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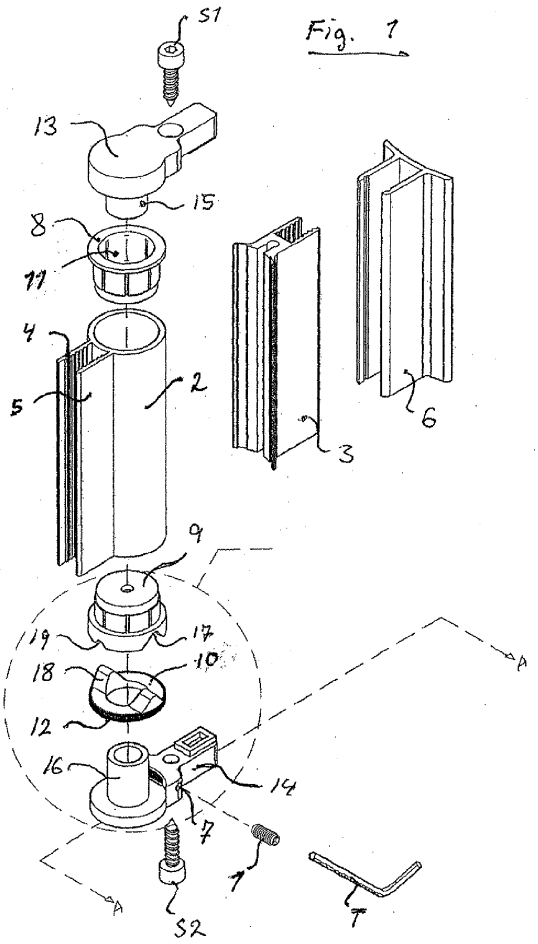
(54) A pivotally adjustable hinge for a swivelling panel

(57) An adjustable hinge for securing a panel to a support structure comprises: a first member which is operable to engage with the panel; a second member which is operable to engage with the support structure; a catching means; and an adjustment means. The first member is pivotally attached to the second member and is operable to rotate relative to the second member through a range of relative positions and, when the hinge is disposed in one or more of said positions, the catching means limits relative movement between the first member and the second member so that they are substantially fixed. The catching means comprises: a first surface disposed on the first member; a complementary second surface disposed on the second member; and a biasing means to bias the first surface towards the second surface. The adjustment means comprises a worm drive which facilitates the fixed positions to be adjusted and locked.



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Description

Field of the invention

[0001] The present invention relates to an adjustable hinge for securing a panel to a support structure. In particular, it relates to an adjustable hinge which allows a panel to rotate relative to a support structure through a range of positions wherein there is at least one rotational position in which said panel is substantially fixed relative to the support structure.

[0002] For this purpose the term "substantially fixed" means that the panel cannot be rotated out of position without exerting a substantial amount of force on the panel, i.e. it cannot swing by itself or by subjecting it to a minor torque.

[0003] The adjustable hinge provided by the present invention is in particular applicable for a door to be used as a shower splashing protection.

Background of the invention

[0004] Hinges for securing swiveling panels, such as e.g. doors, gates, wickets, hatches, lids, covers, windows and the like, have been known for centuries or maybe millenniums.

[0005] Also pivotally adjustable hinges for securing such swiveling panels pivotally about an axis of rotation and having at least one rotational position about said axis in which said panel is substantially fixed, are well-known and are disclosed in the prior art, e.g. WO 2006/054942 A1, WO 2005/102128, and EP 1 630 333 A1.

[0006] However, these pivotally adjustable hinges of the prior art are mainly designed with the object to simplify their manufacturing processes and general versatility, but the installation and adjustment in situ of a panel secured thereto are hampered by the fact that usually at least two persons are required to perform this job making it both cumbersome and costly.

[0007] Hence, there is a need for a pivotally adjustable hinge for securing a swiveling panel, which is not only simple to manufacture and has general versatility, but is also easy to install and adjust with a pivotal panel secured thereto by one single person.

Prior art

[0008] WO 2006/054942 A1 discloses improvements in or relating to a hinge intended to be used together with a glass door in the form of a shower splashing protection and comprising a fixed profile attachable to a wall and a pivotal profile supporting the glass door, said profiles pivot around upper and lower pivots provided on end fittings in a predetermined distance from the fixed profile, said pivotal profile consists of a tube having along its mantle surface at least one fixing means for supporting the glass door and at least one bushing attached to each free end of the tube, having a centrally located opening for supporting and cooperating with the upper and lower pivot, respectively, and at least one transverse recess, provided in at least the lower bushing, in order to cooperate with a correspondingly formed bulge for position fixation of the pivoting angle position location of the glass door, said hinge being characterized in that the bulge is formed on a position washer, which is pivotally provided around the pivot of the lower end fitting between the said end fitting and its adjacent bushing, said position washer is lockable during its turning movement in a predetermined turning angle position of the glass door in relation to the end fittings. - This arrangement, however, suffers from the above drawbacks.

[0009] WO 2005/102128 discloses a pivotal type of hinge for a door leaf, a window and the like, which hinge has a pin pivotally on its longitudinal axis and comprising a holder for the door leaf, the window and the like, and a connecting part. One end of the pin and a first carrier plate engage each other by cam surfaces, and the other end of the pin and a second carrier plate engage each other by cam surfaces. Means are arranged to lock the respective carrier plates to the connecting part and unlock the respective carrier plates from the connecting part so as to allow both a left- and a right-hung door leaf, window and the like. By this arrangement the carrier plates may also be rotational adjusted about the longitudinal pivotal axis of the pin so as to adjust the desired open and closure position of the door leaf. The locking and unlocking means may be screws. The screws secure fixation of the open and closure positions. However, if a distortion of the shower cabinet sheets or the connecting part occurs it is not easy to correct for that. The screws have to be loosened and a refitting becomes difficult because it is difficult to identify the reference position.

[0010] EP 1 630 333 A1 describes a hinge, in which open and/or closure positions can be adjusted, said hinge has a support in the form of a square and a body for mounting a swiveling panel. The support has a slot adapted to be constricted by tightening means (e.g. a screw) for pressing a cylindrical sheath of an indexing block. The sheath surrounds a rotation axis of the body and presents a grip. The sheath is coaxial with the axis, and tightening means (e.g. a screw) is mounted in one of two flanges of the support. The open and/or closure positions of the axis of rotation are defined by its indexed vertical recesses of the indexing block and the position of the grip. The mechanism for securing a stable position of the open or closure position is effected by means of a roller, which are placed in a top and a down cap onto which springs exert a strong pressure to secure stable open or closure positions. The same drawbacks as above also apply to this hinge. In particular, an adjustment of the open and/or closed positions requires the following separate steps: first the tightening means must be loosened; then the indexing block is rotated to move the position of its recesses; finally the tightening means is tightened to so as to constrain the indexing block. Such is complicated and several small adjustments may be required in order to

iteratively find the optimum arrangement, which will be rather time consuming owing to these several steps. Furthermore, the clamping and unclamping of the indexing block affected by the tightening means may lead to damage, in particular wearing of a finishing coating and subsequent corrosion.

