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(54) **SPRING ASSEMBLY WITH LOAD RETAINING MEANS**

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Description

[0001] The present invention relates to a "spring assembly with load retaining system" to be used for sun blinds, mosquito nets, rolling shutters and other kinds of fabric windable around a tube (or roller). The spring according to the invention is configured to be preloaded before being introduced inside the tube, thus accumulating elastic energy which can be released when the system is activated, in order to keep the screening fabric, wound outside the tube, tight, both when it is in rest position and when it is activated.

[0002] The system is applied to those products using on window frames screens winding along an axis, such as indoor and outdoor awnings, sun blinds and mosquito nets.

[0003] All these kinds of windable screens can be provided with an own box configured to contain the fabric when wound. Anyway, the spring assembly according to the invention can be installed also in box systems integral to buildings, as for example boxes for roller shutters.

Field of application and problems

[0004] The devices comprising preloaded springs for applications similar to the just described ones, provided on the market, have a series of problems of usage.

[0005] In order to function these systems, among which for example roller mosquito nets, need a torsion spring introduced inside a hollow tube (usually in aluminum), on which the fabric is wound outside. The spring is preloaded according to the producer specifications, thus allowing to wind and unwind the fabric while keeping it tight.

[0006] The spring has to be preloaded in order to provide a strength (F_m) which allows to stand the loads (F_c) caused by the same fabric, the weight of the handle profile on which the fabric is connected along its whole length, and the frictions deriving from the handle profile sliding inside the guides, normally closed by the bristles of a dust repelling small brush.

[0007] Anyway, actually, it is needed that the spring is able to win also another load of passive strengths (F_a), caused by a sum of frictions inside the load blocking mechanism, which withstand the strength accumulated by the torsion spring F_m and which are additional to the frictions the fabric encounters while sliding in its own guides.

[0008] At this point, it is assumed that in order to wind the fabric again it is needed to increase the torsion spring preload, to balance again the total sum of strengths F_c and F_a . Thus, as a consequence the needed F_m value increases directly proportionally to the passive strengths F_a .

[0009] During usage, the presence of frictions inside the mechanism of the devices known at the state of the art expresses itself for example by means of a certain resistance and stiffness, yet in the beginning descending

step of a fabric for mosquito nets.

[0010] While descending the fabric is unwound, makes the tube rotate, and loads further the spring, which has then an ever-abrupter functioning up to reach the coupling lower portion of the mosquito net.

[0011] The coupling step implies controlling difficulties as well, since the spring reaches such a high number of turns and accumulates such a high energy that the handle profile will be tight at most.

[0012] In fact, it often occurs that a mosquito net, not well controlled in the closing step, goes rapidly upwards. The fabric uncoupling and re-ascending step will be abrupt and stepwise as well.

[0013] During the development of the device object of the present invention, it has been shown that in the known devices, these drawbacks are caused by an excessive friction strength value inside the activating mechanism, which is basically made up of two factors.

[0014] The first friction factor is the usage of a compression spring (also called auxiliary or retaining spring) which introduces an axial strength inside the mechanism between the mechanism fixed and mobile portions.

[0015] This is for example the case of the device described in US2015/0047795, but also in WO 2009/128108 and GB2218142.

[0016] This auxiliary spring has the function of compressing the mobile portion subjected to rotation, and to bring it in a preload position in which a safety block avoids the torsion spring rotation.

[0017] In the next step, in which the torsion spring is activated, the mechanism mobile portion goes backwards to release itself from the blocking mechanism. This backwards moving brings the spring to be compressed even more, thus creating an axial friction against the inner surface of the mobile rotating portion.

[0018] Given the remarkable axial thrust and the consequent friction generation, brass-coated washers with thrust-keeping function are commonly introduced between the auxiliary spring and the inner surface subjected to rotation, in order to dampen the friction deriving from the axial thrust. Anyway, the washer has also the function to avoid that during the bushing rotation, the end portion of the spring turn can get stuck and block the rotation.

[0019] Unfortunately, this solution provides actually a significant friction which has to be won by increasing the strength applied by the torsion spring. Even in WO 2009/128108 is used a thrust-keeping bearing to limit rotation frictions.

[0020] The second friction factor is caused by axial displacements inside the tube of the portions and fittings integral to the torsion spring end.

[0021] The end axial displacement is caused by the torsion spring length variation, which is a function of the increase and decrease of turns due to fabric winding and unwinding.

[0022] At the end portion of the torsion spring, an accessory is fastened which has the function of transmitting to the tube, by means of the inner longitudinal ribs, the

torque of the elastic energy accumulated by the torsion spring.

[0023] This is the case, among others, of the device described in US2015/0047795, in which the end supports of the central rod are fastened thereto in a sliding manner. Also in the device described in WO2019/128108, the end spring assembly is sliding with respect to the winding tube.

[0024] Given that the key is always directly engaged on the tube inner section, due to the received preload, this spring continuous expansion step implies a friction during the displacement inside the tube, a displacement which is not linear and uniform but stepwise.

[0025] In other words, the spring exerts its own torque on the tube by means of a piece sliding forwards and backwards, due to the spring expansion, while engaged.

[0026] This will clearly generate a remarkable friction and a consequent stepwise functioning.

[0027] Another embodiment is described in GB2218142. The system is rather complex, and uses a helical spring and a secondary spring, and it is also configured to be realized necessarily in the length of the screening fabric to be wound. This is clearly a limit to device standardization and industrial realization.

[0028] WO2009/128108A2 describes a spring assembly according to the preamble of claim 1.

[0029] Another limit of the devices known at the state of the art is that, when it is desired to install a mosquito net rotation slowing down device, it is needed it to be installed with a direct fastening to the box, or however to the outer support. In other terms, in the devices known at the state of the art, the slowing down device is fastened on the opposite side of the torsion spring, and this avoids providing the installer with systems yet provided with slowing down devices, which have the spring yet loaded also before the installation inside the tube on which the fabric is wound and which are to be installed only without further adjusting needs.

Aim of the invention

[0030] Therefore, aim of the present invention is to provide a device which overcomes the limits of the devices known at the state of the art.

[0031] In particular, aim of the present invention is to provide a spring assembly for windable fabrics comprising a pre-loadable torsion spring which minimizes frictions caused by its own functioning, so that the system functioning fluidity is not negatively influenced.

[0032] According to another aim, the present invention provides a device which reaches all the prefixed aims, and which is realized by using a low quantity of elements of easy realization, so to have contained production times and costs.

[0033] Yet, the present invention provides a spring assembly for windable fabrics which does not need to be preventively housed inside the tube to allow the mechanism to be blocked in the loading step, which does not

require a dedicated manual key to be engaged in the seat of the device to provide a determined turns number which is often a difficult operation for someone with no great manual skills. In fact, the more the spring is loaded the more difficult is to control the key and to finish the remaining turns.

[0034] Yet, aim of the present invention is to provide a device configured to avoid, by means of a suitable blocking system, that accidental impacts or efforts in transportation or installation step can affect the spring preload.

[0035] Yet, another aim of the invention is to provide a spring assembly on which it is possible to intervene for the spring loading, without the need to remove the box where the device is housed.

[0036] Yet, the present invention provides a spring assembly comprising an outer slowing down device, to avoid that during the fabric re-winding the handle profile can ascend again suddenly and slam against the box, thus creating a dangerous situation for the user.

[0037] Another aim of the present invention is to provide a spring assembly comprising a slowing down device, in which the spring can be loaded also before the installation inside the tube on which the fabric is wound, and which is to be installed only without further adjusting needs.

Brief description

[0038] The present invention realizes the prefixed aims since it is a spring assembly (2) as defined by the appended claims and in particular a spring assembly (2) according to claim 1.

