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EP 3 087 240 B1

Description

TECHNOLOGICAL FIELD

[0001] The subject matter of the present application relates to shutter assemblies and, in particular, to a mechanism configured for spacing shutters.

BACKGROUND

[0002] Shutter systems are well known in the art for closing off an opening of a structure, examples of which can include windows, garage doors, shop entrances etc.

[0003] There are various types of shutters and shutter systems, for example, rolling sliding, retracting, stacking, hinging and more.

[0004] Most shutters are also configured for displacement with respect to the opening so that in an open position of the shutters, the majority of the opening is accessible.

[0005] As mobile shutters are displaceable with respect to the opening, there exist a variety of mechanisms configured for providing the shutters with the required displacement (e.g., tracks) and for collecting/storing the shutters in the above open position, or to any of the other directions.

[0006] The collecting and/or storing mechanisms are designed to provide the stacked/stored shutters with a minimal storage space in order to reduce the overall dimensions of a shutter system.

[0007] Two particular examples of such storing mechanisms are a stacking mechanism configured for closely spacing the shutters with respect to one another and a rolling mechanism configured for rolling the shutters on a spool.

[0008] US 7,681,620 to the Applicant discloses a stacking mechanism for shutter members of a shutter mechanism, comprising: a rotatable screw with external thread of length L and pitch P1; a plurality of N traveling nuts mounted on the screw, having internal thread of pitch P1 and external thread of pitch P2, P1 greater than P2; an arrester preventing rotation of the nuts within a length L1 of the screw, while allowing sliding; and a threaded member of pitch P2 adapted to engage the external thread of the nuts within a length L2 of the screw. In a first position of the mechanism, the nuts are arranged over the length L1. Upon rotation of the screw, the nuts slide along the screw at rate P1 per 1 turn, transit from L1 to L2, and then slide within the length L2 at a rate P2 per 1 turn, thereby achieving reversibly a second position of the mechanism where they are arranged over the length L2, L2 being less than L1.

[0009] EP 2 850 260 discloses a nut stacking mechanism for the displacement of slats between a stacking zone and a sliding zone, comprising a spindle, on which a nut is displaceable between the stacking zone and the sliding zone, a rotation stop element, to form in the sliding zone, in the rotational direction of the spindle, an obstacle for the movement of the nut, and a stacking element, to form in the stacking zone, in the longitudinal direction of the spindle, an obstacle for the movement of the nut. The boundary between the stacking zone and the sliding zone is provided displaceably in the longitudinal direction of the spindle by displacement of at least a part of the rotation stop element and the stacking element.

[0010] Acknowledgement of the above references herein is not to be inferred as meaning that these are in any way relevant to the patentability of the presently disclosed subject matter.

GENERAL DESCRIPTION

[0011] According to one aspect of the subject matter of the present application, there is provided a spacing mechanism for a shutter or blind assembly comprising blind slats, the mechanism comprising a drive screw and a plurality of riding modules configured for being mounted thereon and associated with the blind slats, the dynamic spacing mechanism being configured for dynamically changing the distance between riding modules between a first distance and a second distance, said drive screw having a longitudinal axis and being configured for revolving thereabout, and configured for allowing axial displacement of each of the riding modules along an operative portion of length L of the drive screw, said dynamic spacing mechanism further comprising:

- a dynamic guide member, extending, at least in part, parallel to and along the drive screw, configured for engaging at least some of said riding modules so as to allow rotational displacement thereof with respect to the drive screw;
- a restricting arrangement configured for restricting rotational movement of those of the riding modules, which are not engaged with the dynamic guide member, entailing axial movement thereof along the drive screw;

said dynamic guide member being configured for displacement parallel to the longitudinal axis to define various positions of the dynamic guide member with respect to the drive screw, in at least some of which positions, the dynamic guide member has a working portion juxtaposing a part of the operative portion of the drive screw, in which the riding modules are spaced from one another by said first distance, and wherein in the remainder of the operative portion of the drive screw, the riding modules are spaced from one another by said second distance, the length of the working portion of said dynamic guide member varying with said displacement; wherein the spacing mechanism comprises a static module configured for providing engagement between the drive screw and the dynamic guide member, said static module being disposed at an end of the drive screw is in constant engagement with the dynamic guide member.

[0012] The spacing mechanism can also be referred herein as a *'stacking mechanism'*, a *'collecting mechanism'*, a '*gathering mechanism*'.

[0013] In each of the above positions of the dynamic guide member, the working portion can have a different length L2, so that the remainder has a correspondingly varying length L1 so that L = L1 + L2.

[0014] The dynamic guide member can have a first end position in which the length L2 of the working portion is maximal and the length L1 of the remainder is minimal, and a second end position in which the length L2 is minimal and the length L1 is maximal. In particular, $L \geq L1$, $L2 \geq 0$.

