluid onto mutually different surfaces of a
rail. For example, a first outlet may have a first orientation consistent with directing
cleaning fluid onto a first surface of a rail, and a second outlet may have a second
orientation consistent with directing cleaning fluid onto a second surface of a rail. The
apparatus may be provided with a plurality of outlets, at least two of the outlets being arranged to direct cleaning fluid onto mutually different rails. For example, if the apparatus is to be used on a bi-rail which comprises two parallel rails, then at least one outlet may be arranged to direct cleaning fluid onto a first rail and at least one outlet may be arranged to direct cleaning fluid onto a second rail. For example, at least two outlets may be arranged to direct fluid onto a first rail, and at least two outlets may be arranged to direct fluid onto a second rail.

[0013] At least one outlet may be arranged to direct fluid in a downwards direction (assuming that the rails will be substantially horizontal and when the apparatus is in a normal orientation) so as to provide cleaning fluid to an upwardly facing surface. The direction of fluid need not be vertical, and the direction of fluid may also have some lateral or forwards/backwards component. At least one outlet may be arranged to direct fluid in an upwards direction so as to provide cleaning fluid to a downwardly facing surface. The direction of fluid need not be vertical, and the direction of fluid may also have some lateral or forwards/backwards component.

[0014] At least one (optionally more than one and optionally each) outlet may be provided with a nozzle. The nozzle may be operable to vary one or more characteristics of the cleaning fluid passing through the outlet, for example, the width and velocity of the stream of liquid passing emitted from the outlet. A nozzle may be provided with two or more parts which are movable relative to one another, the position of the two parts relative to one another determining one or more characteristics of the liquid emitted from the nozzle.

[0015] As mentioned above, the apparatus may comprise one or more cleaning surfaces for contacting debris and removing it from a surface. A first rail cleaning device may comprise one or more such cleaning surfaces. There may be more than one cleaning device which comprises one or more such cleaning surfaces. At least one, optionally more than one and optionally each cleaning surface (if present) for contacting debris and removing it from a rail may be provided by a blade, a brush or a roller. A cleaning surface could, for example, be provided by a roller brush. One or more of the cleaning surfaces may be associated with a biasing member for urging the cleaning surface into
contact with a rail. The bias member may, for example, comprise a spring or piece of resiliently deformable material, such as rubber. The number and orientation of such cleaning surfaces will typically depend on the geometry of the rail. For example, a roller may be arranged so that movement of the apparatus along a rail causes rotation of the roller.

[0016] The apparatus may comprise a carriage comprising the rail-contacting surface which allows movement of the apparatus along a rail. For example, the carriage may comprise one or more wheels. As mentioned above, the wheel(s) may comprise plastics material, particularly the rail-contacting surface of a wheel. The carriage may comprise a carriage main body. One of more wheels or rollers may be attached to the carriage main body. One of more of the wheels or rollers may be located laterally of the carriage main body. If the apparatus comprises at least two wheels or rollers, the carriage main body may be located between two of the wheels or rollers. The wheels or rollers may typically be located proximate to one end of the carriage. In this case, for example, most of the carriage hangs below the wheels during use. The carriage may be provided with one or more of the cleaning fluid outlets (typically more than one outlet and typically all of the outlets). The carriage may be provided with one or more (and optionally more than one and optionally all) of the cleaning surface for contacting debris (if present). At least one (and optionally move than one) cleaning surface projects laterally from the carriage main body. The carriage may comprise at least one cleaning surface associated with one lateral side of the carriage main body and at least one cleaning surface associated with another lateral side of the carriage main body. In this manner, the cleaning surface are arranged to contact surfaces to each lateral side of the carriage main body.

[0017] The apparatus may comprise a means for pulling the apparatus along a rail. The means for pulling the apparatus along a rail may be connected (either directly or indirectly) to the carriage so that the carriage is movable along a rail by a user using the means for pulling the apparatus along a rail. The means for pulling the apparatus along a rail may comprise a cord. The means for pulling the apparatus along a rail may comprise an arm. The means for pulling the apparatus along a rail may comprise a handle. The
handle may, for example, be attached to the cord. The arm may comprise a handle, for example, at or near to the end of the arm.

[0018] The arm itself will typically be substantially rigid. The arm may, for example, be coupled to the carriage. The coupling between the carriage and the arm may be rigid (for example, with an arm and carriage being made from the same piece of material or being rigidly attached to one another). Alternatively, the coupling between the arm and the carriage may permit movement of the arm relative to the carriage. For example, the coupling may permit pivotal movement of the arm relative to the carriage, for example, pivotal movement of the arm in a lateral direction. This means that should a user move the arm laterally, the carriage remains mounted relative to the rail and is not moved. In use, the arm will typically hang down from the carriage, and be accessible to an abattoir worker without the need to use an elevated platform.

