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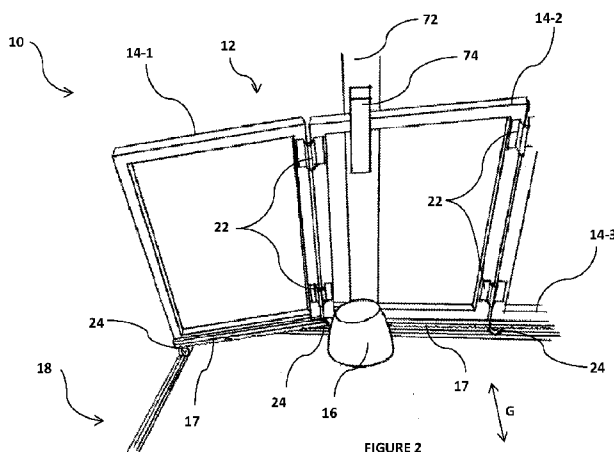
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(54) Title: MOTORISED GATE ARRANGEMENT



(57) Abstract: A motorised gate arrangement including a gate formed by at least two articulated gate sections; a motor; a track defining a track path along which the gate moves under drive by the motor, the track including a non-linear track portion; and at least two rollers, each roller being mounted to a respective gate section for rolling engagement with the track to allow movement of the gate along the track path, At least one of the gate sections is a turning gate section mounted with a turning roller. The turning roller is rotatable about a generally vertical axis to facilitate rolling movement of the turning gate section along the non-linear track portion. At least one of the rollers is mounted to one of the gate sections by an adjustable mounting arrangement which permits vertical adjustment of the roller position relative to the gate section. The gate section and roller associated with the adjustable mounting arrangement comprises an adjustable gate section and an adjustable roller respectively.



MOTORISED GATE ARRANGEMENT

Cross-Reference

[0001] The present application claims priority from Australian provisional patent application No. 2015901752 filed on 14 May 2015, the disclosure of which should be understood to be incorporated into this specification.

Technical Field

[0002] The present invention relates to an improved sliding gate system for closing a gateway or a building point of entry such as a driveway. The invention has been developed for use as a sliding gate system installed at domestic properties, for example to close a domestic driveway, and so will herein be described generally in this context. However, it is to be appreciated that the invention could have wider applications than this context and therefore the invention is not restricted to this particular use.

Background of Invention

[0003] The following discussion of the background to the invention is intended to facilitate an understanding of the invention. However, it should be appreciated that the discussion is not an acknowledgement or admission that any aspect of the discussion was part of the common general knowledge as at the priority date of the application.

[0004] Sliding gate arrangements, for example those used to close the driveway of a domestic property, are provided in a range of configurations and are often built to specification in order to suit a particular driveway.

[0005] In an example of a conventional system, a single gate panel is positioned adjacent to the driveway and mounted alongside a wall or fence at the front of the property such that the gate panel is orientated generally perpendicularly to the driveway. In conventional arrangements, the gate panel may be fitted with a number of rollers to allow the panel to be slidably moved, typically under the influence of an

electric motor, from behind the front (street-side) wall and across the driveway. Having crossed to the other side of the driveway opening, the leading edge of the sliding gate panel will typically abut against a wall or fence on the opposite side of the driveway and thereby close the driveway opening.

[0006] In an alternative sliding gate installation, a pair of sliding gate panels is arranged used with one panel positioned at either side of the driveway. In this type of installation the pair of sliding panels may be configured to slide towards one another until meeting in the centre of, and thereby closing, the driveway. This type of installation is preferable, for example, where the space adjacent to the driveway on one or both sides cannot accommodate a single gate panel which is equal to the width of the driveway. Therefore, this spatial limitation can, in some cases, be addressed by providing a pair of half sized gate panels (which are each half the size of the width of the driveway) in the space adjacent to either side of the driveway.

[0007] However, in other cases, spatial limitations may prevent the use of both of the prior art arrangements discussed above. In these circumstances it may be appropriate to install a non-sliding, hinged gate or pair of non-sliding, hinged gates, which would usually open inwards to a position parallel with the driveway. However conventional hinged gates are undesirable in driveway layouts where a hinged gate panel, in its open position, would present a barrier between the driveway entrance and a parking area adjacent to the driveway. Hinged gates are equally undesirable where a driveway curves immediately beyond the driveway entrance such that a hinged gate, when opened parallel with the driveway entrance, would obstruct a portion of driveway. In these circumstances, both conventional sliding gate systems and conventional hinged gate systems are generally unsuitable for use.

[0008] Conventional hinged gates can also only be used in driveways that are long enough to allow the gates to be swung from the open position to the closed position once a car has been driven through the gates and into its parking position. If the parking position is not sufficiently distant from the gates in the closed position, then the gates might not be able to be swung shut from the open position. In these

circumstances, the gates will only be closable when the car has been driven out of the driveway, which clearly is not desirable.

[0009] An alternative to conventional sliding gates and also to conventional hinged gates is a sliding gate capable of retracting along a curved or angled path. In this regard a series of gate sections which are hingedly connected to form an articulated series of gate sections, allows for a gate to follow a curved or angled track. This type of gate system can therefore be configured to retract, from a closed position, in the manner of a conventional sliding gate (which retracts across the driveway generally perpendicular to the driveway) until reaching a point (the boundary of the property for example) at which the gate can curve away from its initial path, for example through a 90° curve into a position that is parallel with the driveway. This type of system can therefore be fitted at sites which lack the necessary room for a conventional sliding gate on either side of the driveway. Moreover, a curved track which traces the perimeter of a property can position a retracted gate behind a parking space adjacent to the driveway without undesirably enclosing the parking space as can occur with conventional hinged gates.

[0010] However, a disadvantage with curved track gate systems, as compared to straight track sliding gate systems, is that they can have a greater tendency for gate sections to become separated or disengaged from the track as they traverse along the curve of the track. This tends to occur because the gate sections inherently want to move in a straight line whereas the path is curved. Sophisticated arrangements can be adopted to prevent separation or disengagement from the track but this can add significantly to the cost of the gate installation. In addition to track disengagement potentially requiring costly repair, a disengaged gate is typically immobilised thus either stranding the gate in a closed position preventing ingress and egress of vehicles into and out of the property or, alternatively, in an open position potentially compromising domestic security as well as the safety of children and animals.

[0011] Another difficulty with curved track gate systems relates to the increased complexity in conducting repairs. For example, where a single panel straight track gate system may be conveniently re-engaged with a track with relative ease, a multi-panel gate system can require the individual reengagement of multiple panels while they are hingedly connected to one another. This can require time and patience to repair, or even professional assistance.

[0012] For the foregoing reasons, it is desirable to provide an improved curved track gate arrangement by way of increased resistance to track disengagement and/or by way of improved facility for repair in the event of track disengagement.

[0013] Before turning to a summary of the invention it is useful to provide an explanation of some of the terms that will be used to define the spatial relationship of various parts thereof. In this respect, spatial references throughout this specification will generally be based upon an assembled sliding gate arrangement. With this environment as the basis, terms such as 'upper' or 'lower' will be generally understood as relative to the surface (for example a driveway) on which the gate arrangement is installed. Terms such as 'upward direction' or 'downward direction' will therefore be appreciated as referring to directions away from the surface or toward the surface respectively. Terminology such as 'vertical' or 'upright' will be appreciated as referring to a plane approximately perpendicular with the surface and, in most cases, will be generally defined by the orientation of the gate sections.

[0014] Furthermore, it will be understood that all sliding gates move between a 'closed' position in which the gate obstructs a gateway and an 'open' position in which the gate has shifted to a position where the gateway is no longer obstructed and passage through the gateway is facilitated. As discussed above, curved track gate arrangements usually include a series of articulated gate sections, each of which undergo a shifting relative to the track during gate movement between the open and closed positions. In most of these arrangements, the portion of the track overlying the gateway is generally linear, with the curved or non-linear portion of the track being positioned at the edge of the gateway or offset from the gateway altogether, for

example, behind a fence adjacent to the gateway. For this reason, in the closed position, either the majority of, or all of the articulated gate sections will typically lie on the gateway side of the curved track portion. In this context, terms such as the 'leading' gate section can be used in reference to the forward-most gate section when viewed in the direction of movement from a closed position to an open position. In gate installations where, in the closed position, none of the gate sections are engaged with the non-linear track portion, the 'leading' gate section will therefore be the first gate section to engage with the non-linear track portion. Similarly, terms such as the 'trailing' gate section will be understood as gate section at the rear of the articulated gate (remote from the leading gate section) when viewed in the direction of movement from a closed position to an open position.

Summary of Invention

[0015] According to the present invention there is provided a motorised gate arrangement including:

- a gate formed by at least two articulated gate sections;
- a motor;
- a track defining a track path along which the gate moves under drive by the motor, the track including a non-linear track portion; and
- at least two rollers, each roller being mounted to a respective gate section for rolling engagement with the track to allow movement of the gate along the track path,

at least one gate section being a turning gate section mounted with a turning roller rotatable about a generally vertical axis to facilitate rolling movement of the turning gate section along the non-linear track portion, and

at least one of the rollers being mounted to one of the gate sections by an adjustable mounting arrangement which permits vertical adjustment of the roller position relative to the gate section, the gate section and roller associated with the adjustable mounting arrangement thereby comprising an adjustable gate section and an adjustable roller respectively.

[0016] A gate arrangement according to the present invention includes at least one roller being configured for vertical adjustment of the roller position relative to the respective gate section (i.e. the 'adjustable gate section') and is also provided with at least one roller (i.e. the 'turning roller') being configured for rotation about a generally vertical axis. The gate includes a minimum of two articulated gate sections however no upper limit of gate sections is necessarily provided. It will be appreciated that the amount of gate sections necessary for a particular installation will be dependent on the specific parameters of the installation site, for example the width of the gateway and the amount of available space adjacent to the gateway available for the gate to be retracted therein.

[0017] In some embodiments of the invention the rollers may be formed by castors or wheels. Other forms may use ball-type rollers formed by generally spherical rolling members. It will be appreciated that a person skilled in the art may determine and select the appropriate type of roller for a specific installation and to correspond with a specific type of track. In this regard, the rollers are sometimes known in the art as a 'floor track wheel'.

[0018] In some embodiments, each gate section will include at least one respective roller. In alternative embodiments of three gate sections or more, the outermost two (i.e. distal) gate sections may have rollers mounted thereto whilst the intermediate gate section(s) has no rollers and is supported instead by its articulated connection to the neighbouring gate sections on either side of the intermediate gate section(s). In many embodiments, turning gate sections will be provided with a single roller (a turning roller) to facilitate the turning movement. In contrast, non-turning gate sections may include two, non-turning rollers for improved track engagement and more even weight distribution across the length of the non-turning gate section.