[0011] Thus, the prior art comprise hinges which may be easy to manufacture and may have general versatility, but require too much manpower for their mounting and adjustment. Due to the weight of a door two persons are needed when the screws of the hinges are to be loosened or tightened when adjusting the closure and/or open positions of the door in order to obtain a satisfactory result. Besides, whenever a readjustment is needed one fitter cannot perform the readjustment himself as it requires an unlocking and locking procedure and by unlocking the fixing screws the initial angle position of the hinge goes lost together with the reference point for the adjustment, so only by cumbersome trial and error a proper readjustment can be performed.

[0012] Therefore, none of the above hinges of the prior art allows for a simple and cheap adjustment and readjustment, if needed, of the open and/or closure positions of a door, requiring only one person.

[0013] Thus, it is an object of the present invention to provide a pivotally adjustable hinge for securing a swiveling panel, requiring only one person for mounting, adjusting and readjusting, if required, the angular fixed position of a panel, such as a door leaf, a window etc. and the like.

Summary of the invention

[0014] According to an embodiment of the present invention there is provided an adjustable hinge for securing a panel to a support structure comprising: a first member which is operable to engage with the panel; a second member which is operable to engage with the support structure; a catching means; and a combined adjustment and locking means wherein: the first member is pivotally attached to the second member and is operable to rotate relative thereto through a range of positions; the catching means comprises: a first surface disposed on the first member; a complementary second surface disposed on the second member; and a biasing means to bias the first surface towards the second surface; wherein when the hinge is disposed in one or more of said range of positions the catching means limits relative movement between the first member and the second member so that they are substantially fixed; and the combined adjustment and locking means is actuable to adjust the one or more positions wherein relative movement is limited and subsequently to lock said one or more positions via a single action.

[0015] Such an arrangement is simpler to install and/or adjust than prior art hinges due to the use of a single worm drive to facilitate the adjustment and locking of the fixed positions. This is due, in particular, to the fact that a single adjustment action is required.

[0016] The combined adjustment and locking means may be a worm drive comprising: a wheel provided with a gear segment arranged on its outer curved surface and which is disposed on the second member; and a worm which is connected to the first member. Said worm and gear segment may be operable to mutually engage so that: (a) rotation of the worm rotates the wheel which in turn alters the one or more positions wherein relative movement is limited; and (b) the worm locks the position of the wheel. That is, the single action may comprise rotation of the worm.

[0017] Since the worm engages with the gear segment on the circumference of the wheel, rotation of the worm causes the wheel to rotate which results in a change in the fixed positions.

[0018] The second surface may be disposed on the wheel.

[0019] The position of the wheel may be locked by means of the pitch of the worm and/or the gearing ratio of the worm drive.

[0020] The first and second surfaces may be substantially annular in shape. One or more rounded projections may be provided on the first surface and one or more complementary rounded depressions may be provided on the second surface. Alternatively, one or more rounded projections may be provided on the second surface and one or more complementary rounded depressions may be provided on the first surface.

[0021] In one embodiment, two rounded projections are provided, which are are angularly displaced from each other by approximately 180 degrees and two rounded depressions are provided, which are angularly displaced from each other by approximately 90 degrees.

[0022] Alternatively, the first surface may be substantially tilted or wedge shaped, and the second surface may be a corresponding but inverted shape.

[0023] The biasing of the first surface towards the second surface may be achieved by the action of the weight of the first member and/or a panel attached thereto. Furthermore, in use, the wheel may be arranged to lie substantially horizontally and the second surface may form the upper surface of the wheel.

[0024] Alternatively, the second surface may be the curved surface of the wheel and the second surface may be provided with one or more rounded depressions. The first surface may be a corresponding engaging ball or roller which is movably attached to the first member. One or more springs, or any other biasing means, may be employed to bias the first surface towards the second surface.

[0025] The panel may be a door, a gate, a hatch, a lid, a cover, a window or any other type of panel as is desired and/or required.

[0026] Preferably, the axis of rotation of the wheel upon which the gear segment is disposed is substantially parallel to the axis of rotation of the first member about the second member. Furthermore the axis of rotation of the

worm is, preferably, substantially perpendicular to the axis of rotation of the first member about the second member.

[0027] The worm may be operable to engage with a tool, such as a screwdriver or a hex key, in such a manner that movement of the tool may cause rotation of the worm and, consequently, alteration of the one or more positions wherein relative movement is limited.

[0028] The gear segment may comprise gear teeth arranged around the entire circumference of the wheel. Alternatively, the gear segment may comprise gear teeth arranged only part of the circumference of the wheel.

[0029] A further embodiment of the pivotally adjustable hinge according to the invention is characterized in that the engaging ball or roller provided resiliently movable or sliding in a member forms an indexing block.

[0030] The hinge provided by the present invention is particularly applicable for a door to be used as a shower splashing protection. Such door may be attached to a fixed profile via a pivotally hinge supporting the door and having an axis of rotation. The fixed profile is attachable to a wall. The door has adjustable fixed opening and/or closure positions for which reason at least one hinge is provided with the continuously adjustable locking mechanism according to the present invention. The worm wheel or a part thereof have gear teeth around its radial circumference which are engaged by the thread of the worm thus providing a stable open and/or closure position of the door.

[0031] The hinge may comprise a pivoting profile, e.g. a tubular member, having at its outer surface a clutch or seizing member to attach a door, a window or the like, for providing a pivoting movement around an axis of rotation, and guides suited for accommodating bushings at the ends thereof.

[0032] Upper and lower pivots may be provided on end fittings at a predetermined distance from a fixed profile attachable to the wall, for cooperation with upper and lower bushings provided at the ends of the pivotal profile, The means for establishing the adjustable fixed closed and/or open position(s) of the swiveling door may be provided on a worm wheel around at least the lower pivot, said worm wheel being provided with gear teeth cooperating with the thread of a worm revolving mounted in the end fitting at the circumference of the worm wheel.