Detailed description

[0039] The device according to the invention comprises:

- a spring assembly (2) and
- a free support (3),

configured to be able to be introduced from different ends of a tube (4) around which a fabric (5) is wound up, so that each one projects from a portion of said tube, and to allow that the tube (4) rests on suitable fixed supports integral to a containment box or to the structure of a window, so that the tube (4) can rotate around its own axis, thus winding and unwinding the fabric (5).

[0040] So, it is clear that the axial dimension of the spring assembly (2) does not depend on the dimension of the fabric to be wound, since the free support (3) provided at the other end of the fabric is completely fastened by the spring assembly. In other words, the spring assembly can be produced in standard dimensions and used for fabrics of any dimension.

[0041] The fabric (5) can be indifferently a fabric of a mosquito net, a sun blind, or of any other kind, such for example any windable roller shutter, or also a retractable

fabric for projectors.

[0042] The fixed supports can be obtained inside a protective box containing the tube and the fabric when wound, or they can be fixed supports integral to the structure where the fabric is installed.

[0043] The present invention relates in fact to the spring assembly and, from another aspect, to a device comprising a fabric wound on a tube inside which the spring assembly according to the invention is installed, and it is not limited in its embodiments by the shape the box takes or by the structure where the invention is installed.

[0044] It is also to be specified that all the pieces which can rotate are configured to rotate around the same rotation axis, which corresponds to the rotation axis of the tube or roller around which the fabric is wound. In the following, this axis is also called rotation axis of the system or simply axis.

[0045] The free support (3) has the function to support the tube (4) during its rotation and comprises two coaxial portions (31, 32) configured to be able to rotate with respect to each other, the one of the two portions (31) being provided with fastening means (311) to the fixed supports to which the fabric has to be fastened, and the other one (32) - also called bushing - being provided with reliefs (321) configured to engage said tube (4) with a slight interference, so that the rotation of the tube (4) and bushing (32) is integral.

[0046] In other terms, when the system is installed, the first portion remains fixed and integral to the fixed supports, while the second portion rotates with the tube (4).

[0047] Preferably, but not limitingly, the first portion (31) can be realized in two distinct pieces (31-a, 31-b), connected to each other so that they are integral. For example, the two pieces connection can occur by means of a self-threading screw, as it is shown in figure 3.

[0048] Generally, the free support (3) acts with a function comparable to the one of an idle wheel.

[0049] The spring assembly (2) as well has the function to support the tube (4) during its rotation. Anyway, the spring assembly has also the function to accumulate elastic energy and to release it after a rotation of the tube (4).

[0050] So, the spring assembly (2) comprises:

- a rigid axis (15), inside and coaxially positioned to a helical torsion spring (16);
- a first (13) and a second end assembly (14) positioned at the two ends of said torsion spring (16) and fastened so that their axial distance is fixed and determined by the length of the rigid axis (15).

[0051] Each one of the two end assemblies comprises two coaxial portions (131, 132, 141, 142), configured to be able to rotate with respect to each other around the system rotation axis, the first one of said two portions (131, 141) being configured to rotate together with said rigid axis (15) and the second one of said two portions

(132, 142) being mobile, i.e. configured to be able to rotate with respect to the rigid axis (15).

[0052] In particular, the mobile portion (132) of said first end assembly is configured to be fastened to said tube (4) and the fixed portion (131) of said first end assembly (13) is configured to be fastened to an outer fixed support.

[0053] In this way, the rigid axis (15) cannot rotate with respect to the outer fixed support.

[0054] The device comprises further a helical torsion spring (16), configured to be coupled to the mobile portion (132) of the first end assembly (13) and to the fixed portion (141) of the second end (14), so that when the outer tube (4) rotates, by making said mobile portion (132) rotate of the first end assembly, an end of the spring (16) rotates and the other one remains still, and the spring (16) is then subjected to a torsion deformation but, since the distance of the two end assemblies (13, 14) is constant and determined by the length of the rigid axis (15), an axial compression does not correspond to the torsion deformation.

[0055] Preferably, the spring assembly (2) comprises further a protection tube (17) configured to house the spring (16) therein. In this way, the protection tube (17) functions also as silencer.

[0056] As it is known, the torsion springs are subjected to a variation of their diameter after torsion. As a function of the spring turns direction and of the rotation direction, the diameter variation can increase or decrease.

[0057] The device according to the present invention is configured so that the winding direction of the fabric on the tube and the torsion spring turns direction are such that when the fabric is lowered, and so kinetic energy is loaded in the spring, the spring diameter is reduced. For the same reason, also when the spring is preloaded in the manner described in the following, the spring diameter is reduced, and this fact increases the coupling interference between the torsion spring (16) and the two end assemblies (13, 14).

[0058] It is also to be specified that the torsion spring (16) is coupled with interference with said ends (13, 14), and its length at rest is lower than the one of the rigid axis (15), so that, when the system is assembled, the spring (16) is subjected to an axial elastic expansion, and the strength exerted by the spring brings axially towards the centre the mobile portion (132) of said first end (13) and the fixed portion of said second end (14), thus keeping the system correctly coupled.

[0059] Preferably, the length difference between the rigid axis and the spring at rest is about 20-30% of the rigid axis length, so that the spring continues to keep the system assembled also after the rotations which it is subjected to during loading and functioning.

[0060] The reduction of the spring length is needed to balance the axial displacement of the end portion of the spring, which, in the devices known at the state of the art, is balanced by length expansion/reduction of the torsion spring after torsion load increase and decrease dur-

ing functioning.

[0061] Instead, in the just described device, the end portion of the spring is always fastened to the second end assembly (14), whose distance from the first end assembly (13) is fixed by the length of the rigid axis (15) and so it is constant. By eliminating any axial sliding of the spring end, one of the main causes of friction of the devices currently known at the state of the art is eliminated.

[0062] In addition, unlike what happens in the known devices, the spring end portion has not to transmit any strength to the outer tube (4), since the mobile portion (132) of the first end assembly (13) is responsible of the torque transmission.

[0063] On the outer circumference of the mobile portion (132) in fact ribs (1331), configured to engage respective longitudinal inner ribs provided on the surface of the tube (4), are provided. By means of the coupling of these ribs, the transmission of the torque between the spring (16) and the tube (4) occurs.

[0064] The mobile portion (132) and the fixed portion (131) of said first end (13) are axially sliding with respect to each other between a first and a second position, limited by suitable abutting surfaces realized on said fixed (131) and mobile portion (132).

[0065] In the first position, suitable blocking means provided on both said portions (131, 132) allow their respective rotation only in one direction, while in the second position said blocking means are not engaged, and so, the respective rotation between said first and second portion is free.

[0066] In particular, the direction the respective rotation is allowed to in the first position is the one in which the spring is loaded with kinetic energy and the diameter of its turns is reduced. Once the system is assembled, the spring can be loaded by simply applying a respective rotation between the two fixed and mobile portions (131, 132) constituting the first end assembly (13).

[0067] To such aim, preferably, the fixed portion (13) of the first end assembly comprises grasping means (1312) provided with a polygonal print which allows its moving manually or by means of tools.

[0068] Conveniently, said polygonal print is shaped and dimensioned so that it can be engaged with standard tools.

[0069] Since the torsion spring (16) is fastened to the fixed portion (141) of the second end assembly (14) and to the mobile portion (132) of the first end assembly (13), this respective rotation between the fixed portion (131) and the mobile portion (132) of the first end assembly causes an energy accumulation in the spring (16). Anyway, this energy cannot be released since the respective rotation in the opposite rotation direction is prevented. In a preferred embodiment, the blocking means comprise a saw-toothed profile (1311) provided on an outer cylindrical surface of the fixed portion (131), coupled to a respective saw-toothed profile (1321) provided on the inner cylindrical surface of the mobile portion (132) of said first

end assembly.