[0015] According to a particular example, the dynamic guide member can be configured for assuming a plurality of intermediate positions between the first end position and the second end position.

[0016] In accordance with the above, it is appreciated that the restricting arrangement can be configured for occupying and/or juxtaposing the remainder of the operative portion of the drive screw which is not juxtaposed by the dynamic guide member.

[0017] According to one example, the restricting arrangement can comprise a single restricting member which is configured for displacement along the drive screw. Specifically, when the dynamic guide member axially displaces along the drive screw such that L2 increases in length (a longer portion of the dynamic guide member is juxtaposed with the drive screw), the restriction member correspondingly displaces axially so that L1 decreases in length (a shorter portion of the restriction member is juxtaposed with the drive screw) and vice versa.

[0018] Under the above example, an end of the restriction member is associated with an end of the dynamic guide member so that they displace together during operation of the spacing mechanism.

[0019] According to another example, the restriction arrangement can comprise a first restriction member for fixed positioning with respect to the drive screw and a second restriction member configured for displacement along the longitudinal axis with respect to the first restriction member to define said various positions of the restriction arrangement.

[0020] In particular, the second restriction member can be slidingly displaceable with respect to the first restriction member, so that displacement of the former yields a dynamic overlap between the restriction members, the length of said overlap varying according to said displacement.

[0021] The arrangement can be such that and end of the second restriction member can be associated with an end of the dynamic guide member, so that axial displacement of the dynamic guide member entails corresponding axial displacement of the second restriction member.

[0022] In this connection, said first restriction member can span a length L_{FIRST} (for example, a length equivalent to the minimal length of L1 when the dynamic guide member is in its first end position) and said second restriction member can have a length L_{SECOND}, so that $L1 = L_{FIRST} + L_{SECOND}$. Thus, the second restriction member can be divided into a first length L_{SECOND_1}, which is in overlap with the first restriction member and a second length L_{SECOND_2} which is not in overlap, so that $L_{SECOND} = L_{SECOND\_1} + L_{SECOND\_2}$, the lengths L_{SECOND_1}, L_{SECOND_2} varying depending on displacement of the second restriction member and its position along the drive screw.

[0023] Under the above arrangement, in the first end position of the dynamic guide member, there is a maximal overlap (L_{SECOND} 1, at the most) between the second restriction member and the first restriction member, and the end of the dynamic guide member is closest to an end of the first restriction member. Correspondingly, in the second end position of the dynamic guide member, there is a minimal overlap (zero at the least) between the second restriction member and the first restriction member.

[0024] Thus, at any given position of the dynamic guide member, the operative length L of the drive screw can be juxtaposed such that $L = L_{FIRST} + L_{SECOND\_2} + L2$.

[0025] In addition, according to another example of the present application, the second restriction member can also be in the form of a flexible chain comprising a plurality of restricting elements configured to form together a rigid-like restricting member. In particular, the arrangement can be such that when the elements of the second restriction member are linearly aligned they form together a combined structure similar to the above mentioned rigid second restriction member.

[0026] The chain-like structure of such a restriction member can allow it to be rolled/folded/wrapped thereby allowing a more space-efficient configuration. Specifically, the arrangement can be such that the elements of the restriction member are slidable along a rail having a front portion juxtaposed with the drive screw and a rear portion, wherein those elements located at the front portion mimic the restriction member, while the remainder of the elements are disposed on the rear portion.

[0027] According to the above design, the chain-like restricting member can have a first portion which is linear and effectively operates as a rigid restricting arrangement, i.e., engaged with the riding modules to prevent them from revolving (yielding their traveling along the drive screw) and a second portion which is at least angled to the first portion (can even be rolled/folded/wrapped with respect therewith) which is inoperative. The interface between the two portions can be rounded, angled etc.

[0028] Thus, when a riding module reaches the end of the first restriction member it is required to transfer over to the chain elements of the second restriction member, which would take place over the interface between the two portions of the chain-like second restriction member. In order to allow the above mentioned transfer, a bridge element can used, overlapping said interface so that once a riding module leaves the bridge element, it transfers to the first, operative portion of the second restriction arrangement.

[0029] Each of the elements of the chain-like restricting member can be formed, at one axial end thereof with a male part and at the other, opposite axial end thereof with a female port so that two neighboring elements, once linearly aligned, can be engaged via a male-female connection. This arrangement can facilitate more accurate centering and alignment of the elements.

[0030] The spacing mechanism can be such that the external thread of the drive screw has a pitch P_1 and the dynamic guide member has a pitch $P_2 < P_1$.

[0031] In addition, the drive screw can be mechanically engaged with the dynamic guide member in such a way that, in operation, revolution of the drive screw in a predetermined direction facilitates displacement of the riding modules along the drive screw in a first direction along the longitudinal axis thereof and simultaneous displacement of the dynamic guide member in a second, opposite direction. Furthermore, engagement of those of the riding modules which have travelled sufficiently along the drive screw to become engaged with the dynamic guide member, further facilitate its displacement along the longitudinal axis.