[0033] Yet another type of hinge may have the form of an indexing block having a roller or wheel provided with one or more groves capable of engaging with another roller or wheel which is biased by springs or other resilient means so as to be pressed into the groves, when the correct angle between the door (and the like) and the permanent attachment of the hinge to the wall is obtained. The roller or wheel of the indexing block is provided with gear teeth around its radial circumference which are engaged by the thread of a worm thus providing a stable open and/or closed position of the door.

Brief description of the drawings

[0034] In order that the invention can be more clearly understood embodiments thereof are now described further below, by way of example, with reference to the accompanying drawings, of which:

Fig. 1 is an exploded view of a hinge arrangement according to the present invention of the type supporting a door leaf and the like at an upper and lower corner and comprising upper and lower pivots engaging upper and lower bushings inserted into a pivotal tubular profile having at its outer surface a clutch member for securing and carrying the door;

Fig. 2 is a perspective view of a bottom bushing for a hinge according to the present invention of the type shown in Fig. 1;

Fig. 3 is a perspective view of a gear wheel according to the present invention of the type shown in Fig. 1;

Fig. 4 is a perspective view of an end fitting according to the present invention of the type shown in Fig. 1;

Fig. 5 is a perspective view in an enlarged scale of a worm and wheel arrangement according to the present invention;

Fig. 6 illustrates a hinge according to the present invention of the type supporting a door leaf at one of its vertical edges;

Fig. 7 is an exploded view of the supporting components of the hinge shown in Fig. 6;

Fig. 8 is an exploded view of the bracket assembly shown in Fig. 6;

Fig. 9 is a perspective view of the bracket assembly shown in an enlarged scale;

Fig. 10 is a perspective view of the gear wheel shown in an enlarged scale;

Fig. 11 is a perspective view of the worm screw shown in an enlarged scale;

Fig. 12 is a side elevation of a hinge according to the present invention of the type shown in Fig. 6 and comprising an indexing block partly shown with parts broken away; the elevation is parallel to a door leaf to which it is to be attached; and

Fig. 13 is a horizontal section through a hinge according to the present invention of the type shown in Fig. 6 and comprising an indexing block coaxial with the axis of rotation; the section is perpendicular to the door leaf.

Detailed description of the drawings and preferred embodiments of the invention

[0035] The invention will now be described in further details with reference to the drawings and illustrating embodiments of the invention, which, however, should not be construed in a limiting manner.

[0036] Reference is made to Fig. 1, which shows an exploded view of an adjustable hinge arrangement according to the present invention of an end-supporting type for, e.g., a shower splashing protection. The hinge arrangement comprises a pivotal tubular profile 2 having at its outer surface a clutch or seizing member comprising flanges 4, 5 extending along the tube 2 and between which a glass or plastic door 25 (not shown) can be mounted. The tubular profile cooperates pivotally with a fixed profile 3, which via a wall profile 6 can be attached to a wall by screws or other fastening means (not shown). At each end of the tube 2 a bushing 8, 9 is inserted into the hollow tube. Each bushing 8, 9 has a central circular opening 11 for receiving and accommodating a pivot 15, 16 protruding from an end fitting 13,14.

[0037] At least the lower end fitting 14 is provided with a fixed, but rotationally adjustable, wheel member 10 mounted around the erected pivot 16. The upper surface of said wheel 10 has a substantially annular profile being substantially smooth and planar except for one or more rounded beads, bulges or cams 18 provided thereon for engagement with a corresponding rounded depressions or recesses 17 provided in a lower surface of the lower bushing 9. Due to the weight of a door it cannot swing out of position, when one or more of the rounded bead (s), bulge(s) or cam(s) 18 on the upper surface of the wheel 10 engages a corresponding rounded depression or recess 17 in the lower edge surface of the lower bushing 9 without exerting a considerable amount of force on it, i.e, the door cannot swing by itself or by subjecting it to a minor torque. On the other hand the door is able to swing freely when there is no engagement between the rounded bead, bulge or cam 18 and the rounded depression or recess 17. Therefore, the above arrangement allows for a fixed position of the door which may, for example, be a closed or open position. Optionally, however, the lower edge surface of the bushing 9 may be provided with an additional depression or recess 19 angularly displaced from the depression or recess 17. This additional depression or recess 19 allows for both two fixed positions of a door, which may, for example correspond to an open position and a closed position.

[0038] Screws S1, S2 are provided for securing the end fittings 13,14 firmly to the fixed profile 3, thus maintaining the tube attached thereto in a swiveling manner about the pivots 15, 16.

[0039] Therefore, the lower bushing forms a first member which is operable to engage with a panel and the end fitting 14 and the wheel member 10 form a second member which is operable to engage with a support structure.

[0040] The wheel 10 is provided with a gear segment 12 along at least a part of its outer circumference which is operable to engage with a worm screw 1 disposed in a cavity or bore in a side of the end fitting 14 facing towards the gear segment 12 of the wheel 10, so as mutually to act as a worm and wheel drive. By turning the worm screw 1 with a tool T, e.g. a hex key (Allen key) or a screw driver, inserted into an opening to the worm cavity, the wheel 10 will rotate about the pivot 16. The rotation will depend on the gearing ratio between the worm and the wheel. Furthermore, the wheel 10 will be fixed completely in the final position due to this gearing ratio. Hence, the above operation allows for an easy and precise adjustment of the fixed closed and/or fixed open position(s) of the door, which easily can be performed by one single person.

[0041] Instead of rounded beads, bulges or cams 18 provided on the upper surface of the wheel 10 cooperating with depressions or recesses 17, 19 provided in a lower edge surface of the opposite lower bushing 9 the upper surface may be provided with depressions or recesses cooperating with rounded beads, bulges or cams provided on the a lower surface of the opposite lower bushing.

[0042] Alternatively the upper surface of the wheel may be slanted or tilted cooperating with a correspondingly slanted or tilted lower surface on the opposite lower bushing.

