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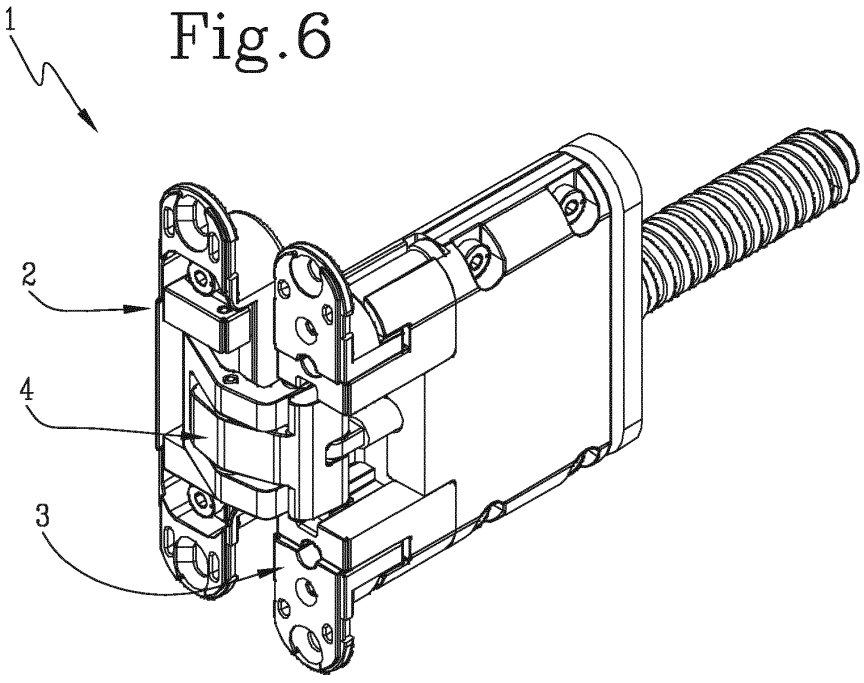
(54) CONCEALED HINGE

(57) Concealed hinge (1), comprising a first hinge body (2) installable in a housing of a fixed frame (T) and a second hinge body (3) installable in a housing of a leaf (A) to be coupled with the fixed frame (T). The hinge (1) further comprises an articulating mechanism (4) connected to the hinge bodies (2, 3) to allow a reciprocal movement of the hinge bodies (2, 3) between a first configuration, in which they are reciprocally distanced, corresponding to an open position of the leaf (A), and a second configuration, in which they are reciprocally near, corresponding to the closed position of the leaf (A). The hinge (1) further comprises an elastic means (10) to activate a closure of the leaf (A) and damping means (18) for attenuating or limiting a stroke speed of the leaf. Further, the hinge (1) comprises a disengagement means (19) configured to automatically disengage the damping means (18).

Fig.6



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Description

TECHNICAL FIELD

[0001] The present invention relates to a concealed hinge. In particular, the invention relates to a concealed hinge for the automatic closure of a door or window having a frame and a relative leaf.

PRIOR ART

[0002] The concealed hinge is a particular type of hinge for doors and windows that is not visible when the door or window with which it is associated is in a closed position with respect to the respective support frame.

[0003] In particular, concealed hinges comprise a first and a second hinge unit connected by an articulating mechanism that enables the two units to rotate in relation to one another around a normally vertical axis, to permit angular movement of the leaf between the open and closed position of a passage. In greater detail, the first and the second hinge unit are inserted and connected inside housings obtained respectively on the frame and on the leaf of the door or window.

[0004] In other words, the two hinge units can be recessed in corresponding cavities made in the thickness of the leaf and in the support frame so as to be invisible when the leaf is in the closed position.

[0005] This type of hinge can be fitted to doors and windows of different type, for example made with an innumerable number of different materials (wood, PVC or various aluminium alloys) and having customizable geometries according to the sought aesthetic and structural needs.

[0006] Devices are commercially available for the automatic closure of the leaf of a door or window that comprise movable outside arms connected to the leaf of the door or window to promote the passage thereof from an open position to a closed position.

[0007] Disadvantageously, these devices are particularly bulky and of limited aesthetic appeal.

[0008] Concealed hinges are further known that enable the leaf to move from the open position to the closed position owing to the presence of a spring.

[0009] Disadvantageously, the accelerated motion due to the constant action of the spring on the leaf promotes the closure of the door or window by making the leaf knock against the frame in a particularly vigorous manner, which in addition to causing a loud noise, can lead to the hinge yielding to fatigue. Disadvantageously, moreover, certain hinges of this type are not able to give the leaf a speed that is such as to permit an effective closure, especially if the door or window has mechanical latch locks and seals of particularly great dimensions.

[0010] Another drawback of the known solutions is constituted by the difficulty of adjustment. In fact, many hinges constrain the adjustment of the so-called "airgap" (i.e. the space existing between the leaf and the frame - at the thickness of the leaf - when the leaf is in the closed position) to the preloading adjustment of the spring, thus making an independent adjustment of the two parameters impossible.

[0011] Hinges exist on the market having damping systems adapted to decrease the speed of the leaf in order to limit the possibility of energy impacts between the leaf and the frame. Disadvantageously, these systems are not able to slow appropriately the leaf when the leaf is closed with force and are thus unable to ensure that the leaf does not knock with force against the frame, risking damage to the leaf and causing noise.

[0012] Document EP3469177, according to the abstract thereof, relates to a device for the automatic closure of a door, to be applied to a concealed hinge comprising two bodies that are articulated together by a pair of arms and are constrainable, respectively, on a leaf and on a fixed structure. In greater detail, the device comprises a translating element that can be engaged on an articulating arm and elastic means interposed between a first element associated with the translating element and a second element associated with one of said articulated bodies, in which the elastic means returns to said translating element the mechanical energy accumulated during the opening step, in order to cause the automatic closure of the leaf associated with the hinge.

[0013] Document DE202020100939, according to the introductory part thereof, relates to a hinge with an integrated closure function.

[0014] Document EP3274533, according to the abstract thereof, relates to a hydraulic hinge for closing, opening and/or controlling a door, a window or a leaf.

SUMMARY

[0015] In this context, the technical task underpinning the present invention is to provide a concealed hinge which obviates the drawbacks of the prior art as described above.

[0016] One aim of the present invention is thus to provide a concealed hinge that permits an effective closure of the door or window.

[0017] A further aim of the present invention is to provide a concealed hinge that has a longer working life than prior-art devices.

[0018] Another aim of the present invention is to provide a concealed hinge that limits the noise caused by the closure of the leaf against the frame.

[0019] A further aim of the present invention is to make available a concealed hinge that allows correct and easy adjustment of the leaf to the frame.

[0020] Another aim of the present invention is to make a concealed hinge that is easily adjustable also by personnel who are not non-highly specialized. The technical task specified above and the mentioned aims are substantially reached by a concealed hinge according to the present invention.

[0021] In greater detail, the present description refers

to a concealed hinge, comprising a first hinge body that is installable in a housing of a fixed frame and a second hinge body installable in a housing of a leaf to be coupled with the fixed frame. The hinge further comprises an articulating mechanism connected to the hinge bodies to allow a reciprocal movement of the hinge bodies between a first configuration, in which they are reciprocally distanced, corresponding to an open position of the leaf, and a second configuration, in which they are reciprocally near, corresponding to the closed position of the leaf. One of the hinge bodies, in particular the second hinge body, comprises a closing device comprising a sliding rod having a first end connected to the articulating mechanism and slidably movable inside the respective hinge body, following a reciprocal movement of the hinge bodies, between a forward position corresponding to the distanced configuration of the hinge bodies and a rearward position corresponding to the neared configuration of the hinge bodies. The closing device further comprises elastic means active on a second end of the sliding rod to maintain the sliding rod pushed towards the rearward position and damping means active on the sliding rod so as to exert a push on the sliding rod which is opposite to the action of the elastic means in the passage of the sliding rod from the forward position to the rearward position, so as to attenuate or limit a stroke speed of the sliding rod. In particular, the damping means is arranged and/or configured so that the push opposite to the action of the elastic means originates when the sliding rod takes on a first intermediate position, i.e. comprised between the forward and rearward positions. Further, the closing device comprises a disengagement means configured to automatically disengage the damping means from the sliding rod in a second position of the sliding rod located downstream of the aforesaid first intermediate position towards the rearward position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Further features and advantages of the present invention will become more apparent from the following indicative, and hence non-limiting, description of a preferred, but not exclusive, embodiment of a concealed hinge as illustrated in the appended drawings, in which:

- figures 1-5 illustrate, in a top view, a concealed hinge in a plurality of different operating conditions according to the present invention;
- figure 6 illustrates, in a perspective view, the external appearance of a concealed hinge according to the present invention;
- figure 7 illustrates, in a frontal view, the concealed hinge of figure 6;
- figure 8-11 illustrates a lateral section view of a concealed hinge in accordance with a first embodiment of the present invention;
- figures 12-15 show technical details of the hinge in accordance with figures 8-11;
- figures 16-19 are schematic representations of technical details of a second embodiment of the present invention;
- figure 20-26 illustrate a lateral section view of a concealed hinge in accordance with a third embodiment of the present invention.

DETAILED DESCRIPTION

[0023] With reference to the figures, a concealed hinge has been indicated in its entirety by the reference number 1 and will be indicated below also simply as "hinge 1".

[0024] The hinge 1 comprises a first hinge body 2 and a second hinge body 3 installable respectively in a housing of a fixed frame "T" and in a housing of a leaf "A" to be coupled with the fixed frame "T".

[0025] The hinge 1 comprises an articulating mechanism 4 connected to the hinge bodies 2, 3 to allow a reciprocal movement of the hinge bodies 2, 3 between a first configuration, in which they are reciprocally distanced, and a second configuration, in which they are reciprocally near.

