



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.09.2007 Bulletin 2007/36

(51) Int Cl.:
E06B 9/54 (2006.01)

(21) Application number: **07386005.8**

(22) Date of filing: **23.02.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

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(30) Priority: **02.03.2006 GR 20060100139**

(54) **Mechanism for the deceleration of a vertically retracting insect-blocking roller screen**

(57) Mechanism for the deceleration of a vertically retracting, upwardly moving insect-blocking roller screen (23) winding onto drum (24), the mechanism comprising a cylinder (1) containing a fluid mass (11), a shaft (2) equipped with blades rotatably mounted within cylinder (1) and means for the engagement of drum (24) with the shaft (2) slowly rotatable within fluid mass (11) during the retracting upward movement of the insect-blocking roller screen. No bolt whatsoever is employed neither in the linear assembly of parts of the mechanism nor in the

mounting of the mechanism onto the side plug means (12). The linear assembly is effected by a circumferential end annular rib (22a) provided at the edge of shaft portion (22) protruding through the open outlet of cylinder (1) clipping onto a circumferential groove (9) of an end stabilizing washer means (8), whilst mounting of the mechanism onto the side plug means (12) is effected by at least one longitudinal slot (19a) along a shaft extension (19) through the closed end of cylinder (1) clipping with at least one rib (14a) of a tube projection (14) of the side plug means (12).

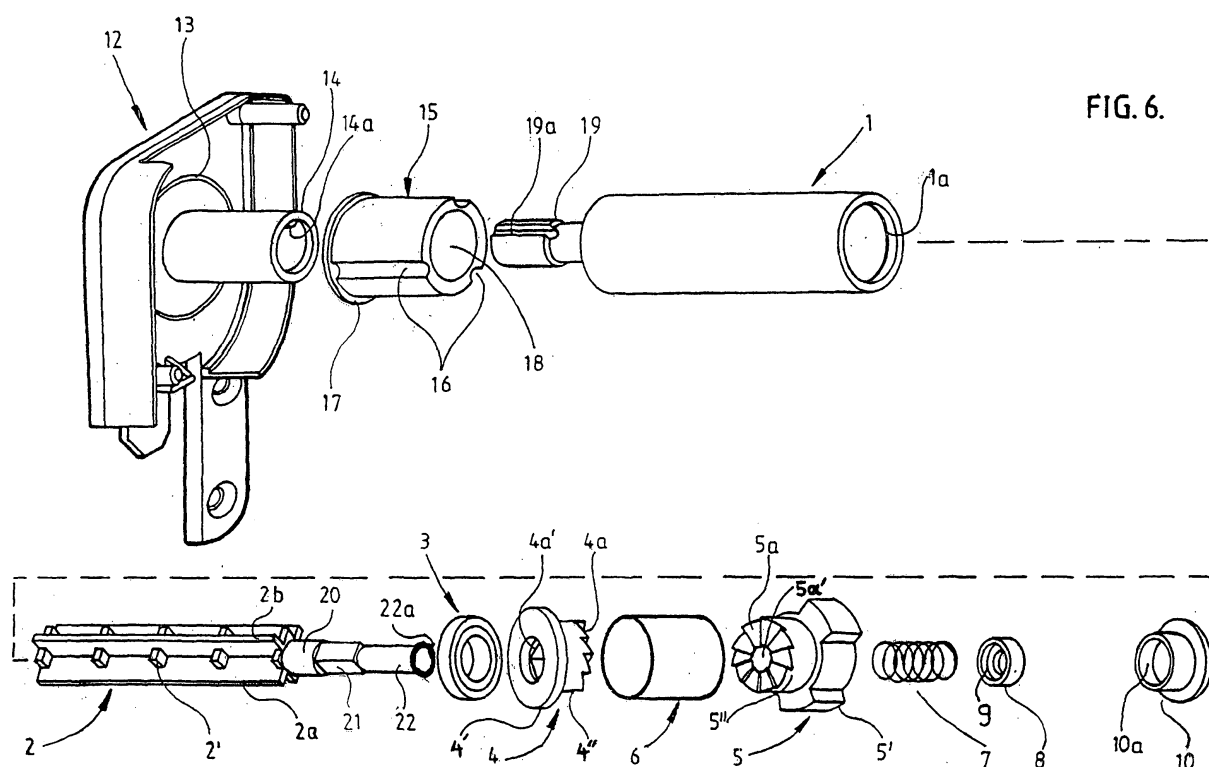


FIG. 6.

Description

THE FIELD OF THE ART

[0001] The invention relates to insect-blocking screens as they are applied in doors and windows assembled by aluminium profiles and in particular it relates to a mechanism for the deceleration of a vertically retracting insect-blocking roller screen.

