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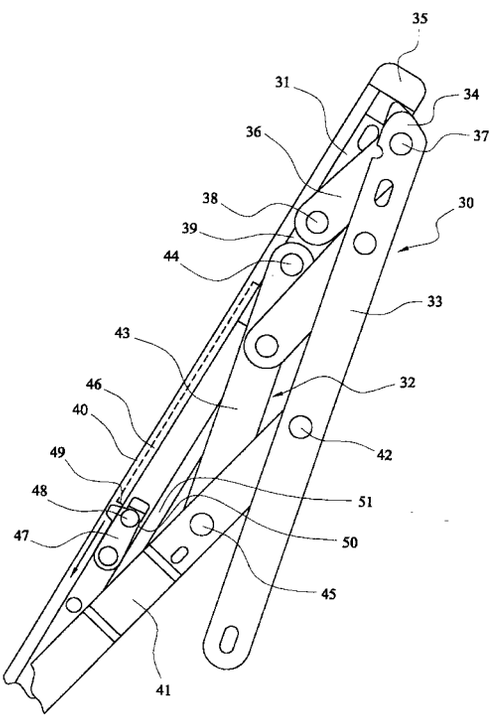
(54) Friction hinge assembly

(57) A restricted friction hinge assembly (30) for mounting an openable closure member, such as a side hung or top hung window frame, on a fixed frame member of a fixed frame, said hinge assembly (30) having a fixed guide track (31) which is securable to said fixed frame member and a linkage (32) which is connectable to a frame element of the openable closure member, and which is capable of carrying out opening and closing movement relative to the fixed guide track (31), in which the linkage (30) comprises: a first arm (33) securable to said frame element; a second connecting arm (36) pivoted at one end (37) to an end region of the first arm (33) and pivoted at its opposite end (38) to the guide track (31) via a slidable mounting block (39) mounted for slidable movement lengthwise of the guide track (31); a third connecting arm (41) pivoted at one end (42) to the first arm (33) and pivoted at its opposite end to a fixed pivot point (not shown) on the guide track (31); and, a fourth control arm (43) pivoted at one end (44) to the guide track (31) on the same mounting block (39) on which said second arm (36) is mounted, said fourth arm (43) also being pivoted at its opposite end (45) to the third arm (41) at a position intermediate the ends of the third arm (41) so that the fourth arm (43) extends substantially parallel to the first arm (33) to form an approximate parallelogram linkage therewith, and in which: an elongate control element (46) is connected to said movable slide block (39) for movement therewith during opening and closing movement of the linkage (32); an abutment (47) is mounted on the guide track (31) and which has an operative position lying in the path of travel of the control element (46) to limit movement thereof and thereby determine a required limit to the opening movement of the linkage (32); the abutment (47) is adjustable to a disabled and inoperative position out of the path of movement of the control element (46) and thereby to allow a greater extent of opening movement of the linkage (32); and, the abutment (47) is automatically returnable to its operative position as the linkage (32) carries out closing movement whereby subsequent opening movement of the linkage (32) can again be restricted by limiting the movement of the control element (46).



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Description

[0001] This invention relate to a friction hinge assembly for mounting an openable closure member on a fixed frame.

[0002] The invention has been developed primarily, though not exclusively, in connection with a friction hinge assembly for mounting an openable window frame in a fixed frame, and in which a respective hinge assembly can be mounted on one or both of the top and bottom horizontal frame members of the openable frame when the window is a "side hung" window; alternatively, when the window is a "top hung" window, a pair of friction hinge assemblies will be provided, arranged one on each respective frame member of the opening window frame.

[0003] In certain circumstances, it is desirable to design a friction hinge assembly in such a way that it allows limited or restricted opening movement only, and typical maximum gap separation which might be allowed is about 100mm. The purpose of this is to prevent children jumping out of an upstairs window, or may be required in institutions to prevent residents jumping out also.

[0004] Restricted friction hinge assemblies are presently provided in both top hung windows and also side hung windows, and test standards are set for this type of window, to make the window able to resist any normal level of force used to force the window open beyond the restricted arc of movement, since for obvious reasons any restricting mechanism provided must be capable of resisting any ordinary attempt to override the mechanism. Therefore, the authorised designs of restricted friction hinge must be capable of withstanding test standards which are set, and therefore the restriction mechanism provided must be quite strong.