[0070] As it is clear from the drawings, in a preferred but not limiting embodiment said fixed portion (131) comprises two pieces (131-a, 131-b) integral to each other by means of connecting means, such for example a screw. In the view of figure 15, in a section view, the pieces (131, 132) constituting the first end assembly (13) are shown in their rest position. The torsion spring (not shown in figure 15) tends in fact to bring towards the centre the mobile element (132), up to when the same abuts against the fixed element (131). In this condition, the blocking means are engaged, and the rotation is allowed only in the direction of loading the torsion spring.

[0071] Figures 16 and 17 show instead two section views in which the mobile portion (132) is axially translated with respect to the fixed portion (13), and the blocking means are not engaged; the rotation is allowed in both the directions. This is, in particular the one of figure 16, the system position, when in function.

[0072] So, it is obtained a spring assembly in which the torsion spring can be loaded without the need that the same is introduced inside the tube (4) on which the fabric (5) is wound, and without the need to use any auxiliary compression spring to keep the system assembled and to activate the blocking system, the function of the compression spring being directly exerted by the torsion spring.

[0073] It is to be specified, for clarity sake, that the fixed portion (131) of the first end assembly is provided with suitable fastening means (1313) configured to fasten the same to a rigid support outside the system, thus preventing the rotation of the fixed portion to this rigid support. In this manner, when the tube (4) rotates integrally to the mobile portion (132) of the first end assembly, it is actually rotating with respect to the outer supports, which can be realized for example in the side walls of a box in which the fabric is housed.

[0074] Similarly, the torque exerted by the torsion spring is exerted between the tube (4) integral to the mobile portion (132) of the first end assembly, and so, at an end of the spring, and the outer support, fastened to the fixed portion (131) of the first end assembly, and so, by means of the central rigid axis (15), to the other end of the spring (16).

[0075] With reference to the appended figures, it is to be observed that inside the inventive load retaining mechanism no axial thrust element is provided, as for example a compression spring, neither it is needed the usage of thrust-keeping elements, as for example washers or the like.

[0076] The second end assembly (14) comprises a fixed portion (141) provided with a coupling cylindrical surface (1411) to the torsion spring and with a shaped recess (1412) for housing the rigid axis (15).

[0077] The second end assembly comprises also a mobile portion (142), coaxially installed to said fixed portion (141) and configured to rotate freely with respect to itself.

[0078] In this manner, the mobile portion (142) acts substantially as bearing to limit friction between the inner surface of the tube (4) and the spring assembly.

[0079] Moreover, preferably, the second end assembly comprises also a fixing plug (143) configured to block the axial position of said second mobile portion (142).

[0080] Preferably, said first fixed portion (141) comprises, opposite to the rigid axis (15), fastening means (1413) to install a slowing down device (10) configured to exert a dampening action aiming at avoiding speed winding excesses.

[0081] The passage from the blocking position to the loading position occurs in the installation step.

[0082] Inside the tube (4) on which the fabric (5) is wound, the spring assembly (2) is introduced at an end and the free support (3) of the other end.

[0083] During installation of the tube (4) inside the box (6) (or anyway, during installation of the tube on the outer rigid supports, also not realized outside a box) it is first introduced the side where the spring assembly (2) is provided, so that the fixed portion (131) of the first end assembly is introduced in its own installation seat.

[0084] During this action, the installer approaches the tube (4) to the outer support, thus bringing the system in the position of figure 17, in which the rotation blocking means are not engaged.

[0085] So, the free support (3) can be introduced in its support, and so the tube (4) can be left. The installation is completed by suitable blocking screws (61).

[0086] The action of the spring (16) brings the system in the position of figure 16, in which the rotation blocking means are not engaged and at the same time the system total length is such that it allows the free support (3) to be installed in its own seat.

[0087] While passing from position of figure 17 to position of figure 16, the free support is subjected in fact to a corresponding axial excursion with respect to the end of the fixed portion (131) of the first end assembly.

[0088] For a correct installation, the length of the tube (4) and supports has in fact to be configured so that the total length of the tube (4), of the portion projecting with respect to the tube of the spring assembly (2) and of the portion projecting with respect to the tube of the free support (3) is little greater than the inner length between the two rigid bearing supports (obtained in the box and integral to the window).

[0089] In this way, the slight compression, which the assembly has to be subjected to, brings the device from the configuration of figure 15, in which the blocking means are engaged, to the configuration of figure 16, in which the rotation is allowed in both the directions.

[0090] So, the rotation of the mobile portion (132), and so of the tube (4) integral thereto with respect to the fixed portion (131), occurs with respect to the rigid supports on which the tube (4) is installed, and allows the winding and unwinding of the fabric (5) with respect to the tube (4).

[0091] Moreover, preferably but not limitingly the device comprises a removable blocking means (28) config-

ured to be fastened to the projecting portion of the spring assembly (2).

[0092] Preferably, the fastening of said removable blocking means (28) occurs at the grasping means (1312) of the fixed portion (131) of the first end assembly (13).

[0093] Said removable blocking means is configured so that the respective axial translation between the fixed portion (131) and the movable portion (132) of the first end assembly is prevented, so that it is avoided that in case of accidental compression the system passes from configuration of figure 16, in which the system is installed and allows the fabric winding and unwinding, to configuration of figure 17, with the risk that the support free side (14) can go out from the housing seat, with consequent bearing loss of the tube (4) and a sudden reduction of the spring assembly (2).

[0094] This fact serves to avoid that, in case of accidental compression, the system brings itself in a configuration in which the rotation is allowed in both the directions.

[0095] The removable blocking device (28) is also configured to leave the fastening means free to the outer supports of the mobile portion (131) of the first end assembly (13). In this way, the device can be installed and left introduced and correctly functioning, with possibility of fabric winding and unwinding.

[0096] The removal of the blocking device (28) is carried out only in case of system removal, for maintenance or substitution of the fabric (5).

Claims

1. Spring assembly (2) for windable mosquito nets, sun blinds, roller shutters or any other screening device windable around a tube (4), comprising:

- a rigid axis (15), inside and coaxially positioned with respect to a helical torsion spring (16), whose ends are housed inside a first (13) and a second end assembly (14);
- the first (13) and the second end assembly (14) positioned at the two ends of said rigid axis (15), each one comprising two portions (131, 132, 141, 142) configured to be able to rotate with respect to each other, whereby each of said end assemblies (13, 14) comprises a first portion (131, 141) of said two portions (131, 132, 141, 142) configured to rotate integrally with said rigid axis (15) and a second mobile portion (132, 142) of said two portions (131, 132, 141, 142) being able to rotate with respect to said rigid axis (15),
- said mobile portion (132) of said first end assembly (13) being configured to be fastened to said tube (4) and said first portion (131) of said first end assembly (13) being configured to be fastened to an outer support;