THE PRIOR ART

[0002] Mechanisms adapted to damp the movement of roller screens being wound around a drum mounted at the top of doors or windows thereby normalizing the return thereof and averting possible undesirable effects, especially when a spring action is exerted upon such roller screens, are known and various designs of the same have been disclosed in the prior art.

[0003] By way of example EP-0922831, NL-1010312, JP-9067987, JP-2000145334, DE-9203450, US-5,634,507, GB-319,811, GR-20020100460, GR-20020100056, GR-20020100410 disclose roller screen hydraulic damper mechanisms, that incorporate an appropriate clutch mechanism to effect engagement thereof in one direction of movement of the screen only. Such hydraulic damper mechanisms comprise a cylinder being filled with a fluid, a shaft with or without blades being rotatably mounted within the cylinder, wherein the rotational speed of this shaft is substantially reduced in comparison to the free, violent, spring-driven rotation of the drum onto which the roller screen, such as an insect-blocking roller screen is being wound. Movement of the roller screen particularly in the direction of retraction thereof is thereby normalized and unpleasant effects due to violent retraction are thereby averted. Mechanical damper mechanisms have also been proposed the operation of which is based on frictional principles, such as by way of example in US-2,758,526 or US-471,467.

[0004] The damper mechanisms of the prior art are fixedly mounted onto the drum whereupon the screen is being wound so as to follow the rotation thereof and they comprise a clutch engaging/disengaging mechanism that allows free rotation of the roller screen in one direction of deployment thereof whereby it follows the free rotation of the drum, whilst in the other direction of the roller screen retracting movement there occurs a reversal of roles and the drum follows the decelerated movement of the damper mechanism's shaft being rotated within the fluid contained in the cylinder.

[0005] Bolts are employed to connect linearly assembled items of the damper mechanisms of the prior art, as well as for mounting the assembled damper mechanism onto a side plug means of the housing within which is located the drum whereupon the roller screen is being wound. One bolt is employed to connect the basic parts of the damper mechanism, i.e. the shaft that rotates within the fluid filled cylinder with the clutch mechanism engag-

ing or disengaging the same to the rotatable drum whereupon is wound the insect-blocking roller screen. Another bolt is employed to connect the assembled damper mechanism to the aforementioned plug means whereupon a bearing means (typically a plastic tube) is also mounted to operate as the rotational basement of the drum onto which the roller screen is being wound.

[0006] The above mentioned mode of connection of the prior art results to delays in the assembly process and demands highly precise tolerances to ensure an optimal screwing process. Furthermore, the employment of metallic bolts is always apt to give rise to risks of injury and it further diminishes the service life of the mechanisms. In general the employment of bolts increases the cost of the parts of the mechanism and of the subsequent installation thereof, whilst the risk of a failure in the assembly or in the installation due to a faulty threading or other inappropriate circumstances is always present.

[0007] It is therefore the object of the present invention to provide an alternative faster, less expensive and absolutely reliable mode of connection of the parts of the damper mechanism and of the subsequent mounting thereof onto the side plug means, such mode of connection eliminating the aforementioned drawbacks of the prior art, as it does not employ any connecting bolt whatsoever. The damper mechanism proposed in the present invention is linearly assembled by clipping the free end of the shaft that rotates within the fluid within a clip washer means located at one end of the linear assembly. Thereafter, the assembled damper mechanism is provided with a shaft extension of the cylinder thereof, said shaft extension being provided with at least one longitudinal slot whereas at least one longitudinal rib is provided within the internal wall of the tube projection of the side plug means; the damper mechanism is thereby mounted onto the side plug means as said at least one longitudinal slot of the cylinder shaft extension thereof clips within said at least one longitudinal rib of the tube projection of the plug means. A rapid, safe and reliable assembly of the damper mechanism and subsequent mounting thereof onto the side plug means is thereby achieved.

[0008] Another characteristic of certain damper mechanisms of the prior art is that they comprise naked springs, in particular spring means in the clutch mechanism thereof and that they in addition are made of too many parts, the assembly of which is time consuming and increases cost.

[0009] It is therefore a further object of the invention to simplify and in the same time obtain functional and aesthetical perfection of the damper mechanism. This is achieved by imparting a double role to the two components of the engaging/disengaging mechanism, i.e. by additionally using one of said components as a cover means of the fluid containing cylinder and by additionally using the other one of these components as a cylindrical cover of the engaging/disengaging mechanism, thereby obtaining a reduction in the number of parts of the damper mechanism and in the same time an improvement of the

functional, safety and aesthetic characteristics of the mechanism. According to a preferred embodiment of the invention a further functional and aesthetical perfection of the damper mechanism is obtained with the employment of an end cover plug means that clips onto the clip-washer of the mechanism, that additionally serves as a basement of the spring incorporated in the engaging/disengaging mechanism.