[0026] The first and second configuration correspond respectively to an open position (figure 1) and to a closed position (figure 5) of the leaf "A" and, in the closed position, the hinge 1 is entirely hidden from view as the respective front surfaces of the leaf "A" and of the fixed frame "T" that are parallel, facing one another and near (figure 5).

[0027] The intermediate positions of figures 2-4 show temporary movement positions of the leaf "A" in which there are speed variations. In particular, in response to a manual initial movement, starting from figure 1, the leaf "A" starts an acceleration step under the action of elastic means as far as the position of figure 3, in which the leaf starts a slow-down step as far as the position of figure 4, in which acceleration of the leaf "A" resumes as far as the final closure blow (figure 5), in which for example the leaf has to overcome the resistance of pawls, latch or other movable stop elements of the handle or of the lock.

[0028] Advantageously, the reciprocal distance between the first hinge body 2 and the second hinge body 3 can be adjustable in order to ensure effective closure of the door or window.

[0029] In other words, the hinge 1 can permit adjustment of the so-called "airgap" i.e. the interspace comprised between the leaf "A" and the fixed frame "T" (figure 5).

[0030] In accordance with a possible embodiment and as illustrated in the attached figures, in particular in figures 7 and 8, the hinge 1 comprises a pair of threaded elements 5 that are active on the second hinge body 3 and actuatable for adjusting the reciprocal distance between the second hinge body 3 and the first hinge body 2.

[0031] Further, in accordance with a general aspect common to all the embodiments, one of the hinge bodies 2, 3, preferably the second hinge body 3, comprises a

closing device 6 configured to promote a movement of the leaf "A" from the open position to the closed position.

[0032] In particular, the closing device 6 is active on the articulating mechanism 4 so as to promote the passage of the hinge bodies 2, 3 from the first, reciprocally distanced configuration, to the second configuration, in which they are reciprocally near.

[0033] In other words, the closing device 6 induces a passage of the leaf "A" from the open condition to the closed condition as will be disclosed below.

[0034] For reasons of simplicity and clarity of illustration, reference will be made below to embodiments in which the closing device 6 is comprised in the second hinge body 3, installed in the leaf "A", nevertheless, in accordance with further embodiments, the closing device 6 can be comprised in the first hinge body 2 installed in the fixed frame "T" without the inventive concept on which the present invention is based being altered.

[0035] The closing device 6 comprises a sliding rod 7 having a first end 8 connected to the articulating mechanism 4 and adapted to slide inside the hinge body 3 following a reciprocal movement of the hinge bodies 2, 3. The sliding rod 7 is reversibly movable between a forward position (figures 8, 20), corresponding to the distanced configuration of the hinge bodies 2, 3, and a rearward position (figures 11, 23), corresponding to the neared configuration of the hinge bodies 2, 3.

[0036] In other words, the movement of the articulated mechanism 4 and thus the sliding of the sliding rod 7 causes the rotation of the leaf "A" with respect to the fixed frame "T".

[0037] The sliding rod 7 has, further, a second end 9 on which an elastic means 10 is active to maintain the sliding rod 7 pushed towards the rearward position and, thus, to promote a movement of the sliding rod 7 towards the rearward position.

[0038] In this manner, the elastic means 10 promotes a passage of the hinge bodies 2, 3 from the reciprocally distanced configuration to the reciprocally neared configuration, thus to promote a passage of the leaf "A" from the open position to the closed position.

[0039] Preferably, the elastic means 10 comprises a spring 11 fitted to the sliding rod 7.

[0040] The spring 11 is active between a fixed abutment surface 12 of the closing device 6 and a movable abutment surface 13 constrained near the second end of the sliding rod 7.

[0041] Preferably, the sliding rod 7 translates inside a guide bushing 14 fixed to the hinge body 3 and defining the fixed abutment surface 12. Further, the closing device 6 comprises a transverse element, for example a washer 15, constrained on the second end 9 of the sliding rod 7 by means of a stop element, preferably a self-locking nut 16, and defining the movable abutment surface 13.

[0042] The positioning of the fixed abutment surface 12 and/or the movable abutment surface 13 can be adjusted along a direction parallel to the longitudinal axis "X" of the sliding rod 7 so as to modify the preload of the elastic means 10.

[0043] In this manner, the closing device 6 enables the action of the elastic means 10 on the sliding rod 7 and thus the extent of the closing push exerted on the leaf "A" to be adjusted.

[0044] In accordance with the embodiments illustrated, the closing device 6 comprises a pair of grubscrews 17 operationally connected to the fixed abutment surface 12 to adjust the positioning thereof along a direction parallel to the longitudinal axis "X", preferably at a normally accessible front surface of the hinge body 3.

[0045] Further, the closing device 6 can permit positioning adjustment of the movable abutment surface 13, for example by acting on the self-locking nut 16 (this adjustment is performed from the rear side, i.e. by acting on the self-locking nut, thus it is achievable with the hinge body 3 dismantled).

[0046] In this manner, the hinge 1 ensures the independence of the adjustment of the preload of the elastic means 10 from the adjustment of the so-called "airgap" and vice versa. The hinge 1 further comprises damping means 18 active on the sliding rod 7 so as to exert a push on the sliding rod 7 which is opposite to the action of the elastic means 10 in the passage of the sliding rod 7 from the forward position to the rearward position.

[0047] In particular, the damping means 18 contrasts the action of the elastic means 10 so as to attenuate and/or limit the movement speed of the sliding rod 7.

[0048] In other words, the action of the damping means 18 determines a braking or deceleration of the motion of the sliding rod 7.

[0049] Thus, the damping means 18 enables the speed of the leaf "A" to be moderated with respect to the fixed frame "T" in a section of the closing stroke, in particular in the deceleration step comprised between the position of figure 3 to the position of figure 4.

[0050] Advantageously, the damping means 18 can give rise to the aforesaid braking/deceleration at a preset position between the leaf "A" and the fixed frame "T", so-called "engagement position" (figure 3), so as to moderate the speed induced on the leaf "A" by the action of the elastic means 10, avoiding a strong impact of the leaf during the closing step.

[0051] In particular, the damping means 18 is arranged and/or configured in such a way that the aforesaid braking/deceleration originates when the sliding rod 7 takes on a first position (figures 9, 21) comprised between the forward position (figures 8, 20) and the rearward position (figures 11, 23).

[0052] Such damping means 18 preferably comprises damping cylinders (figures 8-11) and/or springs (figures 20-23), in particular helical springs. Using damping (for example oil) cylinders or springs is not strictly linked to the type of embodiment, being solutions that are interchangeable as a function of need.

[0053] Advantageously, the hinge 1 further comprises disengagement means 19 configured to automatically disengage the damping means 18 from the sliding rod 7.

[0054] In particular, the disengagement means 19 disengages the damping means 18 at a second position ("disengagement position", figures 10, 22) of the sliding rod 7 arranged downstream of the first position (figures 9, 21), in an intermediate point between the first position (figure 9) and the rearward position.

[0055] In this manner, the disengagement means 19 enables further braking of the sliding rod 7 to be inhibited, thus enabling subsequent acceleration of the sliding rod, and thus of the leaf "A", under the action of the elastic means 10 to obtain the final closure blow.

[0056] It is thus important for the disengagement position to be carefully determined inasmuch as the disengagement position determines, during the passage from the disengagement position to the closed position (figure 5), i.e. in the section in which the damping means 18 is not active on the sliding rod 7, the action of the elastic means 10, which has to be such as to give the leaf "A" sufficient speed to permit an effective closure without inducing great impacts against the frame "T".

[0057] In this manner, the closing device 6 ensures effective closure of the leaf "A" and prevents the leaf "A" from knocking with excessive force against the fixed frame "T" causing a loud noise and damaging the door or window. Preferably, the disengagement means 19 defines a kinematic coupling between the damping means 18 and the sliding rod 7.

[0058] This kinematic coupling is configured to adopt a disengaged configuration (figures 9, 21), in which the sliding rod 7 is subjected to the action of the damping means 18, and an engaged configuration (figures 10, 22), in which the kinematic coupling permits free sliding of the sliding rod 7 with respect to the damping means 18.

[0059] In particular, with the definition "coupling", a relation between the damping means 18 and the sliding rod 7 is meant, such that the operation of the former influences the operation of the latter and, preferably, vice versa. This coupling can include connections of fixed or detachable type and can be achieved directly between the damping means 18 and the sliding rod 7 or by interposing further elements.

[0060] Advantageously, the aforesaid kinematic coupling can be achieved according to different technical solutions, for example by friction or by shape coupling.

[0061] The hinge 1 can comprise a central block 20 mounted on the sliding rod 7 defining at least one front surface 21 on which the damping means 18 acts to attenuate or limit the stroke speed of the sliding rod 7.

[0062] The central block 20 is removably connected to the sliding rod 7, in particular it is normally integral with the sliding rod 7 in the translation motion imposed by the elastic means 10 and is disconnected from the sliding rod 7 by the disengagement means 19 such that the sliding rod 7 is no longer subject to the action of the damping means 18.

[0063] In particular, the disengagement means 19 is switchable from the disengaged configuration to the engaged configuration through the interaction between the central block 20 and a fixed abutment portion 22 of the hinge body 3 such that the axial position adopted by the central block 20 determines the actuation of the disengagement means 19 (in other words, activation of the disengagement means 19 is automatic when the preset axial position is reached by the sliding rod 7).

[0064] Advantageously, the fixed abutment portion 22 can be adjustable along a direction parallel to the longitudinal axis "X" of the sliding rod 7 so as to modify the engagement and disengagement position of the disengagement means 19.

[0065] In accordance with a possible embodiment and as illustrated in figures 14, 15, 25, 26, the fixed abutment portion 22 can be defined by a manually adjustable eccentric pin 100 that, following a rotation, determines a forward or rearward movement of the front surface thereof intended to come into contact with the central block 20, thus bringing forward or postponing activation of the disengagement means.