- the helical torsion spring (16), coupled to the mobile portion (132) of the first end assembly (13) and to the first portion (141) of the second end assembly (14), so that when said mobile portion (132) of the first end assembly (13) rotates with respect to said first portion (131) of the same first end assembly (13), an end of said spring (16) rotates and the other one remains still, this respective rotation between the fixed portion (131) and the mobile portion (132) of the first end assembly causes an energy accumulation in the spring (16) said spring (16) being configured to exert an axial strength directed towards the centre on said first (13) and second end assembly (14), whereby said spring assembly (2) is **characterized in that** said mobile portion (132) and said fixed portion (131) of said first end assembly (13) are axially sliding with respect to each other between a first and a second position, limited by suitable abutting surfaces realized on said fixed portion (131) and on said mobile portion (132), and **in that** said spring assembly (2) comprises blocking means provided on both said fixed and mobile portions (131, 132) of said first end assembly, which in said first position allow their respective rotation only in one direction, while in said second position allow their respective rotation in both directions.
2. Spring assembly (2) for screening devices windable around a tube (4) according to claim 1, **characterized in that** said mobile portion (132) of the first end assembly (13) and said fixed portion (141) of the second end assembly (14) are fastened so that their axial distance is constant during system rotation and determined by the length of said rigid axis (15).
 3. Spring assembly (2) for screening devices windable around a tube (4) according to claim 1 or 2, **characterized in that** the winding direction of the screening device on the tube and the turns direction of said spring (16) are such that when the fabric is lowered, and so kinetic energy is loaded in the spring, the spring diameter is reduced.
 4. Spring assembly (2) for screening devices windable around a tube (4) according to any one of the preceding claims, **characterized in that** said torsion spring (16) is coupled with interference with said end assemblies (13, 14), and its length at rest is lower than the one of the rigid axis (15), so that, when the system is assembled, the spring (16) is subjected to an axial elastic expansion.
 5. Spring assembly (2) for screening devices windable around a tube (4) according to claim 1, **characterized in that** the direction the respective rotation is allowed to in said first position is the one in which the spring is loaded with elastic energy and the diameter of its turns is reduced.
 6. Spring assembly (2) for screening devices windable around a tube (4) according to any one of the preceding claims, **characterized in that** said fixed portion (13) of said first end assembly (13) comprises grasping means (1312) allowing its moving manually or by means of tools.
 7. Spring assembly (2) for screening devices windable around a tube (4) according to any one of claims 1, 5 and 6, **characterized in that** said blocking means comprise a saw-toothed profile (1311) provided on an outer cylindrical surface of the fixed portion (131), coupled to a respective saw-toothed profile (1321) provided on an inner cylindrical surface of the mobile portion (132) of said first end assembly.
 8. Spring assembly (2) for screening devices windable around a tube (4) according to any one of the preceding claims, **characterized in that** said second end assembly (14) comprises:
 - a fixed portion (141) provided with a coupling cylindrical surface (1411) to said torsion spring and with a shaped recess (1412) for housing said rigid axis (15), and
 - a mobile portion (142), coaxial to said fixed portion (141) and configured to rotate freely with respect to itself.
 9. Screening device for window protection, comprising:
 - a tube (4),
 - a spring assembly (2) according to any one of the preceding claims and a free support (3), introduced from different ends of said tube (4) around which the screen (5) is wound, so that each one projects from a portion of said tube,
 and configured further to allow the tube (4) to rest on suitable fixed supports so that the tube (4) can rotate around its own axis, thus winding or unwinding the screen.

Patentansprüche

1. Federanordnung (2) für aufrollbare Moskitonetze, Sonnenblenden, Rollläden oder andere Abschirmvorrichtungen, die um ein Rohr (4) aufrollbar sind, umfassend:
 - eine starre Achse (15), die innerhalb und koaxial zu einer Schraubendrehfeder (16) angeordnet ist, deren Enden in einer ersten (13) und einer zweiten Endanordnung (14) unterge-

bracht sind;

- die erste (13) und die zweite Endanordnung (14), die an den beiden Enden der starren Achse (15) angeordnet sind und jeweils zwei Abschnitte (131, 132, 141, 142) umfassen, die so konfiguriert sind, dass sie sich in Bezug zueinander drehen können, wobei jede der Endanordnungen (13, 14) einen ersten Abschnitt (131, 141) der beiden Abschnitte (131, 132, 141, 142) umfasst, der so konfiguriert ist, dass er sich integral mit der starren Achse (15) dreht, und einen zweiten beweglichen Abschnitt (132, 142) der beiden Abschnitte (131, 132, 141, 142), der sich in Bezug auf die starre Achse (15) drehen kann,

- der bewegliche Abschnitt (132) der ersten Endanordnung (13) ist so konfiguriert, dass er an dem Rohr (4) befestigt wird, und der erste Abschnitt (131) der ersten Endanordnung (13) ist so konfiguriert, dass er an einem äußeren Unterstützung befestigt wird;

- die Schraubendrehfeder (16), die mit dem beweglichen Teil (132) der ersten Endanordnung (13) und mit dem ersten Teil (141) der zweiten Endanordnung (14) gekoppelt ist, so dass, wenn sich der bewegliche Teil (132) der ersten Endanordnung (13) in Bezug auf den ersten Teil (131) derselben ersten Endanordnung (13) dreht, rotiert ein Ende der Feder (16) und das andere stillsteht, wobei diese jeweilige Drehung zwischen dem festen Teil (131) und dem beweglichen Teil (132) der ersten Endanordnung eine Energieansammlung in der Feder (16) bewirkt, wobei die Feder (16) so konfiguriert ist, dass sie eine axiale Kraft ausübt, die auf die Mitte der ersten (13) und zweiten Endanordnung (14) gerichtet ist, wobei die Federanordnung (2) ist **dadurch gekennzeichnet, dass** der bewegliche Teil (132) und der feste Teil (131) der ersten Endanordnung (13) in Bezug aufeinander zwischen einer ersten und einer zweiten Position axial gleiten, begrenzt durch geeignete Anschlagflächen, die auf dem festen Teil (131) und dem beweglichen Teil (132) angeordnet sind,

und dass die Federanordnung (2) Spermmittel umfasst, die sowohl an dem festen als auch an dem beweglichen Teil (131, 132) der ersten Endanordnung vorgesehen sind, die in der ersten Position ihre jeweilige Drehung nur in eine Richtung zulassen, während sie in der zweiten Position ihre jeweilige Drehung in beide Richtungen zulassen.

2. Federanordnung (2) für um ein Rohr (4) aufrollbare Abschirmvorrichtungen gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der bewegliche Teil (132) der ersten Endanordnung (13) und der feste Teil (141) der zweiten Endanordnung (14) so befestigt sind, dass ihr axialer Abstand während der Sys-

temdrehung konstant ist und durch die Länge der starrer Achse (15) bestimmt wird.

3. Federanordnung (2) für Abschirmvorrichtungen, die um ein Rohr (4) aufrollbar sind, nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Aufrollrichtung der Abschirmvorrichtung auf dem Rohr und die Richtung der Windungen der Feder (16) so geschaffen sind, dass beim Absenken des Gewebes und der damit verbundenen Belastung der Feder mit kinetischer Energie, ist der Federdurchmesser reduziert.
4. Federanordnung (2) für Abschirmvorrichtungen, die um ein Rohr (4) aufrollbar sind, gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Drehfeder (16) durch Übermaß mit den Endanordnungen (13, 14) gekoppelt ist und ihre Länge im Ruhezustand geringer ist als die der starren Achse (15), so dass die Feder (16) bei zusammengebautem System einer axialen elastischen Ausdehnung ausgesetzt ist.
5. Federanordnung (2) für Abschirmvorrichtungen, die um ein Rohr (4) aufrollbar sind, gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die Richtung, in die die jeweilige Drehung in der ersten Position zulässig ist, diejenige ist, in der die Feder mit elastischer Energie belastet ist und der Durchmesser ihrer Windungen verringert ist.
6. Federanordnung (2) für Abschirmvorrichtungen, die um ein Rohr (4) aufrollbar sind, gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der feste Abschnitt (13) der ersten Endanordnung (13) Greifmittel (1312) umfasst, die seine Bewegung manuell oder mit Werkzeugen ermöglichen.
7. Federanordnung (2) für Abschirmvorrichtungen, die um ein Rohr (4) aufrollbar sind, gemäß einem der Ansprüche 5 bis 8, **dadurch gekennzeichnet, dass** die Blockiermittel ein Sägezahnprofil (1311) umfassen, das auf einer äußeren zylindrischen Oberfläche des festen Abschnitts (131) vorgesehen ist, gekoppelt mit einem entsprechenden Sägezahnprofil (1321), das auf einer inneren zylindrischen Oberfläche des beweglichen Abschnitts (132) der ersten Endanordnung vorgesehen ist.
8. Federanordnung (2) für Abschirmvorrichtungen, die um ein Rohr (4) aufrollbar sind, gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Endanordnung (14) umfasst:
 - einen festen Abschnitt (141), der mit einer zylindrischen Kopplungsfläche (1411) für die

Schraubendrehfeder und mit einer geformten Aussparung (1412) zur Aufnahme der starren Achse (15) versehen ist, und

- einen beweglichen Abschnitt (142), der koaxial zu dem festen Abschnitt (141) ist und so konfiguriert ist, dass er sich frei in Bezug auf sich selbst drehen kann.