[0010] A further object of the present invention is to propose in connection to the advantageous characteristics described herein above, a hydraulic mechanism for the deceleration of the roller screen wherein an arrangement of blades is provided onto the shaft that rotates within the fluid containing cylinder, said blades having a length substantially equal to the internal diameter of the cylinder, so that the ends of these blades may come in a slight frictional contact with the internal walls of the cylinder during rotation of the shaft therein, whereby the fluid is substantially divided into discrete chambers, such division enhancing flow turbulence and accordingly increasing flow resistance and decelerating capacity of the damper mechanism.

[0011] These and other objects, characteristics and merits of the present invention will be made apparent in the detailed description that follows hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present invention will be made clear to those skilled in the art by reference to the drawings attached herewith that present the invention in an illustrative, non restrictive manner.

Fig. 1 shows a perspective view of the mechanism for the decelerated retraction of the insect-blocking roller screen moving in the direction of retraction.

Fig. 2 shows a perspective view of the mechanism of Fig. 1 mounted onto a side plug means of the housing incorporating the drum onto which is wound the insect blocking roller screen.

Fig. 3 shows a perspective view of the mechanism mounted onto the side plug means of the housing incorporating the drum onto which is wound the insect-blocking roller screen, the mechanism being inserted within this drum.

Figs 4a and 4b present a cross sectional view of the shaft of the mechanism for the deceleration of the insect-blocking roller screen, the shaft being equipped with blades and being adapted to rotate within the tightly closed cylinder containing fluid, the fluid being shown at rest and during operation respectively.

Fig. 5 shows a portion of the drum whereupon is being wound the insect blocking roller screen, the

drum being mounted onto the side plug means with the roller screen being partially deployed.

Fig. 6 shows the mechanism for deceleration of the insect blocking roller screen dismantled into the parts it is comprised of.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0013] By reference to the accompanying drawings we will hereinafter describe an illustrative, preferred embodiment of the invention.

[0014] The mechanism for the deceleration of the insect-blocking roller screen of the invention as shown in Fig. 6 comprises the cylinder 1 that has a diameter such as to be freely introduced within the hollow cylindrical drum 24 on the circumference of which is being wound the insect-blocking screen 23 (Figs 3, 5), wherein cylinder 1 is hollow and is provided with a circumferential rib 1a in the internal wall of the open outlet at one end thereof and with a shaft extension 19 with at least one longitudinal slot 19a at the other closed end thereof.

[0015] A shaft 2 is introduced within cylinder 1 that is filled up with fluid 11 of appropriate viscosity, the shaft 2 comprising a pair of blades 2a, 2b that form a crosslike pattern and extend up to the internal walls of the cylindrical housing 1 and notably the tolerance of their fitting within cylinder 1 is such as to potentially come into a slight frictional contact with the walls of the cylindrical housing 1, whilst being freely rotatable within the same.

[0016] As shown in the detailed sectional views of Figs 4a and 4b, wherein the rotatable shaft 2 is depicted at rest and in operation respectively, it is observed that, during operation, shaft 2 initiates rotation of the amount of fluid 11 provided within cylinder 1, the damper mechanism of the invention, contrary to mechanical or hydraulic damper mechanisms of the prior art, is a mechanism combining hydraulic and mechanical damping, the latter resulting from the slight frictional contact of the ends of blades 2a, 2b with the walls of cylinder 1, whilst hydraulic damping results from the flow resistance of the fluid contained in cylinder 1, such resistance being advantageously increased because of the division of the bulk of fluid in four discrete chambers, being defined by the abovementioned crosslike pattern of blades. Such division in the bulk of fluid enhances, during rotation of shaft 2, the turbulence of the rotating fluid mass 11 within each one of the abovementioned chambers and consequently increases the resistance of the fluid in the rotation of the shaft.

[0017] As shown in Figs 4a, 4b and 6, shaft 2 is also provided with an arrangement of longitudinally extending and equidistantly spaced ribs 2' that optimize rigidity and in the same time contribute in increasing turbulence of the fluid mass contained within cylinder 1.

[0018] Shaft 2 extends beyond cylinder 1 from the open outlet thereof with the circumferential rib provision

1a, such shaft extension comprising three consecutive portions and in particular a first inner cylindrical portion 20, a second intermediate square portion 21 and a third outermost cylindrical portion 22 that has a cross section smaller than that of the first cylindrical portion 20, wherein said third outermost portion 22 is characterized by a circumferential end annular rib 22a instead of the central threaded aperture apt to receiving the connecting bolt of the assembly as is the case with corresponding shafts of the prior art.