[0019] If the apparatus (typically in the form of a cleaning device) comprises one or more outlets for the egress of cleaning fluid, the apparatus optionally comprises one or more conduits for providing cleaning fluid to the outlets. The conduits are typically provided in the form of plastic or rubber tubing. A cleaning device would typically comprise said conduits. The conduits are arranged to receive cleaning fluid from a source of cleaning fluid. The source of cleaning fluid may optionally be provided as part of the apparatus of the present invention (for example, as part of a rail cleaning device). Alternatively, the source of cleaning fluid may comprise an external fluid source, such as a source of cleaning water, such as mains water which is typically provided in an abattoir.

[0020] The apparatus may be provided with a hose for connection to an external source of pressurised water, such as a jet washer or the like. The apparatus may comprise a cleaning fluid pressure-relief valve.

[0021] As mentioned above, the apparatus may be provided with a source of cleaning fluid. The source of cleaning fluid may comprise a reservoir for holding cleaning fluid. Those skilled in the art will realise that the cleaning fluid is not an essential part of the present invention. The apparatus may comprise a pressurising device for pressurising the contents of the reservoir, such as a gas cartridge. One or both of the pressurising device and the reservoir may be provided with a pressure-relief valve. The one or more outlets
for emitting cleaning fluid may be arranged to produce a spray, for example, by providing one or more outlets with a suitably-arranged nozzle.

[0022] The apparatus may operable to perform more than one cleaning method. For example, the apparatus may comprise more than one cleaning device. For example, the apparatus may be operable to clean a rail in a first cleaning mode and may be operable to clean a rail in a second cleaning mode which is different from the first cleaning mode. In the first cleaning mode, the apparatus may be operable to emit a cleaning fluid of relatively high pressure onto a surface of a rail, and in the second cleaning mode, the apparatus may be operable to emit a cleaning fluid of relatively low pressure into a surface of a rail. The fluid outlets may, for example, be interchangeably connected to either one of two sources of fluid. For example, in the first cleaning mode, the fluid outlets may be connected to a high-pressure source of fluid, such as a pressure washer, whereas in the second cleaning mode, the fluid outlets are connected to a reservoir for containing disinfectant. This may, for example, be achieved by providing a carriage with outlets which are connectable to liquid-providing conduits provided on a first arm and liquid-providing conduits provided on a second arm, the first and second arms being interchangeable, the first and second arms providing mutually different cleaning modes.

[0023] A rail cleaning device may comprise a source of electromagnetic radiation for illuminating and cleaning a surface of a rail. The electromagnetic radiation may comprise infra-red, ultra-violet or gamma radiation.

[0024] A rail cleaning device may comprise a steam generator for generating steam to clean a surface of a rail. The steam generator may comprise a heater. The heater may be arranged to heat cleaning fluid (typically water or an aqueous suspension or solution).

[0025] The apparatus may comprise a motor for propelling the apparatus along a rail. The motor may be arranged to provide power to one or more rail-contacting wheels or rollers. The motor may be operably associated with a switch for controlling operation of the motor. The switch may be actuated manually. Alternatively or additionally, the switch may be actuated using a remote control device which is operable to send control signals to the switch.
[0026] The apparatus may comprise a rail inspection device, such as a rail imaging device, such as a camera, and/or a mount for a rail inspection device. The rail inspection device may be operable to provide information relating to the state of a rail to a data collection device. The data collection device may comprise a microprocessor, and may be in the form of a computer, tablet or mobile phone or the like.

[0027] In accordance with a second aspect of the present invention, there is provided an apparatus for inspecting a meat-hanging rail, the apparatus being mountable for movement along a meat-hanging rail and being provided with at least one rail-contacting surface which allows movement of the apparatus along the rail, the apparatus comprising a rail inspection device.

[0028] The apparatus according to the second aspect of the present invention may comprise the features described above in relation to the apparatus of the first aspect of the present invention. For example, the apparatus may comprise an apparatus main body and wheels for contacting a rail surface (optionally a wheel comprising a rail-contacting surface provided by plastics material). The apparatus of the second aspect of the present invention may or may not comprise one or more rail cleaning devices. Optionally, the apparatus of the second aspect of the present invention does not comprise one or more rail cleaning devices.

[0029] The rail inspection device may be operable to provide information relating to the state of a rail to a remote data collection device. The rail inspection device may be operable to transmit signals via wires or wirelessly to a remote data collection device. The data collection device may comprise a microprocessor, and may be in the form of a computer, tablet or mobile phone or the like. Alternatively or additionally, the rail inspection device may be operable to store locally information relating to the state of a rail. For example, the apparatus may comprise a memory store for storing information relating to the state of a rail. The memory store may or may not be removable.

[0030] The rail inspection device may comprise an imaging device, for example, an imaging device operable to acquire images in a particular part of the electromagnetic spectrum, for example, in the visible part of the electromagnetic spectrum. The rail inspection device may therefore comprise a camera, for example, a camera capable of
obtaining single ("still") images or moving images (typically a plurality of images capable of being viewed sequentially to produce moving images).

[0031] According to a third aspect of the present invention there is also provided a method of cleaning a meat-hanging rail, the method comprising: mounting a rail-cleaning apparatus for movement along the rail; and causing the rail-cleaning apparatus to clean the rail.