9. Abschirmvorrichtung zum Schutz von Fenstern, umfassend:

- ein Rohr (4),
- eine Federanordnung (2) gemäß einem der vorhergehenden Ansprüche und eine freie Unterstützung (3), die von verschiedenen Enden des Rohrs (4), um das die Abschirmung (5) aufgerollt ist, eingeführt wird, so dass jedes Ende aus einem Abschnitt des Rohrs hervorragt, und die außerdem so konfiguriert ist, dass das Rohr (4) auf geeigneten festen Unterstützungen ruhen kann, so dass sich das Rohr (4) um seine eigene Achse drehen kann und so die Abschirmung auf- oder abrollen kann.

Revendications

1. Ensemble ressort (2) pour moustiquaire enroulable, store pare-soleil, volet roulant ou tout autre dispositif d'occultation enroulable autour d'un tube (4), comprenant:

- un axe rigide (15), intérieur et positionné coaxialement par rapport à un ressort hélicoïdal de torsion (16), dont les extrémités sont logées à l'intérieur d'un premier (13) et d'un deuxième ensemble d'extrémité (14);
- le premier (13) et le deuxième ensemble d'extrémité (14) étant positionnés aux deux extrémités dudit axe rigide (15), chacun comprenant deux parties (131, 132, 141, 142) configurées pour pouvoir tourner l'une par rapport à l'autre, chacun desdits ensembles d'extrémité (13, 14) comprenant une première partie (131, 141) desdites deux parties (131, 132, 141, 142) configurée pour tourner de manière solidaire avec ledit axe rigide (15) et une deuxième partie mobile (132, 142) desdites deux parties (131, 132, 141, 142) pouvant tourner par rapport audit axe rigide (15);
- ladite partie mobile (132) dudit premier ensemble d'extrémité (13) étant configurée pour être fixée audit tube (4) et ladite première partie (131) dudit premier ensemble d'extrémité (13) étant configurée pour être fixée à un support extérieur;
- le ressort de torsion hélicoïdal (16), couplé à la partie mobile (132) du premier ensemble d'extrémité (13) et à la première partie (141) du

deuxième ensemble d'extrémité (14), de sorte que lorsque ladite partie mobile (132) du premier ensemble d'extrémité (13) tourne par rapport à ladite première partie (131) du même premier ensemble d'extrémité (13), une extrémité dudit ressort (16) tourne et l'autre reste immobile, cette rotation respective entre la partie fixe (131) et la partie mobile (132) du premier ensemble d'extrémité provoquant une accumulation d'énergie dans le ressort (16) ledit ressort (16) étant configuré pour exercer une force axiale dirigée vers le centre sur ledit premier (13) et ledit deuxième ensemble d'extrémité (14) de sorte que ledit ensemble ressort (2) est **caractérisé en ce que** ladite partie mobile (132) et ladite partie fixe (131) dudit premier ensemble d'extrémité (13) coulisent axialement l'une par rapport à l'autre entre une première et une deuxième position, limitées par des surfaces de butée appropriées réalisées sur ladite partie fixe (131) et sur ladite partie mobile (132),

et **en ce que** ledit ensemble ressort (2) comprend des moyens de blocage prévus sur lesdites parties fixe et mobile (131, 132) dudit premier ensemble d'extrémité, qui dans ladite première position permettent leur rotation respective uniquement dans un sens, tandis que dans ladite deuxième position permettent leur rotation respective dans les deux directions.

2. Ensemble ressort (2) pour dispositifs de protection enroulables autour d'un tube (4) selon la revendication 1, **caractérisé en ce que** ladite partie mobile (132) du premier ensemble d'extrémité (13) et ladite partie fixe (141) du deuxième ensemble d'extrémité (14) sont fixées de manière à ce que leur distance axiale soit constante pendant la rotation du système et déterminée par la longueur dudit axe rigide (15).

3. Ensemble ressort (2) pour dispositifs de protection enroulables autour d'un tube (4) selon la revendication 1 ou 2, **caractérisé en ce que** la direction d'enroulement du dispositif de protection sur le tube et la direction de rotation dudit ressort (16) sont tels que lorsque le tissu est abaissé, et donc que de l'énergie cinétique est chargée dans le ressort, le diamètre du ressort est réduit.

4. Ensemble ressort (2) pour dispositifs de protection enroulables autour d'un tube (4) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit ressort de torsion (16) est couplé avec interférence auxdits ensembles d'extrémité (13, 14), et sa longueur au repos est inférieure à celle de l'axe rigide (15), de sorte que, lorsque le système est assemblé, le ressort (16) est soumis à

une expansion élastique axiale.

5. Ensemble ressort (2) pour dispositifs de protection enroulables autour d'un tube (4) selon la revendication 5, **caractérisé en ce que** la direction dans laquelle la rotation respective est autorisée dans ladite première position, est celle dans laquelle le ressort est chargé d'énergie élastique et le diamètre de ses spires est réduit. 5
6. Ensemble ressort (2) pour dispositifs de protection enroulables autour d'un tube (4) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite partie fixe (13) dudit premier ensemble d'extrémité (13) comprend des moyens de préhension (1312) permettant son déplacement manuel ou au moyen d'outils. 10 15
7. Ensemble ressort (2) pour dispositifs de protection enroulables autour d'un tube (4) selon l'une quelconque des revendications 5 à 8, **caractérisé en ce que** lesdits moyens de blocage comprennent un profil en dents de scie (1311) prévu sur une surface cylindrique extérieure de la partie fixe (131), couplé à un profil en dents de scie respectif (1321) prévu sur une surface cylindrique intérieure de la partie mobile (132) dudit premier ensemble d'extrémité. 20 25
8. Ensemble ressort (2) pour dispositifs de protection enroulables autour d'un tube (4) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit deuxième ensemble d'extrémité (14) comprend: 30
 - une partie fixe (141) pourvue d'une surface cylindrique de couplage (1411) audit ressort de torsion et d'un évidement profilé (1412) pour loger ledit axe rigide (15), et 35
 - une partie mobile (142), coaxiale à ladite partie fixe (141) et configurée pour tourner librement par rapport à elle-même. 40
9. Dispositif de protection pour la protection de fenêtres, comprenant: 45
 - un tube (4),
 - un ensemble ressort (2) selon l'une quelconque des revendications précédentes et un support libre (3), introduit à partir de différentes extrémités dudit tube (4) autour duquel est enroulée la protection (5), de sorte que chacun dépasse d'une portion dudit tube, et configuré en outre pour permettre au tube (4) de reposer sur des supports fixes appropriés de sorte que le tube (4) puisse tourner autour de son propre axe, enroulant ou déroulant ainsi la protection. 50 55