[0019] In order to ensure deceleration of the vertically deployed insect-blocking roller screen 23 only in one direction of movement thereof, in particular in the retracting upward movement thereof as it is being wound under the action of the spring means onto the drum 24, a clutch arrangement is employed that comprises a pair of cooperatively engaged members 4 and 5, each one of them comprising a cylindrical portion 4" and 5" respectively, each such cylindrical portion 4" and 5" extending into toothed ends, wherein the teeth 4a, 5a in said toothed ends are engraved at reverse directions and an outermost cylindrical portion 4' and 5' respectively that has a diameter larger than the corresponding cylindrical portion 4", 5", wherein the outermost cylindrical portion 4' has a diameter such as to clip and tightly seal the outlet of cylinder 1 wherein rib 1a is provided, whilst the outermost cylindrical portion 5' is provided with radially arranged protrusions that serve to stabilize the assembled mechanism within the interior walls of drum 24 wherein the mechanism is introduced (Fig. 3).

[0020] The two members 4 and 5 of the engaging/disengaging mechanism are provided with a central aperture from one end to the other end thereof, the aperture being denoted by numeral 4a' in member 4 and 5a' in member 5, the two members being assembled along the shaft extension with the three sequential portions 20, 21 and 22. An annular rubber washer 3 that seals cylinder 1 is introduced along the shaft 2 prior to the introduction of members 4 and 5 and on the other side a spring means 7 is inserted within member 5 of the engaging/disengaging mechanism including a stabilizing clip washer means 8 that sits within a recession 10a of a final end cap 10. Prior to the assembly of the two members 4 and 5, a tubular housing 6 that provides coverage of the toothed cylindrical portions 4" and 5" of the engaging/disengaging mechanism is inserted in between members 4 and 5 as shown in Fig. 6. According to a preferred embodiment of the invention the tubular housing 6 is not an independent item, as depicted in Fig. 6 that serves to illustrate the role thereof, but it constitutes an extension and a part of one of the two members 4 and 5 of the engaging/disengaging mechanism.

[0021] Finally, prior to final sealing of the assembled mechanism with cap 10, the outermost end 22 of shaft 2, after having passed through the coincident apertures 5a' and 4a' of members 5 and 4 respectively and through spring means 7, it comes in contact with the clip washer means 8 that is adapted to provide a basement of the

spring means, whereby the annular rib 22a of the shaft clips within a groove 9 of the clip washer means 8.

[0022] Operation of the engaging/disengaging mechanism leads into two discrete modes of cooperative meshing of the toothed ends 4a and 5a as the insect-blocking roller screen 23 moves in the direction of deployment or retraction following the corresponding two opposite directions of rotation of drum 24. In one operating mode, during deployment (vertical downward movement) of the insect-blocking roller screen, the toothed end of member 5 that follows the rotation of drum 24 rotates in a manner such as to contact the toothed end of member 4 that remains stationary since it is connected to shaft 2 that does not rotate as long as the insect-blocking roller screen moves in the vertical downward direction, whereby consecutive teeth of member 5 jump over contacting consecutive teeth of member 4 thereby emitting a kind of rattling sound that contributes towards desirably signaling proper function of the mechanism. When on the contrary the insect-blocking roller screen 23 retracts (moves vertically upwards) the consecutive teeth of member 5, being rotated in the opposite direction, since member 5 keeps following the rotation of drum 24 that now rotates in the opposite direction, engage with the teeth of member 4, thereby initiating rotation of shaft 2 within the fluid mass 11 of cylinder 1, whereby the speed of rotation of drum 24 and subsequently of the retracting insect-blocking roller screen is decreased and is henceforth being determined by the decelerating mechanism of the invention.

[0023] Another characteristic advantage of the mechanism of the invention is the alternative mode of speedier and reliable connection thereof onto the side plug means 12, wherein the shaft extension 19 of cylinder 1 of the mechanism is provided with at least one slot 19a and the internal walls of the tube projection 14 of side plug means 12 is correspondingly provided with at least one rib 14a, such that the deceleration mechanism may be connected to the side plug means 12 when the abovementioned at least one rib 14a of tube projection 14 clips into the at least one slot 19a of the shaft extension 19 of cylinder 1 of the deceleration mechanism.