[0043] Fig. 2 is a perspective side view of a bottom bushing 9 for a hinge according to the present invention of the type shown in Fig. 1. The cylindrical part 25 of the bushing which is intended to be inserted into the bottom part of the tube 2 (shown in Fig. 1), whereas 23 is the cylindrical part of the bushing which is maintained outside the tube due to the horizontal ledge 24 connecting the lower cylindrical part 23 of the bushing with its upper cylindrical part 25, the latter having a smaller diameter than the former. Compression grooves 22 are provided in the upper cylindrical part 25 of the bushing for facilitating the insertion of the bushing 9 into the tube 2. The uppermost part 21 of the cylindrical part 25 of the bushing 9 is tapered in order also to facilitate the insertion of the bushing into the tube. The lower surface 26 of the bushing has a substantially annular profile and is plane and even except for the recesses 17, 19 provided for cooperation with the corresponding cam 18 on the top surface of the gear wheel 10 (Fig. 3). The recesses 17, 19 are angularly displaced from each other along the circumference of the lower edge of the bushing by, e.g. about 90°, The recess 17 is deeper than the recess 19 so that the door is maintained more firmly in a position in which the recess 17 is engaged by the cam 18 on the gear wheel 10 than when the recess 19 is engaged by said cam 18. This arrange-

ment allows for making it easier to close the door than to open it or vice versa according to the preference of the door position from which it should not be displaced unintentionally.

[0044] Figs. 3 and 5 show enlarged views of the gear wheel according to the present invention. The gear wheel 10 has a plane and even top surface and is provided with a gear segment 12 along at least a part of its outer circumference to be engaged by a worm 1 (Fig. 5) so as mutually to act as a worm and wheel drive, when the worm 1 is maintained in a cavity or bore in the end fitting 14 (Fig. 4). The gear segment along the outer circumference of the wheel may in some embodiments extend along the total circumference, but usually only a part of the wheel circumference is provided with a gear segment, e.g. about half of the circumference. The gear wheel has a central circular opening 31, the diameter of which matches the diameter of the pivot 16, so that the gear wheel 10 can be pushed onto the pivot 16 and pivot around it. A cam 18 is provided on the top surface of the wheel 10. The surface of the cam 18 is also smooth and even so as to facilitate its movement into and out of the recesses 17, 19 in the lower edge of the bushing 9. The gearing ratio between the worm and the wheel is so great that it is easy to turn the wheel by turning the worm with a tool, e.g. a screwdriver or a hex (Allen) key, but it is impossible to turn the worm by trying to turn the wheel, i.e. the wheel is locked in any rotational position by the worm.

[0045] Fig. 4 is a perspective view of an end fitting according to the present invention. The end fitting has a cylindrical base part 41 with a plane and even top surface 42 to support the bottom surface of the wheel 10 and a mainly rectangular side portion 43 extending radially from one side of the cylindrical part 41 and upwards from its top surface 42 so as to form an elevated superstructure 44 above the top surface 42.

[0046] A substantially cylindrical pivot 16 extends from the center of the cylindrical top surface 42, the outer diameter of the pivot 16 being substantially the same size as the circular opening 31 of the gear wheel 10, so that the gear wheel 10 can be pushed onto the pivot 16 and swivel around it. A cavity is provided in the end portion of the elevated superstructure 44 of the rectangular part 43 and has an elongated opening facing towards the pivot 16 of such size that it is capable of receiving and accommodating a worm screw 1 which will engage with the gear segment 12 of the wheel 10 when the wheel is pushed down onto the pivot 16. The cavity has also a circular opening 7 at the side of the elevated structure 44 for the insertion of a tool like e.g. a screwdriver or a hex (Allen) key to rotate the worm and thereby the gear wheel 10. However, the circular opening 7 has a smaller diameter than the worm 1 so that the worm cannot pass out through the circular opening 7 and thus it is completely locked in place when the gear wheel 10 is pushed onto the pivot 16.

[0047] The tube 2 with flanges 4, 5 and profiles 3, 6 may be produced of any appropriate constructional material, preferably a metal such as aluminum, an aluminum alloy or stainless steel. The end fittings 16, 41, 43, the bushing 9 and wheel 10 may also be made of these materials but, in particular, the wheel may alternatively be produced of an impact-proof plastic such as PVC or similar. The worm and other screws may also be made of an impact-proof plastic, but are preferably made of an inert metal like stainless steel.

[0048] Having explained the construction of a hinge according to the invention of the type supporting a door leaf at an upper and lower corner another embodiment of the hinge according to the present invention of the type supporting a door lower at one of its vertical edges is described.

[0049] Reference is made to Fig. 6 showing a perspective side elevation of a hinge according to the present invention of the type supporting a door leaf or other panel at one of its vertical edges. The hinge comprises an angular bracket 61 and two parallel clutch plate members 62, 63 secured to each other by screws 64, 65. The door leaf or other panel (not shown), which is to be suspended by the hinge, is squeezed between these clutch plate members 62, 63 which in turn are attached to the angular bracket 61 in a swiveling manner which will be explained in more details below. The bracket 61 is secured to a wall or other support structure (not shown), e.g. by screws, bolts or other fastening means, through the apertures 66, 67.

[0050] Therefore, the clutch plate members 62, 63 together form a first member which is operable to engage with a panel and the angular bracket 61 forms a second member which is operable to engage with a support structure.

[0051] Fig. 7 is an exploded view of the supporting components of the hinge shown in Fig. 6. 61, 62 and 63 have the same meanings as above, and 70 indicates an indexing block integral with or secured to the plate member 62, which will be explained in more details below with reference to Fig. 12. The indexing block 70 comprises two parallel branching lobes provided with through-going apertures 71, 72 for receiving a connection member, e.g. a bolt or screw, for attachment of the clutch plates 62, 63 to the angular bracket 61 through the through-going aperture 73. Thus, the supporting hinge members 61, 62, 63 allow for a secure fastening of a door leaf or other panel to a wall of a building or other structure in a swiveling manner. However, usually two hinge assemblies are required, one above the other or side by side, in order to suspend a door leaf or other panel in safe manner. A spacer member 73 secures parallelism between the clutch plates 62 and 63 when assembled.

[0052] Fig. 8 is an exploded view of the bracket assembly showing the worm and wheel components according to the present invention. The bracket 61 comprises two mutually parallel angular lobes 86, 87 each of which is provided with a through-going apertures 73, 74. A gear wheel 80 which is pierced by a central aperture 79 is disposed between the two lobes 86, 87. The gear

wheel 80 is maintained in place between the lobes 86, 87 by a tube 78 which extends through the apertures 73, 74 in each of the two lobes and the central aperture 79 of the wheel 80. The tube 78 is secured to the lobes 86, 87 by end bushings 88, 89 and, optionally, a bolt or screw (not shown). In this manner the wheel 80 is allowed to pivot freely about the center axis of the tube 78.