[0066] The eccentric pin 100 is adjusted along an axis that is perpendicular to the sliding rod 7, thus by acting on a side of the hinge body 3.

[0067] Alternatively, the fixed abutment portion 22 can be defined by a front wall of the damping means 18 or of a containment body of the damping means 18. During closure of the door or window, the leaf "A" is arranged in an open position with respect to the fixed frame "T" (figure 1). The movement, preferably manual, of the leaf "A" towards the closed position enables the elastic means 10 to promote a push on the leaf "A" (figure 2). At the engagement position (figure 3), the damping means 18 gives rise to braking/deceleration on the sliding rod 7 opposing the action of the elastic means 10. After the disengagement position (figure 4) has been reached, the disengagement means 19 disengages the damping means 18 so that during the passage from the disengagement position to the closed position (figure 5) the action of the elastic means 10 gives the leaf "A" sufficient speed to permit effective closure thereof.

[0068] During the passage of the leaf "A" from the closed position to the open position, the disengagement means 19 moves from the engaged configuration to the disengaged configuration following sliding of the sliding rod 7 from the rearward position to the forward position.

[0069] Some specific embodiments are illustrated below.

[0070] In figures 8-15, a first embodiment is shown in which the kinematic coupling is achieved by friction between the central block 20 and the sliding rod 7.

[0071] The central block 20 comprises a main portion 26, mounted in an axially slidable manner on the sliding rod 7 and having at least one front surface 21, and a rotatable wall 28 that is substantially hinged to the main portion 26.

[0072] In particular, the rotatable wall 28 defines an opening 23 into which the sliding rod 7 is inserted.

[0073] Preferably, the rotatable wall 28 can rotate with respect to the main portion 26 along an axis of rotation

that is perpendicular to the longitudinal axis "X" of the sliding rod 7.

[0074] In greater detail, the perimeter portion of the opening 23 of the rotatable wall 28 is activatable on a portion of the lateral surface of the sliding rod 7 defining the aforesaid kinematic coupling.

[0075] In other words, the opening 23 and the sliding rod 7 are operationally connected to define the kinematic coupling.

[0076] This solution enables the passage of the disengagement means 19 from the disengaged configuration (figure 10) to the engaged configuration (figure 11) to be determined with great accuracy.

[0077] As illustrated in figures 8-10, the rotatable wall 28 is initially in a forward rotated position to permit the disengaged configuration of the kinematic coupling.

[0078] In this position, the perimeter portion of the opening 23 is active on the lateral surface of the sliding rod 7, constraining in a translating manner the central block 20 on the sliding rod 7.

[0079] In particular, the rotatable wall 28 is initially maintained in the forward rotated position by at least one elastic member 29 interposed between the main portion 26 and the rotatable wall 28.

[0080] Further, the rotatable wall 28 is inserted into a recess 30 of the main portion 26 shaped so as to enable the rotatable wall 28 to maintain the forward rotated position to abut against the fixed abutment portion 22 after reaching a preset angle. In other words, the rotatable wall 28 has a maximum angle of forward rotation, pushed by the elastic member 29.

[0081] As illustrated in figure 13, the main portion 26 of the central block 20 is "C"-shaped, with the concavity facing towards the damping means 18 so as to house the elastic member 29 and at least partially the rotatable wall 28.

[0082] In this configuration, during translation of the sliding rod 7 under the action of the elastic means 10, the rotatable wall 28 is also dragged (together with the inside of the central block 20) in translation to a rearward position, the rotatable wall 28 being constrained by friction on the sliding rod 7 and, thus, the disengagement means 19 disengaged (the rotatable wall 28 is active on the sliding rod 7 generating, also owing to the action of the elastic member 29, a constraining action that, by friction, constrains translation of the central block 20 on the sliding rod 7).

[0083] In other words, the geometric configuration between the sliding rod 7 and the rotatable wall 28, which are mutually tilted, permits coupling by friction between the outer surface of the rod and the perimeter of the opening 23 of the rotatable wall 28.

[0084] Subsequently to coming into contact between the rotatable wall 28 and the fixed abutment portion 22 (figure 10) during translation of the sliding rod 7 towards the rearward position, the rotatable wall 28 is made to adopt a rearward rotated position (not shown in the attached figures), i.e. towards the outer part of the hinge unit 3 (i.e. to the left figures 8-11), owing to the fact that a (frontally facing) peripheral part of the rotatable wall 28 comes into contact against the fixed abutment wall 22 whilst a central part of the rotatable wall 28 is pressed forwards (i.e. towards a more internal part of the hinge unit, i.e. towards the right in figures 8-11) by the sliding rod 7. This generates torque on the rotatable wall 28 that rotates the rotatable wall 28 rearwards.

[0085] In particular, the position rotated rearward of the rotatable wall 28 is defined by rearward rotation of the rotatable wall 28 against the action of the elastic member 29. As illustrated in figures 14, 15, the fixed abutment portion 22 can be adjustable along a direction parallel to the longitudinal axis "X" to bring forward or postpone activation of the disengagement means 19 by the movement of the eccentric pin 100.

[0086] Initially, during the passage of the sliding rod 7 from the forward position to the rearward position, the sliding rod 7 slides coupled with the central block 20 under the action of the elastic means 10 (figure 8). In particular, the central block 20 is initially constrained on the translation of the sliding rod 7 by the force of friction generated by the action of the rotatable wall 28 on the lateral surface of the sliding rod 7. Upon reaching the first position (figure 9) of the sliding rod 7, the central block 20 comes to abut against the damping means 18 which gives rise to the aforesaid slowing or braking push. Upon reaching the second position (figure 10) of the sliding rod 7, the disengagement means 19 disengages the damping means 18 by rotation of the rotatable wall 28, which reduces, preferably cancels, the action normal to the lateral surface of the sliding rod, determining a reduction of the resulting force of friction that enables the movement of the central block 20 to be decoupled from the movement of the sliding rod 7.

[0087] In this situation, the central body 20 remains disconnected from the sliding rod 7, which continues sliding until the rearward position is reached (figure 11).

[0088] During the passage from the sliding rod 7 from the rearward position to the forward position, suitable reactivating means 101, preferably one or more springs, acts on the central block 20 being pushed towards the damping means 18 so that the central block 20 maintains a predetermined position so as to permit disengagement of the disengagement means 19. The reactivating means 101 is preferably arranged between a rear wall of the central block 20, in particular of the main portion 26, opposite the damping means 18, and a fixed wall of the hinge body 3.

[0089] As illustrated in the figure 12, the main portion 26 has a hole 27 inside which the sliding rod 7 is inserted. In other words, the sliding rod 7 is inserted inside the opening 23 and the hole 27.

[0090] Further, the sliding rod 7 has at least one radial protrusion 24 that defines a stroke stop for the sliding of the stroke of the sliding rod 7 with respect to the main portion 26.

[0091] In particular, the radial protrusion 24 can be

made in the shape of a pin 25 that is transverse, preferably perpendicular, to the longitudinal axis "X" of the sliding rod 7.

[0092] Further, the opening 23 has a passage that is so shaped as to permit sliding of the sliding rod 7 and a passage of the radial protrusion 24 inside the opening 23 in an engagement condition of the disengagement means 19. Whilst this sliding is taking place, the radial protrusion 24 can pass inside the opening 23, enabling the sliding rod 7 to reach the rearward position. During the passage from the sliding rod 7 from the rearward position to the forward position, the reactivating means 101 maintains the central block 20 pushed towards the damping means 18 as far as the radial protrusion 24, coming to abut against the main portion 26, is activated on the central block 20 promoting distancing thereof from the damping means 18.

[0093] At the same time as this movement, the rotatable wall 28 rotates under the action of the elastic member 29 until the forward rotated position is reached. This rotation occurs automatically under the action of the elastic member 29 and returns the active rotatable wall 28 to the sliding rod 7, determining the passage of the disengagement means 19 from the engaged configuration to the disengaged configuration.

[0094] In other words, during the passage of the leaf "A" from the closed position to the open position the radial protrusion 24, constrained on the movement of the sliding rod 7, acts on the main portion 26 by inducing a passage of the rotatable wall 28 from the rearward rotated position to the forward rotated position in which it is activated on the sliding rod 7, determining disengagement of the disengagement means.

[0095] In figures 16-19, a second embodiment is shown in which the kinematic coupling is defined by shape coupling achieved between the central block 20 and the sliding rod 7.

[0096] With reference to figures 16-19, the central block 20 has an opening 23 that is countershaped to the radial protrusion 24 to make the shape coupling.

[0097] In particular, the central block 20 is guided in movement along the direction of translation of the sliding rod 7 by a pair of opposite linear guides 31 made on a fixed portion of the hinge body 3.

[0098] Further, at least one linear guide 31 has an at least partially helical or non-rectilinear movement such as to make a rotation movement of the central block 20 around the direction of translation.

[0099] In this manner, during an advancement along the direction of translation the linear guide 31 induces a rotation of the central block 20 leading progressively to the engaged configuration of the shape coupling.

[0100] In other words, the shape coupling is defined by a central block 20 that is rotatable around an axis that is parallel to or coincident with, the longitudinal axis of the sliding rod 7.

[0101] Advantageously, the central block 20 comprises a pair of cam-follower elements or rollers 32 that are adapted to promote the movement of the central block 20.

[0102] The rollers 32 are respectively inserted inside a groove that defines the linear guide 31 and approximates by excess the dimension thereof.

[0103] Unlike the embodiment illustrated in figures 8-13, the damping means 18 is made in the shape of a helical spring 102 fitted to the sliding rod 7 and activatable thereupon to limit the stroke speed of the leaf "A".

[0104] The remaining structural part of the hinge can be made as in the previous embodiment illustrated in figures 8-11.