[0024] A further characteristic is the employment of the tubular housing 6 for the coverage of toothed portions of the engaging/disengaging mechanism, said tubular housing being preferably incorporated into member 5 of the engaging/disengaging mechanism, as well as the employment of a sealing end cap 10, wherein these accessories facilitate precise assembly of the mechanism and impart an operational and aesthetic perfection to the same.

[0025] In as far as connection of the mechanism to side plug means 12 is concerned, a further characteristic, as depicted in Fig. 6, is the annular recession 13 on the surface of plug means 12 wherein precisely fits the basement 17 of the plastic bearing 15 whereupon drum 24 is rotatably mounted, such plastic bearing 15 being provided with a circumferentially spaced arrangement of slots

16 that fit within correspondingly arranged ribs of the internal walls of drum 24.

[0026] It must herein be noted that the description of the invention was made by reference to an illustrative, non-restrictive embodiment. Thus any change or amendment relating to configuration, size, form, precise dimensions, materials and accessories used in the manufacturing and assembling process, as long as they do not constitute a new inventive step, are considered part of the scope and the aims of the invention as briefed in the following claims:

Claims

1. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen (23) that is being wound or unwound on a drum (24) rotatably mounted within a suitable housing on top of a door or window aperture, wherein the mechanism being inserted within one end of drum (24) and being fixedly connected at a side plug means (12) comprises a cylinder (1) containing a fluid mass (11), a shaft (2) equipped with blades rotatably mounted within cylinder (1), means for the engagement of drum (24) with the slowly rotatable within fluid mass (11) shaft (2) so as to control, during the retracting vertical upward movement of the insect-blocking roller screen, the speed of winding thereof onto drum (24) and for the disengagement of shaft (2) from drum (24) so as to allow free deployment in the vertical downward movement of the insect-blocking roller screen, said engagement / disengagement means comprising two members (4, 5), wherein member (5) is provided with radially spaced protrusions that fit onto the interior walls of drum (24) thereby fixedly connecting member (5) with drum (24), **characterized by** that no bolt whatsoever is employed, neither in the linear assembly of parts of the mechanism nor in the mounting of the mechanism onto the side plug means (12), wherein in this respect the mechanism comprises:

a circumferential end annular rib (22a) at the edge of the shaft portion (22) extending through the open outlet of cylinder (1), wherein, following passing of shaft portion (22) through a central aperture (4a', 5a') of members (4, 5) of said engagement/disengagement means and insertion of a spring means (7) around shaft portion (22), said circumferential end annular rib (22a) clips onto an end stabilizing washer means (8) that in the same time constitutes the basement of spring means (7) and comprises a circumferential groove (9) within which fits said circumferential end annular rib (22a) provided at the edge of shaft portion (22) protruding through the open outlet of cylinder (1), thereby effecting a fixed

linear connection of the total of the parts of the mechanism, and

at least one longitudinal slot (19a) along a shaft extension (19) through the closed end of cylinder (1), said at least one longitudinal slot (19a) clipping with at least one rib (14a) of the tube projection (14) of the side plug means (12) thereby effecting mounting of the mechanism onto the side plug means (12).

2. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen according to claim 1, **characterized by** that it further comprises an end cap (10) provided with a recession (10a) within which sits said stabilizing end washer means (8), wherein said end cap (10) clips onto the basement of member (5) of the engagement/disengagement means and covers the same.
3. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen according to claim 1, **characterized by** that the cylindrical portion (4') of member (4) of said engagement/disengagement means has a diameter such as to clip onto a circumferential rib (1a) of the interior wall of cylinder (1) thereby tightly sealing the open outlet of said cylinder.
4. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen according to claim 1, **characterized by** each one of said members (4, 5) of the engagement/disengagement means comprising a cylindrical portion (4'') and (5'') respectively, each such cylindrical portion (4'') and (5'') extending into toothed ends (4a) and (5a) respectively, said toothed ends (4a) and (5a) being engraved at reverse directions, and an outermost cylindrical portion (4') and (5') respectively that has a diameter larger than the corresponding cylindrical portion (4'') and (5''), wherein, during vertical downward deployment movement of the insect-blocking roller screen, the toothed end (5a) of member (5) that follows the rotation of drum (24) rotates in a manner such as to contact the toothed end (4a) of member (4) that remains stationary since it is connected to shaft (2) that does not rotate as long as the insect-blocking roller screen moves in the vertical downward direction, whereby consecutive teeth of member (5) jump over contacting consecutive teeth of member (4) thereby emitting a kind of rattling sound that desirably signals proper function of the mechanism, whilst, when the insect-blocking roller screen (23) moves in the vertically upward retracting direction, the consecutive teeth (5a) of member (5), being rotated in the opposite direction, since member (5) keeps following the rotation of drum (24) in the opposite direction, engage with the teeth (4a) of member (4), thereby initiating rotation of shaft (2) within the fluid

mass (11) of cylinder (1), whereby the speed of rotation of drum (24) and subsequently of the retracting insect-blocking roller screen (23) is decreased and is henceforth being determined by the decelerating mechanism.