[0032] This provides an effective and simple method of cleaning a meat-hanging rail without the need for the cleaner to use an elevated platform.

[0033] Those skilled in the art will realise that the term "meat-hanging rail" refers to the fact that such rails are used to hang meat (such as meat carcasses or part thereof, such as sides or flanks of meat), live animals (typically hung in preparation for slaughter, for example, chickens) or dead whole animals (such as chicken) but are not so used when being cleaned when the method of the present invention is being performed. Meat which is typically hung on such rails include beef, pork, lamb and chicken, but particularly beef, pork and lamb.

[0034] The meat-hanging rail is typically elevated, for example, by at least 2m, optionally at least 2.5m, optionally at least 3m, optionally at least 4m, optionally up to 4m and optionally up to 6m from the ground.

[0035] Causing the rail-cleaning apparatus to clean the rail may comprise removing debris from the rail, for example, by causing a rail-cleaning surface to contact debris on the rail or by exposing the debris to a flow of fluid, such as a cleaning liquid. This may comprise, for example, moving the rail-cleaning apparatus along the rail, thereby causing the rail-cleaning surface to remove debris. The rail-cleaning surface may be provided by one of a brush, roller or blade. Causing the rail-cleaning apparatus to clean the rail may comprise treating a rail surface so as to disinfect it (optionally and typically in the absence of removal of debris from a rail). This may, for example, comprise exposing said rail surface to electromagnetic radiation of a particular wavelength, and/or of a particular intensity. Alternatively or additionally, treating a rail surface so as to disinfect it may comprise providing a rail surface with a disinfecting fluid. Causing the rail-cleaning apparatus to clean the rail may additionally or alternatively comprise causing cleaning
fluid (typically a cleaning liquid) to be emitted from the rail-cleaning apparatus onto a surface of the rail.

[0036] The method may comprise moving the apparatus along the rail. The method may comprise sliding the apparatus along the rail.

[0037] The method may comprise moving the apparatus along a length of rail, performing a first cleaning operation, and subsequently moving the same apparatus or a different rail-cleaning apparatus along said length of rail, performing a second cleaning operation. The first cleaning operation and the second cleaning operation are optionally mutually different. The first cleaning operation is typically performed using a first rail-cleaning apparatus and the second cleaning operation is typically performed using a second rail-cleaning apparatus. The first cleaning operation may, for example, comprising removing debris (and optionally the majority of debris) from the rail. The second cleaning operation may, for example, comprise treating a surface of the rail so as to disinfect it. The first cleaning operation may, for example, comprise subjecting said rail to a first pressure of cleaning fluid and the second cleaning operation may comprise subjecting said rail to a second pressure of cleaning fluid, the first pressure being greater than the second pressure. For example, the first cleaning operation may comprise subjecting the rail to pressure washing. The first cleaning operation may comprise contacting a cleaning surface (such as a brush, roller or blade) with the debris, optionally in combination with providing a cleaning fluid onto the rail. The fluid used in the second cleaning operation may comprise a disinfectant or sterilising fluid. The method may comprise inspecting the rail, optionally after the first cleaning operation, and optionally after the second rail cleaning operation.

[0038] The rail-cleaning apparatus used in the third aspect of the present invention may comprise those features mentioned above in relation to the rail-cleaning apparatus of the first aspect of the present invention. Additionally, the rail-cleaning apparatus of the first aspect of the present invention may comprise those features described above in relation to the method of the third aspect of the present invention.

[0039] In accordance with a fourth aspect of the present invention, there is provided a meat rail-cleaning kit comprising a carriage with outlets which are connectable to liquid-
providing conduits provided on a first arm and liquid-providing conduits provided on a second arm, the first and second arms being interchangeable, the first and second arms providing mutually different cleaning modes, the carriage being connectable to the first and/or second arm so as to form an apparatus in accordance with the first aspect of the present invention.

[0040] In accordance with a fifth aspect of the present invention, there is provided a kit converting a meat-hanging conveyor which is mountable for movement along a meat-hanging rail, the conveyor being provided with at least one rail-contacting surface which allows movement of the conveyor along a rail, into an apparatus according to the first or second aspect of the present invention, the kit comprising a body comprising one or more rail cleaning device or a rail inspection device, the body being attachable to be meat-hanging conveyor so as to form an apparatus in accordance with the first or second aspect of the present invention. The meat-hanging conveyor may, for example, comprise a hook. The meat-hanging conveyor may be suitable for hanging meat (for example, a meat carcass), a live animal (such as a chicken) or a dead animal (such as a chicken). The meat-hanging conveyor may, for example, comprise one or more rail-contacting wheels or rollers, optionally attached to a carriage. The kit may comprise those features described above in relation to the apparatus of the first or second aspect of the present invention and the method of the third aspect of the present invention.