[0005] However, in emergencies, e.g. to allow escape out of a restricted window when a fire takes place, it is important to provide some authorised facility to override the restricting mechanism. This may also be desirable for cleaning purposes, to allow a window to be moved through a greater angle, to allow access to the outside face of the window for cleaning purposes.

[0006] The invention therefore has been developed with a view to provide an improved design of restricted friction hinge assembly, which is strong enough to meet test standards, but which has a facility which allows the restriction mechanism to be overridden by an authorised person in any particular situation in which it is required to allow greater opening movement of the window, but to provide for automatic return of the restriction mechanism to its ordinary restricted function upon subsequent closure of the window. This latter feature is important, to provide a safeguard against unintentional failure to return the restriction mechanism to its ordinary function, which might otherwise occur in the absence of any automatically operating restoring arrangement.

[0007] According to the invention there is provided a restricted friction hinge assembly for mounting an openable closure member, such as a side hung or top hung window frame, on a fixed frame member of a fixed frame, said hinge assembly having a fixed guide track which is securable to said fixed frame member and a linkage which is connectable to a frame element of the openable closure member, and which is capable of carrying out opening and closing movement relative to the fixed guide track, in which the linkage comprises:

a first arm securable to said frame element;
a second connecting arm pivoted at one end to an end region of the first arm and pivoted at its opposite end to the guide track via a slidable mounting block mounted for slidable movement lengthwise of the guide track;
a third connecting arm pivoted at one end to the first arm and pivoted at its opposite end to a fixed pivot point on the guide track; and,
a fourth control arm pivoted at one end to the guide track on the same mounting block on which said second arm is mounted, said fourth arm also being pivoted at its opposite end to the third arm at a position intermediate the ends of the third arm so that the fourth arm extends substantially parallel to the first arm to form an approximate parallelogram linkage therewith, and in which:
an elongate control element is connected to said movable slide block for movement therewith during opening and closing movement of the linkage;
an abutment is mounted on the guide track and which has an operative position lying in the path of travel of the control element to limit movement thereof and thereby determine a required limit to the opening movement of the linkage;
the abutment is adjustable to a disabled and inoperative position out of the path of movement of the control element and thereby to allow a greater extent of opening movement of the linkage; and,
the abutment is automatically returnable to its operative position as the linkage carries out closing movement whereby subsequent opening movement of the linkage can again be restricted by limiting the movement of the control element.

[0008] A restricted friction hinge assembly according to the invention therefore is able to provide restricted or limited opening of a window or other closure member, and so as to provide any required maximum opening space, and prevent egress by children or others during normal operation. However, the provision of the adjustable abutment allows authorised personnel, having knowledge of the location and adjustability of the abutment, to move the abutment to a disabled position out of the path of movement of the control element, thereby allowing a greater extent of opening movement of the linkage when required e.g. to obtain egress via the window in the case of a fire, or simply to allow access to the outside of the window for cleaning purposes.

[0009] The automatic return of the abutment to its operating position may be obtained by any suitable means, and including: (a) spring-loading of the abutment towards its operative position or (b) providing interengagement between a part of the linkage and the abutment as the linkage carries out its closing movement.

[0010] Therefore, upon subsequent return of the window to its closed position, the abutment returns automatically to its operative position, and therefore subsequent opening movement of the window is again restricted by the abutment limiting the movement of the control element. This therefore provides a valuable safeguard, in that the operator moving the abutment to the disabled position is not obliged to remember to return it to the operative position for a subsequent restricted window opening operation.

[0011] The guide track is shaped to allow captive sliding movement of the slide block, in the sense that it allows the slide block to move lengthwise of the guide track, but is guided in the sense that it is not readily able to be displaced in a direction perpendicularly away from the axis of the guide track.

[0012] Conveniently, the guide track therefore has a longitudinally extending flat base surface over which the slide is movable, and short upstanding side walls which are turned inwardly, to engage over at least part of the exposed surface of the slide block and thereby hold it captive in the guide track.

[0013] With such an arrangement of guide track, it is preferred that the elongate control element takes the form of a rod shaped easily to fit and slide lengthwise along one of the side walls, and also be held captive therein.