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5. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen according to claim 4, **characterized by** that it further comprises a tubular housing (6) for covering toothed cylindrical portions (4") and (5") of the engagement/disengagement means. 10

6. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen according to claim 5, **characterized by** that said tubular housing (6) covering the toothed cylindrical portions (4") and (5") of the engagement/disengagement means constitutes an extension part of either one of the two members (4, 5) of the engagement/disengagement means. 15
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7. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen according to claim 5 or 6, **characterized by** that said tubular housing (6) covering the toothed cylindrical portions (4") and (5") of the engagement/disengagement means has the same diameter as that of said cylinder (1) and fits onto the perimeter of the open outlet of cylinder (1) that is sealed by means of the outermost cylindrical portion (4') of member (4) of said engagement/disengagement means, so that the whole mechanism appears in the form of an integrated cylinder (1, 6) with the outermost cylindrical portion (5') of member (5) provided with the radially spaced protrusions for fitting within drum (24) and the final sealing cap (10) at one end and the shaft extension (19) fitting onto the tube projection (14) of side plug means (12) at the other end thereof. 25
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8. Mechanism for the deceleration of a vertically retracting insect-blocking roller screen according to anyone of claims 1-7, **characterized by** said shaft (2) comprising a pair of blades (2a, 2b) that form a crosslike pattern, each blade having two legs extending up to the internal walls of the cylinder (1) and contacting the same, their fitting within cylinder (1) being such as to potentially come into a slight frictional contact with the walls thereof, wherein blades (2a, 2b) divide the fluid mass contained within cylinder (1) into four discrete chambers, whereby the decelerating mechanism provides combined hydraulic and mechanical damping, the mechanical damping resulting from the slight frictional contact of the ends of blades (2a, 2b) with the walls of cylinder (1), whilst hydraulic damping results from the flow resistance of the fluid contained in said four discrete chambers within cylinder (1) during rotation of shaft (2). 45
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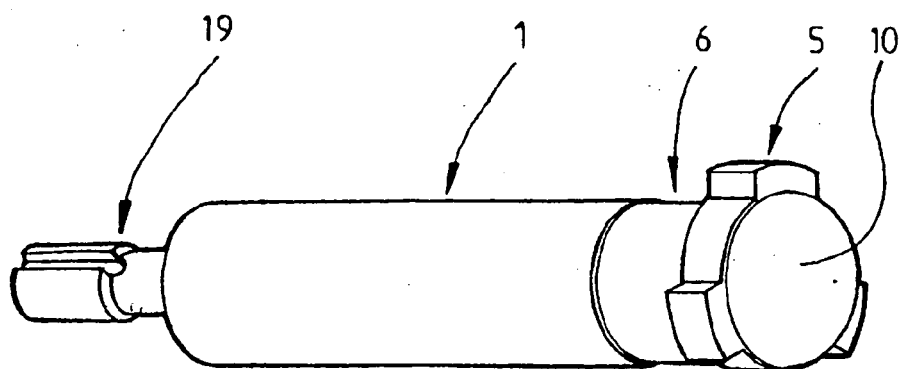


FIG. 1.

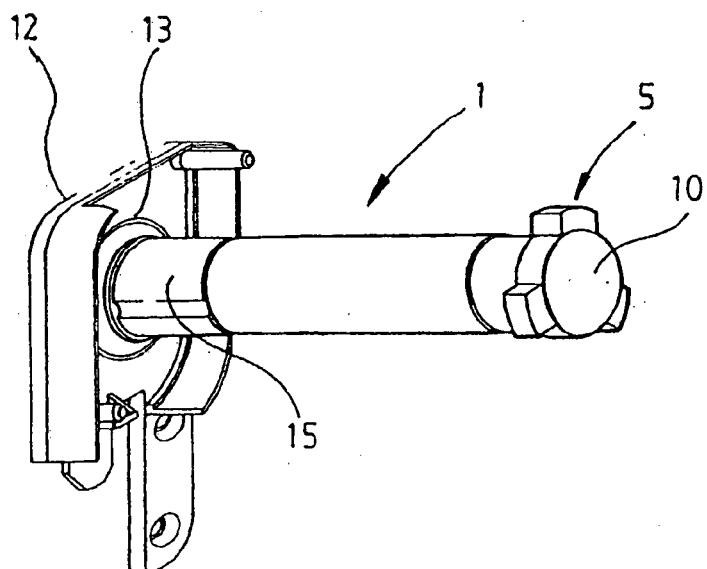


FIG. 2.