[0032] According to a particular example, the engagement between the drive screw and the dynamic guide member can be provided by a static module disposed at an end of the drive screw and which is in constant engagement with the dynamic guide member.

[0033] The static module can be affixed to a predetermined location on the drive screw (usually at an end thereof) and configured for revolving together with the drive screw. Thus, revolution of the drive screw entails revolution of the static module, which, in turn, causes displacement of the dynamic guide member. In this sense, the revolution of the drive screw both drives the riding modules along the screw as well as, simultaneously, controlling the dynamic guide member. This yield a very convenient synchronization between the traveling of the riding modules in one direction along the screw and the displacement of the dynamic guide member in the opposite direction.

[0034] In accordance with a particular example, the static module can be engaged directly with the dynamic guide member. In addition, the static module can be designed essentially similar to the riding modules, i.e., mimicking a thread and having, in combination with the remainder of the modules, the same pitch P_2 corresponding to the pitch of the dynamic guide member.

[0035] Thus, in each given position of the dynamic guide member, those of the riding modules which are not engaged with the dynamic guide member has a distance S_1 from the consecutive riding module, corresponding to pitch P_1 of the drive screw, and those of the riding modules which are engaged with the dynamic guide member have a spacing S_2 therebetween, corresponding to pitch P_2 of the dynamic guide members.

[0036] The dynamic guide member can be of a linear design, in which it extends parallel to the drive screw. In addition, said dynamic guide member can comprise a flexible chain constituting said portion, the chain in turn comprising a plurality of engagement elements configured for mimicking a portion of an internal thread.

[0037] The dynamic guide member can comprise a guide support having a front track facing said drive screw and a rear track facing away from the drive screw, and wherein said flexible chain is engaged with both tracks and can travel therealong to assume a position in which at least a portion thereof which is not juxtaposed with the drive screw extends along the rear support surface.

[0038] Under the above example, in a first end position of the dynamic guide member in which its overlap with the drive screw is minimal in length, the length of the portion of the dynamic guide member disposed along the rear track is maximal, while in a second end position in which its overlap with the drive screw is maximal in length, the length of the portion of the dynamic guide member disposed along the rear track is minimal.

[0039] Each riding module can be formed with a recess configured for receiving therein a ridge of the restricting arrangement, thereby preventing revolution of the ride modules, causing their travel along the drive screw. It is also appreciated that the external thread of each riding module is of greater diameter than its body. In order for the engagement between the riding modules and the restricting arrangement not be only by the thread itself (which may cause wear of the riding modules), i.e., a recess of deapth **h**, a deeper recess of depth **H** can be used within the body of the riding module itself.

[0040] In operation, when each riding module transfers from being engaged with the restricting arrangement and the dynamic guide member, the ridge of the restricting arrangement should first be completely extracted from the recess to allow the riding module to revolve.

[0041] Thus, in accordance with one example of the present application, the restricting arrangement can comprise a transition member having a ridge with a first height **H** at an end closer to the restricting arrangement and a second height **h** < **H** closer to the dynamic guide member, and including a relief portion of height h or less in which the body of the riding module is not engaged with the ridge, but rather only the thread or a portion thereof.

[0042] The transition member is designed so that the axial length of the relief portion is at least equal to the axial dimension of the riding module so that when a first end of the riding module eventually engages with the dynamic guide member, it is assured that the body at a second, opposite end thereof is not in engagement with the restricting arrangement.

[0043] The above design allows, on the one hand, a robust engagement between the riding modules and the restricting arrangement (especially for long operative portions), and, on the other hand, a smooth transition of the riding module between the restricting arrangement and the dynamic guide member.

[0044] In accordance with a particular example of the present application, the spacing mechanism can comprise both a chain-like restricting arrangement and a chain-like dynamic guide-member which are slidable along a mutual rail structure. In particular, the rail structure can define a closed contour having a front portion juxtaposed with the drive screw and a rear portion facing away from the drive screw. The arrangement can be such that said restricting arrangement and said dynamic guide-member can be linked in order to mutually slide along the closed contour, thereby varying, for each of them the effective length facing the drive screw.

[0045] The articulation between the restricting arrangement and said dynamic guide-member can be a flexible arrangement, allowing for compensation on tolerances and alignments of both the former and the latter. More specifically, the articulation can be constituted by an articulation unit which can axially expand/contract to change its axial length within a predetermined limit. Examples of such an articulation unit can be a spring, a rubber-band like arrangement etc.

[0046] In other words, for each position, the dynamic guide member has a portion of length $L_{D\text{-}Front}$ facing the drive screw and a portion of length $L_{D\text{-}rear}$ facing away from the drive screw, and the restricting arrangement has also a portion of length $L_{R\text{-}Front}$ facing the drive screw and a portion of length $L_{R\text{-}rear}$ facing away from the drive screw. The arrangement can be such that $L_{D\text{-}Front} + L_{R\text{-}Front} = L_{D\text{-}Rear} + L_{R\text{-}Rear} = C$ (a constant).