[0105] In use, the central block 20 is initially constrained on the translation of the sliding rod 7 by a push of the radial protrusion 24 against the central block 20, the shape coupling between the protrusion 24 and opening 23 being precluded. During the passage from the sliding rod 7 from the first to the second position, the central block 20 undergoes rotation under the combined action of the linear guide 31 and of the protrusion 24 that couples the central block 20 with the translation of the sliding rod 7. Upon reaching the second position, the protrusion 24 is aligned with the opening 23, permitting in this manner the disengagement means 19 to disengage the damping means 18. In other words, the protrusion 24 passes through the opening 23, uncoupling the central block 20 from the sliding rod 7.

[0106] In figures 20-26, a third embodiment of the present invention is shown, in which the kinematic coupling of the disengagement means 19 is defined by shape coupling made, in this case, between the central block 20 and the damping means 18, in particular between the front surface 21 of the central block 20 and a front thrust surface 33 of the damping means 18.

[0107] In accordance with this embodiment, the central block 20 comprises a main portion 26 fixed on the sliding rod 7 and at least one shaped member 34 hinged on the main portion 26 to rotate around a hinge axis that is transverse, preferably perpendicular, to the longitudinal axis "X" of the sliding rod 7.

[0108] In particular, the shaped member 34 has an abutment tooth 35 defining the front surface 21.

[0109] Further, the shaped member 34 has a recess 36 adjacent to the abutment tooth 35 to define a seat adapted to receive a corresponding front abutment portion 37 of the damping means 18.

[0110] In particular, the recess 30 has a depth that is such as to exclude any further abutment between the shaped member and the damping means 18 until the stroke stop is reached, i.e. the rearward position (figure 23), of the sliding rod 7.

[0111] The shaped member 34 is rotatable around the hinge axis between a first angular position (figure 21), in which it turns the front surface 21 so that it abuts against the front abutment portion 37 of the damping means 18 defining the disengaged configuration of the coupling formed by the mating shapes, and a second angular position (figure 23), in which it turns the recess 36 towards the front abutment portion 37 of the damping means 18

so to house the front abutment portion 37 thus defining the engaged configuration of the coupling formed by the mating shapes.

[0112] In particular, the shaped member 34 is rotated around the hinge axis following an impact against the fixed abutment portion 22 of the hinge body 3.

[0113] Further, the shaped member 34 is so configured that the rotation starts when the sliding rod 7 has almost reached the second position.

[0114] As illustrated in figures 25 and 26, and similarly to what has been disclosed previously, the fixed abutment portion 22 can be adjustable along a direction parallel to the longitudinal axis "X" to modify the engagement and disengagement positions of the disengagement means 19 by the movement of the eccentric pin 100.

[0115] In accordance with the present embodiment, the damping means 18 is made in the shape of a helical spring 102 fitted to the sliding rod 7 and active between a fixed abutment 38 constrained on the hinge body 3 and a movable abutment 39.

[0116] In particular, the movable abutment 39 defines, further, the front abutment portion 37.

[0117] Also in this case, however, the damping means 18 can be made differently, for example by one or more cylinders like in the embodiment shown in figures 8-11.

[0118] In use, the central block 20 translates constrained on the translation of the sliding rod 7 (figure 20). When the sliding rod reaches the first position (figure 21), the shaped member 34 turns the front surface 21 so that it abuts against the front abutment portion 37 of the damping means 18 thus defining the disengaged configuration of the coupling formed by the mating shapes and starting from this point the further advancement of the sliding rod 7 causes compression of the damping means 18, receiving a slowing or braking action. Upon reaching the second position of the sliding rod 7, the shaped member 34 intercepts the fixed abutment portion 22 around which torque is determined as it is eccentric to the hinge axis of the shaped member 34, the torque rotating on the shaped member 34 is such as to disengage the front surface 21 from the front abutment portion 37 of the damping means 18. The shaped member 34 then rotates towards the second angular position turning the recess 36 towards the front abutment portion 37 of the damping means 18 so as to house the front abutment portion 37 (figure 22) such that the sliding rod 7 can advance further in a manner that is disconnected from the damping means 18. In this manner, the disengagement means 19 defines the engaged configuration of the shape coupling that enables the sliding rod 7 to reach the rearward position (figure 23) without being subjected to the push of the damping means 18. During a passage of the sliding rod 7 from the rearward position to the forward position, the reactivating means 101 (made, for example, of an elastic sheet or another equivalent member) acts on the shaped member 34 to move the shaped member 34 from the second angular position to the first angular position.

[0119] It can therefore be observed that the present invention achieves the proposed aims by creating a concealed hinge that is able to achieve effective closure of the door or window owing to the presence of the disengagement means configured to disengage in an automatic manner the damping means acting on the sliding rod at a predetermined position of the leaf with respect to the fixed frame.

[0120] Advantageously, the concealed hinge permits low-noise closure of the door or window owing to the possibility of calibration of the action of the elastic means on the leaf.

[0121] Advantageously, the concealed hinge is easily adjustable and, in particular, enables the airgap to be adjusted independently of the adjustment of the force of closure or vice versa.

Claims

1. A concealed hinge (1), comprising:

- a first hinge body (2) installable in a housing of a fixed frame (T);
- a second hinge body (3) installable in a housing of a leaf (A) to be coupled to said fixed frame (T);
- an articulating mechanism (4) connected to said hinge bodies (2, 3) to allow a reciprocal movement of the hinge bodies (2, 3) between a first configuration, in which they are reciprocally distanced, corresponding to an open position of leaf (A), and a second configuration, in which they are reciprocally near, corresponding to the closed position of the leaf (A); wherein one of said hinge bodies (2, 3), preferably said second hinge body (3), comprises a closing device (6) comprising:

  a sliding rod (7) having a first end (8) connected to said articulating mechanism (4) and slidably movable inside the respective hinge body (3),
  following a reciprocal movement of said hinge bodies (2, 3), between a forward position corresponding to the distanced configuration of the hinge bodies (2, 3) and a rearward position corresponding to the neared configuration of the hinge bodies (2, 3);

- an elastic means (10) active on a second end (9) of the sliding rod (7) so as to maintain the sliding rod (7) normally pushed towards the rearward position;
- a damping means (18) active on the sliding rod (7) so as to exert a push on the sliding rod (7) which is opposite to the action of said elastic means (10) in the passage of the sliding rod (7) from the forward position to the rearward posi-

tion, in particular to attenuate or limit a stroke speed of the sliding rod (7), said damping means (18) being arranged and/or configured so that said push opposite to the action of the elastic means (10) originates when the sliding rod (7) takes on a first position comprised between said forward and rearward positions;

characterised in that it comprises a disengagement means (19) configured to automatically disengage the damping means (18) from the sliding rod (7) in a second position of the sliding rod (7) located downstream of said first position and towards said rearward position.

2. The concealed hinge according to claim 1, wherein said disengagement means (19) defines a kinematic coupling between the damping means (18) and the sliding rod (7) configured to take on a disengaged configuration, wherein the sliding rod (7) is subjected to the action of said damping means (18), and an engaged configuration, wherein the kinematic coupling allows a free sliding of the sliding rod (7) relative to the damping means (18).

3. The concealed hinge according to claim 2, further comprising a central block (20) mounted on the sliding rod (7) and defining at least one front surface (21) on which said damping means (18) act so at to attenuate or limit the stroke speed of the sliding rod (7), and wherein said disengagement means (19) is switchable from the disengaged configuration to the engaged configuration through the interaction between said central block (20) and a fixed abutment portion (22) of said hinge body (3).

4. The concealed hinge according to claim 3, wherein said kinematic coupling is created by friction between the central block (20) and the sliding rod (7), in particular between a perimeter portion of an opening (23) of the central block (20) and a portion of the lateral surface of the sliding rod (7).

5. The concealed hinge according to claim 4, wherein the central block (20) comprises a main portion (26), mounted in an axially slidable manner on the sliding rod (7) and having said at least one front surface (21), and a rotatable wall (28) hinged to the main portion (26) and defining said opening (23); said rotatable wall (28) being initially in a position defining said disengaged configuration of the disengagement means (19) and being led to take on a rotated position, thus defining said engaged configuration of the disengagement means (19), following a contact between the rotatable wall and said fixed abutment portion (22) during the translation of the sliding rod (7) towards the rearward position; said fixed abutment portion (22) preferably being defined by a front wall of said damping means (18) or of a containment body for said damping means (18).

6. The concealed hinge according to claim 5, wherein said rotatable wall (28) is initially maintained in a forward rotated position, i.e. in the sliding direction towards the forward position, by means of at least one elastic member (29) interposed between the main portion (26) of the central block (20) and the rotatable wall (28); said rotated position of the rotatable wall (28) being defined by a backward rotation, i.e. in the sliding direction towards the rearward position, of the rotatable wall against the action of said at least one elastic member (29); the main portion (26) of the central block (20) preferably being "C" shaped, with the concavity facing towards the damping means (18) so as to house said elastic member (29) and, preferably, at least partially, also said rotatable wall (28).

7. The concealed hinge according to claim 3, wherein said kinematic coupling is defined by a coupling formed between the central block (20) and the sliding rod (7) by virtue of their mating shape, in particular between an opening (23) of the central block (20) and at least one radial protrusion (24) of the sliding rod (7), wherein said at least one radial protrusion (24) and the opening (23) are substantially complementarily shaped so as to achieve a reciprocal engagement only when there is a reciprocal alignment between the opening (23) and said at least one radial protrusion (24).

8. The concealed hinge according to claim 7, wherein said central block (20) is guided in movement along the translation direction of the sliding rod (7) by means of at least one linear guide (31), in particular a pair of opposing linear guides (31) preferably fashioned on a fixed portion of the hinge body, and wherein said at least one linear guide (31) has an at least partially helical or non-rectilinear shape such as to produce a movement of rotation of the central block (20) about said translation direction during a forward movement along said translation direction so as to lead progressively to the engaged configuration of the coupling formed by the mating shapes.