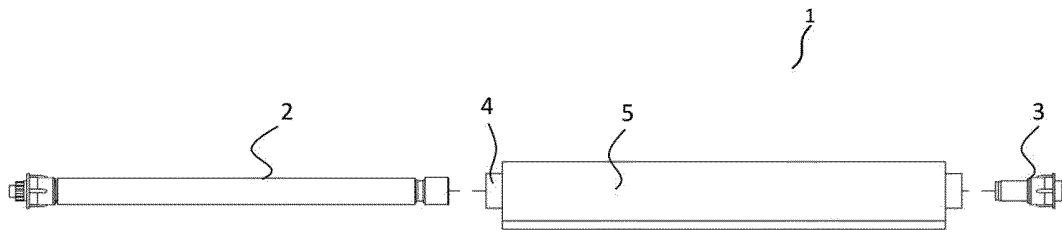


Fig. 1

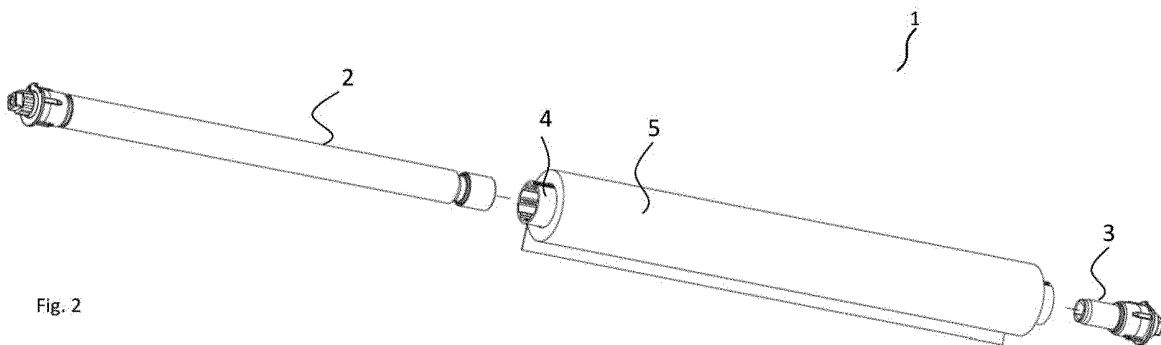


Fig. 2

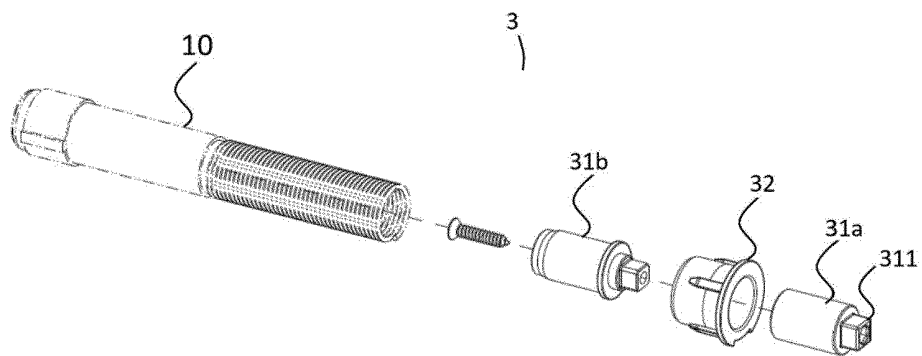


Fig. 3

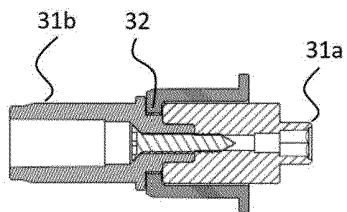


Fig. 4

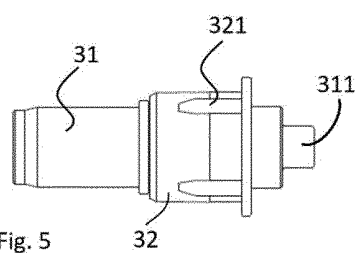


Fig. 5

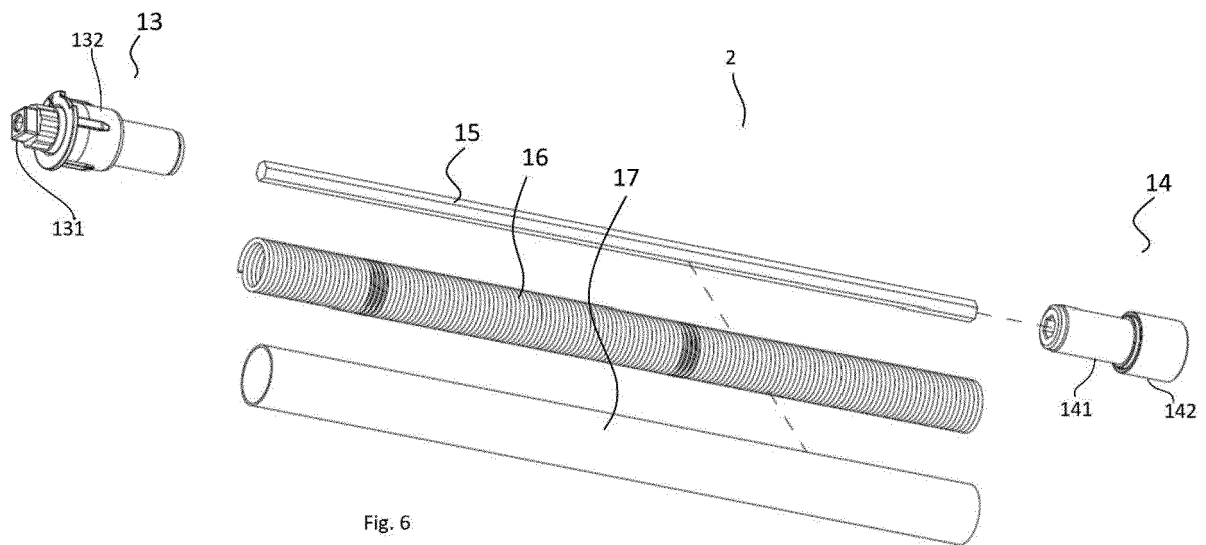


Fig. 6