[0053] The wheel 80 has a circumferential track or groove 85 along at least a segment of its circumference provided with cogs to be engaged by the thread of a worm 81. Parallel with its center axis the wheel 80 also has three longitudinal recesses or grooves 82, 83, 84 at different positions around its circumference. These grooves 82, 83, 84 are complementary to, and operable to engage with, a spring-loaded roller in the indexing block 70 as explained below with reference to Fig. 12. Alternatively the wheel may have spherical depressions at its circumference which are operable to cooperate with a ballshaped member biased in the indexing block against the circumference of the wheel 80.

[0054] Reference is made to Figs. 9, 10 and 11 wherein the reference numerals 61, 80, 81, 82, 83, 84, 85, 86, 87 have the same meaning as explained above and 91 indicates a cavity or bore at the bottom of the interstitium between the lobes 86, 87 of the bracket 61. The dimensions of the cavity are such that it can accommodate the worm 81 in a freely rotating manner, but unable to move out of the cavity when the wheel 80 is mounted. The worm 81 has a helical thread along its circumference and at one end it is provided with an aperture 90 appropriate for engagement with a hex (Allen) key. Such a hex key (not shown) can be introduced therein through the cylindrical aperture 92 at the basis of the bracket 61. Because the thread of the worm 81 engages the cogs 85 of the wheel 80 a rotation of the worm will cause a rotation of the wheel about its center axis, but due to the pitch of the thread of the worm 81 and the gearing ratio between the worm and the wheel the latter will be completely fixed in any angular position defined by the rotational position of the worm. This will also fix the angular positions of the longitudinal recesses 82, 83, 84 at the circumference of the wheel 80.

[0055] Reference is made to Fig. 12 which is a side elevation of a hinge according to the present invention of the type shown in Fig. 6 and comprising an indexing block with parts broken away; the elevation is parallel to a door leaf attached thereto. A worm and wheel assembly 81, 80 is disposed in the space between the lobes 86, 87 of the bracket 61 and secured therein by the tube 78. The indexing block 70, shown in cross section, has a cavity 95 and two cylindrical bores 96, 97 each of which accommodates a strong spring 98, 99 or other biasing means bearing against a hollow abutment 94 (also shown in cross section). A roller 100 is seated in said hollow abutment 94, which in turn bears against the circumference of the wheel 80 due to the resilient force exerted by the springs 98, 99.

[0056] As seen from Fig. 13, which is a section along the lines B-B in Fig. 12, angular fixed positions of the indexing block 70 and consequently the clutch plates 62, 63 secured thereto are only obtained when the roller 100 rests in one of the longitudinal recesses 82, 83, 84 of the gear wheel 80. Thus, these positions can be used to fix the open and/or closed positions of a door leaf or other panel member squeezed between the clutch plates 62, 63.

[0057] As mentioned above with reference to Figs. 9, 10, 11 the angular positions of the recesses or depressions 82, 83, 84 can be changed by rotating the worm 81 by means of a tool introduced into the opening or bore 92. Hence, precise continuous and optional tiny adjustments of the open and/or closed positions of a door leaf or other panel are quite easy to perform for one single person.

[0058] The bracket 61, the clutch plates 62, 63 and the indexing block 70 are preferably made of a metal such as brass although other appropriate metals like stainless steel may alternatively be used. The visible external surfaces of these objects may be plated, e.g. with nickel or chromium and others providing an attractive appearance. The same applies to the tube 78, the bushings 88, 89 and the wheel 80, which, however, alternatively may be produced of an impact-proof plastic such as PVC or similar. The worm and other screws may also be made of an impact-proof plastic but are preferably made of an inert metal like stainless steel.

[0059] It is of course to be understood that the invention is not to be restricted to the details of the above embodiments which have been described by way of example only.

Claims

1. An adjustable hinge for securing a panel to a support structure comprising: a first member which is operable to engage with the panel; a second member which is operable to engage with the support structure; a catching means; and a combined adjustment and locking means wherein:

   the first member is pivotally attached to the second member and is operable to rotate relative thereto through a range of positions;
   the catching means comprises: a first surface disposed on the first member;
   a complementary second surface disposed on the second member; and a biasing means to bias the first surface towards the second surface; wherein when the hinge is disposed in one or more of said range of positions the catching means limits relative movement between the first member and the second member so that they are substantially fixed; and
   the combined adjustment and locking means is actuable to adjust the one or more positions wherein relative movement is limited and sub-

seqently to lock said one or more positions via a single action.

2. An adjustable hinge as claimed in claim 1 wherein the adjustment and locking means is a worm drive comprising: a wheel provided with a gear segment arranged on its outer curved surface and which is disposed on the second member; and a worm which is connected to the first member; wherein said worm and gear segment are operable to mutually engage so that: (a) rotation of the worm rotates the wheel which in turn alters the one or more positions wherein relative movement is limited; and (b) the worm locks the position of the wheel; and the single action comprises rotation of the worm.

3. An adjustable hinge as claimed in claim 2 wherein the second surface is disposed on the wheel.

4. An adjustable hinge as claimed in claim 2 or claim 3 wherein the position of the wheel is locked by means of the pitch of the worm and/or the gearing ratio of the worm drive.

5. An adjustable hinge as claimed in any preceding claim wherein the first and second surfaces are substantially annular in shape and wherein one or more rounded projections (18) are provided on either of the first surface or the second surface and one or more complementary rounded depressions (17,19) are provided on the other surface.

6. An adjustable hinge as claimed in claim 5 wherein two rounded projections are provided and wherein the two rounded projections are angularly displaced from each other by approximately 180 degrees.

7. An adjustable hinge as claimed in claim 5 or claim 6 wherein two rounded depressions are provided and wherein the two rounded depressions are angularly displaced from each other by approximately 90 degrees.

8. An adjustable hinge as claimed in claim 1 wherein the first surface is substantially tilted or wedge shaped, and the second surface is a corresponding but inverted shape.

9. An adjustable hinge as claimed in any preceding claim wherein the biasing of the first surface towards the second surface is achieved by the action of the weight of the first member and/or a panel attached thereto.

10. An adjustable hinge as claimed in any preceding claim when dependent upon claim 2 wherein, in use, the wheel is arranged to lie substantially horizontally and the second surface forms the upper surface of the wheel.

11. An adjustable hinge as claimed in claim 2 wherein: the second surface is the curved surface of the wheel; the second surface is provided with one or more rounded depressions (82, 83, 84); and the first surface is a corresponding engaging ball or roller (100) which is movably attached to the first member.

12. An adjustable hinge as claimed in claim 11 wherein the biasing means comprises two springs (98, 99).

13. An adjustable hinge as claimed in any preceding claim when dependent upon claim 2 wherein the axis of rotation of the wheel upon which the gear segment is disposed is substantially parallel to the axis of rotation of the first member about the second member.