9. The concealed hinge according to claim 3, wherein said kinematic coupling is defined by a coupling formed between the central block (20) and the damping means (18) by virtue of their mating shape, in particular between said front surface of the central block (20) and a front thrust surface (33) of the damping means (18).

10. The concealed hinge according to claim 9, wherein said central block (20) comprises a main portion (26) fixed onto the sliding rod (7) and at least one shaped member (34) hinged to the main portion (26) so as

to rotate about an axis that is transversal, preferably perpendicular, to the longitudinal axis (X) of the sliding rod (7), wherein said shaped member (34) has an abutment tooth (35) defining said front surface (21) and a recess (36) adjacent to said abutment tooth (35) so as to define a seat for receiving a corresponding front abutment portion (37) of the damping means (18), and wherein said shaped member (34) is rotatable about its axis between a first angular position, wherein it turns said front surface (21) so that it abuts against said front abutment portion (37) of the damping means (18), thus defining said disengaged configuration of the coupling formed by the mating shapes, and a second angular position, wherein it turns said recess (36) towards the front abutment portion (37) of the damping means (18) so as to house said front abutment portion (37), thus defining said engaged configuration of the coupling formed by the mating shapes.

11. The concealed hinge according to claim 10, wherein said at least one shaped member (34) is driven in rotation about its axis following an impact against said fixed abutment portion (22) of the hinge body (3), said shaped member (34) being configured so that said rotation starts in proximity to the reaching of said second position by said sliding rod (7).

12. The concealed hinge according to any one of the preceding claims 3 to 10, wherein said fixed abutment portion (22) is adjustable along a direction parallel to the longitudinal axis (X) of the sliding rod (7), preferably by means of a manually adjustable eccentric pin (100).

13. The concealed hinge according to any one of the preceding claims, wherein said damping means (18) comprises damping cylinders or springs, in particular helical springs.

14. The concealed hinge according to any one of the preceding claims, comprising a fixed abutment surface (12) adjustable along a direction parallel to the longitudinal axis (X) of the sliding rod (7) so as to modify the preloading of the elastic means (10).

15. The concealed hinge according to any one of the preceding claims, wherein a preloading of the elastic means (10) and a distance between said first hinge body (2) and said second hinge body (3) are configured to be adjustable in a reciprocally independent manner.