[0041] It will of course be appreciated that features described in relation to one aspect of the present invention may be incorporated into other aspects of the present invention. For example, the method of the invention may incorporate any of the features described with reference to the apparatus of the invention and vice versa. The various aspects of the present invention may be applied to any elevated rail, particularly rails situated above (and optionally used to hang) items which are advantageously to be kept free of rail debris. Therefore, the reference above to “meat-hanging rail” in relation to the present invention may be replaced by “elevated rail”.
DESCRIPTION OF THE DRAWINGS

[0042] Embodiments of the present invention will now be described by way of example only with reference to the accompanying schematic drawings of which:

[0043] Figure 1 shows a simplified perspective view of a meat-hanging rail cleaning apparatus according to a first embodiment of the invention;

[0044] Figure 2 shows a simplified end view of the apparatus of Fig. 1;

[0045] Figure 3 shows a simplified side view of the apparatus of Fig. 1;

[0046] Figure 4 shows a simplified, partially cut-away side view of a rail cleaning apparatus according to a second embodiment of the invention;

[0047] Figure 5A shows a simplified end-on view of a rail cleaning apparatus according to a third embodiment of the invention, the apparatus being mountable on a rail of I-beam cross-section;

[0048] Figure 5B shows a simplified end-on view of a rail cleaning apparatus according to a fourth embodiment of the invention, the apparatus being mountable on a rail of circular cross-section; and

[0049] Figure 5C shows a simplified end-on view of a rail cleaning apparatus according to a fifth embodiment of the invention, the apparatus being mountable on a Fergocar rail which has a cross-sectional shape of an inverted U, with inwardly projecting flanges.

DETAILED DESCRIPTION

[0050] An example of an embodiment of an apparatus according to the first aspect of the present invention will now be described with reference to Figures 1 to 3. The rail cleaning apparatus is denoted generally by reference numeral 100 and comprises a carriage 101 attached to an arm 102 via a pivotal link 103. The arm 102 is provided with a handle 104 best seen in Figure 1. The carriage 101 comprises two rotatable wheels 109, 110 attached a carriage main body 170, one wheel either side of the carriage main body 170. The carriage 101 is further provided with a first rail cleaning device (not shown) comprising nozzles 111, 111’, 112 and 112’ through which cleaning fluid may be
dispensed, and two rail cleaning devices in the form of two cleaning rollers 150, 150’ which remove debris from a surface of a rail.

[0051] The apparatus of Figs. 1 to 3 is typically used to clean a type of rail known to those skilled in the art as “bi rail” because there are two rails, shown as R1 and R2 in Figs. 1 and 2. The rails R1, R2 are typically elevated several meters from the floor (not shown) so that, in use, meat-carcasses are sufficiently far from the floor. The wheels 109, 110 are mounted either side of carriage main body 170 so that the carriage main body 170 is positioned between rails R1 and R2, with wheels 109, 110 contacting the upper surfaces of rails R1 and R2 respectively. The wheels 109, 110 are mounted to the upper part of carriage main body 170 so that the majority of the carriage main body 170 hangs below the rails R1, R2. Carriage main body 170 is made from aluminium, but may be made from any suitable material, such as stainless steel. The wheels 109, 110 are made from plastics material to reduce wear on the rail. The wheels 109, 110 maintain the apparatus 100 in contact with the rails R1, R2 and also facilitate the easy, unhindered movement of the apparatus 100 along rails R1, R2. The carriage 101 also comprises cleaning nozzles 111, 111’, 112, 112’, each of which is arranged to direct cleaning fluid onto a rail. In this connection, nozzles 111 and 112 are arranged to direct cleaning fluid onto an upper and lower surface respectively of rail R2, and nozzles 111’ and 112’ are arranged to direct cleaning fluid onto an upper and lower surface respectively of rail R1. The arrows labelled “F” in Fig. 1 shows an approximate directed of fluid flow from the nozzles. In this connection, nozzles 111, 111’ direct cleaning fluid generally downwards and forwards, and nozzles 112, 112’ direct cleaning fluid generally upwards and rearwards. This arrangement of the upper nozzles directing fluid in a generally forwards and down direction and the lower nozzles directing fluid in a generally rearwards and up direction is belied to provide fluid flows which balance out, and thereby reduce the risk of the apparatus 100 tipping or rocking during use. Each nozzle is provided with an outlet aperture, two of which 113, 114 are shown for nozzles 111, 112. Each nozzle is provided with cleaning fluid via a respective conduit; two conduits 120, 130 are shown, for nozzles 111, 112 respectively. The conduits are in fluid communication with a fluid inlet 105 through which cleaning fluid may be supplied to the apparatus 100, for example, via a
hose H. In this case, the hose H is attached to a high pressure source of water, such as a jet washer. High pressure water is therefore directed onto the upper and lower surfaces of rails R1, R2. The water can, in certain circumstances, remove debris if the debris is not strongly adhered to the rail surface. The water also facilitates the removal of debris by wetting the debris, which generally aids removal of debris. The conduits are typically made from a rubber or plastics material, as are the nozzles. The fluid inlet 105 is provided with a connector (not shown) for connecting with a hose H of a high pressure water source. A regulator valve (not shown) may be provided in the fluid flow bath between the nozzles and fluid inlet 105.