[0014] The abutment is movable to the operative position in which it lies in the path of travel of the control element, and by engaging the end thereof, and this provides a strong resistance to any attempt to forcibly move the slide block a greater distance lengthwise of the guide track, in any unauthorised attempt at forcing the closure member (e.g. window) beyond its required restricted opening movement set by the engagement between the abutment and the control element. In addition, this strong resistance provided by engagement between the end of the control element and the abutment also can allow the restricted friction hinge assembly of the invention to meet any required test safety standards.

[0015] The abutment preferably takes the form of a stop element pivotally mounted on the base of the guide track, and which may have a small upstanding projection, to allow finger or thumb manipulation by authorised personnel, when it is required to adjust the abutment to the disabled inoperative position. Such displacement of the stop then defines a clear path of movement for the control element along one of the side walls of the guide track, when authorised greater opening movement of the linkage and the window is permitted.

[0016] The stop element may be biased so as to tend to move back to its operative position, if required e.g. by spring loading. Alternatively, the abutment may be arranged to maintain its inoperative position by frictional engagement with the base of the guide track, but any suitable engaging element may be connected to the linkage, provided that it is arranged so that it moves into engagement with the stop element during the movement of the linkage to the closed position, during which time the control element will be returning with the slide block to the closed position, when the control element will move past the stop element as it slides lengthwise of the side wall of the guide track. The arrangement is such that, after the facing end of the control element has moved past the stop element, the stop element can then be moved back to the operative position, in the path of travel of the control element to limit its movement during a subsequent restricted opening movement of the linkage and the closure member mounted thereon.

[0017] Conveniently, an engaging element provided on the linkage to engage the stop element may comprise a depression, lug or the like mounted on the fourth arm, and which engages the stop element as the fourth arm pivots about its three pivot connections (to the guide track, to the first arm and to the fourth arm) during the closing movement.

[0018] It does not matter precisely at what stage the abutment is returned to its operative position, provided that the control element has moved to a position in which it allows the abutment to return to the operative position i.e. the return of the abutment to the operative position can be at or near to the end of the closing movement of the linkage to the fully closed position of the closing member.

[0019] In a further aspect of the invention, a friction hinge assembly can function as an egress type of hinge as defined in claim 11, and optionally spring-loading is provided to return the abutment automatically to its operative position.

[0020] A preferred embodiment of restricted friction hinge assembly according to the invention will be described in detail, by way of example only, with reference to the accompanying detail diagrammatic drawing, showing the hinge assembly in a restricted opening position.

[0021] Referring now to the drawing, a restricted friction hinge assembly according to the invention is designated generally by reference 30, and which is intended to mount an openable closure member, such as a top hung window or a side hung window, on a fixed rectangular frame. Friction hinge assemblies will be well known to those of ordinary skill in the art. and only the essential operating components are illustrated in the drawing which will now be described.

[0022] The hinge assembly 30 has a fixed guide track 31 which is securable to a fixed frame member, and the assembly 30 also includes a linkage, designated generally by reference 32, which is connectable to a frame element of an openable closure member, and which is capable of carrying out opening and closing movement

relative to the guide track 31 to allow opening and closing movement of the window or other closure member to which it is secured.

[0023] The linkage 30 comprises a first arm 33 which is securable to the frame element of the closure member, and which has a nose 34 at one end which can engage with an end cap 35 at one end of guide track 31, when the linkage 30 is in a closed position, to provide resistance to any attempt at forced opening movement of the window relative to the fixed frame.

[0024] A short second connecting arm 36 is pivoted at one end 37 to an end region of the first arm 33, and at its opposite end 38 to a slide block 39 which is held captive by the inturned side walls 40 of the guide track 31, and which is movable lengthwise of the guide track 31 during opening and closing movement of the linkage 30.

[0025] A longer third connecting arm 41 is pivoted at one end 42 to the first arm 33, and at its opposite end (not shown) to a fixed pivot mounting provided at or near to an end of the guide track 31 opposite to the end cap 35.

[0026] A fourth control arm 43 is pivoted at one end 44 to the same slide block 39 on which second arm 36 is also pivotally mounted, and fourth arm 43 is pivoted at its opposite end 45 to the third longer connecting arm 41 at a position intermediate the ends of arm 41 so that the fourth arm 43 extends generally parallel to the first arm 33 to form an approximate parallelogram linkage therewith.