Fig.1

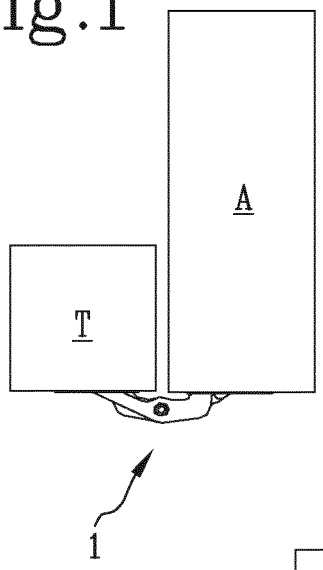

Fig.2

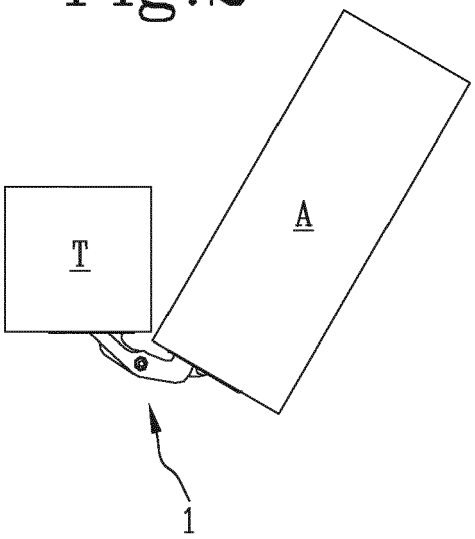

Fig.3

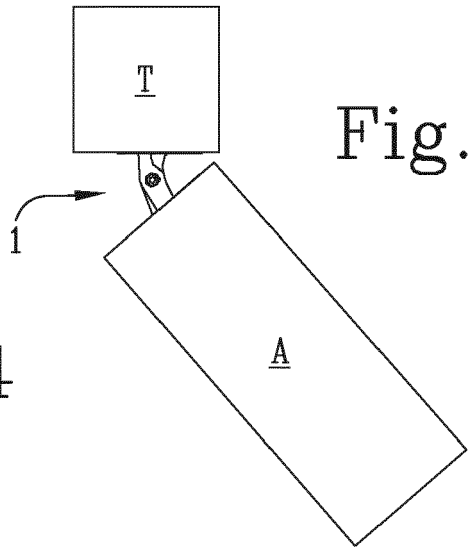

Fig.4

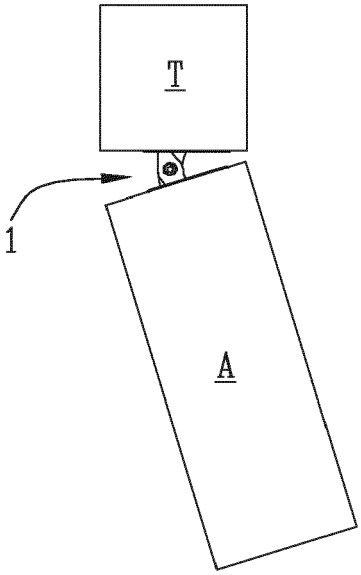

Fig.5

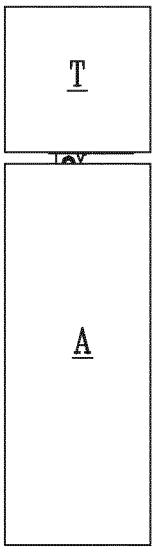

Fig.6

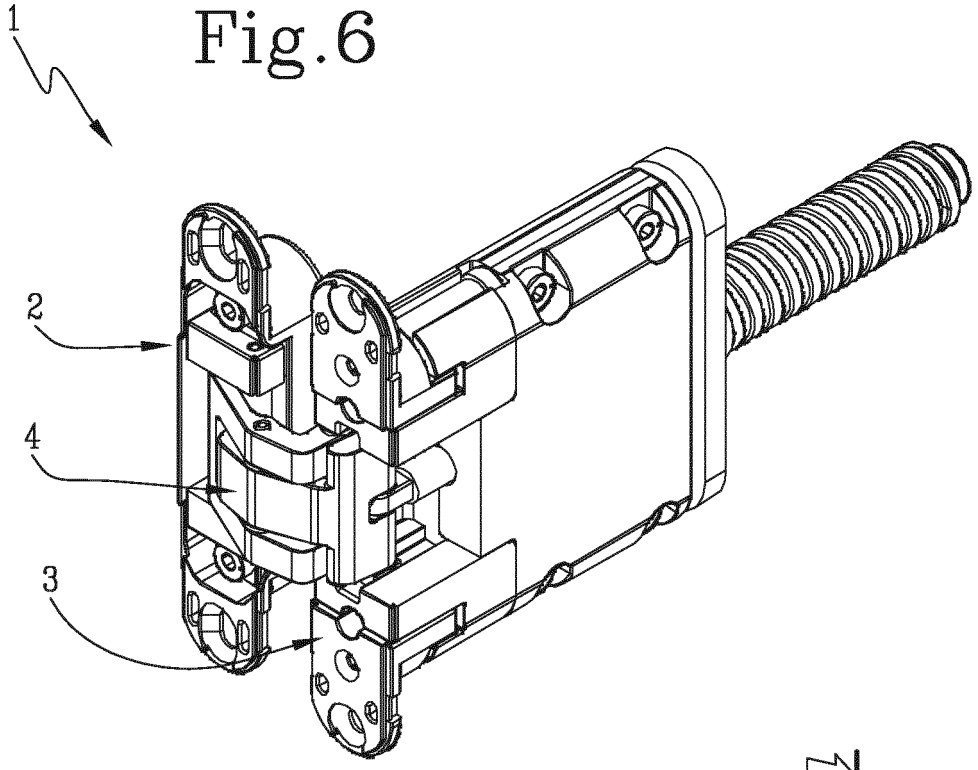

Fig.7

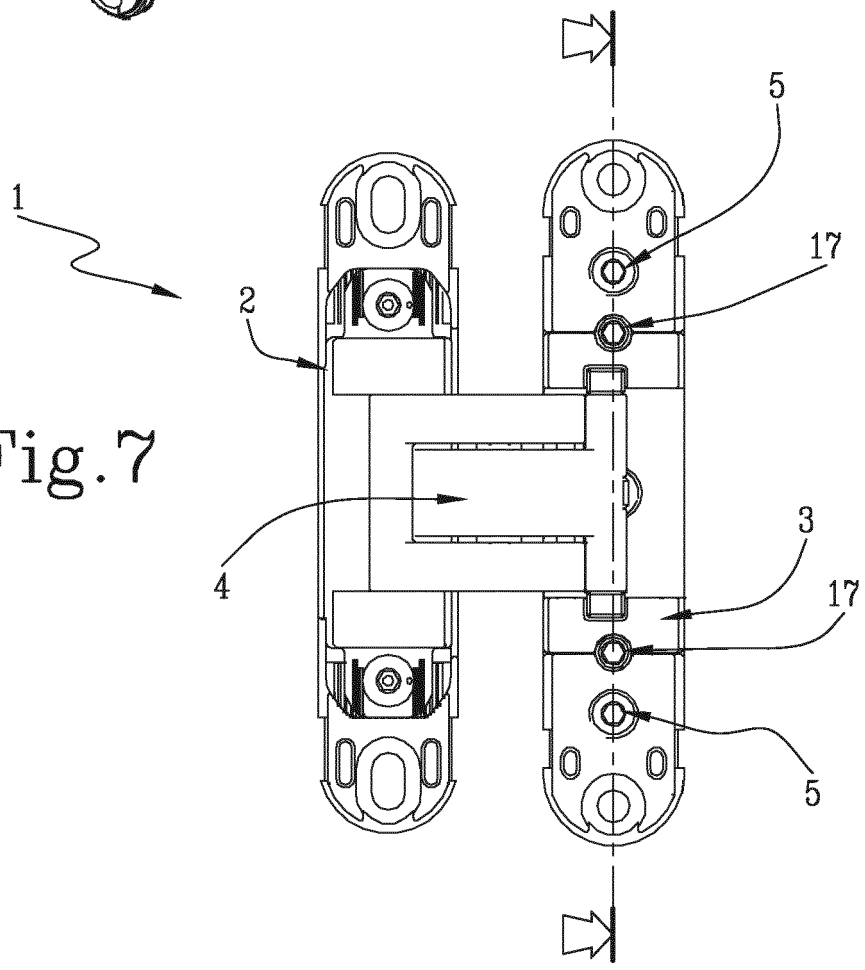

Fig.8

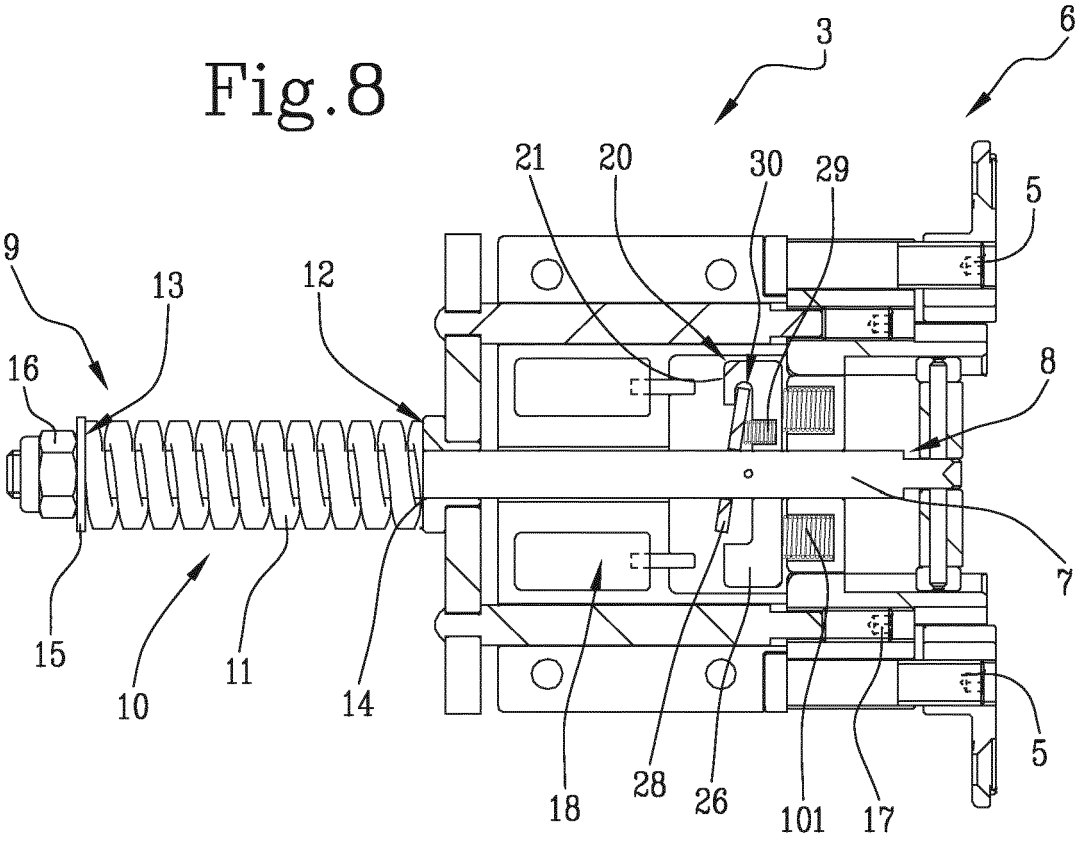
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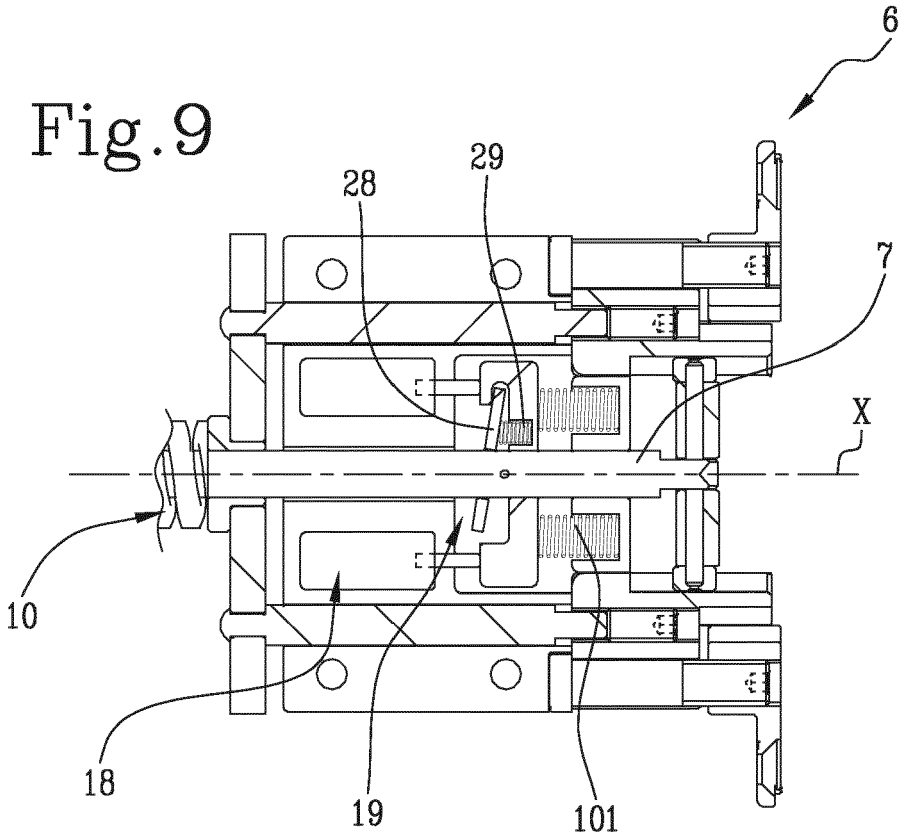
Fig.9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X
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101