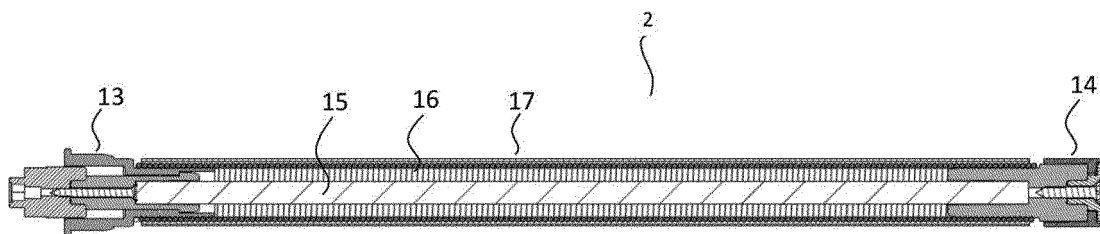


Fig. 7

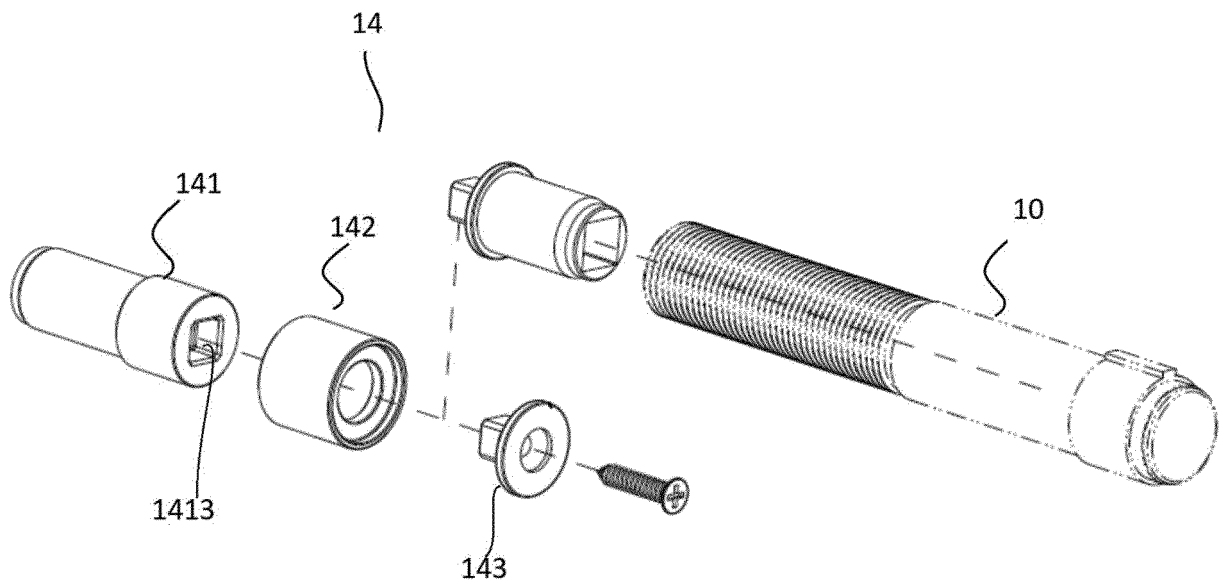


Fig. 8

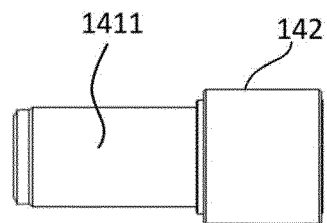


Fig. 9

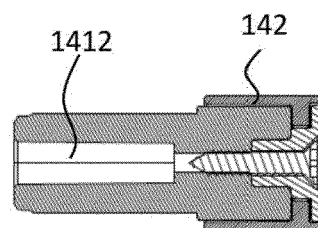
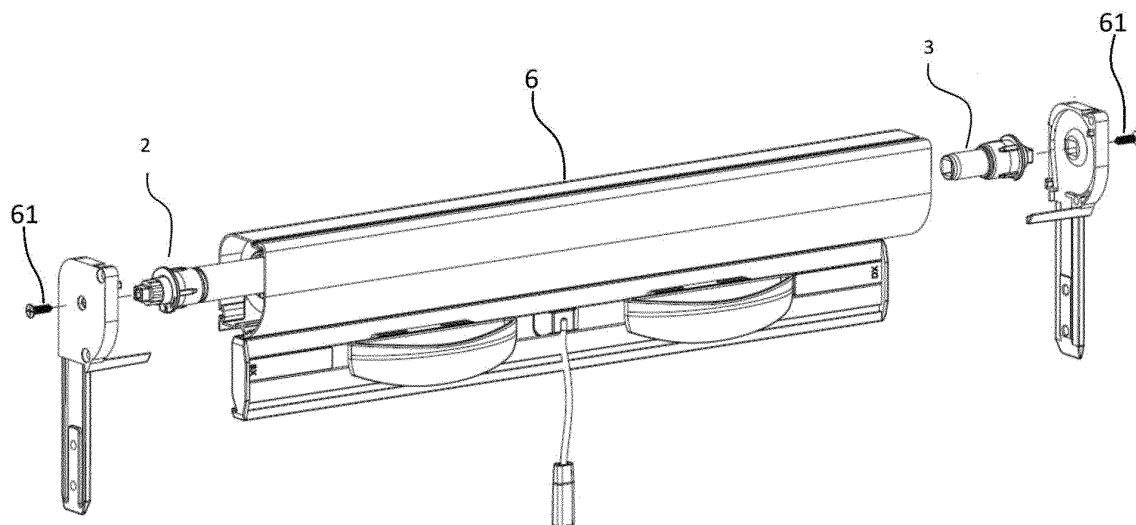
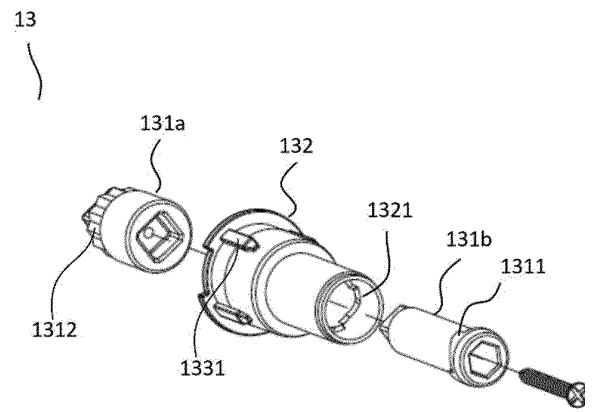
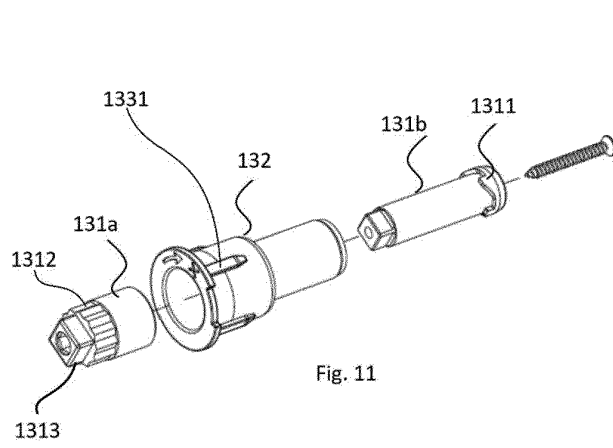