[0019] In some forms of the invention, the turning functionality of the turning rollers will be provided by an open or closed bearing in the roller housing. In alternative forms, the turning rollers may be connected to an inner member rotatably

fitted within an outer sleeve such that the inner member and the associated roller are configured to rotate relative to the outer sleeve. Of course, various types of pivoting or swivelling castors or other turning wheel arrangements will be appreciated and known by a person skilled in the art for use with the present invention.

[0020] In one form of the invention, the adjustable mounting arrangement includes a biasing arrangement for biasing the adjustable roller in a downward direction towards the track and permitting dynamic vertical adjustment of the adjustable roller as the gate moves along the track. In this form of the invention, the biasing arrangement renders the adjustable mounting arrangement dynamically adjustable and therefore will be referred to herein as a “dynamically adjustable mounting arrangement”. Likewise, an adjustable roller mounted to an adjustable gate section by a dynamically adjustable mounting arrangement will therefore be referred to herein as a “dynamically adjustable roller” and a “dynamically adjustable gate section” respectively. This form of the invention advantageously provides dynamic resistance to track disengagement by addressing two known causes of roller disengagement in prior art gate arrangements as discussed below.

[0021] Firstly, the rollers of prior art gate arrangements are known to disengage when debris such as sticks, stones or clumps of gravel have become littered across the track. In this case, prior art rollers can lift out of engagement with the track while rolling over the top of the debris. In doing so, the respective gate section is temporarily raised during which time the roller may undergo a lateral or perpendicular shift with respect to the track such that the whole gate section is shifted out of alignment with the track and is consequently disengaged or derailed. The above form of the present invention addresses this issue by advantageously permitting dynamic vertical movement of the roller in an upwards direction in response to debris caught under the roller. A roller mounted using the above biasing arrangement (i.e. a dynamically adjustable roller) is therefore capable of temporarily moving upwards relative to the gate section without causing the gate section to lift, thereby significantly reducing the likelihood of disengagement with the track.

[0022] Secondly, the downward bias provided by the biasing arrangement of the dynamically adjustable mounting arrangement dynamically adapts the dynamically adjustable roller position in response to uneven terrain such as raised or lowered portions of the track. By way of example, in prior art gate arrangements it is not uncommon for a roller to encounter a portion of track which is lower than the portions of track which is presently engaging the neighbouring rollers. The lower portion of track might arise due to uneven ground in which the track is laid, or through shifting movement of the ground over time, or through poor laying of the track when the gate arrangement is installed. In this instance, the roller adjacent to the lower track portion of track may be 'carried' by the neighbouring rollers engaged with higher track portions, the 'carried' roller thereby failing to maintain track engagement as the track slopes away and subsequently fails to re-engage with the track after being moved above the lower portion to a higher portion. In the above embodiment of the present invention, the downward bias on the dynamically adjustable roller can maintain track engagement by shifting the dynamically adjustable roller in a downward direction relative to the gate section when portions of lower track are encountered.

[0023] The dynamically adjustable mounting arrangement is also advantageous in the unlikely event that disengagement does occur and an adjustable roller has become separated from the track. In prior art arrangements, it will usually be necessary to lift a disengaged roller back onto the track by lifting the whole gate section to which the roller is attached. In contrast, a disengaged dynamically adjustable roller can be raised by applying an upward force on the roller until the bias applied by the biasing arrangement is overcome and the dynamically adjustable roller is moved vertically upward. While holding the dynamically adjustable roller in this partially retracted position, an operator may then re-position the dynamically adjustable roller onto the track without the need to lift the gate section. Once positioned above the track as desired, the dynamically adjustable roller can be released and will thus return downward under the influence of the biasing arrangement to re-engage with the track. In this regard, the dynamically adjustable mounting arrangement avoids the need to for the whole gate section to be lifted and

therefore significantly improves the overall motorised gate arrangement's facility for repair.

[0024] In a particular form of the invention, the biasing arrangement has a pair of opposite ends with one end being attached to the dynamically adjustable gate section and the opposite end being attached to the dynamically adjustable roller. In certain embodiments, the dynamically adjustable gate section includes a vertical sleeve at least partially housing the biasing arrangement. Advantageously, this embodiment of the invention may facilitate the retrofitting of a biasing arrangement according to the present invention into the vertical sleeve of a pre-existing gate arrangement.

[0025] In a particular embodiment the adjustable roller is connected to a sliding member that extends into the sleeve for sliding movement within the sleeve and the biasing arrangement applying a biasing load to an upper end of the sliding member within the sleeve. In some forms, the sliding member and the sleeve have complementary cross-sectional profiles. In some embodiments, the sliding member and the sleeve each have square cross-sectional profiles. In alternative embodiments, the sliding member and the sleeve may each have circular cross-sectional profiles. Of course, it will be appreciated by a person skilled in that art that a variety of profile shapes or configurations are suitable for use with the present invention.

[0026] In some embodiments of the present invention, the biasing load applied by the biasing arrangement is applied by a coil spring. In alternative embodiments, the biasing load may be applied by a torsion spring, rubber spring or a pneumatic spring. The biasing load could be applied by other forms of biasing arrangement.

[0027] In addition, or as an alternative, to the above described dynamically adjustable mounting arrangement including a biasing arrangement, the adjustable mounting arrangement may include a manual adjustment arrangement for manually extending or retracting the adjustable roller relative to the adjustable gate section. This form of the invention therefore allows for manual adjustment of the roller to a specific vertical position relative to the adjustable gate section. Adjustable rollers

mounted to an adjustable gate section by a manual adjustment arrangement will thus be referred to herein as 'manually adjustable rollers' and 'manually adjustable gate sections' respectively.

[0028] In embodiments where the manual adjustment arrangement is provided as an alternative form of adjustable mounting arrangement to the dynamically adjustable mounting arrangement, the above discussed advantage of conveniently re-engaging a disengaged roller is equally provided by the manual adjustment arrangement. In this regard, the manual adjustment arrangement allows an operator to manually retract (i.e. move in an upward direction) a disengaged manually adjustable roller thereby moving the roller upwards relative to the track but without the need to lift the whole gate section as can be necessary in prior art arrangements. Once the manually adjustable roller has been manually retracted to a desirable height, the manually adjustable gate section and manually adjustable roller can then be re-positioned above the track as necessary and the adjustable roller can be manually extended (i.e. lowered) relative to the gate section until it is re-engaged with the track.

[0029] Embodiments of the invention which include a plurality of adjustable mounting arrangements that are provided as manual adjustment arrangements are also advantageous in that they allow calibration of the overall gate height relative to the track or the motor. In this regard, after installation is complete, adjustable rollers mounted by manual adjustment arrangements can be selectively raised or lowered to a preferred height in order to, for example, optimise the movement of the articulated gate or to improve engagement between the motor and the articulated gate.

[0030] In embodiments of the invention where a manual adjustment arrangement is provided as an additional feature to the above described dynamic adjustment arrangement, there is therefore provided all of the above described advantages of dynamic disengagement resistance to lowered track portions and track debris as well as the earlier noted benefits provided by a manually adjustable mounting arrangement, namely the ability to calibrate the gate height for the reasons discussed above.

[0031] In some forms of the invention, the manual adjustment arrangement can include a threaded adjustment member extending from the adjustable roller into threaded engagement with a corresponding mounting aperture in the adjustable gate section, whereby manual adjustment of the adjustable roller is by rotation of the threaded adjustment member or by rotation of the mounting aperture. In such forms, vertical adjustment of the adjustable roller can be effected using, for example, a spanner to grip and rotate the adjustment member, which could be formed as a nut for example.

[0032] The at least two gate sections of the motorised gate arrangement may each include include a respective toothed rack for engagement with a gear that is driven by the motor to drive the gate sections along the path, the toothed racks being substantially continuous or coextensive between the gate sections when the gate sections are in substantially the same plane. In these embodiments, the toothed surface of the toothed racks will be spaced outwardly from the one side of the respective gate sections by a first margin, distance or spacing and the gate sections can be hingedly connected by a hinge having a substantially vertical axis of rotation which is spaced from same side of the gate sections as the toothed surface by a second margin, distance or spacing, which is at least equal to the first margin. Where toothed racks are used to drive movement of the gate, this form of the invention advantageously mitigates the possibility neighbouring toothed racks (i.e. mounted to neighbouring articulated gate sections) colliding during the turning of one or both of the neighbouring articulate gate sections around the non-linear track portion. In alternative embodiments of the invention, the motor may drive the articulated gate via means other than a toothed rack, for example, a chain or belt drive.

[0033] In the above form of the invention, the first margin (i.e. the distance between the toothed surface of the toothed racks and the side of the gate sections to which the toothed racks are mounted) is about 40mm. According to the previously described form of the invention, a toothed rack of this size will therefore necessitate the use of gate hinges having an axle (i.e. axis of rotation) at least 40mm from the

surface of the gate section to which the toothed rack and the hinge arm is mounted. Of course, in alternative embodiments of the invention that employ a drive that does not use toothed racks, the above noted issue with rack collisions might be obviated and therefore an alternative type of hinge, pivot or joint may be used for the articulation of the gate sections.

[0034] The type of track suitable for use with the present invention will be known to a person skilled in the art and may typically be formed with a convex profile intended for engagement with a complementarily shaped concave wheel profile. Alternative track profiles could include an inverted V-shape for use with a complementary inverted V-shaped wheel profile. In many forms of the invention the track will comprise a discrete element, typically formed by steel, which is laid upon and fixed to the surface of the gateway. However, in other forms the track may be formed integrally with the surface of the gateway, for example formed as a ridge or a groove formed during the formation of a concrete slab.

[0035] In some forms of the invention, all but one of the articulated gate sections may be turning gate sections. For example, in installation sites where there is sufficient room adjacent to the gateway for one gate section to be retracted to an open position without obstructing the gateway, this gate section may be configured as a 'non-turning' gate section. In such a configuration, the non-turning gate section will therefore be ordered at the distal end of the articulated gate series that is opposite to the non-linear track portion i.e. the 'rear' end of the articulated gate series when viewed in the direction of movement from a closed position to an open position.

[0036] The selection of which gate sections to configure as adjustable gate sections will be determined by the gate technician installing or designing the gate arrangement and will typically depend on factors such as cost, terrain, ground levelness and the determined likelihood of a disengagement occurring. In many installations it may be preferable to install only adjustable rollers and therefore each of the articulated gate sections will comprise adjustable gate sections. However in other installations, it may be determined that the disengagement risk is sufficiently low that,

in order to reduce costs, only one or some (but not all) gate sections should be configured as adjustable gate sections.