[0047] According to another aspect of the subject matter of the present application there is provided a shading system comprising a plurality of slats configured for at least partially covering an opening of a wall or structure, said slats being configured for assuming a first, closed position characterized by a first spacing between the slats and in which said opening is maximally covered by the slats, and a second open position characterized by a second spacing between the slats, smaller than the first, and in which said opening is minimally covered by the slats, each of the slats being associated with a riding module of the dynamic spacing mechanism of the previous aspect.

[0048] The slats can be configured for axial displacement along the drive screw together with its respective riding module. In addition, the shading system can further comprise a tilting arrangement configured for tilting each of the slats about an axis transverse to the longitudinal axis of said drive screw.

[0049] Each of the slats can have a front surface, wherein in said first, closed position the front surfaces of the slats of the shading system are oriented generally parallel to the plane of the opening to be covered, and in said second, open position, the front surfaces of the slats of the shading system are oriented generally perpendicular to the plane of the opening to be covered.

[0050] In addition, a shading system can comprise a first support and a second support, each comprising a spacing mechanism according to the previous aspect of the present application. The slats can extend between the first and the second support member. Each slat can have at one end thereof, associated with the first support, a first riding module and at another end thereof, associated with the second support, a second riding module. The first riding modules can be configured for traveling along the first spacing mechanism and the second riding modules can be configured for traveling along the second spacing mechanism.

[0051] The first spacing mechanism and the second spacing mechanism are driven by a first motor and a second motor respectively, which may be electronically synchronized in order to maintain a permanent relative alignment between the slats, i.e., preventing one end of the slat from traveling faster/slower along its respective drive screw than the other end thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0052] In order to better understand the subject matter that is disclosed herein and to exemplify how it may be carried out in practice, embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Fig. 1A is a schematic isometric view of a blind system according to the subject matter of the present application, shown in a closed position thereof;

Fig. 1B is a schematic isometric view of the system of Fig. 1A, shown in an open, deployed position thereof;

Fig. 1C is a schematic front view of the system shown in Fig. 1B;

Fig. 1D is a schematic isometric view of the system of Figs. 1A to 1C, shown in an open, retracted position thereof;

Fig. 1E is a schematic enlarged view of a top portion of the system shown in Figs. 1A to 1D;

Fig. 2A is a schematic isometric view of main components of the system shown in Figs. 1A to 1E;

Figs. 2B to **2D** are schematic enlarged views of respective details A to C shown in Fig. 2A;

Figs. 3A to **3F** are schematic front views of the system shown in Figs. 2A to 2D, in six consecutive positions thereof;

Figs. 4A to **4F** are schematic enlarged views of respective details D to I shown in Figs. 3A to 3F;

Fig. 5A is a schematic isometric view of a dynamic guide member employed in the system shown in Figs. 1A to 4E;

Fig. 5B is a schematic front view of the dynamic guide member shown in Fig. 5A;

Figs. 6A to **6D** are schematic isometric views of consecutive stages of operation of the blind system of Figs. 1A to 5B, corresponding to the stages shown in Figs. 3B to 3E;

Figs. 7A and **7B** are schematic isometric and side views of another example of a spacing mechanism according to the present application, with portion of the mechanism being stripped away for clearer representation;

Figs. 8A to **8C** are schematic enlarged views of details I, J and K shown in Figs 7A and 7B;

Fig. 9 is a schematic isometric view of a shading system comprising a spacing mechanism according to another example of present application;

Fig. 10 is a schematic side view of a portion of the spacing mechanism used in the shading system shown in Fig. 9;

Fig 11A is a schematic front view of the spacing mechanism shown in Fig. 10;

Figs. 11B and **11C** are schematic enlarged isometric views of portions of the spacing mechanism shown in Fig. 11A;

Fig. 12A is a schematic enlarged isometric side view of a riding module of the spacing mechanism shown in Figs. 11A to 11C; and

Fig. 12B is a schematic isometric view of several riding modules engaged with the spacing mechanism shown in Figs. 11A to 11C.

DETAILED DESCRIPTION OF EMBODIMENTS

[0053] Attention is first drawn to Figs. 1A to 1D, in which a blind system is shown generally designated as 1, configured for closing of an opening (not shown) in a wall or a structure. The blind system 1 comprises a guide assembly 2 and a plurality of blind slats 3a to 3e, configured for displacing along the guide assembly (main axis X_M) and tilting about respective axes thereof Xa to Xe.