[0052] The carriage 101 is further provided with cleaning rollers 150, 150’ which may be seen in Fig. 2. The cleaning rollers 150, 150’ are arranged to contact the inwardly-facing surfaces of rails R1, R2 so that when the apparatus 100 is moved along rails R1, R2, the rollers 150, 150’ rotate and remove debris from the inwardly-facing surfaces of said rails.

[0053] As mentioned above, the apparatus 100 comprise an arm 102. The arm 102 is elongate and is typically made from aluminium or stainless steel. The arm 102 hangs down from the carriage 101 and is sufficiently long so that it is accessible to a user standing on the ground. In this connection, the arm 102 is provided with a handle 104 which is located near to the end of the arm 102 remote from the carriage 101. The carriage 101 is connected to arm 102 via a pivotal link 103. The pivotal link 103 which is provided by two hinges (not shown) allows the arm 102 to be moved in the directions labelled S in Figs. 1 and 2. This means that any such movement of the arm 102 is not transferred to the carriage 101; the arm 102 merely rotates about pivotal link 103, and the carriage 101 remains substantially vertical, with the wheels 109, 110 in contact with the rails.

[0054] The use of the rail-cleaning apparatus of Figures 1 to 3 in an example of a method in accordance with the present invention will now be described. The apparatus 100 is mounted on rails R1, R2 substantially as shown in Figs. 1 to 3, with wheels 109, 110 in contact with R1, R2 respectively, with carriage main body 170 hanging between rails R1, R2. A supply of high pressure water is attached to inlet 105, thereby providing to and through nozzles 111, 111’, 112, 112’ via respective conduits, thereby directing high
pressure cleaning water onto the upper and lower surfaces of rails R1, R2. A user (not shown) grabs handle 104 and moves the apparatus 100 along the rails R1, R2, thereby exposing a length of each of rail R1, R2 to high pressure cleaning water as the apparatus is moved along the rails. Furthermore, rollers 150, 150’ contact the inwardly-facing surfaces of rails R1, R2, and as the apparatus 100 is moved along the rails, the rollers rotate and clean those inwardly-facing surfaces. The apparatus 100 may be passed along the rails in one direction, or may be moved to and fro along the rails.

[0055] The apparatus 100 may be provided with a user-operable valve (not shown) for shutting off the supply of cleaning liquid to the nozzles. Such a valve will typically be located near to the fluid inlet 105.

[0056] A further example of an embodiment of an apparatus according to the first aspect of the present invention will now be described with reference to Figure 4. The apparatus is denoted generally by reference numeral 200. The apparatus 200 is very similar to the apparatus 100 described above in relation to Figs. 1 to 3 in that apparatus 200 comprises a carriage 201 comprising rotatable wheels 210 mounted either side of a carriage main body 270, with the carriage 201 being positioned, in use, between two rails (one of which R2 is shown in Fig. 4), with each of the two wheels 210 sitting on an upper surfaces of a respective rail. The apparatus 200 comprises an arm 202 comprising a handle 204, as described above in relation to the apparatus of Figs. 1 to 3, with the arm being pivotally attached to carriage 201 via pivotal attachment 203. Apparatus 200 comprises nozzles, two of which are shown 211, 212, which have apertures 213, 214 for the egress of cleaning fluid, the nozzles being provided cleaning fluid via respective conduits, two of which are shown 220, 230. However, apparatus 200 is not intended to provide a high pressure cleaning liquid to the surfaces of the rails. Apparatus 200 is intended to provide a spray of disinfectant or other cleaning liquid to a rail. In this connection, the nozzles 211, 214 are arranged to provide a mist or broadly-directed spray (as opposed to a high pressure localised jet) onto a rail. The nozzles may be adjustable to vary the angle of the spray or mist. The disinfectant is provided to the nozzles from a tank 250 attached to arm 202. The tank 250 is pressurised with gas (typically compressed air) which is provided by gas cylinder 240. The tank 250 is provided with a pressure-relief valve 260 which
relieves pressure in the event of over-pressurisation of the tank 250. A user-operable valve (not shown) is provided to allow the user to control the spraying of the rails.

[0057] The use of the rail-cleaning apparatus of Figure 4 in an example of a method in accordance with the present invention will now be described. The apparatus 200 is mounted on the rails substantially as described above in relation to the apparatus 100 of Figs. 1 to 3. The apparatus 200 is then moved along the rails so as to expose the length of the rail to the disinfectant. The apparatus 200 may be moved one way along the rails, or may be move to and fro.

[0058] A further example of a method of cleaning meat-hanging rails will now be described with reference to Figs. 1 to 4. The rails R1, R2 are firstly cleaned using the apparatus of Figs. 1 to 3. This removes the majority of the debris from the rails. Then, the rails R1, R2 are cleaned using the apparatus of Fig. 4. This disinfects the rail to provide a high level of cleanliness.

[0059] The examples above describe various apparatus that may be used to clean rails of a particular geometry i.e. two spaced rails of approximately square cross-section. The hypothetical examples below show how apparatus may be arranged to clean rails having a geometry which is different from that described above with reference to Figs. 1 to 4.