[0027] The illustrated embodiment usually permits restricted opening movement only of the linkage 30, and with a typical maximum window opening movement of about 100mm being provided. To achieve this restriction to the opening movement, and necessary strength to resist any forced attempts at overriding the restriction mechanism (and also to meet any required test safety standards), an elongate control element is connected to the movable slide block 39 for movement therewith during opening and closing movement of the linkage 30, but which has its movement lengthwise of the guide track 31 limited, by means described below.

[0028] The elongate control element takes the form of a control rod, shown by dotted outline 46, which is also held captive within one of the side walls 40 of the guide track 31, and which moves lengthwise thereof with sliding movement of the slide block 39, until such time as it engages an abutment, designated generally by reference 47, which is mounted on the base of the guide track 31 and which has an operative position which lies in the path of travel of the control element 46 to limit the movement thereof, and thereby determine a required limit to the opening movement of the linkage 30, and therefore also of the window or other closure member mounted thereon.

[0029] The abutment 47 is adjustable to a disabled inoperative position out of the path of movement of the control element 46, and thereby to allow a greater extent of authorised opening movement of the linkage 30. The abutment 47, in the illustrated arrangement, comprises a catch pivotally mounted on the base of the guide track 31, and which is movable against frictional opposition by finger or thumb manipulation of an upstanding lug or operating knob 48. In the illustrated arrangement, the pivotal adjustment of the abutment 47 to the disabled position will be clockwise pivoting of the abutment away from engagement with one of the side walls 40 of the guide track 31, and in a direction towards, or in engagement with the opposite side wall of the guide track. The frictional engagement with the base is such that the abutment 47 maintains either the operative or the inoperative positions to which it is moved.

[0030] To provide for automatic return of the mechanism to its mode of operation in which it restricts the opening movement, the linkage 30 is arranged to be capable of returning the abutment 47 to its operative position as the linkage moves to its closed position, whereby subsequent opening movement of the linkage can again be restricted by limiting the movement of the control element 46.

[0031] When the abutment 47 is moved to the inoperative position, the control element 46 is able to slide past the abutment 47, engaging the side wall, as the linkage 30 continues to pivot outwardly relative to the fixed guide track 31, thereby providing greater opening movement of the window.

[0032] Upon subsequent closing movement of the window, the control element 46 slides past the abutment 47 (which is still in its inoperative position), but after the end 49 of the control element 46 has moved clear of the abutment 47, the abutment can then be returned automatically to its operative position, in which it will again lie in the path of movement of the end 49 of the control element 46, to restrict the opening movement.

[0033] The linkage may be provided with any suitable engaging means to return the abutment 47 to the operative position as the linkage 30 moves to the closed position, and in the illustrated embodiment a simple lug or other depression applied to the underside of the third arm 41 may have a path of travel whereby it can engage the upstanding lug 48 of abutment 47, as the arm 41 pivots back to a position overlying the guide track 31 when closing movement will be completed. The abutment 47 then moves back to its operative position, and which takes place automatically upon closing movement of the window, so that it is then in a state of readiness to apply restriction to any subsequent opening movement of the window.

[0034] The illustrated embodiment therefore provides a simple and reliable, and also strong restriction mechanism, which limits the opening movement, but which can be disabled by authorised personnel, when greater opening movement is required, but which automatically restores the mechanism to a mode of operation restricting subsequent opening movement following closure of the window.

[0035] The means of release of the restriction mechanism is accessible, when the window is only partially open.

[0036] The control element 46 which moves with the slide block 39 provides a simple but effective means of controlling the manner by which the mechanism operates i.e. restricted mode or authorised unrestricted opening mode, and the control element, or control rod effectively extends the slide block 39, and by virtue of its small cross sectional area, it only takes-up a small part of the available space defined within the guide track, and allows the abutment 47 to be located robustly in the path of travel of the control element when restriction to the opening movement is required.

[0037] When the abutment 47 is moved to the inoperative position, this can release the control rod and allow it to move past the catch and allow the window to travel to a normally fully opened position when authorised.

[0038] The embodiment illustrated in the drawings provides a restricted friction hinge assembly of the type in which the second connecting arm 36 is pivoted at one end 37 to an end region of the first arm 33 and is pivoted at its opposite end 38 to the guide track 31 via the slidable mounting block 39 mounted for slidable movement lengthwise of the guide track 31.