[0037] Similarly, the selection of whether the adjustable mounting arrangement is formed by a dynamically adjustable biasing arrangement or, alternatively, a manual adjustment arrangement, or a combination of both, will be determined by parameters specific to the installation site as well as cost limitations. In some forms, each of the articulated gate sections will be an adjustable gate section including a biasing arrangement i.e. a dynamically adjustable mounting arrangement. In other forms, each of the articulated gate sections will include rollers mounted by a manual adjustable arrangement. In alternative forms, some rollers may be mounted with a dynamically adjustable mounting arrangement while other rollers are mounted by manually adjustable mounting arrangements. In still further forms, at least some of the rollers may be mounted by an adjustable mounting arrangement which includes a combination of dynamic adjustment and manual adjustment arrangements.

[0038] According to a second aspect of the present invention, there is provided a roller assembly for a gate section of a rolling gate arrangement, the roller assembly including a roller and an adjustable mounting arrangement for mounting the roller to the gate section, the adjustable mounting arrangement permitting vertical adjustment of the roller position relative to the gate section. Advantageously, the second aspect of the present invention provides a roller assembly which may be conveniently inserted into a gate arrangement to permit vertical adjustment the roller in order to alleviate some or all of the above-discussed difficulties relating to rolling gate arrangements. Moreover, the second aspect of the present invention advantageously allows for an existing gate arrangement to be retrofitted with an adjustable roller assembly.

[0039] The adjustable mounting arrangement can include a biasing arrangement permitting dynamic vertical adjustment of the roller during operation of the rolling gate arrangement. Advantageously, the roller assembly can therefore define a dynamic roller assembly capable of dynamically adjusting the vertical position of the roller

during operation and in response to dynamic loads applied to the roller. In some embodiments of the invention, the roller assembly includes a roller shaft extending from the roller and a sleeve member, the roller shaft being at least partially received within the sleeve member and configured for sliding movement relative to the sleeve member. According to a particular embodiment, the biasing arrangement is located within the sleeve member. According to an alternative embodiment, the biasing arrangement is located outside of the sleeve member, for example a helical spring surrounding a portion of the sleeve member.

[0040] The sleeve member can include an abutment and the biasing arrangement can be located between the abutment and the roller shaft. The sleeve member can include an open end and a closed end opposite to the open end. The closed end may define an abutment for abutting an upper end of the biasing arrangement, the lower end of the biasing arrangement may abut the roller shaft which can extend through the opening in the sleeve.

[0041] As noted above, the biasing arrangement of the second aspect of the present invention can comprise a helical spring. In alternative embodiments, the biasing arrangement may include a torsion spring, rubber spring or a pneumatic spring. Of course, other forms of biasing arrangements may be suitable for use with the present invention.

[0042] In an alternative embodiment of the invention, the roller assembly may include an abutment connected to the roller, defining a roller abutment, and the biasing arrangement may be comprised of a helical spring surrounding a portion of the sleeve member. In this instance, an upper end of the helical spring can be secured to a portion of the sleeve and the lower end of the helical spring can abut the roller abutment.

Brief Description of Drawings

[0043] In order that the invention may be more fully understood, some embodiments will now be described with reference to the figures in which:

[0044] Figures 1 to 4 illustrate a sequence of movement demonstrating the operation of a non-linear, curved-track, four gate section sliding gate arrangement according to an embodiment of the invention.

[0045] Figure 5 is a side view of an embodiment of an adjustable mounting arrangement according to the present invention including a dynamically adjustable biasing arrangement.

[0046] Figure 6 is a partially exploded view of the adjustable mounting arrangement illustrated in Figure 5.

[0047] Figure 7 is a perspective view of an adjustable mounting arrangement according to an alternative embodiment of the present invention including a manually adjustable mounting arrangement.

[0048] Figure 8 is a view of a curved track two gate section sliding gate arrangement according to an embodiment of the invention.

[0049] Figure 9 is a plan view of the hinge arrangement illustrated in Figure 8.

[0050] Figure 10 is a cross sectional view of a dynamic roller assembly according to an embodiment of the present invention.

[0051] Figure 11 is a cross sectional view of the dynamic roller assembly of Figure 10, under compression.

[0052] Figures 12 and 13 illustrate the process of inserting and securing the dynamic roller assembly of Figures 10 and 11 within the frame of a gate section.

Detailed Description

[0053] Figures 1 to 4 illustrate a four gate section sliding gate arrangement 10 comprising an articulated gate 12 formed by four gate sections 14 hingedly connected for articulation by hinges 22 and mounted with rollers 24, 26 for rolling movement along track 18. A motor 16 includes a drive gear (not shown) which is positioned to

engage with a series of toothed racks 17 fixed to the lower frame of each gate section 14 to drive movement of the articulated gate 12 along the track 18. Figure 1 illustrates the gate 12 in a closed position in which gateway G is obstructed by gate 12 and therefore closed against passage therethrough. Figures 2 and 3 illustrated a sequence whereby gate 12 is moving from the closed position shown in Figure 1 toward an open position shown in Figure 4 in which gateway G is now unobstructed by gate 12 and therefore open for passage therethrough. With reference to Figure 4, the four articulated gate sections 14 comprise (from left to right) a first gate section 14-1, a second gate section 14-2, a third gate section 14-3 and a fourth gate section 14-4.

[0054] The motorised gate arrangement 10 further includes a support post 72 with a guide bracket 74 extending therefrom which overlies and engages with the upper frame of gate sections 14 thereby retaining gate 12 in a generally upright orientation. In the illustrated embodiment, post 72 also defines one boundary of gateway G such that gate sections 14 positioned on the right hand side of post 72 will obstruct or partially obstruct gateway G as illustrated in Figures 1-3 and gate sections 14 which are positioned on the left hand side of post 72 have thereby retracted to a position which no longer obstructs gateway G.

[0055] As best illustrated in Figure 1, track 18 includes a non-linear track portion which, in the illustrated embodiment, is formed by a curved portion 28. As will be appreciated with reference to the discussion above, the curved track portion 28 allows for the first 14-1, second 14-2 and third 14-3 gate sections to be retracted from the closed position to an open position wherein these gate sections 14-1, 14-2, 14-3 are angled or even perpendicular with respect to their initial closed position shown in Figure 1. This is best exemplified in Figure 4 in which the gate 12 has shifted to the open position such that gate sections 14-1, 14-2, 14-3 have moved along (and therefore turned around) the curved track portion 20 and have thereby assumed an orientation generally parallel with the direction of passage through the gateway G. In contrast, the fourth gate section 14-4 has arrived at its open position short of the

curved track portion 20 and is therefore still in its original orientation generally perpendicular with the direction of passage through the gateway G.

[0056] It will therefore be appreciated as to why, in the illustrated embodiment, the non-pivoting rollers 26 of the fourth gate section 14-4 are appropriate. This is because the non-pivoting rollers 26 do not engage with the curved track portion 20 whereas the rollers 24 of the first, second and third gate sections 14-1, 14-2, 14-3 do engage with the curved track portion 20. For this reason, the first, second and third gate portions 14-1, 14-2, 14-3 are fitted with a dynamically adjustable pivoting rollers 24 capable of rotation about a generally vertical axis. The pivoting movement of pivoting roller 24 is facilitated by a bearing 54 which is best illustrated further in Figures 5-7. As best illustrated in Figure 2, the roller 24 of the first gate section 14-1 is aligned with the portion of the track 18 on which it is engaged. In contrast, the orientation of the first gate section 14-1 relative to this portion of the track 18 is almost perpendicular. It will thus be appreciated that the pivoting nature of rollers 24 allow rollers 24 to align with and follow the track 18 and, in particular, the contour of curved portion 20, independently of the orientation of the gate section 14 to which the roller 24 is mounted. In contrast, and as noted above, the fourth gate section 14-4 does not move along curved track portion 20 and therefore remains generally collinear with the track 18 at all times during movement between the closed and open positions. Consequently, the fourth gate section 14-4 does not require the pivoting rollers 24 and, instead, non-pivoting rollers 26 may be used for the fourth gate section 14-4 and, in some cases, thereby reducing the overall cost of the motorised gate arrangement 10.

[0057] As noted above, Figures 1-4 illustrate a dynamically adjustable motorised gate arrangement 10. As will be discussed in greater detail below, Figure 8 illustrates a manually adjustable motorised gate arrangement 70 having only two gate sections 15-1 and 15-2. However, in both of the illustrated embodiments 10 and 70 the 'turning' gate sections (i.e. gate sections 14-1, 14-2, 14-3 and 15-1) that are intended for engagement with the non-linear track portion 20 will desirably include only a single

pivotable roller 24, 28 to facilitate the turning movement. In relation to the non-turning gate sections 14-4, 15-2, these gate sections are intended for linear movement only and are therefore better supported by providing them with a pair of non-pivoting rollers 26, 30.

[0058] Turning now to Figures 5 and 6, the rollers 24 of the motorised gate arrangement will be discussed in greater detail. Figure 5 illustrates a dynamically adjustable mounting arrangement 32 by which roller 24 is mounted to a gate section, only a sleeve portion 34 of which is shown in Figure 5. Roller 24 comprises a castor wheel including wheel 50 rotatably mounted within a roller frame 52 which is pivotally mounted via a bearing 54 to a piston member 36. Bearing 54 thereby allows swivelling or pivoting rotation of the roller frame 52 about a generally vertical axis relative to piston member 36. At the opposite end of piston member 36 is a boss 40 over which a coil spring 38 is fitted and fixed thereto by a bolt 46. The opposite end of the coil spring 38 is fitted in an equivalent manner with another bolt 46 to a boss 40 which extends from a mounting block 42. In this manner, the roller 24 is connected to the piston member 36 which is connected, via coil spring 38 to the mounting block 42, the connection of these components thereby forming a biasing arrangement 33.

[0059] The gate section 14 to which roller 24 is mounted includes a generally vertical sleeve 34 which has a generally rectangular profile. In the embodiment illustrated in Figures 1-4, sleeve 34 is formed by the lower portion of one of the hollow vertical frame portions of the gate section 14. This is exemplified in Figure 6 which shows the lower left corner of a gate section 14 and the sleeve 34 being formed by the hollow, lower vertical frame portion of gate section 14. Vertical sleeve 34 includes an opening 35 at the lowermost side of the sleeve 34 which, in the illustrated embodiment, will also be the underside of the gate section 14.

[0060] Piston member 36 and mounting block 42 are sized and shaped with a complementary rectangular profile such that the biasing arrangement 33 can be partially inserted into the opening 35 of the sleeve 34. Mounting block 42 includes mounting apertures 44 which correspond with similar mounting apertures 44 in the

sleeve 34 and allow for a fastener such as a screw or bolt to be fitted through the mounting apertures 44 of the sleeve 34 and into the mounting apertures of the mounting block 42 to secure the mounting block 42 in position within the sleeve 44. In this configuration, the upper portion of piston member 36 is housed within the sleeve 44 while the lower portion of piston member 36 protrudes from the sleeve opening 35, beneath which the roller 24 is located. The movement of piston member 36 within the sleeve 36 is therefore influenced by the bias of coil spring 38 but is otherwise free to engage in vertical sliding movement within, and relative to, sleeve 34.