[0060] Figure 5A shows a simplified end-on view of a further example of an embodiment of a rail-cleaning apparatus according to the present invention, suitable for cleaning a rail having an I-beam cross-section. The apparatus is denoted generally by reference numeral 500. The apparatus 500 is very similar to the apparatus 100 described above in relation to Figs. 1 to 3 in that apparatus 500 comprises a carriage 501 comprising rotatable wheels 509, 510. Each of the two wheels 509, 510 sits on a respective upwardly-facing surface of the I-beam. The carriage 501 is pivotally connected to an arm 502 via a pivotal connection 503, the arm comprising a handle 504. Apparatus 500 comprises nozzles 511, 512, each of which is provided with an aperture 513, 514 for the egress of cleaning fluid. The nozzles 511, 512 are provided with cleaning fluid via conduits (not shown) which are, in turn, in fluid communication with fluid inlet 505. Carriage 501 has a different geometry from carriage 101 of Figs. 1 to 3 due to the difference in rail shape. Carriage 501 has two upwardly-projecting limbs 506, 508 which are connected by lateral limb 507.
[0061] Figure 5B shows a simplified end-on view of a further example of an embodiment of a rail-cleaning apparatus according to the present invention, suitable for cleaning a rail having a circular cross-section. The apparatus is denoted generally by reference numeral 600. The apparatus 600 is very similar to the apparatus 100 described above in relation to Figs. 1 to 3 in that apparatus 600 comprises a carriage 601 comprising a rotatable wheel 609 which, in use, sits on an upwardly-facing surface of the circular section beam. The carriage 601 is pivotally connected to an arm 602 via a pivotal connection 603, the arm comprising a handle 604. Apparatus 600 comprises nozzles 611, 612, each of which is provided with an aperture 613, 614 for the egress of cleaning fluid. The nozzles 611, 612 are provided with cleaning fluid via conduits (not shown) which are, in turn, in fluid communication with fluid inlet 605. Carriage 601 hangs to the side of rail O, and therefore nozzles 611, 612 are located on one side of the carriage main body 670. The rail-contacting surface of wheel 609 is concave so that it sits neatly atop rail O.

[0062] Figure 5C shows a simplified end-on view of a further example of an embodiment of a rail-cleaning apparatus according to the present invention, suitable for cleaning a rail having a cross-section of inverted U shape, with inwardly-projecting, wheel-supporting flanges. The rail is denoted by reference numeral U. The apparatus is denoted generally by reference numeral 700. The apparatus 700 is very similar to the apparatus 100 described above in relation to Figs. 1 to 3 in that apparatus 700 comprises a carriage 701 comprising rotatable wheels 709, 710. Each of the two wheels 709, 710 sits on a respective upwardly-facing surface of a flange. The carriage 701 is pivotally connected to an arm 702 via a pivotal connection 703, the arm comprising a handle 704. Apparatus 700 comprises nozzles 711, 712, each of which is provided with an aperture 713, 714 for the egress of cleaning fluid. The nozzles 711, 712 are provided with cleaning fluid via conduits (not shown) which are, in turn, in fluid communication with fluid inlet 705. Nozzle 711 is pointed upwards to clean the underside of rail U. Furthermore, in contrast to the apparatus of Figs. 1 to 3, the apparatus 700 of Fig. 5C is not provided with cleaning rollers 150, 150' (see Fig. 2).

[0063] The examples above describe embodiments of meat rail cleaning apparatus in accordance with the first aspect of the present invention. The apparatus described above
can be modified to provide examples of rail inspection devices in accordance with the second aspect of the present invention. For example, the cleaning parts of the apparatus mentioned above may be removed and replaced by a camera which is arranged to image a rail. The camera may, for example, be in the form of a GoPro ® or other camera which records images onto a local memory store (such as an SD memory card or the like). Alternatively, the camera may be arranged to provide images to a remote data collection device, such as a computer or tablet. The data collection device would typically display the images captured by the camera, typically in “real time”, to a user so that the user can inspect the rail in real time. The camera may be arranged to transmit image data wirelessly (for example, via a wireless network or Bluetooth) or via a wired connection.

[0064] Whilst the present invention has been described and illustrated with reference to particular embodiments, it will be appreciated by those of ordinary skill in the art that the invention lends itself to many different variations not specifically illustrated herein. By way of example only, certain possible variations will now be described.

[0065] The examples of methods of cleaning described above are described with reference to examples of apparatus in accordance with the present invention. Those skilled in the art will realise that other apparatus may be used in the method of cleaning of the present invention.

[0066] The examples above illustrate how a pivotally-mounted arm may be used to move the apparatus along the rail. Alternatively, the arm may be rigidly attached to the carriage. Alternatively, the apparatus may not be provided with an arm, but may be provided with a cord with which a user may pull the apparatus along the rail.

[0067] The examples above illustrate how rollers may be used to engage and remove debris from a surface of the rail. Alternatively or additionally, brushes may be used to engage and remove debris from a surface of the rail. One or more brushes may be rotatable. For example, cleaning fluid may be used to cause rotation of said one or more brushes. Alternatively or additionally, one or more blades may be used to engage with and remove debris from a surface of the rail. Such blades may be set to lightly contact the rail or be set to sit a very small distance from the rail. For example, a blade may be biased into contact with the rail, the biasing force being sufficiently large so that the blade cleans
the surface of the rail properly but not being so large as to dig into the rail and cause damage.