[0054] In the position shown in Fig. 1A, the blind system 1 is in a closed position thereof, in which the blind slats 3a to 3e are shown deployed along the guide assembly 2 and tilted about their axes Xa to Xe such that the surface of the slat is oriented generally along the plane of the opening, so as to form a continuous surface configured for closing off the opening. In this position, it is noted that the slats 3a to 3e are spaced from one another at a distance S1 corresponding to the width W of the slats.

[0055] In the position shown in Figs. 1B and 1C, the blind system 1 still in a deployed position thereof, however, the slats are now tilted about their axes Xa to Xe so that the surface thereof is now perpendicular to the main axis X_M and to the plan of the opening. In this position, the slats 3a to 3e are still spread out and spaced from one another, but no longer form a continuous surface obstructing the opening.

[0056] In the position shown in Fig. 1D, the blind system 1 is in an open, retracted position, in which the slats 3a to 3e are closely spaced at a top portion of the guide assembly 2, with a distance S2 therebetween, S2 << S1, completely clearing the opening and providing full access therethrough.

[0057] With reference to Fig. 1E, the guide assembly 2 comprises a drive shaft 5 (shown here without explicit display of the external thread thereof) extending along the main axis X_M operated by a motor M, and a restriction arrangement 30 extending along the drive shaft 5 and having mounted thereon a dynamic guide member 50 (also referred herein as 'a movable comb').

[0058] The slats 3a to 3e are articulated to the drive shaft 5 via riding modules configured for displacing along the drive shaft 5 and allowing tilting of the slats 3a to 3e about their respective axes Xa to Xe.

[0059] Attention is now drawn to Fig. 2A in which the main components of the blind system 1 are shown: the motor M, the drive shaft 5, the restriction member 30, the dynamic guide member 50 and riding modules 20a to 20e, configured for traveling up and down along the drive shaft 5. The modules 20a to 20e will be used to demonstrate here the dynamic spacing between the respective slats 3a to 3e.

[0060] In the position shown in Fig. 2A (equivalent to the position shown in Figs. 1A to 1C), the riding modules 20a to 20e are evenly spaced along the drive shaft 5 at a spacing S1 therebetween.

[0061] With reference to Fig. 2B, the dynamic guide member 50 is constituted by a plurality of links 52, mimicking a portion of a thread 54 creating a pitch P2. The dynamic guide member 50 is slidingly mounted over a top member 60, having a front side facing the drive shaft and a rear side facing away from the drive shaft with a curved bend portion 66 at a top end thereof. It is observed that the dynamic guide member 50 is bent about the bend portion 66 thereof so that it also has a front portion extending along part of the front side of the top member 60 and a rear portion extending along part of the rear side of the top member 60.

[0062] In addition, it is observed that the system 1 further comprises a base module 20_0 (also referred herein as a 'static module') which is engaged with the front portion of the dynamic guide member 50. The base module 20_0 is axially fixed, i.e., not configured for traveling along the drive shaft 5, and serves for facilitating sliding of the dynamic guide member 50 along the top member 60. Thus, module 20o is always engaged with the dynamic guide member.

[0063] It is also noted that the base module 20_0 is mimicked to have a design similar to that of the other riding modules, and that its thread, through which it is engaged with the dynamic guide member 50, is of the same pitch as the threads of all other riding modules 20a to 20e.

[0064] Turning now to Fig. 2C, it is noted that each of the riding modules 20a to 20e comprises a main body 22, a threaded mounting bore 24 configured for engagement with the drive shaft 5, an external thread portion 26 configured for engagement with the dynamic guide member 50 and a slot 28 configured for engagement with the restriction member.

[0065] In general, and as will be explained in detail with respect to Figs. 3a to 3e, the engagement between the riding modules 20a to 20e with the restriction member 30 (via the slot 28) prevents rotation thereof about the main axis X_M, whereby revolution of the drive shaft 5 entails displacement of the riding modules 20a to 20e along the drive shaft 5. Once the slot 28 is disengaged from the restriction member 30, the modules are free for revolving about the shaft 5, thereby halting displacement thereof along the drive shaft 5.

[0066] In particular, as shown in Fig. 2C, the restriction arrangement comprises a sliding arresting member 70 having a main body 72. The sliding arresting member 70 is configured for sliding along the restriction member 30 and for engaging at least some of the riding modules. The sliding arresting member is fixedly attached to the dynamic guide member 50 and configured for displacing up and down parallel to the main axis X_M together with the dynamic guide member 50. In the specific position shown in Fig. 2C, the slot 28 of the module 20a is engaged with a sliding arresting member 70.

[0067] With reference to Fig. 2D, the second riding module 20b is shown mounted over the drive shaft 5 and having its slot 28 engaged with an arresting portion 36 of the restriction arrangement 30. In this position, a bottom end 74 of the sliding arresting member 70 can be observed, disposed between the first and second riding modules 20a, 20b.

[0068] Attention is now drawn to Figs. 3A to 4F, showing six consecutive stages of operation of the blind system 1, in particular, from a fully deployed position to a fully retracted position.