[0061] The insertion of biasing arrangement 33 within the vertical sleeve 34 forms a dynamically adjustable mounting arrangement 24 by which pivoting rollers 24 and non-pivoting rollers 26 are mounted to the gate sections 14. As discussed earlier, the dynamically adjustable mounting arrangement 24 is capable of dynamically adjusting the position of the roller 26 relative to the gate section 14 in response to track debris which might otherwise force roller 26 out of engagement with track 18 thereby disengaging the whole motorised gate arrangement. Moreover, the dynamically adjustable mounting arrangement 24 is capable of absorbing other vertical forces applied to the rollers 24 such as uneven or sinusoidal terrain which can result in some rollers 26 being subjected to greater weight than other rollers. By way of example, a track which crosses a gateway having a slight trough or concave portion will create an increased risk of disengagement when prior art rollers traverse the concave portion of the track. In contrast, the dynamically adjustable mounting arrangement 32 applies a downward bias on roller 24 under the weight of the gate section 24 which can therefore maintain the roller 24 in contact with the concave portion of the track 18. In this way, the dynamically adjustable mounting arrangement 32 provides significantly increased resistance to disengagement.

[0062] A further advantage of the dynamically adjustable mounting arrangement 32 can be observed in the unlikely event that disengagement does occur and a dynamically adjustable roller 24, 26 has become separated from the track 18. As will be appreciated with reference to Figure 7, which will be discussed in further detail

below, roller wheels 50 typically include a concave profile 66 which corresponds to a convex portion 64 on track 18. In prior art mounting arrangements, raising the concave wheel 50 for re-engagement with the convex track 18 therefore requires the weight of the gate section 14 to be lifted while the wheel 50 is re-positioned above the track 18 before being lowered into re-engagement with the convex portion 64 of the track 18. In contrast, a disengaged roller 24, 26 mounted to the dynamically adjustable gate section 14 by the dynamically adjustable mounting arrangement 32 can be raised, relative to the track 18, by applying an upward force on the roller 24, 26 thereby compressing the coil spring 38 and pushing piston member 36 into the sleeve 34. While holding the roller 24, 26 in this partially retracted or uplifted position, the wheel 50 may then be re-positioned above the convex portion 64 of the track 18 before releasing the roller 24, 26 which will extend from the sleeve 34 under the influence of the coil spring 38 and thus re-engage with the track 18. In this regard, the dynamically adjustable mounting arrangement 32 avoids the need to lift the weight of the entire gate section 14 and thereby improves the repair facility of the entire dynamically adjustable motorised gate arrangement 10.

[0063] The present invention's above-noted improved facility for repair is also provided by an alternative mounting arrangement which is illustrated in Figure 7. As opposed to the dynamically adjustable mounting arrangement 32 illustrated in Figures 5 and 6, Figure 7 illustrates a manually adjustable mounting arrangement 48 which enables manual extension or retraction of manually adjustable rollers 28, 30 which are illustrated in Figure 8. In a similar manner to the rollers mounted via the dynamically adjustable mounting arrangement 32, the rollers mounted via the manually adjustable mounting arrangement 48 are either a manually adjustable pivoting roller 28 or a manually adjustable non-pivoting roller 30. Still referring to Figure 8, there is illustrated an alternative motorised gate arrangement, namely a manually adjustable gate arrangement 70 which includes two manually adjustable gate sections 15 comprising a first gate section 15-1 and a second gate section 15-2. The two manually adjustable gate sections 15 are articulated via hinges 22. Similar to the gate arrangement 10 illustrated in Figures 1-4, the first gate section 15-1 in the

manually adjustable gate arrangement 70 is configured to engage with a non-linear portion in the track 18 and thereby undergo a turning motion. For this reason, the first gate section 15-1 is mounted with a manually adjustable pivoting roller 28 at its leading side. In contrast, the second gate section 15-2 is designed to reach its fully open position (i.e. where the right hand side of the second gate section 15-2 generally aligns with post 72 thereby opening gateway G) without engaging with the non-linear portion of the track 18. For this reason, pivoting rollers are usually unnecessary and the second gate portion 15-2 is instead mounted with a pair of manually adjustable non-pivoting rollers 30.

[0064] Returning to Figure 7, there is illustrated a manually adjustable pivoting roller 28 comprising a wheel 50 having a concave profile 66 designed to engage with the convex portion 64 of the track 18. Wheel 50 is rotatably mounted in a roller frame 52 which is pivotally mounted to a mounting flange 53 via a bearing 54. A threaded shaft 56 extends upwardly from the mounting flange 53 through a mounting aperture 58 in the base rail 61 of the manually adjustable gate section 15 and is secured in place by a nut and washer combination 60. The manually adjustable mounting arrangement 48 therefore allows for vertical adjustment of the roller 28 by manual rotation of the threaded shaft 56 with respect to the mounting aperture 58 in the base rail 61. As noted above, the manually adjustable mounting arrangement therefore allows for disengaged manually adjustable pivoting rollers 28 or disengaged manually adjustable non-pivoting rollers 30 to be conveniently retracted in an upwards direction to allow for their re-positioning above the convex portion 64 of the track 18 before being manually extended again in a downwards direction to re-seat the roller 28, 30 on, and in engagement with, the track 18. Moreover, the manually adjustable mounting arrangement 48 facilitates convenient calibration of the manually adjustable gate arrangement 70 during the installation process. In this regard, each of the manually adjustable rollers 28, 30 can be conveniently adjusted to the height desired by the installer. For example, in instances where a roller is out of height alignment with the remaining rollers the risk of disengagement is amplified. Alternatively, after installation it may become necessary to raise or lower the whole articulated gate 15

by a small margin to facilitate smoother operation or better engagement between the motor 16 and the toothed rack 17. It will therefore be appreciated that the manually adjustable mounting arrangement 48 not only facilitates calibration of the gate arrangement 70 to reduce the risk of disengagement but also provides improved facility for repair in the event of roller disengagement.

[0065] Turning now to Figure 9 there is illustrated a plan view of a the embodiment illustrated in Figure 8 showing the pair of gate sections 15 consisting of a first gate section 15-1 and a second gate section 15-2 which are articulated via a hinge 22 having a hinge axle 62. As illustrated in Figure 8, each gate section 15 is mounted with a toothed rack 17 positioned below the hinge 22. The toothed racks 22 and the hinge 22 are mounted to mounting surfaces 63 on the gate sections 15. With reference to Figure 9, it will be appreciated that the radius of rotation of each gate section 15 relative to the alternative gate section 15 will be determined by the spacing of the hinge axle 62 (which defines the hinge axis of rotation) from each of the mounting surfaces 63. To avoid undesirable collision between the pair of toothed racks 17, the illustrated embodiment provides that the distance B between the hinge axle 22 and the mounting surface 63, is greater than the distance A between the outermost surface of the toothed rack (the toothed surface) and the mounting surface 63. In some embodiments, the dimension A is about 40mm. In this example, the hinge 22 would be sized such that dimension B is therefore equal to, or greater than, 40mm.

[0066] Turning now to Figures 10 and 11, there is illustrated an alternative embodiment of a dynamically adjustable mounting arrangement to that which is illustrated in Figures 5 and 6. Figures 10 and 11 illustrate a dynamic roller assembly 100 suitable for insertion into the frame of a rolling gate, for example a motorised gate arrangement.

[0067] Roller assembly 100 includes a roller comprising a swivel castor 102 pivotally connected to castor shaft 104 and an adjustable mounting arrangement for mounting the roller to the gate section, the adjustable mounting arrangement permitting vertical adjustment of the roller position relative to the gate section.

[0068] The adjustable mounting arrangement includes a cylindrical hollow sleeve 106 and a biasing arrangement located within the hollow sleeve 106. Sleeve 106 includes an opening 107 at its lower end to permit receipt of castor shaft 104 to be partially received therein. The opposite, upper, end of sleeve 106 is enclosed with a cap 108 which defines an abutment surface at the upper end of the aperture within sleeve 106. The biasing arrangement comprises a helical spring 110 positioned within sleeve 106 between the cap 108 and the castor shaft upper end 112. Helical spring 110 can be selected for sufficient stiffness to support the portion of the gate arrangement mass expected to be applied to the particular roller assembly 100. As illustrated in Figure 10, during normal operation castor helical spring 110 is partially compressed under the mass of the gate arrangement. Castor 102 is thereby urged downward, relative to sleeve 106.

[0069] Figure 11 illustrates assembly 100 when a force F is applied to castor such as when castor 102 encounters an obstacle on the track of a rolling gate arrangement or, alternatively, when castor 102 is driven to roll upward along an incline in a gateway surface. Under the influence of force F , castor shaft 104 slides upward within sleeve 106, toward cap 108 compressing helical spring 110. When force F is removed, castor shaft 104 extends outward from sleeve 106, thereby maintaining contact between castor 102 and the track of the gate arrangement.

[0070] Turning to Figures 12 and 13, there is illustrated the process for inserting dynamic roller assembly 100 into a gate section 115 of a gate arrangement, such as that which is illustrated in Figures 1 to 4. Gate section 115 includes a hollow vertical frame member 116 and a hollow base rail 118. Vertical frame member 116 includes an opening 114 extending into an internal passageway 120. As illustrated in Figure 12, assembly 100 is sized for insertion into opening 114. Turning now to Figure 13, assembly 100 is illustrated in its inserted position within, occupying a portion of passageway 120 within vertical frame member 116. Castor shaft 104 extends downward from opening 114 beneath gate section 115. A screw 122 is drilled through vertical frame member 116 into sleeve 106 to secure sleeve 106 relative to gate

section 115. In alternative embodiments, a rivet or locating pin may be used to secure the sleeve to the gate section. In still further embodiments, sleeve 106 may be sized for an interference fit within passageway 120 such that no additional securing member or fastener is used.

[0071] Assembly 100 therefore provides an adjustable mounting arrangement capable of mounting castor 102 within a gate section 115. With reference to Figures 10 to 13, it will thus be appreciated that the present invention provides for a dynamic roller assembly capable of convenient insertion into a gate section of a motorised gate arrangement to provide increased resistance to track disengagement and/or improved facility for repair in the event of track disengagement.

[0072] In a particular embodiment of the invention, sleeve 106 is formed from nylon. Advantageously, nylon provides a desirably low-friction surface facilitating sliding movement between the internal surface of sleeve 106 and the external surface of castor shaft 104. However it will be appreciated that a variety of alternative, low-friction materials may be suitable for example polymers such as PTFE, POM or PU.

[0073] It will also be appreciated that the outer surface of the sleeve can vary in its profile to correspond with the profile of the frame into which it is inserted. For example a cylindrical sleeve can be inserted into a square frame or, alternatively, could be inserted into a cylindrical frame. Similarly, the sleeve may be formed with a square outer surface which could also be inserted into a square gate frame. It will therefore be appreciated that the exact shape of the sleeve may be tailored to suit the frame profile of a particular gate section.