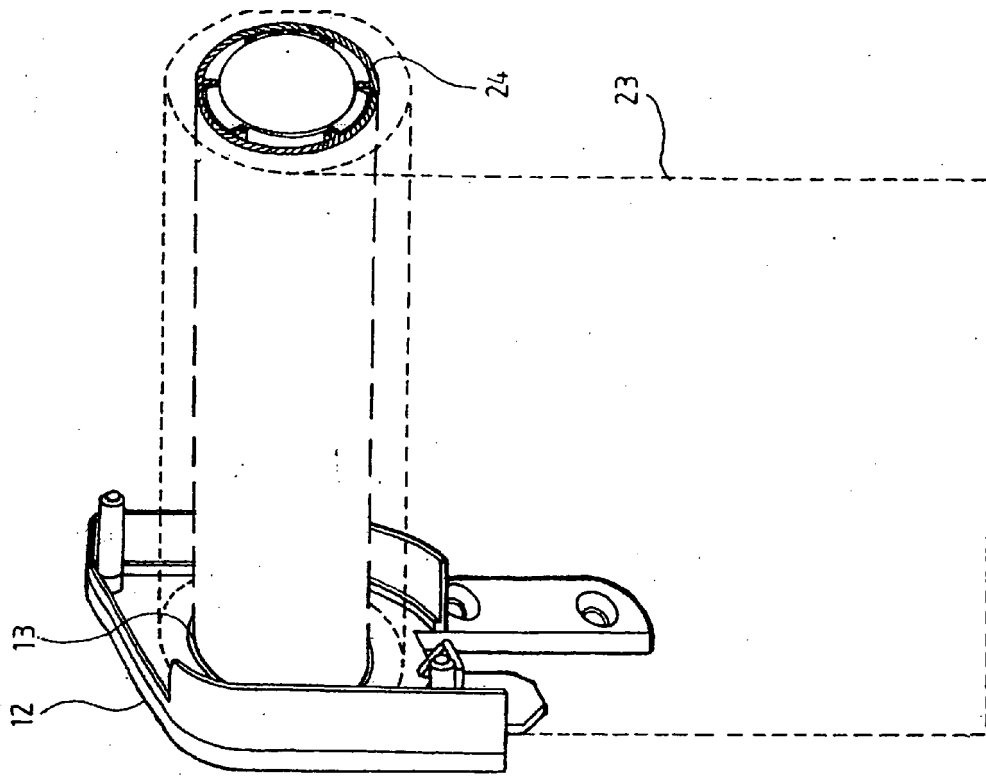


FIG. 5.

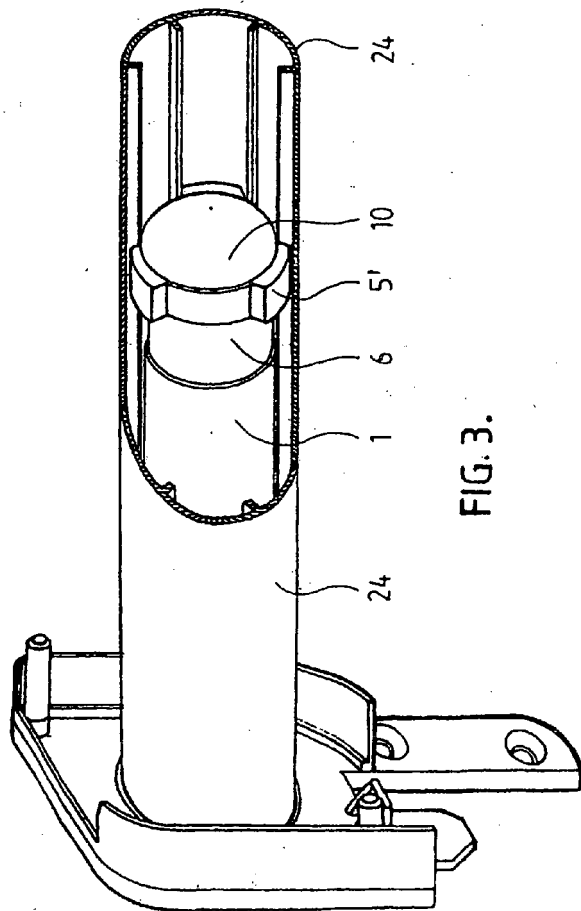


FIG. 3.