[0069] In the position shown in Figs. 3A, 4A, the riding modules 20a to 20e are shown evenly spaced along the drive shaft 5 at a spacing S1 therebetween. The first module 20a is prevented from rotation via engagement with the sliding arresting member 70 and the remaining modules 20b to 20e are prevented from rotation via engagement with the arresting member 36 of the restriction arrangement 30.

[0070] From the above position, and since all the riding modules 20a to 20e are prevented from rotation about the drive shaft 5, rotation of the drive shaft 5 by the motor M entails upward displacement of the riding modules 20a to 20e therealong.

[0071] Simultaneously, the base module 20_0, which is engaged with the mimicked thread 54 of the dynamic guide member 50 and is not restricted from rotation (it revolves together with the drive screw) pulls on the dynamic guide member 50 and displaces it downwards. Under such sliding displacement, links 52 displace to the front side of the top member 60, so that, in effect, the front portion of the dynamic guide member increases in length, while its rear portion decreases in length.

[0072] The above operation takes place until the first riding module 20a meets the dynamic guide member 50 and engages the first link 52a thereof as shown in Figs. 3B, 4B. In this position, the first riding module 20a is disengaged from the sliding arresting member 70 and is free for revolving about the drive shaft 5, yielding a halt in its upward displacement. In other words, once the upward moving riding module 20a encounters the downward moving front portion of the dynamic guide member 50, it halts its upward displacement, fixing it at a spacing S2' << S1 with respect to the base module 20_0.

[0073] From this position, revolution of the drive shaft 5 about its axis X_M yields the following: on the one hand, the riding modules 20_0 and 20a, now engaged with the dynamic guide member 50 revolve in place along with the drive shaft 5, entailing further downward displacement of the dynamic guide member 50. On the other hand, the remaining modules 20b to 20e, which are still engaged with the arresting member 36 or sliding arresting member 70, are prevented from rotation and therefore continue their upward displacement along the drive shaft 5.

[0074] This displacement continues until the second riding module 20b encounters the first link 52a of the dynamic guide member 50, as shown in Figs. 3C, 4C. In this position, the front portion of the dynamic guide member 50 is constituted by links 52a to 52h, wherein the base module 20_0 is engaged with the link 52g and the first module 20a is engaged with the link 52d. As observed, the spacing between the modules 20a and 20b is S2, while the spacing between the modules 20b through 20e is still S 1.

[0075] As the revolution of the drive shaft 5 continues, the three modules 20_0, 20a and 20b, now engaged with the dynamic guide member 50 revolve in place along with the drive shaft 5, entailing further downward displacement of the dynamic guide member 50. Simultaneously, the remaining modules 20c to 20e, which are still engaged with the arresting member 36 or sliding arresting member 70, are prevented from rotation and therefore continue their upward displacement along the drive shaft 5.

[0076] Each time a riding module encounters the first link 52a of the dynamic guide member 50 it halts its displacement and the remaining riding modules keep displacing upwards until all modules are 'collected' one by one at the higher portion of the drive screw.

[0077] As shown in the penultimate position of Figs. 3E, 4E, four of the riding modules are at the top of the drive screw with a spacing S2 therebetween. In addition, the dynamic guide member 50 is nearly fully displaced towards the front side of the top member 60.

[0078] Further revolution of the drive screw the spacing mechanism reaches the position shown in Figs. 3F, 4F, in which all the riding modules are now collected at the top of the drive screw and the dynamic guide member is now fully deployed).

[0079] It is observed that although all the riding modules 20a to 20e are equally spaced from one another at a distance S_2, the disposition of the threaded portion thereof is not identical, i.e., the riding modules can assume different angular positions about the central axis of the drive screw with respect to one another. This, in fact, bears no significance on the mechanism so long as the threads are properly engaged with the links 52 of the dynamic guide member.

[0080] It is noted that the spacings S1 and S2 are codependant, i.e., the even spacing S2 between all the modules results from an initial even spacing S1 at which the modules were originally mounted onto the drive shaft. In other words, even spacing of the modules in the deployed position yields and even spacing of the modules in the retracted position and vice versa.

[0081] In addition, the ratio between the spacing S1 and the spacing S2 is predetermined and can be given, for example, by the following formula:

$$S1 = \frac{S2(P1+P2)}{P2}.$$

[0082] As shown in Figs. 5A and 5B, the dynamic guide member 50 is formed as a chain constituted by links 52a to 52s, which are articulated to one another in a pivotal engagement. It is also observed that each of the links 52a-52s comprises a thread tooth which is configured so that several links of the same kind mimic the form of a portion of an internal thread.

[0083] It should be noted that since the guide member 50 is made of links, the length thereof can be changed by adding link thereto or subtracting links therefrom (whereby the length of the guide member is increased and decreased respectively), according to the requirement of the shutter system 1. For example, if the system comprises ten riding modules (and not five as described above), links can be added to meet this requirement.