[0039] The longer third connecting arm 41 is pivoted at one end 42 to the first arm 33 and is pivoted at its opposite end to a fixed pivot point (not shown) on the guide track 31. Finally. the fourth control arm 43 is pivoted at one end 44 to the guide track 31 on the same mounting block 39 on which the second arm 36 is mounted.

[0040] However, in a further aspect of the invention, a modified embodiment may be provided, which is able to function as an egress type of friction hinge assembly. Modification will be made to the embodiment shown in the drawing, whereby the mounting block 39 is fixed, and the bottom pivot by which third arm 41 is pivotally mounted on the guide track 31 comprises a slidable mounting. A control element, similar to control element 46, will then be connected to the movable slide block on which third arm 41 is pivotally mounted, and an abutment, similar to abutment 47, will be mounted on the guide track 31 and have an operative position lying in the path of travel of the control element to limit movement thereof and thereby determine a require limit to the opening movement of the linkage 32. However, this abutment will be adjustable to a disabled and inoperative position out of the path of movement of the control element, and thereby to allow a greater extent of opening movement of the linkage 32, when it is required to function as an egress hinge.

[0041] The embodiments disclosed herein comprise restricted friction hinge assemblies, but it should be understood that these features may also be incorporated into a security friction hinge assembly e.g. as disclosed in our co-pending UK patent application No 9928846.6.

[0042] It should be noted, however, that the means disclosed to cause automatic return of the abutment 47 from its disabled position and back to its window-opening limiting position (the engagement of a lug on the underside of arm 41 with the button 48 of abutment 47), is one example only. Other arrangements are possible, whereby the abutment 47 can automatically return to the limiting or operative position.

[0043] Thus, although not shown, the abutment 47 may be spring-loaded towards the limiting position (in which it normally restricts the lengthwise movement of the rod 46). Simple manual manipulation of push button 48 against the spring-loading allows the rod 46 to move lengthwise without being impeded, so as to permit larger opening movement of the window. However, upon release of the push button, the spring-loading presses the abutment 47 against the outer surface of the rod 46, and therefore as the window is returned to the closed position the rod 46 slides against the abutment 47 until the rod end 49 has moved past the abutment 47, and then the abutment 47 automatically snaps back to its limiting position.

[0044] Although the spring-loading is not shown (and could be a tension or compression spring as required), it could be a compression spring located between side face 50 of the abutment 47 and the adjacent inturned flange 51 of guide track 31.

[0045] This alternative means of automatically returning the abutment 47 to the limiting or operative position may also be provided when the hinge assembly is being employed in the "egress" mode as referred to above.

Claims

1. A restricted friction hinge assembly (30) for mounting an openable closure member, such as a side hung or top hung window frame, on a fixed frame member of a fixed frame, said hinge assembly (30) having a fixed guide track (31) which is securable to said fixed frame member and a linkage (32) which is connectable to a frame element of the openable closure member, and which is capable of carrying out opening and closing movement relative to the fixed guide track (31), in which the linkage (30) comprises:

a first arm (33) securable to said frame element;
a second connecting arm (36) pivoted at one end (37) to an end region of the first arm (33) and pivoted at its opposite end (38) to the guide track (31) via a slidable mounting block (39) mounted for slidable movement lengthwise of the guide track (31);
a third connecting arm (41) pivoted at one end (42) to the first arm (33) and pivoted at its opposite end to a fixed pivot point (not shown) on the guide track (31); and,
a fourth control arm (43) pivoted at one end (44)

to the guide track (31) on the same mounting block (39) on which said second arm (36) is mounted, said fourth arm (43) also being pivoted at its opposite end (45) to the third arm (41) at a position intermediate the ends of the third arm (41) so that the fourth arm (43) extends substantially parallel to the first arm (33) to form an approximate parallelogram linkage therewith, and in which:

an elongate control element (46) is connected to said movable slide block (39) for movement therewith during opening and closing movement of the linkage (32);

an abutment (47) is mounted on the guide track (31) and which has an operative position lying in the path of travel of the control element (46) to limit movement thereof and thereby determine a required limit to the opening movement of the linkage (32);

the abutment (47) is adjustable to a disabled and inoperative position out of the path of movement of the control element (46) and thereby to allow a greater extent of opening movement of the linkage (32); and,

the abutment (47) is automatically returnable to its operative position as the linkage (32) carries out closing movement whereby subsequent opening movement of the linkage (32) can again be restricted by limiting the movement of the control element (46).