14. An adjustable hinge as claimed in any preceding claim when dependent upon claim 2 wherein the axis of rotation of the worm is substantially perpendicular to the axis of rotation of the first member about the second member.

15. An adjustable hinge as claimed in any preceding claim when dependent upon claim 2 wherein the worm is operable to engage with a tool (T), such as a screwdriver or a hex key, in such a manner that movement of the tool may cause rotation of the worm and, consequently, alteration of the one or more positions wherein relative movement is limited.

16. An adjustable hinge as claimed in any preceding claim wherein the gear segment comprises gear teeth arranged around only a part of the circumference of the wheel.

Fig. 1

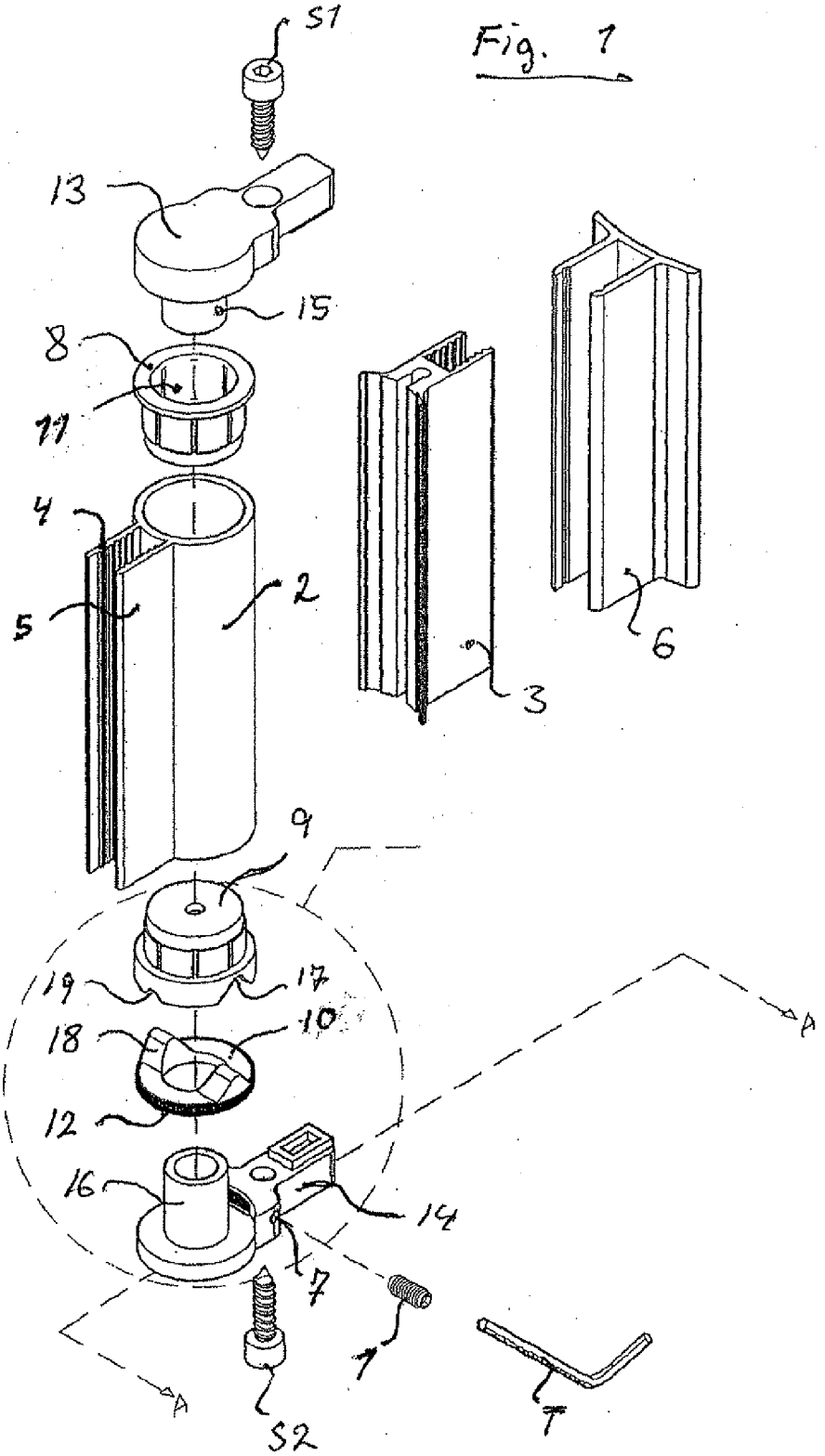


Fig. 2

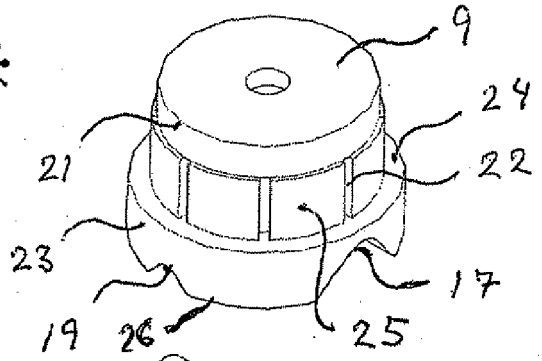


Fig. 3

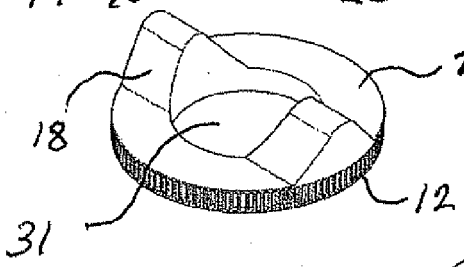


Fig. 4

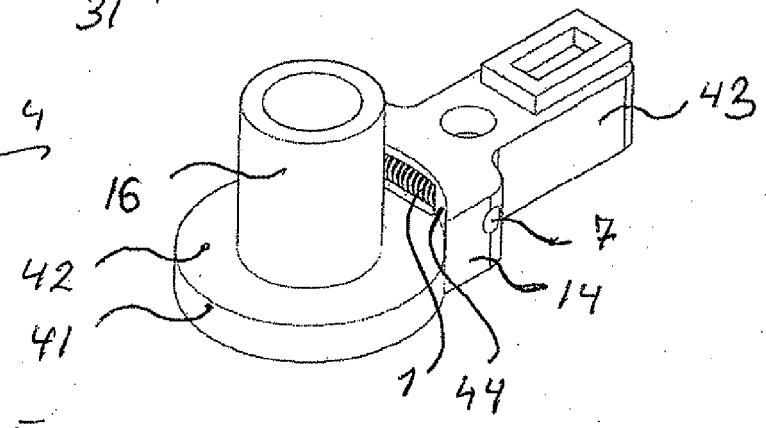
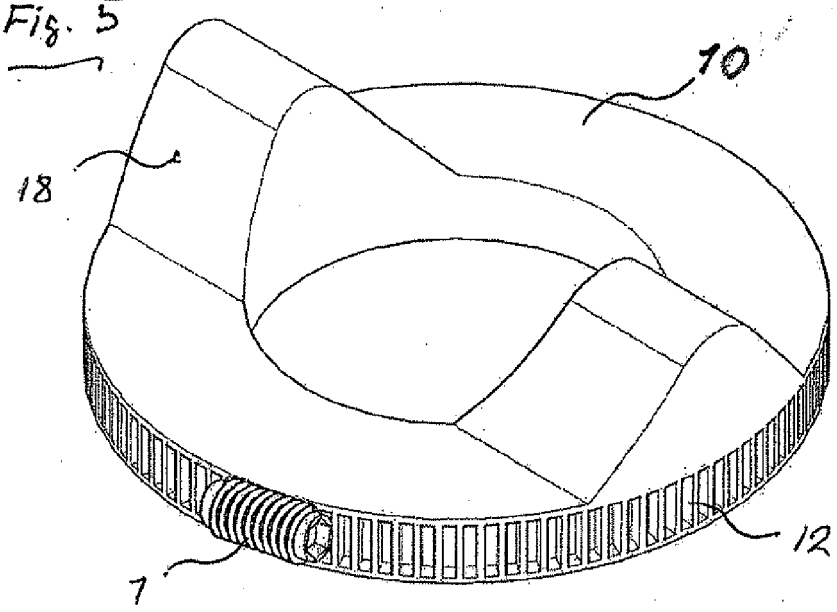


Fig. 5



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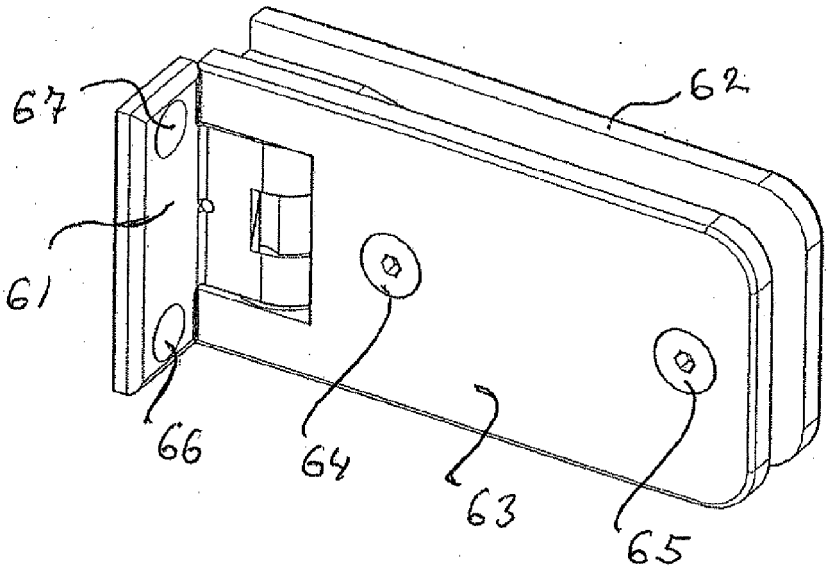

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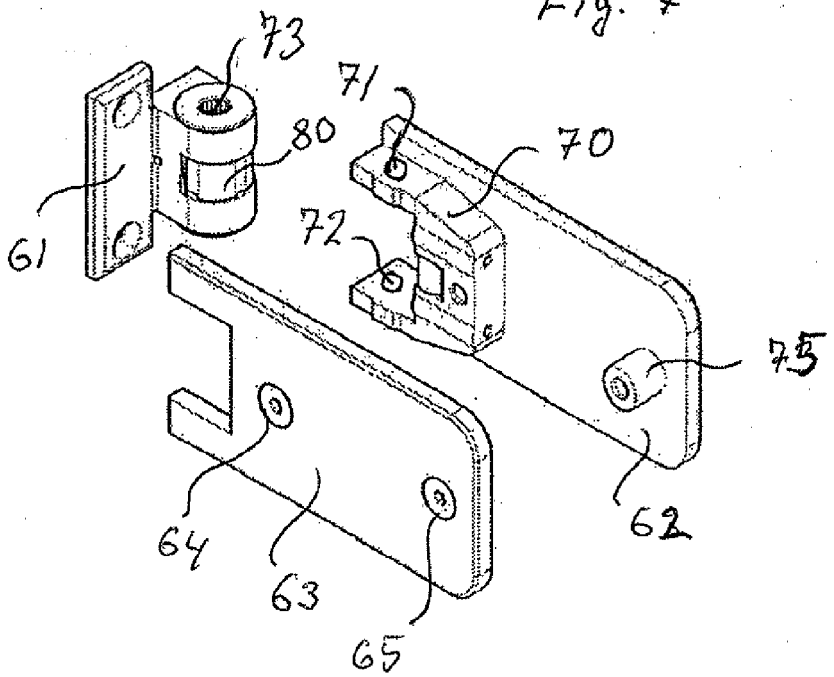