[0074] Similarly, it will be appreciated that whilst the inner aperture of the sleeve may be cylindrical to correspond with the cylindrical shape of the castor shaft, a variety of alternative shaft profiles may be used in which case the profile of the sleeve aperture may vary in order to correspond. For example the castor sleeve may be square or octagonal in profile in which case the aperture of the sleeve may be equivalently square or octagonal in profile.

[0075] Where the terms “comprise”, “comprises”, “comprised” or “comprising” are used in this specification (including the claims) they are to be interpreted as specifying the presence of the stated features, integers, steps or components, but not precluding the presence of one or more other feature, integer, step, component or group thereof.

[0076] Finally, it is to be understood that the invention described herein is susceptible to variations, modifications and/or additions other than those specifically described and it is to be understood that the invention includes all such variations, modifications and/or additions which fall within the spirit and scope of the present disclosure.

CLAIMS

1. A motorised gate arrangement including:
 - a gate formed by at least two articulated gate sections;
 - a motor;
 - a track defining a track path along which the gate moves under drive by the motor, the track including a non-linear track portion; and
 - at least two rollers, each roller being mounted to a respective gate section for rolling engagement with the track to allow movement of the gate along the track path,
 - at least one gate section being a turning gate section mounted with a turning roller rotatable about a generally vertical axis to facilitate rolling movement of the turning gate section along the non-linear track portion, and
 - at least one of the rollers being mounted to one of the gate sections by an adjustable mounting arrangement which permits vertical adjustment of the roller position relative to the gate section, the gate section and roller associated with the adjustable mounting arrangement thereby comprising an adjustable gate section and an adjustable roller respectively.
2. A motorised gate arrangement according to claim 1, the adjustable mounting arrangement including a biasing arrangement for biasing the adjustable roller in a downward direction towards the track and permitting dynamic vertical adjustment of the adjustable roller as the gate moves along the track.
3. A motorised gate arrangement according to claim 2, the biasing arrangement having a pair of opposite ends with one end being attached to the adjustable gate section and the opposite end being attached to the adjustable roller.
4. A motorised gate arrangement according to claim 2 or 3, the adjustable gate section including a vertical sleeve at least partially housing the biasing arrangement.

5. A motorised gate arrangement according to claim 4, the adjustable roller being connected to a sliding member that extends into the sleeve for sliding movement within the sleeve and the biasing arrangement applying a biasing load to an upper end of the sliding member within the sleeve.
6. A motorised gate arrangement according to claim 5, the sliding member and the sleeve having complementary cross-sectional profiles.
7. A motorised gate arrangement according to claim 6, the sliding member and the sleeve each having square cross-sectional profiles.
8. A motorised gate arrangement according to any one of claims 5 to 7, the biasing load being applied by a coil spring.
9. A motorised gate arrangement according to any one of claims 1 to 8, the adjustable mounting arrangement including a manual adjustment arrangement for manually extending or retracting the adjustable roller relative to the adjustable gate section.
10. A motorised gate arrangement according to claim 9, the manual adjustable arrangement including a threaded adjustment member extending from the adjustable roller into threaded engagement with a corresponding mounting aperture in the adjustable gate section, whereby manual adjustment of the adjustable roller is by rotation of the threaded adjustment member or by rotation of the mounting aperture.
11. A motorised gated arrangement according to any one of claims 1 to 10, wherein at least two gate sections each include a respective toothed rack for engagement with a gear that is driven by the motor to drive the gate sections along the path, the toothed racks being substantially continuous between the gate sections, the toothed surface of the toothed racks being spaced from the one side of the respective gate sections by a first margin and the gate sections being hingedly connected by a hinge having an axis of rotation spaced from same side of the

gate sections as the toothed surface by a second margin which is at least equal to the first margin.

12. A motorised gate arrangement according to claim 11, the first margin being 40mm.
13. A motorised gate arrangement according to any one of claims 1 to 12, wherein all but one of the articulated gate sections are turning gate sections.
14. A motorised gate arrangement according to any one of claims 1 to 12, each of the articulated gate sections being turning gate sections.
15. A motorised gate arrangement according to any one of claims 1 to 14, each of the articulated gate sections being adjustable gate sections.
16. A motorised gate arrangement according to any one of claims 2 to 8, each of the articulated gate sections being a dynamically adjustable gate section.
17. A motorised gate arrangement according to claims 9 or 10, each of the adjustable mounting arrangements including a manual adjustment arrangement.
18. A roller assembly for a gate section of a rolling gate arrangement, the roller assembly including a roller and an adjustable mounting arrangement for mounting the roller to the gate section, the adjustable mounting arrangement permitting vertical adjustment of the roller position relative to the gate section.
19. A roller assembly according to claim 18, the adjustable mounting arrangement including a biasing arrangement permitting dynamic vertical adjustment of the roller during operation of the rolling gate arrangement.
20. A roller assembly according to claim 19, the roller assembly including a roller shaft extending from the roller and a sleeve member, the roller shaft being at least partially received within the sleeve member and configured for sliding movement relative to the sleeve member.

21. A roller assembly according to claim 20, the biasing arrangement being located within the sleeve member.
22. A roller assembly according to claim 21, the sleeve member including an abutment and the biasing arrangement being located between the abutment and the roller shaft.
23. A roller assembly according to claim 22, the biasing arrangement comprising a helical spring.
24. A roller assembly according to any one of claims 20 to 23, the sleeve member including an open end and a closed end located opposite to the open end.