[0068] Where in the foregoing description, integers or elements are mentioned which have known, obvious or foreseeable equivalents, then such equivalents are herein incorporated as if individually set forth. Reference should be made to the claims for determining the true scope of the present invention, which should be construed so as to encompass any such equivalents. It will also be appreciated by the reader that integers or features of the invention that are described as preferable, advantageous, convenient or the like are optional and do not limit the scope of the independent claims. Moreover, it is to be understood that such optional integers or features, whilst of possible benefit in some embodiments of the invention, may not be desirable, and may therefore be absent, in other embodiments.
CLAIMS

1. An apparatus for cleaning a meat-hanging rail, the apparatus being mountable for movement along a meat-hanging rail and being provided with at least one rail-contacting surface which allows movement of the apparatus along the rail, the apparatus comprising one or more rail cleaning devices.

2. The apparatus of claim 1 comprising one or more rail-contacting skids, the skids having a low friction rail-contacting surface.

3. The apparatus of claim 1 comprising one or more rail-contacting wheels or rollers.

4. The apparatus according to any preceding claim wherein at least one rail cleaning device is arranged to remove, or facilitate the removal of, debris.

5. The apparatus according to any preceding claim wherein at least one rail cleaning device is arranged to treat a rail surface so as to disinfect it.

6. The apparatus of any preceding claim wherein at least one rail cleaning device comprises one or more outlets for the egress of cleaning fluid onto a rail.

7. The apparatus of any preceding claim wherein at least one rail cleaning device comprise one or more cleaning surface for contacting debris and removing it from a rail.

8. The apparatus of any preceding claim comprising a plurality of outlets for the egress of cleaning fluid onto a rail.

9. The apparatus of claim 8, at least two of the plurality of outlets being arranged to direct cleaning fluid onto mutually different surfaces of a rail.

10. The apparatus of claim 9, a first outlet having a first orientation consistent with directing cleaning fluid onto a first surface of a rail, and a second outlet having a second orientation consistent with directing cleaning fluid onto a second surface of a rail.

11. The apparatus of any of claims 8 to 10 comprising a plurality of outlets, at least two of the outlets being arranged to direct cleaning fluid onto mutually different rails.
12. The apparatus of any of claims 8 to 10, at least two outlets being arranged to direct fluid onto a first rail, and at least two outlets being arranged to direct fluid onto a second rail.

13. The apparatus of claim 6 and any of claims 7 to 12 when dependent on claim 6 comprising at least one outlet being arranged to direct fluid in a downwards direction (assuming that the rails will be substantially horizontal and when the apparatus is in a normal orientation) so as to provide cleaning fluid to an upwardly facing surface.

14. The apparatus of claim 6 and any of claims 7 to 13 when dependent on claim 6 comprising at least one outlet being arranged to direct fluid in an upwards direction so as to provide cleaning fluid to a downwardly facing surface.

15. The apparatus of claim 6 and any of claims 7 to 14 when dependent on claim 6, comprising at least one outlet, the outlet being provided with a nozzle.

16. The apparatus of claim 7 and any of claims 8 to 15 when dependent on claim 7, said cleaning surface being provided by a blade, a brush or a roller.

17. The apparatus of claim 16, one or more of said cleaning surfaces being associated with a biasing member for urging the cleaning surface into contact with a rail.

18. The apparatus of any preceding claim comprising a carriage comprising the rail-contacting surface which allows movement of the apparatus along a rail.

19. The apparatus of claim 18 comprising one or more rail-contacting wheels or rollers attached to a carriage main body.

20. The apparatus of claim 19, one of more of the wheels or rollers being located laterally of the carriage main body.

21. The apparatus of claim 20 comprising at least two rail-contacting wheels or rollers, the carriage main body being located between two of the wheels or rollers.