Fig. 8

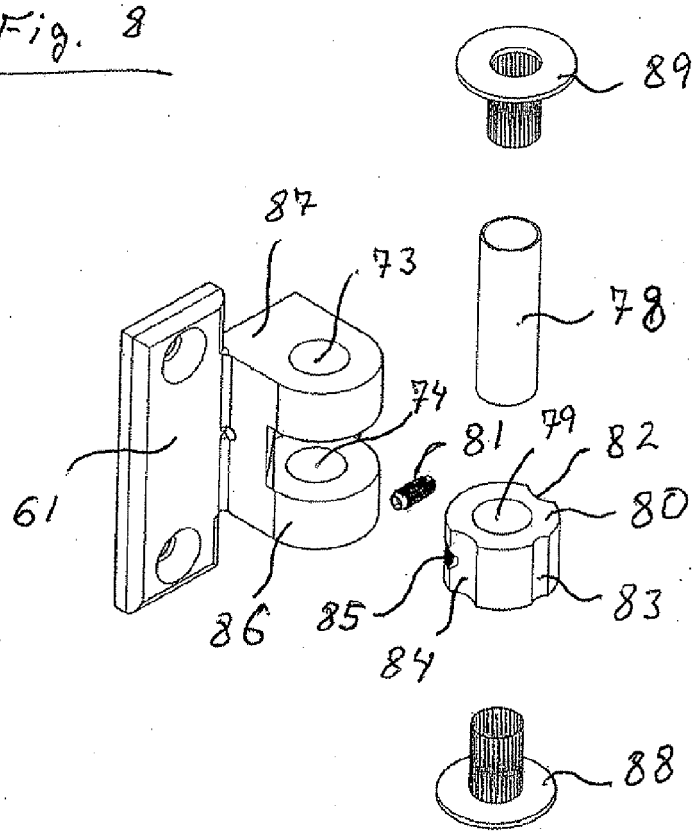


Fig. 9

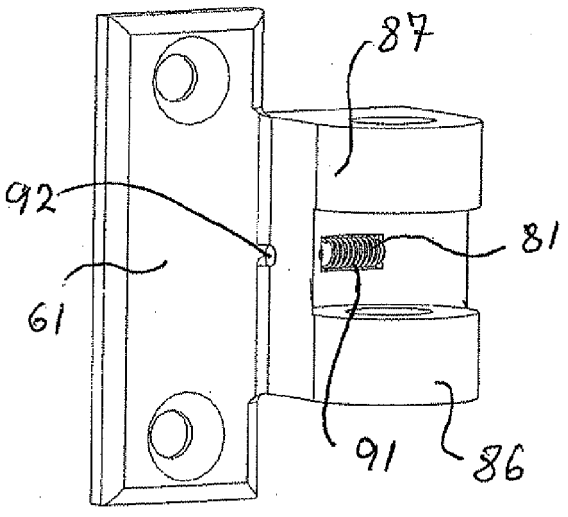
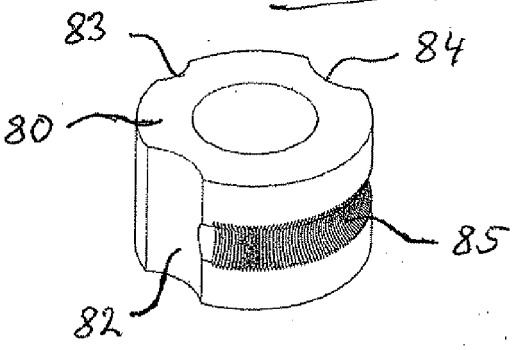


Fig. 10



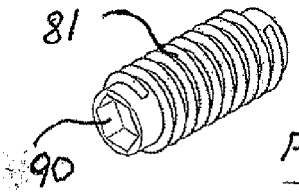


Fig. 11

Fig. 12

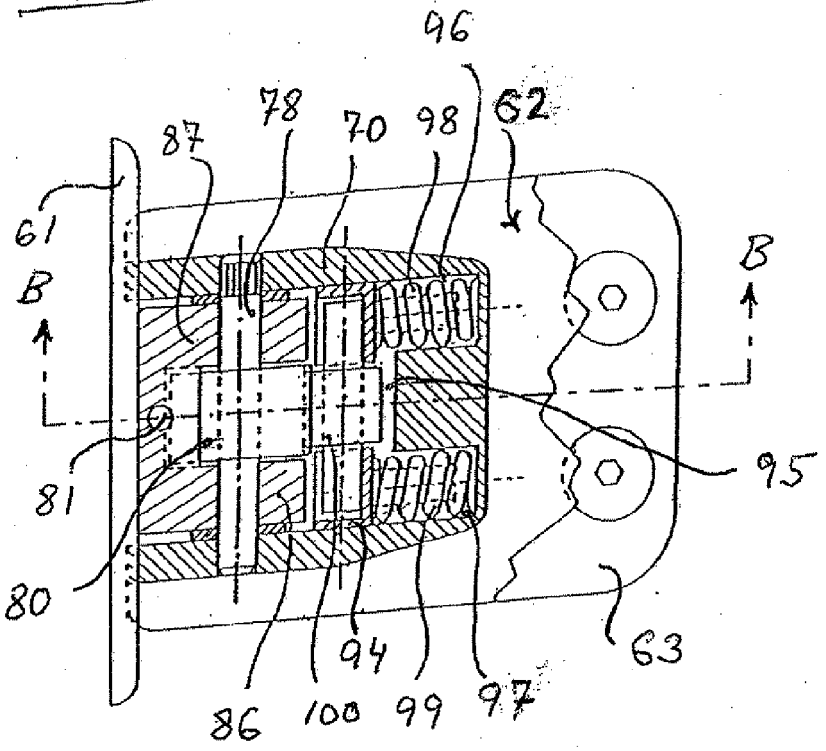

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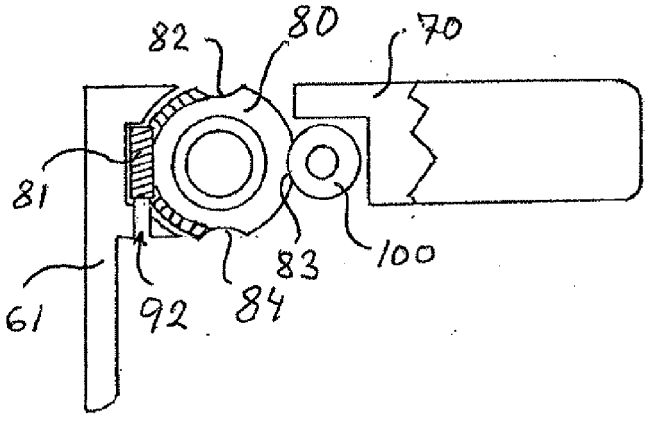
Fig. 13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EUROPEAN SEARCH REPORT

Application Number
EP 10 18 9397

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	DE 103 13 961 A1 (DORMA GMBH & CO KG [DE]) 7 October 2004 (2004-10-07) * paragraph [0037] - paragraph [0043]; figures 1,2 * -----	1-4,8, 11-16 5-7,9,10	INV. E05D5/02 E05D11/10 E05F1/06 E05D7/08
Y,D	WO 2006/054942 A1 (GLASMAESTERIBRANSCHENS SERVICE [SE]; FELLMAN BERNT [SE]) 26 May 2006 (2006-05-26) * page 2, paragraph 7 - page 3, paragraph 1; figure 1 * -----	5-7,9,10	

TECHNICAL FIELDS SEARCHED (IPC)
E05D E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 March 2011	Guillaume, Geert

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16-03-2011

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