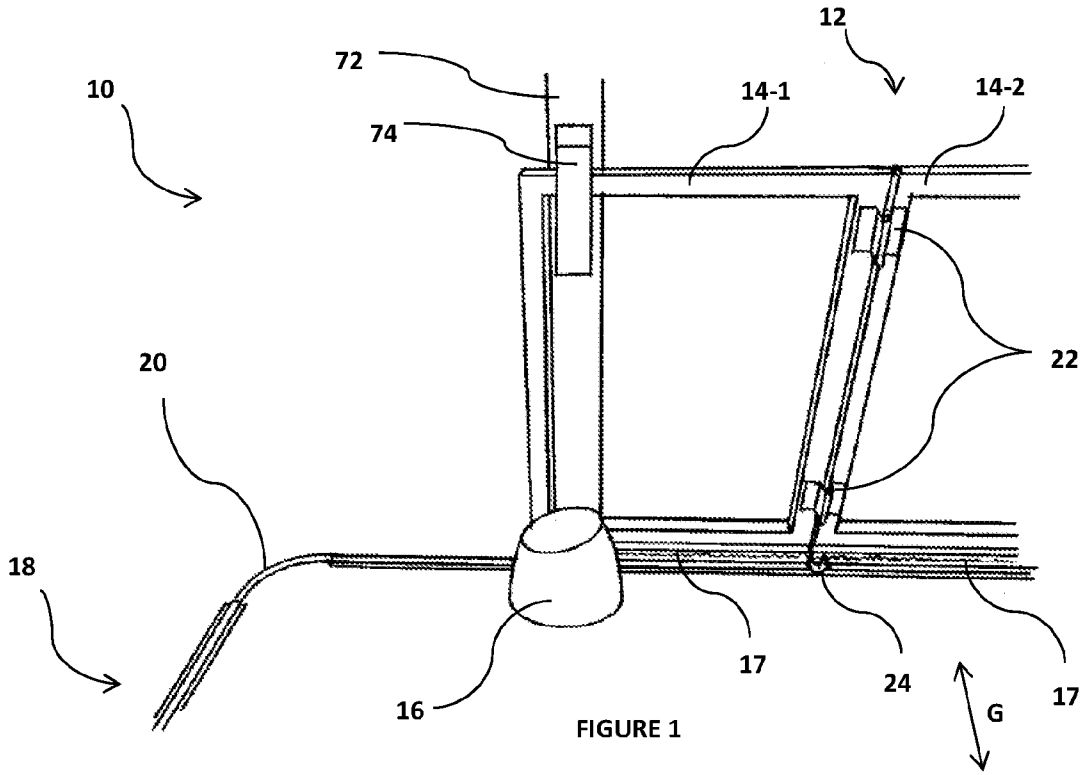


FIGURE 1

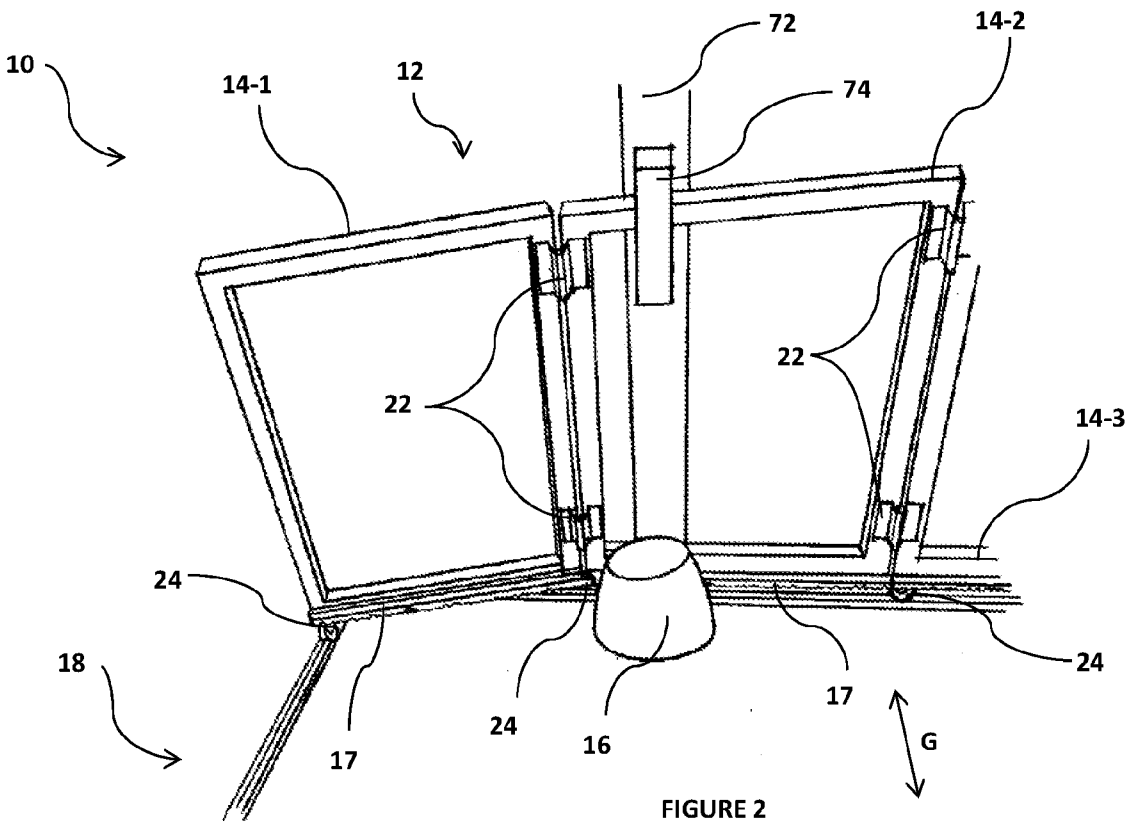


FIGURE 2

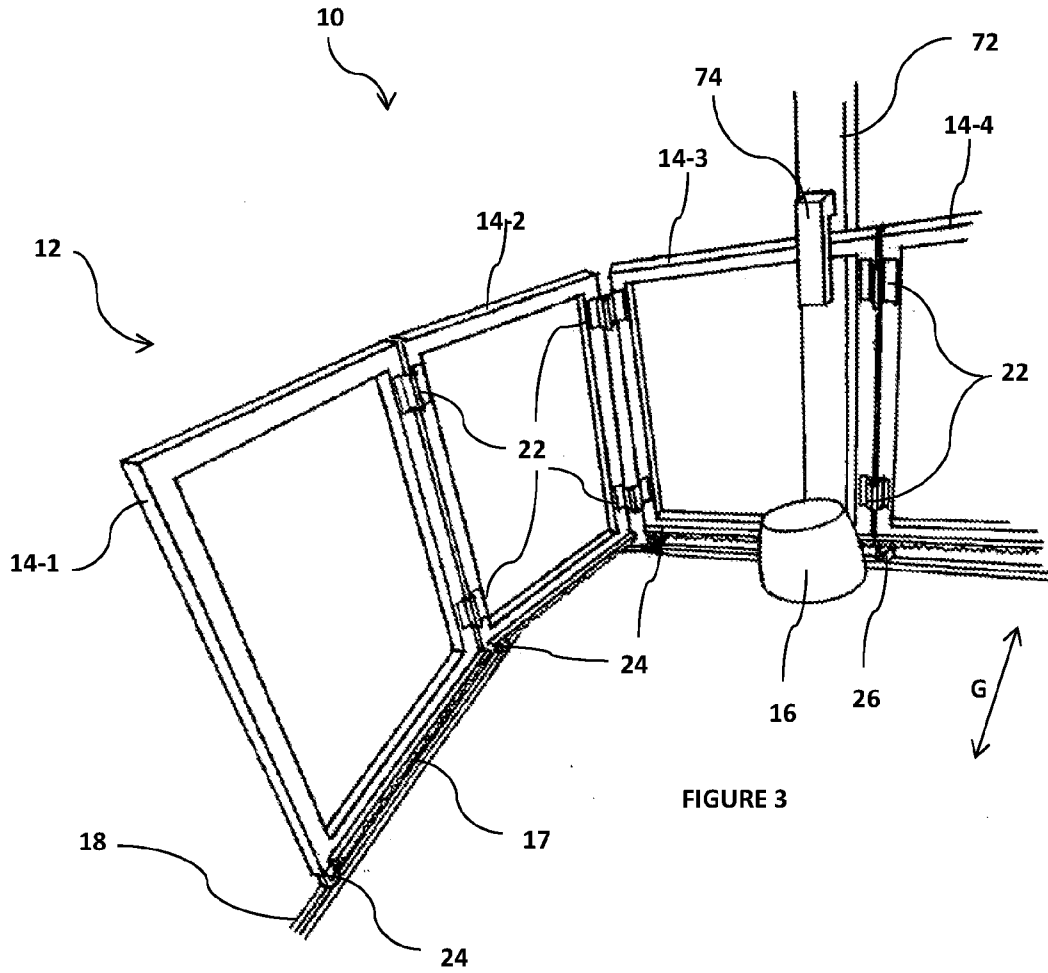


FIGURE 3

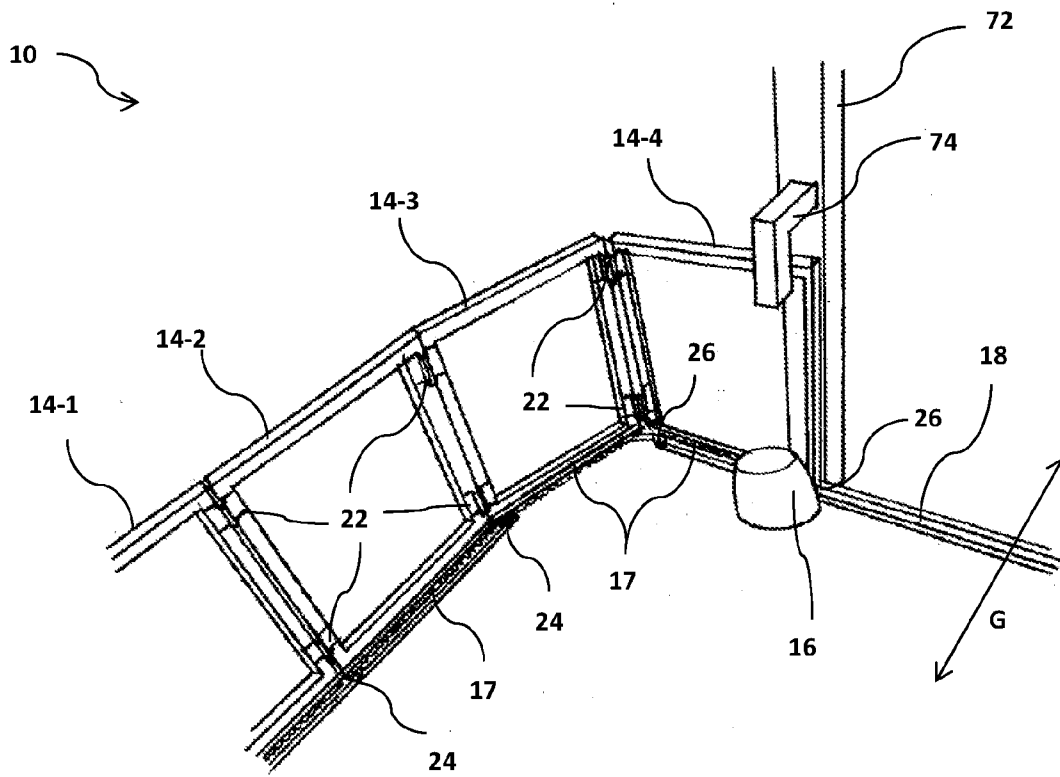


FIGURE 4

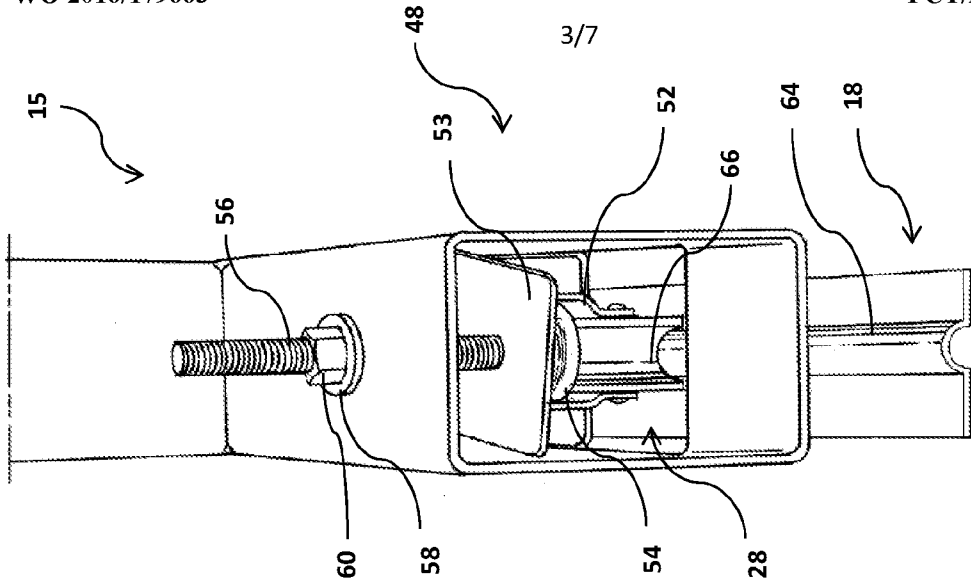


FIGURE 7