2. A restricted friction hinge assembly according to claim 1, in which the guide track (31) has a longitudinally extending flat base surface over which the slide block (39) is movable, and short upstanding side walls (40) which are turned inwardly, to engage over at least part of the exposed surface of the slide block (39) and thereby hold it captive in the guide track.

3. A restricted friction hinge assembly according to claim 2, in which the elongate control element (46) takes the form of a rod shaped easily to fit and slide lengthwise along one of the side walls (40) of the guide track (31), and to be held captive therein.

4. A restricted friction hinge assembly according to any one of claims 1 to 3, in which the abutment (47) takes the form of a stop element pivotally mounted on the base of the guide track (31), and having a small upstanding projection (48) to allow finger or thumb manipulation by authorised personnel, to adjust the abutment to the disabled inoperative position.

5. A restricted friction hinge assembly according to claim 4, in which the abutment (47) defines a clear path of movement for the control element (46), to move along one of the side walls (40) of the guide track, when the abutment (47) is adjusted to the disabled inoperative position.

6. A restricted friction hinge assembly according to claim 4 or 5, in which the abutment (47) has frictional engagement with the base of the guide track (31), so as to tend to maintain either its operative position, or its inoperative position.

7. A restricted friction hinge assembly according to any one of claims 4 to 6, in which an engaging element (not shown) is connected to the linkage (32), and which is movable into engagement with the stop element (47) during the movement of the linkage to the closed position, and during which time the control element (46) being returnable with the movement of the slide block to the closed position such that when the end (49) of the control element (46) moves past the stop element, said engaging element can return the abutment to the operative position.

8. A restricted friction hinge assembly according to claim 7, in which the engaging element provided on the linkage (32) to engage the stop element comprises a depression, lug or the like mounted on one of the arms of the linkage and which is engageable with the stop element during the closing movement of the linkage.

9. A restricted friction hinge assembly according to any one of claims 1 to 5, in which the abutment (47) is spring loaded towards its operative position, so as to be returnable automatically to its operative position as the linkage (32) carries out its closing movement.

10. A restricted friction hinge assembly according to any one of the preceding claims, in which the second connecting arm (36) is a short arm and the third connecting arm (41) is a longer arm.