Fig. 10



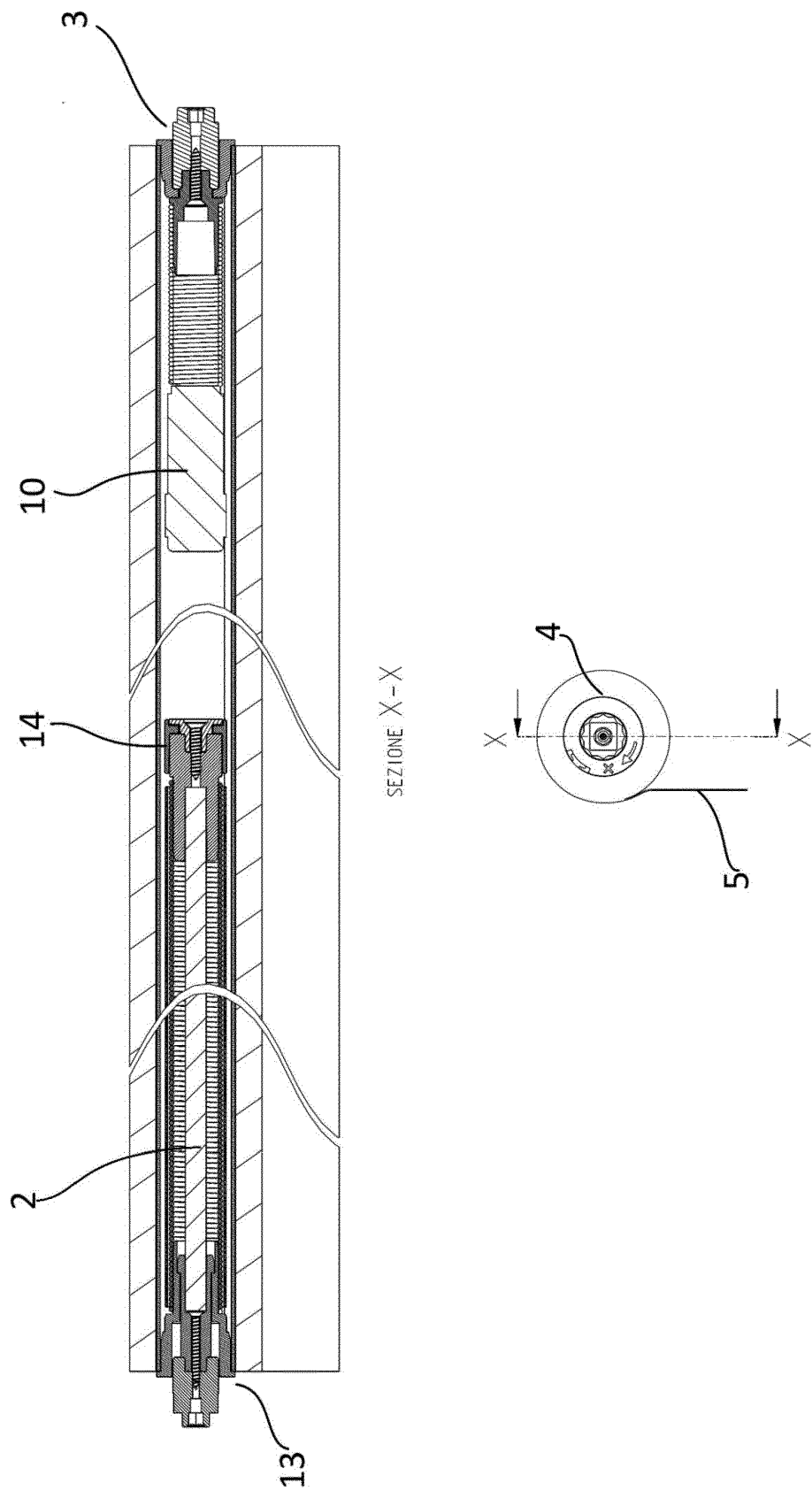


Fig. 14

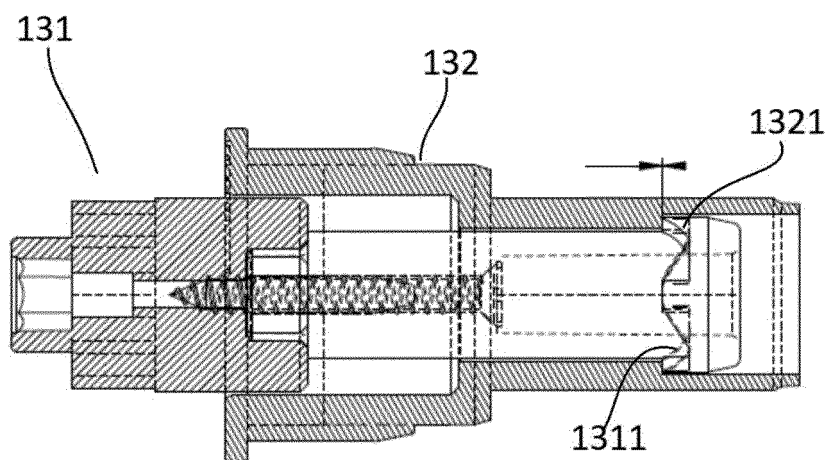


Fig. 15

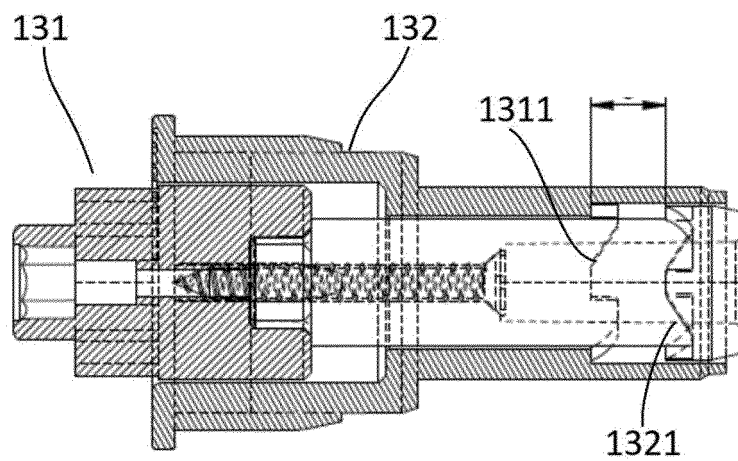


Fig. 16

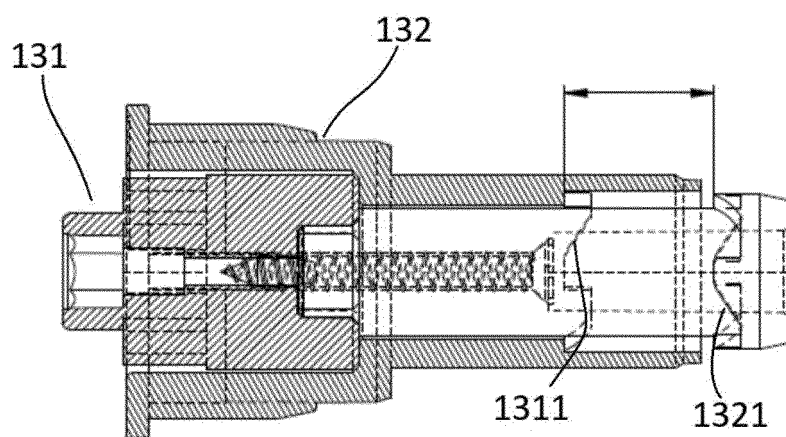


Fig. 17

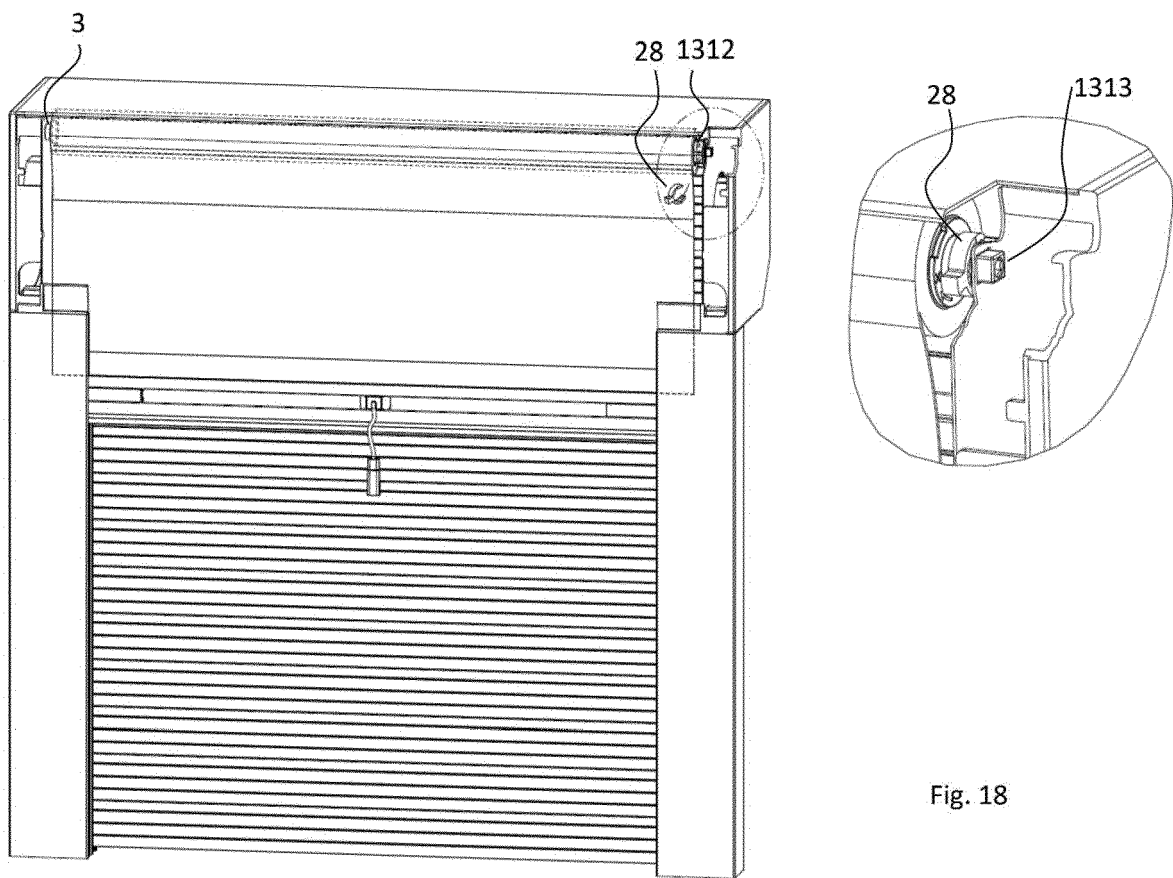


Fig. 18

REFERENCES CITED IN THE DESCRIPTION

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