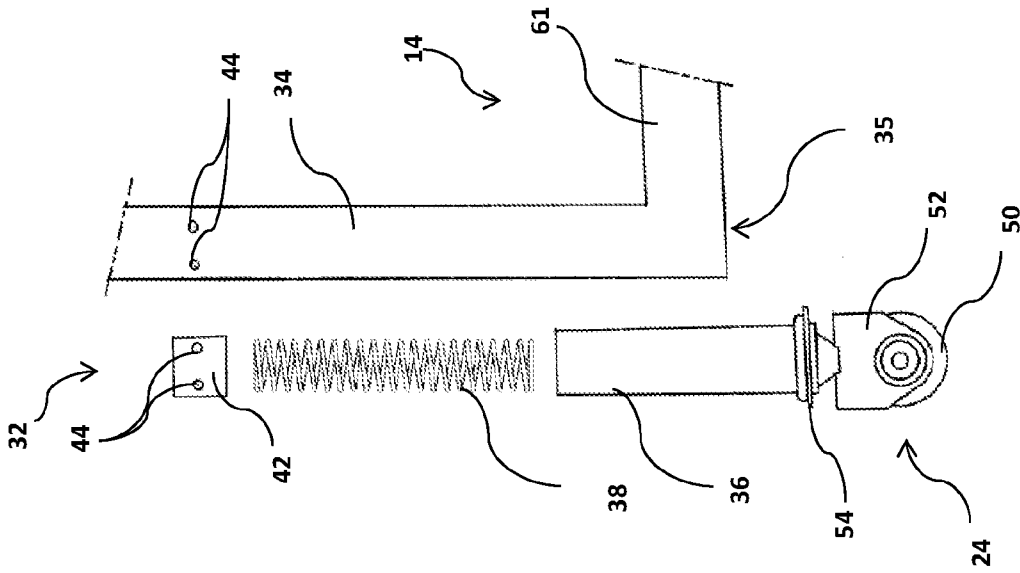


FIGURE 6

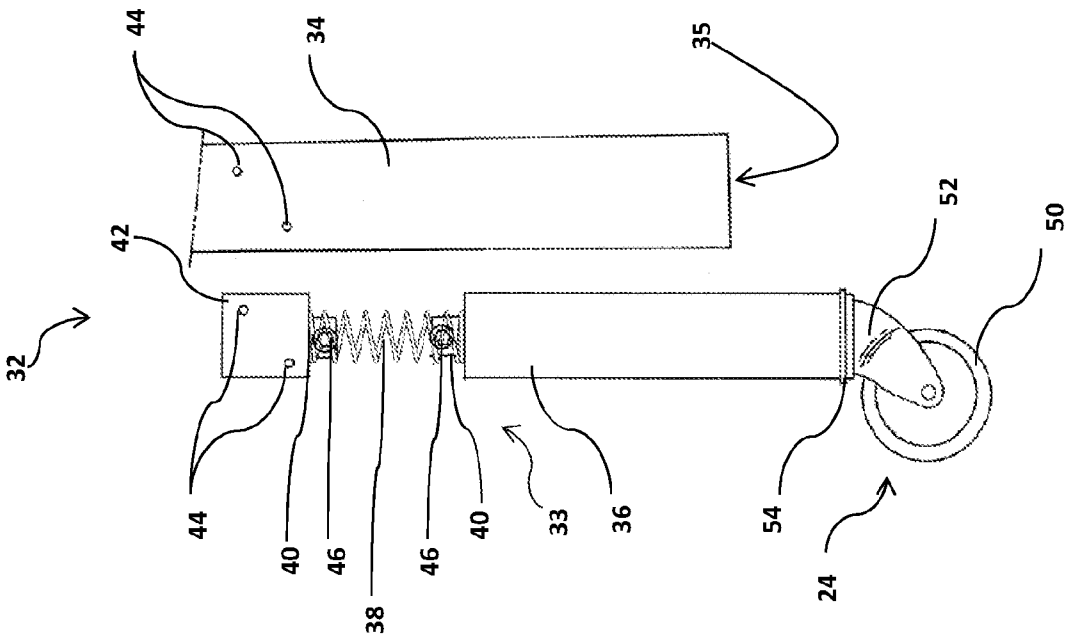


FIGURE 5

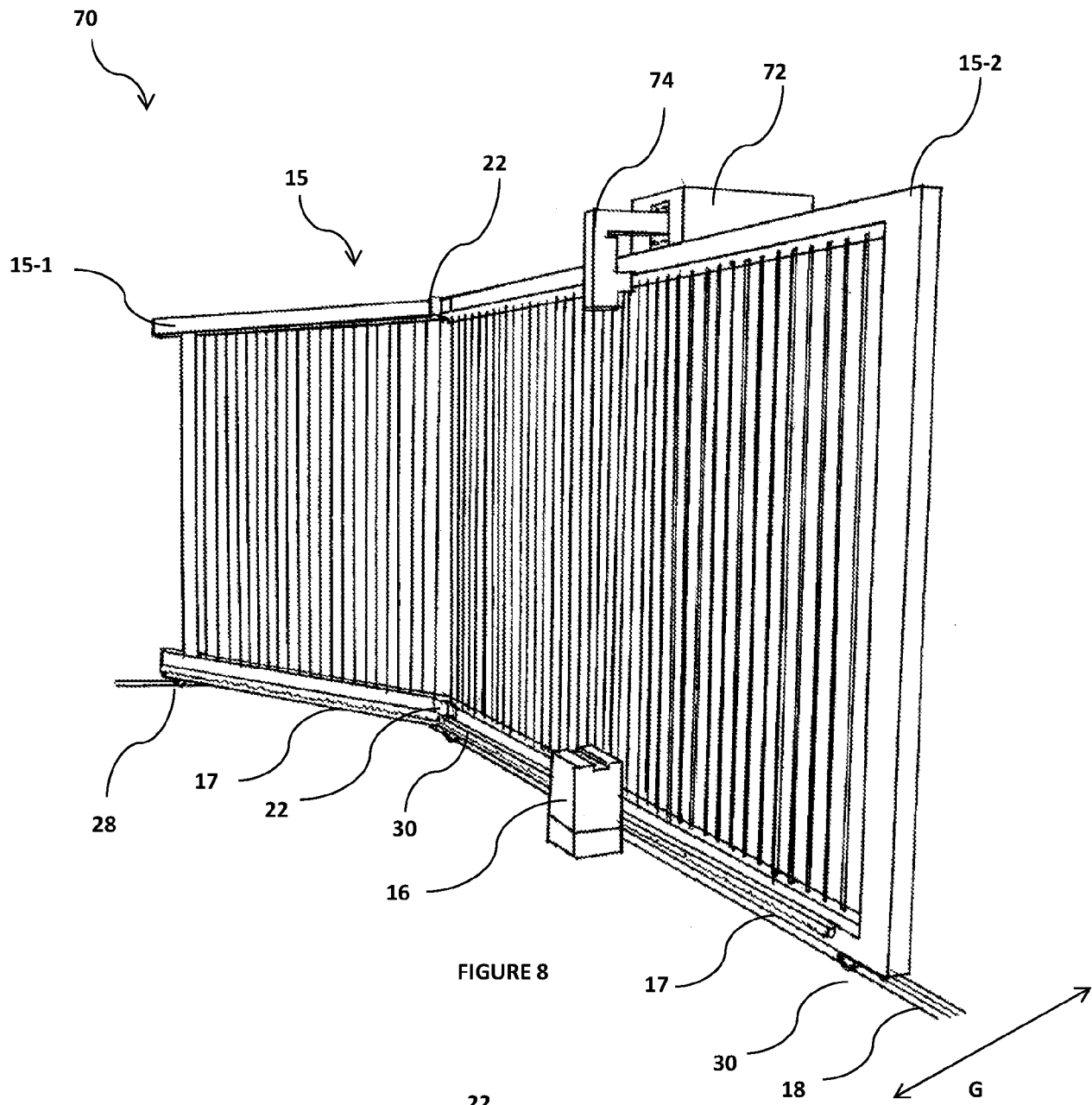


FIGURE 8

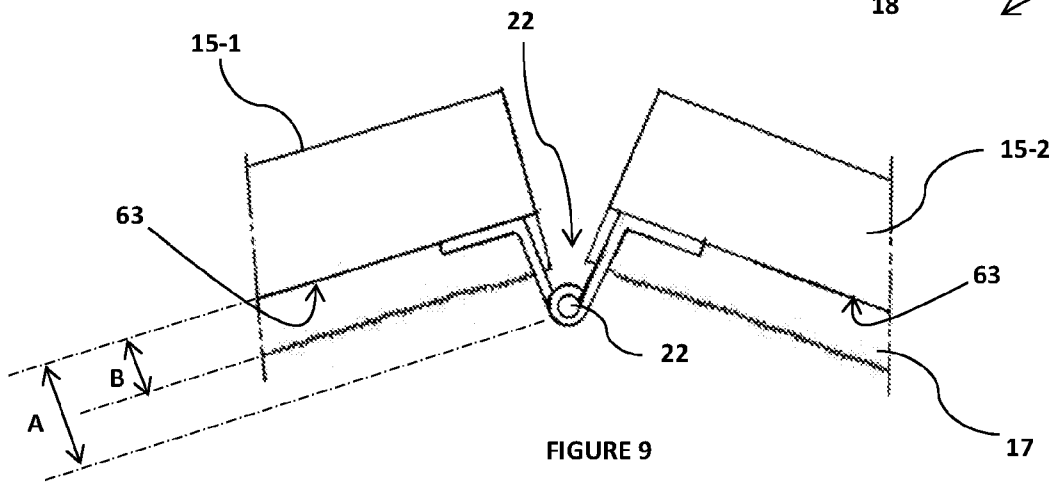
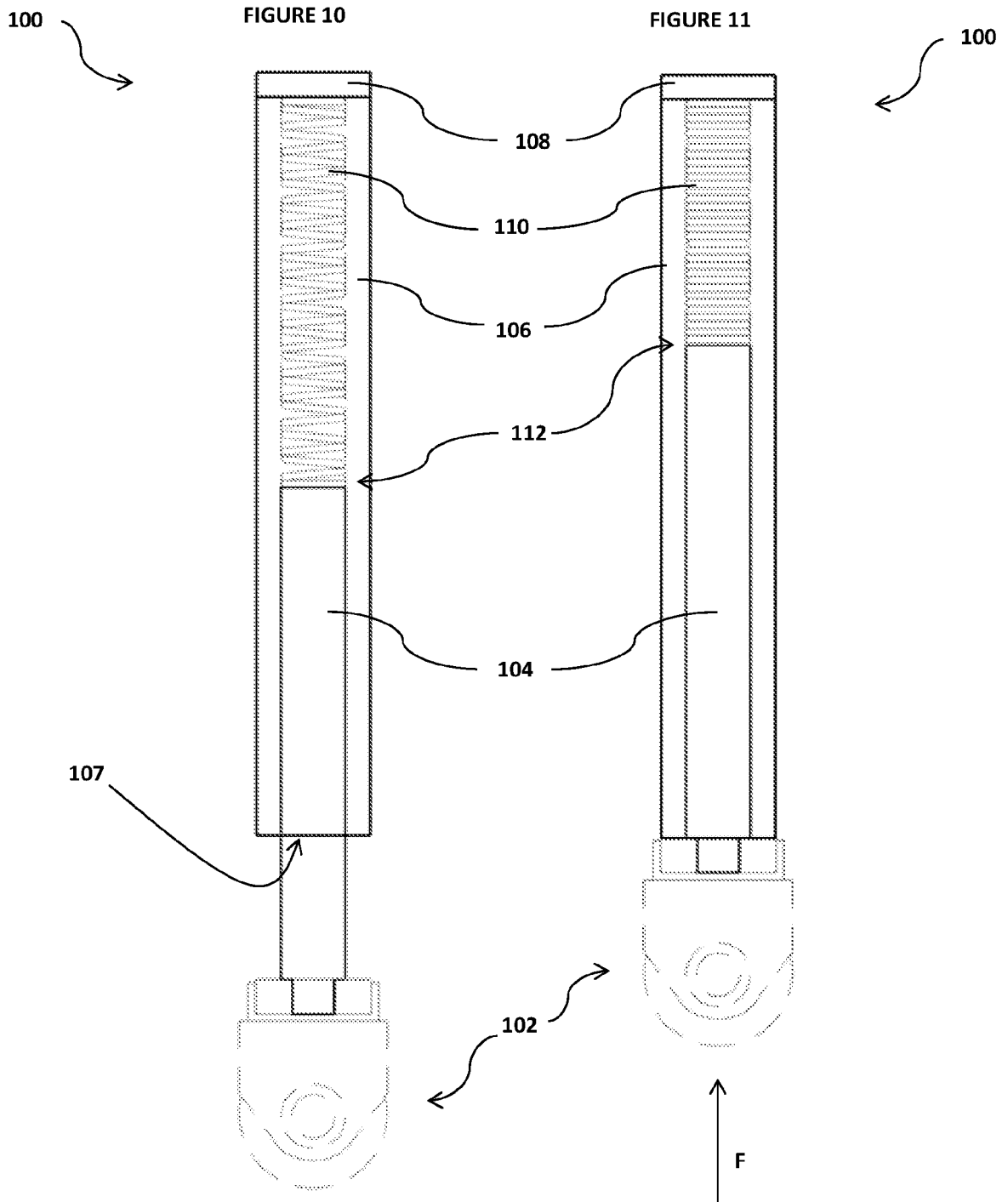
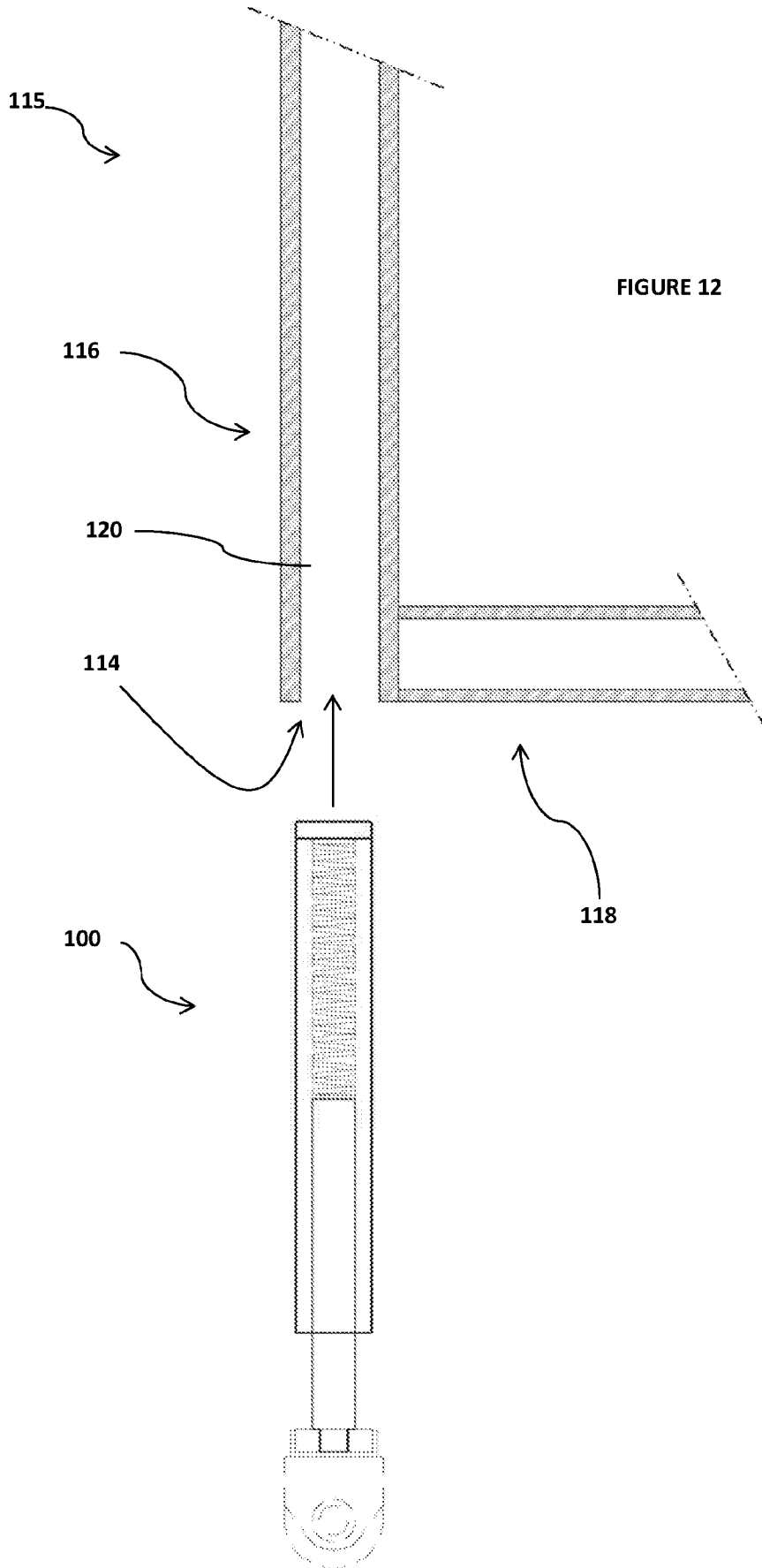