22. The apparatus of claims 18 to 21, the carriage being provided with one or more of the cleaning fluid outlets.

23. The apparatus of claims 18 to 22, the carriage being provided with one or more cleaning surface for contacting debris.
24. The apparatus of claim 23, at least one cleaning surface projecting laterally from 
the carriage main body.
25. The apparatus of any preceding claim comprising a means for pulling the 
apparatus along a rail.
26. The apparatus of claim 25, the means for pulling the apparatus along a rail 
comprising a cord.
27. The apparatus of claims 25 or 26, the means for pulling the apparatus along a rail 
comprising a handle.
28. The apparatus of claim 25 or claim 27, the means for pulling the apparatus along a 
rail comprising an arm.
29. The apparatus of claim 28, the arm being substantially rigid.
30. The apparatus of either of claims 28 or 28 when dependent on claim 18, the arm 
being coupled to the carriage.
31. The apparatus of to claim 30, the coupling permits pivotal movement of the arm 
relative to the carriage.
32. The apparatus of any preceding claim, comprising a reservoir for holding cleaning 
fluid.
33. The apparatus of claim 32 comprising a pressurising device for pressurising the 
contents of the reservoir,
34. The apparatus of claim 32 or claim 33, one or both of the pressurising device and 
the reservoir being provided with a pressure-relief valve.
35. The apparatus of any preceding claim, wherein a cleaning device comprises a 
source of electromagnetic radiation for illuminating and cleaning a surface of a 
rail.
36. The apparatus of any preceding claim, wherein a cleaning device comprises a 
steam generator for generating steam to clean a surface of a rail.
37. The apparatus of any preceding claim comprising a motor for propelling the 
apparatus along a rail.
38. The apparatus of any preceding claim comprising a rail inspection device and/or a 
mount for a rail inspection device.
39. An apparatus for inspecting a meat-hanging rail, the apparatus being mountable for movement along a meat-hanging rail and being provided with at least one rail-contacting surface which allows movement of the apparatus along the rail, the apparatus comprising a rail inspection device.

40. A method of cleaning a meat-hanging rail, the method comprising:
mounting a rail-cleaning apparatus for movement along the rail; and
causing the rail-cleaning apparatus to clean the rail.

41. The method of claim 40 wherein comprising causing the rail-cleaning apparatus to clean the rail comprises causing a rail-cleaning surface to contact debris on the rail.

42. The method of claims 40 or 41 wherein causing the rail-cleaning apparatus to clean the rail comprises causing cleaning fluid to be emitted from the rail-cleaning apparatus onto a surface of the rail.

43. The method of claims 40 to 42 comprising moving the apparatus along the rail.

44. The method of claims 40 to 43 comprising moving the apparatus along a length of rail, performing a first cleaning operation, and subsequently moving the same apparatus or a different rail-cleaning apparatus along said length of rail, performing a second cleaning operation, the first cleaning operation and the second cleaning operation being mutually different.

45. The method of claims 40 to 44 comprising inspecting the rail.

46. A meat rail-cleaning kit comprising a carriage with outlets which are connectable to liquid-providing conduits provided on a first arm and liquid-providing conduits provided on a second arm, the first and second arms being interchangeable, the first and second arms providing mutually different cleaning modes, the carriage being connectable to the first and/or second arm so as to form an apparatus in accordance with any of claims 1 to 38.

47. A kit converting a meat-hanging conveyor which is mountable for movement along a meat-hanging rail, the conveyor being provided with at least one rail-contacting surface which allows movement of the conveyor along a rail, into an apparatus according to claims 1 to 39, the kit comprising a body comprising one
or more rail cleaning device or one or a rail inspection device, the body being attachable to be meat-hanging conveyor so as to form an apparatus in accordance with any of claims 1 to 39.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

<table>
<thead>
<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1-24, 32-38, 40-43, 45 and 47</td>
<td>US3935610 A (VOGT) See especially column 1 lines 36-54, column 5 lines 44-56 and figures</td>
</tr>
<tr>
<td>X</td>
<td>1-8, 11-20, 22, 23, 24, 32-38, 40-43, 45 and 47</td>
<td>US3806979 A (BONAMI) See especially column 1 lines 1-37, column 2 lines 30-47 and figures</td>
</tr>
<tr>
<td>X</td>
<td>1-4, 7, 16, 18-21, 23-31, 35, 38, 40, 41, 43, 45 and 47</td>
<td>US2102537 A (KHAN) See especially column 1 lines 1-13, column 2 line 46 to column 3 line 61 and figures</td>
</tr>
<tr>
<td>X</td>
<td>1-4, 7, 16, 18, 19, 20, 23, 24, 35, 37, 38, 40, 41, 43, 45 and 47</td>
<td>US3786779 A (BRUNEL) See especially column 1 lines 38-62 and figures</td>
</tr>
<tr>
<td>X</td>
<td>1-4, 7, 16, 18, 19, 20, 23, 24, 35, 38, 40, 41, 43, 45 and 47</td>
<td>JP2001001890 A (IWAMOTO) See especially WPI abstract Accession No. 2001-144310 and figures</td>
</tr>
</tbody>
</table>

Categories:

- **X**: Document indicating lack of novelty or inventive step
- **Y**: Document indicating lack of inventive step if combined with one or more other documents of same category.
- **&**: Member of the same patent family
- **A**: Document indicating technological background and/or state of the art.
- **P**: Document published on or after the declared priority date but before the filing date of this invention.
- **E**: Patent document published on or after, but with priority date
Field of Search:
Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

Worldwide search of patent documents classified in the following areas of the IPC:
A22B; B65G; E01H

The following online and other databases have been used in the preparation of this search report:
WPI & EPODOC

International Classification:

<table>
<thead>
<tr>
<th>Subclass</th>
<th>Subgroup</th>
<th>Valid From</th>
</tr>
</thead>
<tbody>
<tr>
<td>A22B</td>
<td>0007/00</td>
<td>01/01/2006</td>
</tr>
<tr>
<td>B65G</td>
<td>0045/22</td>
<td>01/01/2006</td>
</tr>
</tbody>
</table>