[0084] When switching from the retracted position (Figs. 3F, 4F) back to the deployed position (Figs. 3A, 4A), the drive shaft 5 is revolved in the opposite direction, whereby the entire process repeats itself in reverse order.

[0085] In particular, upon such revolution, the dynamic guide member 50, engaged with the modules 20_0 to 20e is displaced upwards until the link 52a disengages from the thread portion 26 of the last riding module 20e. At this point, the riding module 20e becomes engaged with the sliding arresting member 70, preventing its rotation about the axis X_M. As a result, the riding module 20e now begins downward displacement along the drive shaft 5.

[0086] Upon further revolution of the drive shaft 5, the link 52a reaches the riding module 20d, and then disengages it. At this point, the spacing between riding module 20d and riding module 20e is now again S1, and the riding modules 20d, 20e, both being engaged with the sliding arresting member 70 and arresting member 36 respectively, continue to travel together along the drive shaft 5, the spacing between them remaining fixed at S1.

[0087] This process continues until the next riding module, 20c, disengages from the dynamic guide member 50 and follows the same process, and so on, yielding a fixed spacing S1 between all modules 20a to 20e, when disengaged from the dynamic guide member 50. In this essence, the dynamic guide member 50 also serves as a timing mechanism for gradual, continuous releasing of the riding modules 20a to 20e.

[0088] Turning now to Figs. 6A to 6D, the blind system 1 is shown in consecutive stages of operation thereof, corresponding to the stages of Figs. 3A to 4F. As each of the slats 3a to 3e is associated with a riding module 20a to 20e respectively (, the slats also follow the same displacement pattern as described above.

[0089] Attention is now drawn to Figs. 7A and 7B, in which another example of the spacing mechanism in presented. In particular, the mechanism shown in these figures includes a dynamic guide arrangement 150 and a dynamic restricting arrangement 170 mounted on a mutual rail support 160 extending between a top at bottom end 161T, 161B respectively.

[0090] As observed, the dynamic guide arrangement 150 comprises a plurality of links 152a to 152q and is mounted on the rails 162 in a manner similar to the previously described dynamic guide member 50.

[0091] However, in the present example, the restricting arrangement is also dynamic and also comprises a plurality of links 172a to 172r, which are also mounted on the rails 162.

[0092] The articulation between the dynamic guide member 150 and the dynamic restricting arrangement 170 is such that the last link 152q of the dynamic guide member (shown positioned at the rear of the rail support 160) is articulated to the first link 172a of the dynamic restricting arrangement 170 using a spring arrangement 180.

[0093] Thus, both the dynamic guide member 150 and the dynamic restricting arrangement 170 are free to travel along the closed contour of the rail support 160 so that in each position, each of them has a first portion at a front of the rail support (show here to be the left side) and a second portion at a rear of the rail support (show here to be the right side), while the mutual combined length of them together remains the same.

[0094] Turning now to Figs. 8A to 8C, it is noted that each link 172 of the restricting arrangement 170 comprises a body having two side walls 175 defining therebetween a recess 173, and two peripheral wings 177. In addition, each link 172 has, at a first end thereof a male part 171 and, at a second end thereof, a female port 179, so that when two or more links 172 are linearly aligned (as shown, for example, in Fig. 8C), the mutual male/female part and port engage one another, thereby facilitating a more accurate alignment and centering between the links 172.

[0095] Turning now to Figs. 9 and 10, a shading system generally designated 101 is shown comprising two supports 102 with a plurality of slats 103 extending therebetween. Each of the supports 102 comprises a spacing mechanism as shown in Fig. 10 and generally designated 150'.

[0096] In principle, the spacing mechanism 150' is essentially similar to the spacing mechanism 150 previously described, with the sole difference of it being considerably longer. As will be shown in detail later, the spacing mechanism 150' comprises a considerably greater number of links 152' and 172' of the dynamic guide member and dynamic restriction member than shown in the previous example.

[0097] With particular reference being made to Fig. 10, each spacing mechanism comprises a motor X_M (only the right spacing mechanism is shown), configured for driving the drive screw and causing the riding modules to travel therealong during its revolution.

[0098] Attention is now drawn to Fig. 11A, in which only that portion of the drive screw 105 is shown which is juxtaposed with the spacing mechanism 150'. As observed, both the dynamic guide member 150' and the dynamic restricting arrangement 170' of the spacing mechanism are extremely long, and the latter is shown with seven riding modules, 120a to 120g being engaged therewith. The riding modules 120a to 120g are loosely spaced from one another and are not yet stacked.

[0099] It is also observed that at the top of the drive screw there is positioned a static module 120_0 which is fixed to the drive screw similar to base module 20_0 previously described.