FIGURE 9





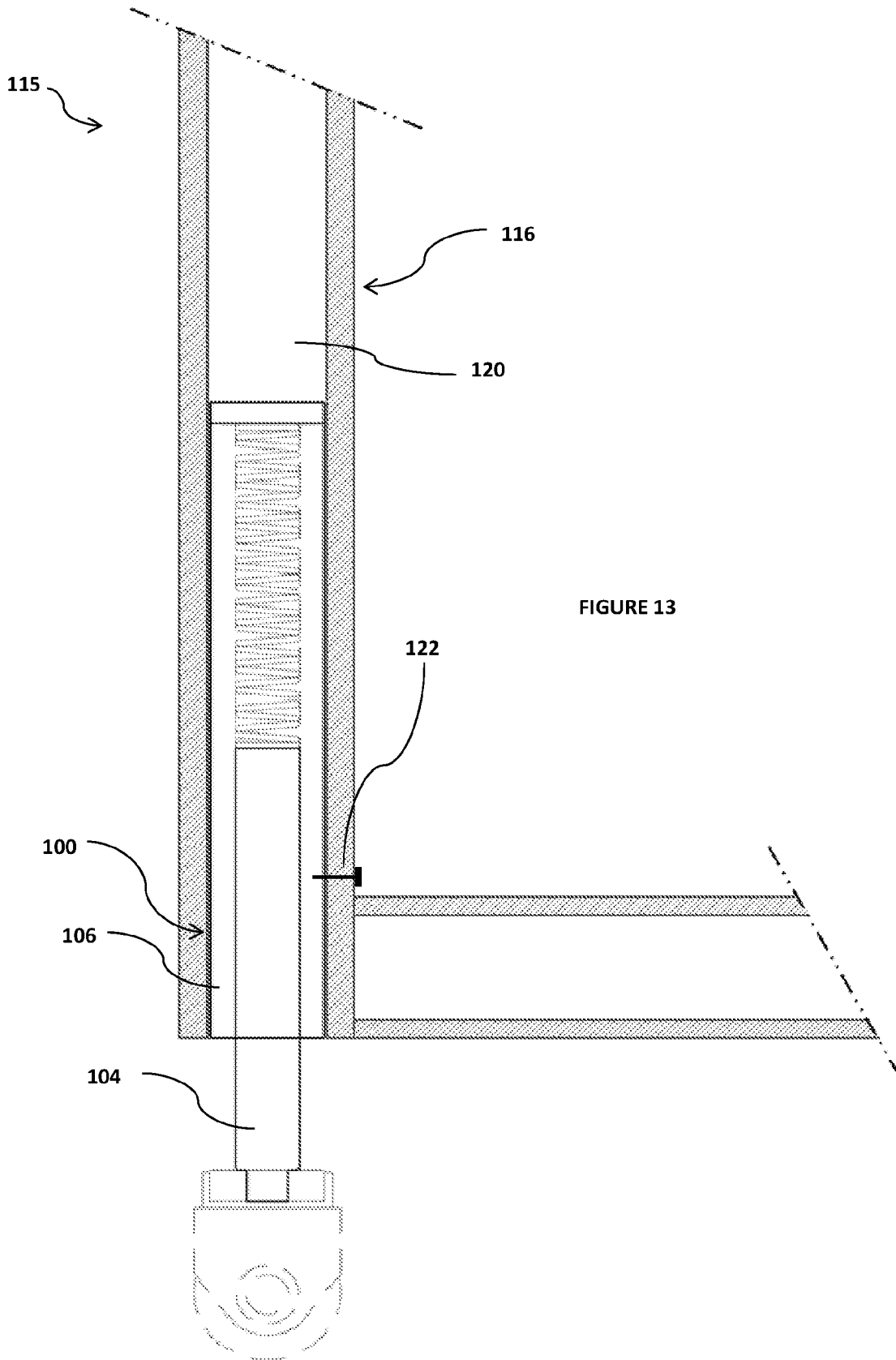


FIGURE 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2016/050362

A. CLASSIFICATION OF SUBJECT MATTER		
E05D 15/06 (2006.01) E06B 3/46 (2006.01) E06B 11/04 (2006.01) E05F 15/632 (2015.01)		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
Epoque: Databases: WPIAP, EPODOC & ALLFULL TEXT ENGLISH DATABASES: IPC/CPC: E06B11/02, E05D15/0669, E06B11/045, E05D15/06, E05F15/632, E06B3/46, E06B11, E05Y2201/614, E05D15/12, E06B3/485 & keywords: configure, adjust, height, vertical, roller, guide, wheel, spring, bias & similar keywords.		
Espacenet, Auspat & internal databases provided by IP Australia: Applicant & Inventor name Search.		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
Date of the actual completion of the international search 21 July 2016	Date of mailing of the international search report 21 July 2016	
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustalia.gov.au	Authorised officer Conor O'Brien AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832901	

INTERNATIONAL SEARCH REPORT		International application No. PCT/AU2016/050362
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	FR 2904030 A1 (ZANUTTO ARNAUD) 25 January 2008 Abstract, Figs. 1-3 Abstract, Figs. 1-3	1-3, 9-19 4-8, 20-24
X Y A	4Seasons Supply Deluxe Gate Wheel with Suspension and FlatFree Tire — 220Lb. [retrieved from internet on 15 July 2016] http://web.archive.org/web/20150420194324/http://www.northerntool.com/shop/tools/product_200639084_200639084 published on 20 April 2015 as per Wayback Machine	18-24 4-8, 20-24 1-3, 9-19
X Y A	CN 202249701 U (HENAN XUEYANG GREEN FOOD CO LTD) 30 May 2012 Abstract; Fig. 1 Abstract; Fig. 1	18-19 20-24 1-17
X Y A	BR MU9002588 U2 (MARCUS AUGUSTO RIGO) 14 April 2015 Abstract, Figs. 1-3 Abstract, Figs. 1-3	18-19 20-24 1-17
X Y A	US 20130042534 A1 (POLUS) 21 February 2013 Abstract, Figs. 1-19 Abstract, Figs. 1-19	18-19 20-24 1-17
A	DE 10308155 A1 (FREUDENBURGER) 16 September 2004	1-24
A	Gate Casters [retrieved from internet on 15 July 2016] http://web.archive.org/web/20140620235922/http://www.castercity.com/specific-app-casters/gate-casters.htm published on 20 June 2014 as per Wayback Machine	1-24
A	Gate Wheel with Suspension [retrieved from internet on 15 July 2016] http://web.archive.org/web/20150223110436/http://www.northerntool.com/shop/tools/product_200461678_200461678 published on 23 February 2015 as per Wayback Machine	1-24

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2016/050362

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
FR 2904030 A1	25 January 2008	FR 2904030 A1	25 Jan 2008
		FR 2904030 B1	07 Feb 2014
CN 202249701 U	30 May 2012		
BR MU9002588 U2	14 April 2015		
US 20130042534 A1	21 February 2013	US 2013042534 A1	21 Feb 2013
DE 10308155 A1	16 September 2004	DE 10308155 A1	16 Sep 2004

End of Annex