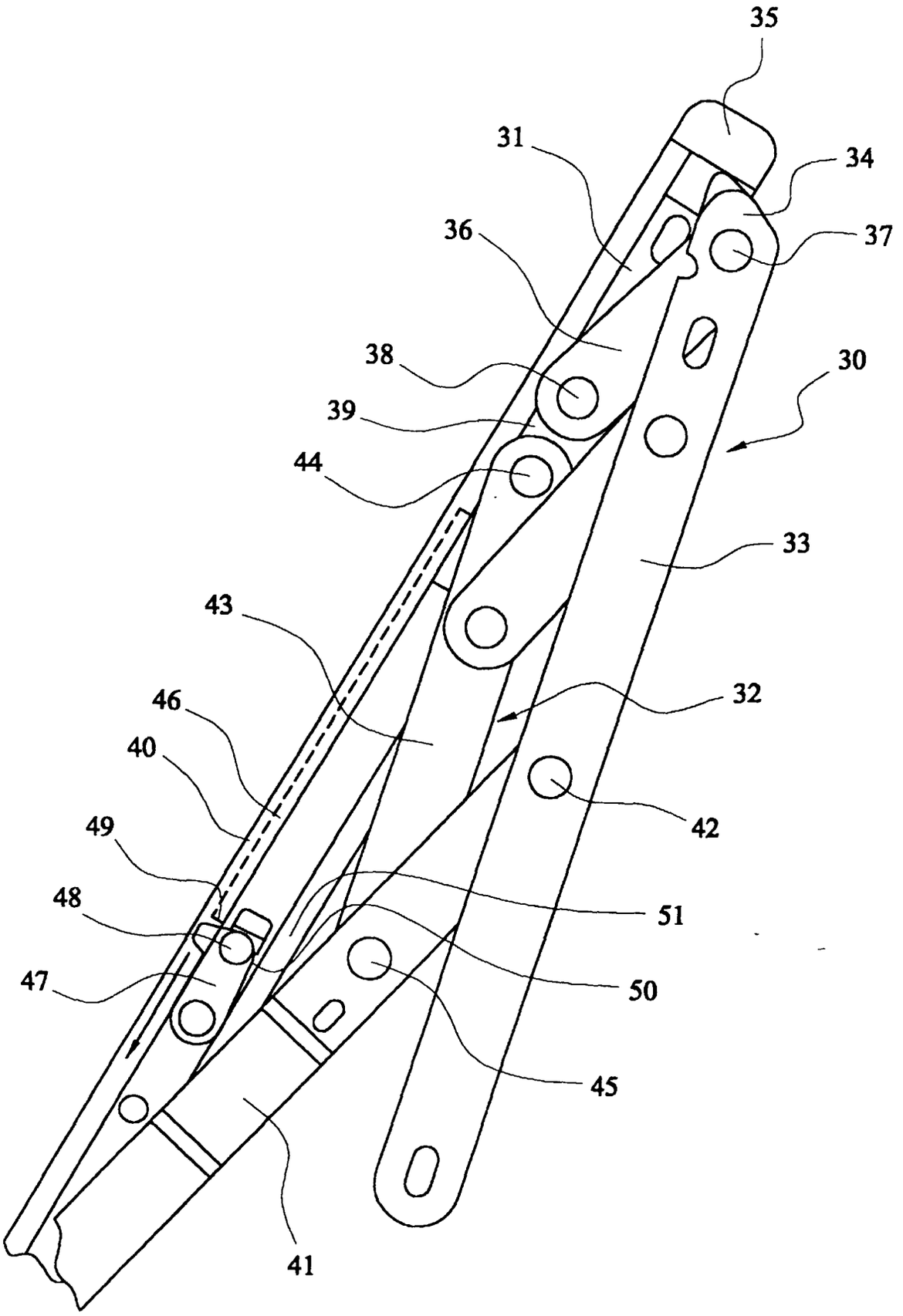
11. A restricted friction hinge assembly (30) for mounting an openable closure member, such as a side hung or top hung window frame, on a fixed frame member of a fixed frame, said hinge assembly (30) having a fixed guide track (31) which is securable to said fixed frame member and a linkage (32) which is connectable to a frame element of the openable closure member, and which is capable of carrying out opening and closing movement relative to the fixed guide track (31), in which the linkage (30) comprises:

a first arm (33) securable to said frame element;

a second connecting arm (36) pivoted at one end (37) to an end region of the first arm (33)

and pivotally mounted at its opposite end (38) on the guide track (31);
a third connecting arm (41) pivoted at one end (42) to the first arm (33), and pivotally mounted at its opposite end to the guide track (31) via a slidable mounting block mounted for slidable movement lengthwise of the guide track; and,
a fourth control arm (43) pivoted at one end (44) to the guide track (31) on the same mounting block (39) on which said second arm (36) is mounted, said fourth arm (43) also being pivoted at its opposite end (45) to the third arm (41) at a position intermediate the ends of the third arm (41) so that the fourth arm (43) extends substantially parallel to the first arm (33) to form an approximate parallelogram linkage therewith, and thereby to form an egress type of friction hinge assembly, and in which:
an elongate control element (46) is connected to the movable slide block for movement therewith during opening and closing movement of the linkage (32):
an abutment is mounted on the guide track (31) and which has an operative position lying in the path of travel of the control element (46) to limit movement thereof and thereby determine a required limit to the opening movement of the linkage (32);
the abutment is adjustable to a disabled and inoperative position out of the path of movement of the control element (46) and thereby to allow a greater extent of opening movement of the linkage (32) and to allow the friction hinge assembly to function as an egress hinge assembly; and,
the abutment (47) is automatically returnable to its operative position as the linkage (32) carries out closing movement from the egress position whereby subsequent opening movement of the linkage (32) can again be restricted by limiting the movement of the control element.

12. A restricted fringe hinge assembly according to claim 11, in which the abutment (47) is spring loaded towards its operative position, so as to be automatically returnable to its operative position as the linkage (32) carries out its closing movement.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