Fig.10

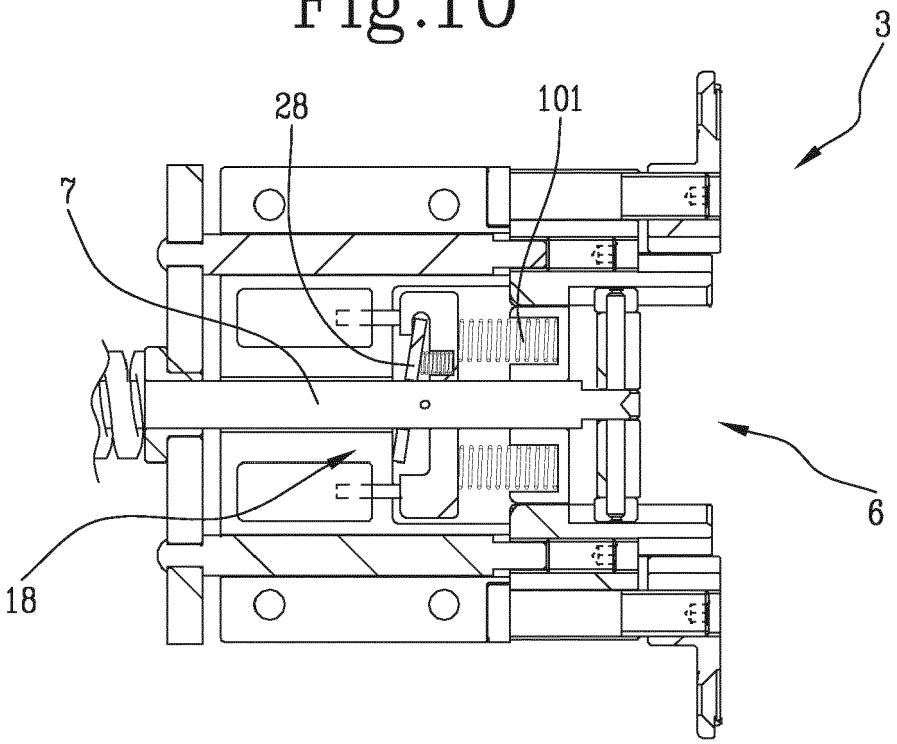


Fig.11

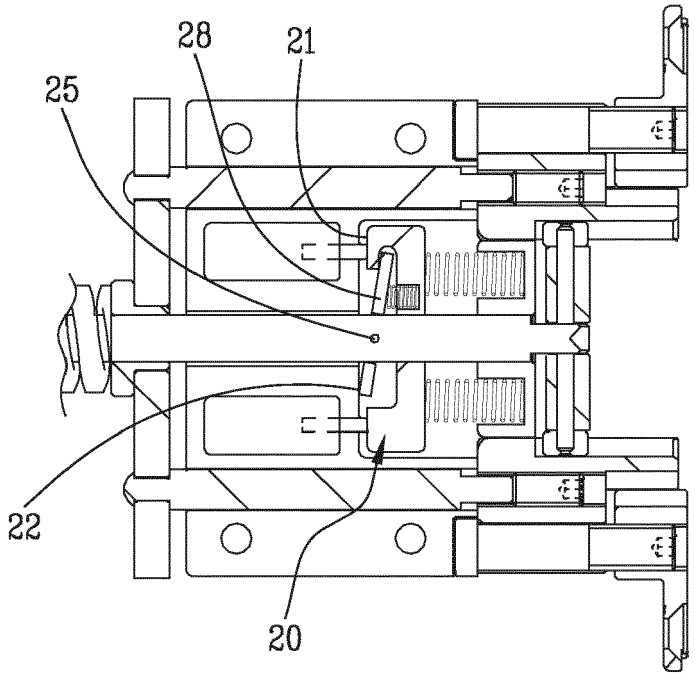


Fig.12

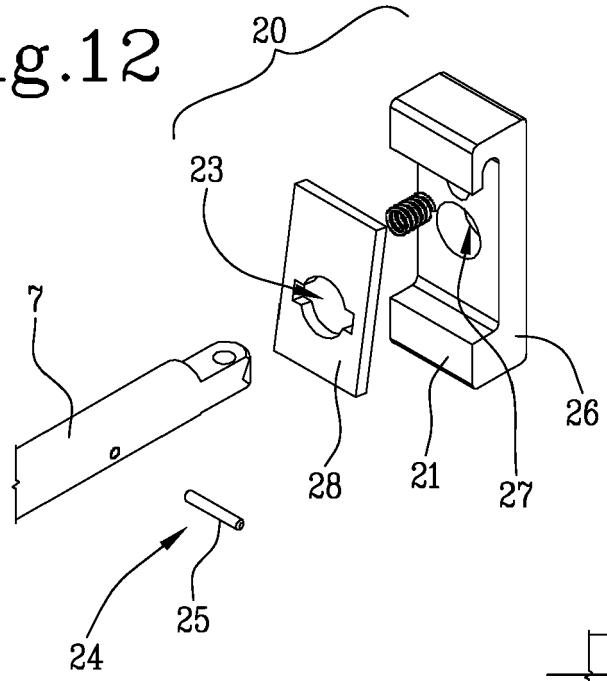


Fig.13

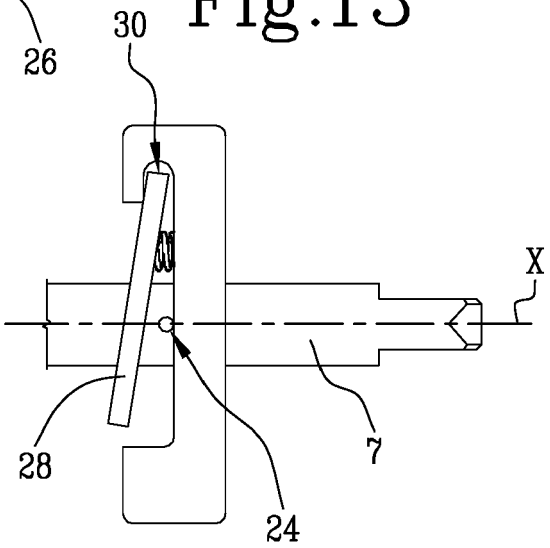


Fig.14

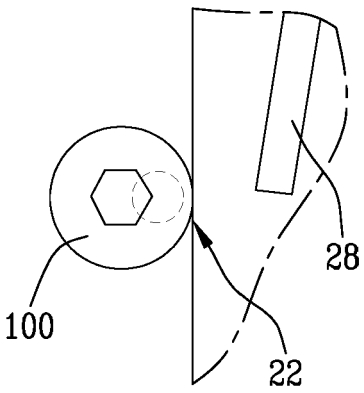


Fig.15

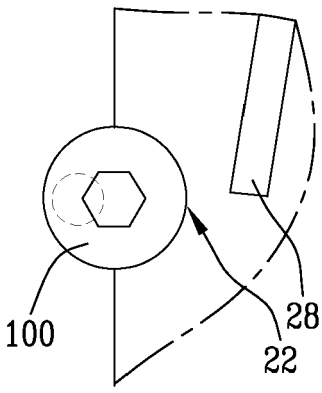


Fig.16

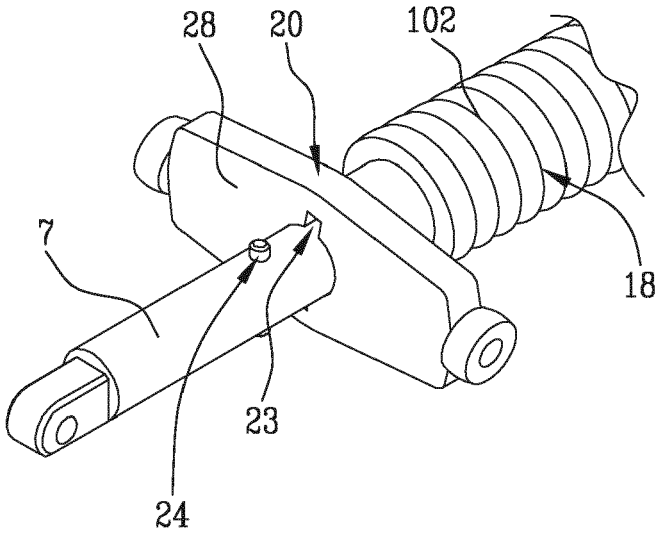


Fig.17

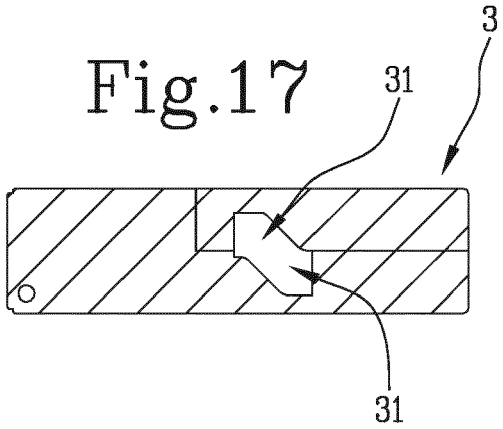


Fig.18

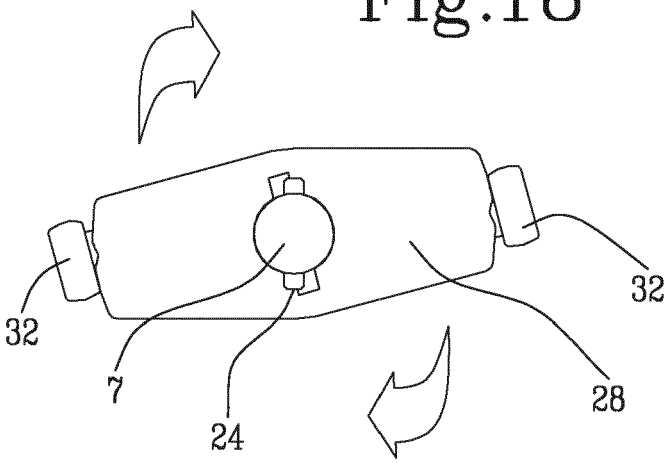


Fig.19

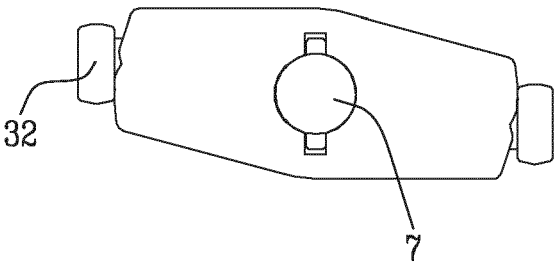


Fig.20

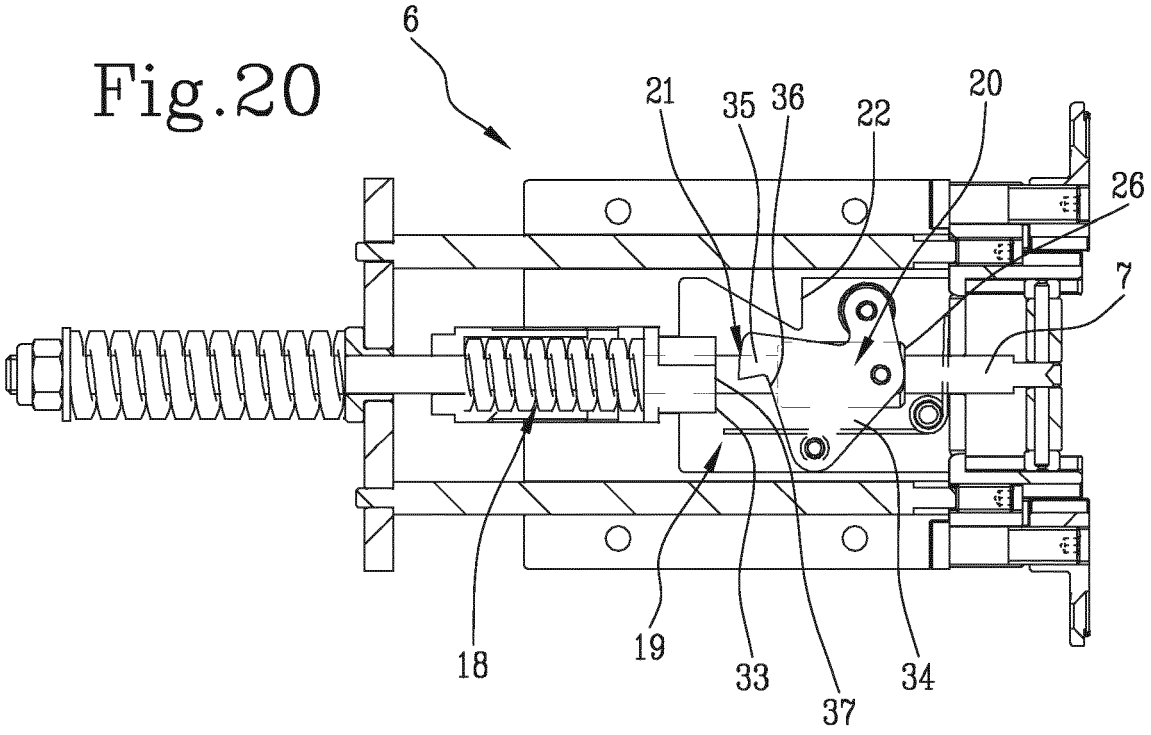


Fig.21

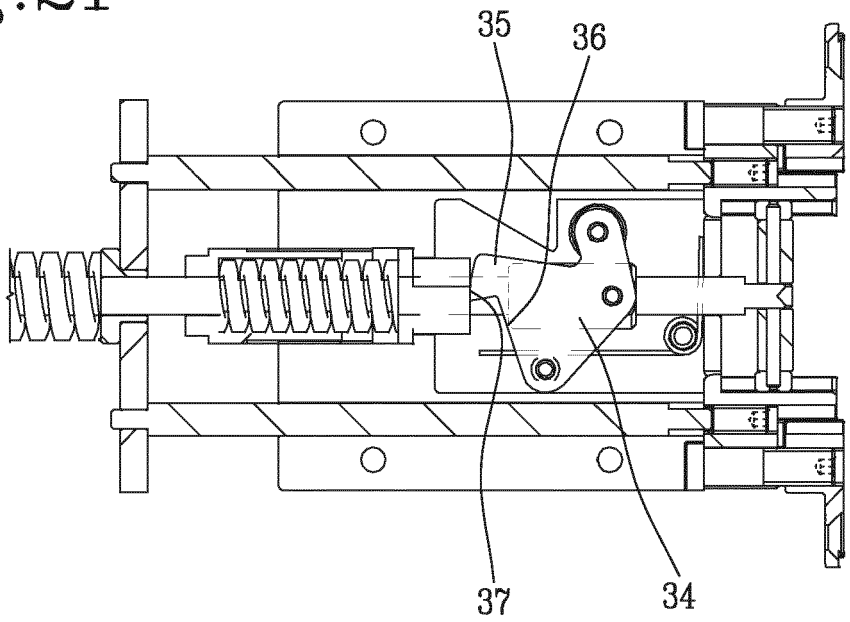


Fig.22

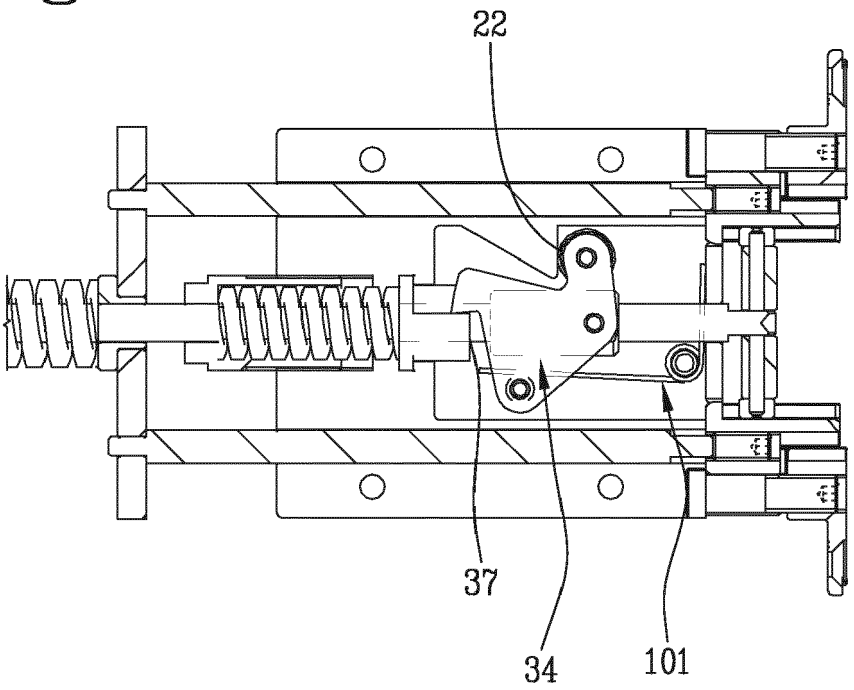


Fig.23

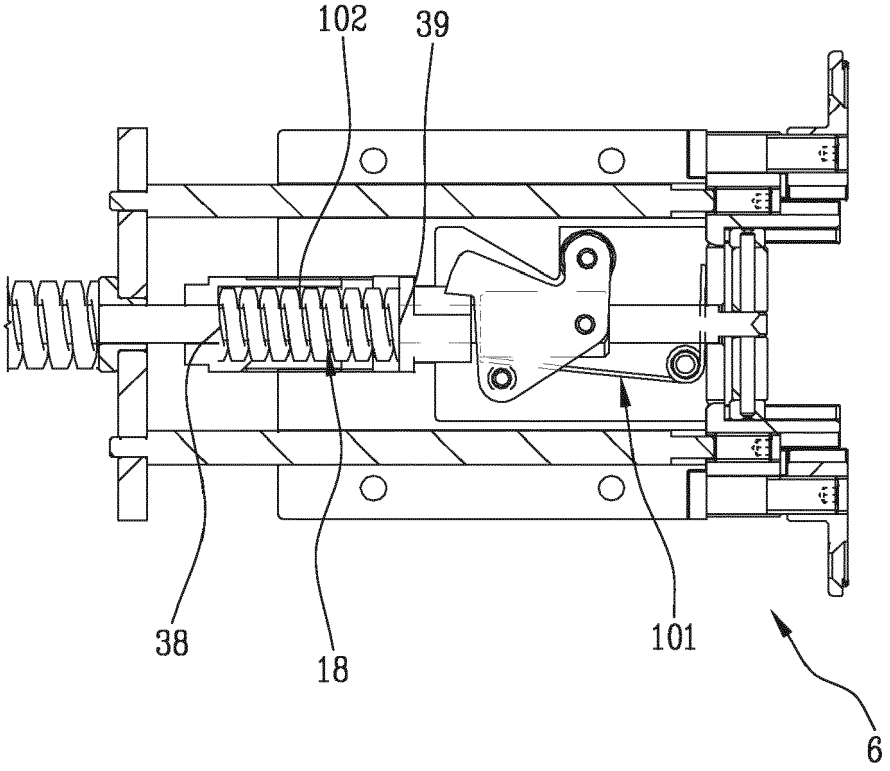


Fig.24

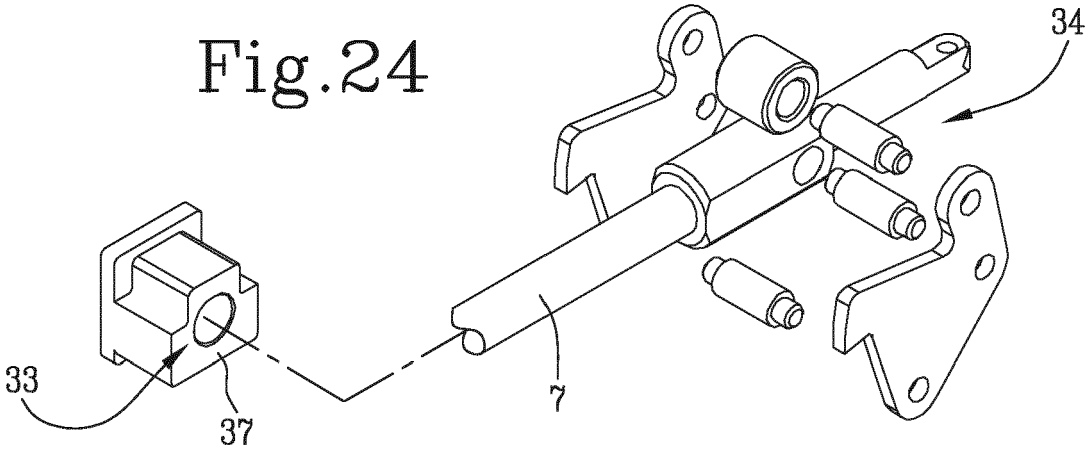


Fig.25

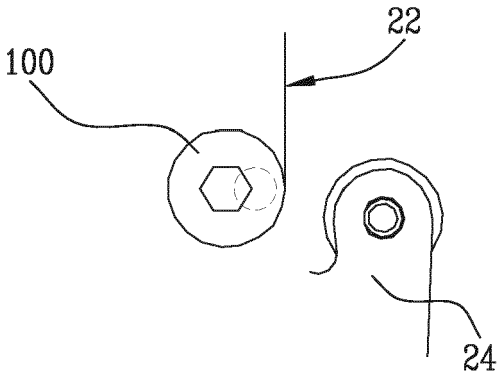
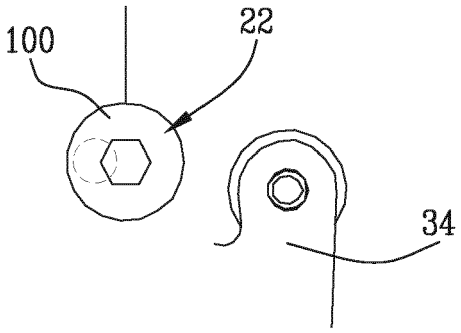


Fig.26



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EUROPEAN SEARCH REPORT

Application Number
EP 21 17 4244

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 3 469 177 A1 (ANSELMI & C SRL [IT]) 17 April 2019 (2019-04-17) * paragraphs [0072] - [0115] * * figures 9-15 *	1-15	INV. E05D3/18 E05F1/12 E05F3/20
A	DE 20 2020 100939 U1 (SIMONSWERK GMBH [DE]) 28 February 2020 (2020-02-28) * paragraphs [0026] - [0038] * * figures *	1-15	
A	EP 3 274 533 A1 (OL MI SRL [IT]) 31 January 2018 (2018-01-31) * paragraphs [0057] - [0072] * * figures *	1-15	
A	DE 17 08 349 A1 (GARTNER & CO) 19 May 1971 (1971-05-19) * page 1, paragraph 1 - page 2, paragraph 2 * * figures *	1	

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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	27 September 2021	Mund, André

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27-09-2021

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