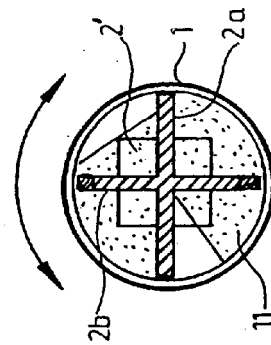


FIG. 4b.

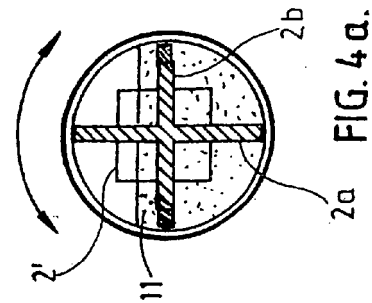
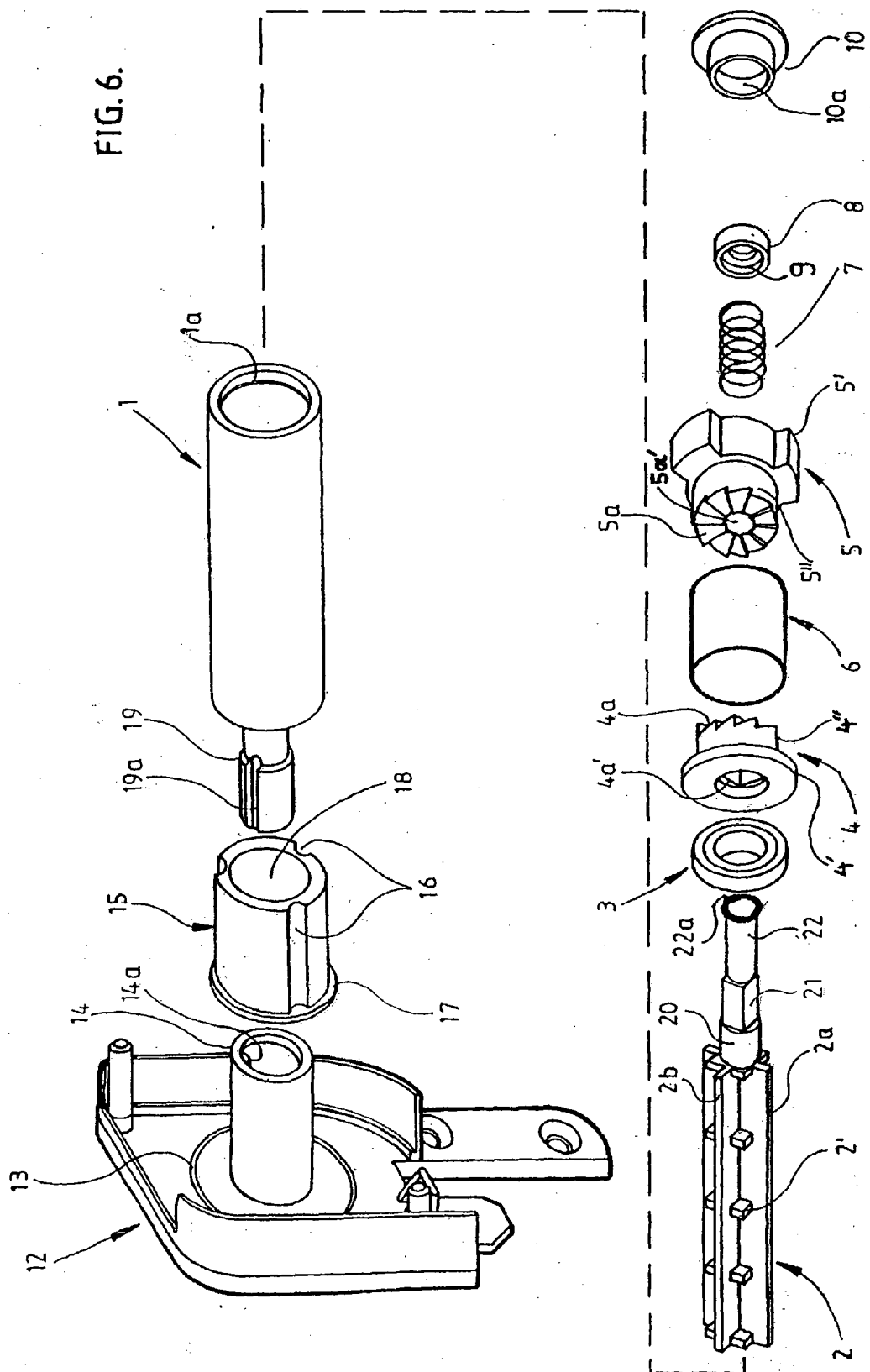


FIG. 4a.



REFERENCES CITED IN THE DESCRIPTION

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