[0100] In operation, during revolution of the drive screw 105, the corresponding riding modules 120a to 120z of slats 103a to 103z of the shading system 101 begin traveling along the drive screw 105. Modules 120h to 120z (not shown) are engaged with a static portion of the restricting arrangement (not shown) while the modules 120a to 120g are engaged with the dynamic restricting arrangement 170'. Both the static portion of the restricting arrangement and the dynamic restricting arrangement 170' assume a collinear position wherein the engagement prevents the riding modules 120a to 120z from revolving, urging them to travel up the drive screw 105.

[0101] With additional reference being made to Figs. 11B to 12B, in operation, revolution of the drive screw 105 also entails revolution of the static module 120_0. Since the static module 120_0 is directly engaged with the links 152' of the dynamic guide member 150', revolution of the static module 120_0 entails downward pulling of the dynamic guide member 150' chain.

[0102] However, as previously described, the dynamic guide arrangement 150' and the dynamic restricting arrangement 170' are articulated via a spring 182, whereby downward displacement of the dynamic guide member 150' chain at the front portion of the rail support 160' entails upward displacement of a portion of the dynamic restricting arrangement 170' at a rear portion of the rail support 160'. At each end of the rail support 160', a respective axle is provided 166, 164 allowing this smooth sliding of the links along the rail.

[0103] As a result, while each riding module travels upwards along the drive screw 105, it reaches an end of the dynamic restricting arrangement 170' (see Fig. 11C), and gradually transitions over to become engaged with the links 152' of the dynamic guide member 150'.

[0104] This process continues, similarly to that described with respect to Figs. 3A to 4F, until the chain of the dynamic guide member 150' fully occupies the front portion of the rail support 160' and engages with the riding modules 120a to 120z and the dynamic restricting arrangement fully occupies the rear portion of the rail support 160' and is completely disengaged from the riding modules 120a to 120z.

[0105] Two additional features will now be described with respect to the present example, making reference to Figs. 7A and 11C, and 11B respectively.

[0106] As shown in Figs. 7A and 11C, the dynamic restricting arrangement 170' comprises, at a top end thereof, a transition member 174 (shown in Fig. 7A but similar to that shown in Figs. 11C and 12A), which serves as a transition link between the dynamic restricting arrangement 170 and the dynamic guide member 150, 150'.

[0107] In particular, especially for long rails as in the shading system of Fig. 9, it is desired that the engagement between the riding modules 120 and the restricting arrangement 170, 170' is as robust as possible. For this purpose, the recess 128 formed in the riding modules 120 is very deep and extends radially towards the center of the riding module beyond the dimension of the thread 126, into the body 122.

[0108] However, in order to provide for a smooth transition of the riding modules 120 in their engagement from the restricting arrangement 170 to the dynamic guide member 150, the transition member 174 comprises an elevated portion of a height corresponding to the depth of the recess 128, and a second portion 176, which is of a lower elevation, configured for occupying only that portion of the recess 128 associated with the thread 126.

[0109] Thus, when a riding module 120 approaches the end of the dynamic restricting arrangement 170, it gradually disengages from the first portion 174 leaving it in engagement only via its thread. Thereafter, upon further travel along the drive screw 105, it encounters the dynamic guide member 150 and the thread of the riding module engages it.

[0110] The above design allows, on the one hand, a robust engagement between the riding modules and the restricting arrangement, and/ on the other hand, a proper transition of the riding module into engagement with the dynamic guide arrangement 150.

[0111] Additional reference is now made to Fig. 11B, in which the bottom portion of the dynamic restricting arrangement is shown, comprising a bridge member 192. As observed, the bridge member 192 overlaps the links 172 of the bottom portion of the dynamic restricting arrangement 170', so that when a riding module 120 reaches that point, it is not required to engage with links 172 which are not linearly aligned. Rather, the bridge member 192 has such an overlap that when the riding module disengages from the bridge member 192 it encounters already linearly aligned links 172' dynamic restricting arrangement 170'.

[0112] Finally, reverting to Fig. 9, it is noted that each of the supports 102 comprises a spacing mechanism and a motor X_M. The shading system further comprises an electronic controller and control unit (not shown) configured for synchronizing the operation of the two motors, making sure that the slats remain aligned (i.e., that both ends of the slats travel at the same speed and maintain the same position with respect to one another).

[0113] Those skilled in the art to which this invention pertains will readily appreciate that numerous changes, variations, and modifications can be made without departing from the scope of the invention, as defined by the appended claims.

Claims

1. A dynamic spacing mechanism (2) for a shutter or blind assembly comprising blind slats, the mechanism comprising a drive screw (5) and a plurality of riding modules (20_a, 20_b, 20_c, 20_d, 20_e) configured for being mounted thereon and associated with the blind slats, the dynamic spacing mechanism (2) being configured for dynamically changing the distance between riding modules between a first distance and a second distance (S1, S2), said drive screw (5) having a longitudinal axis (X_M) and being configured for revolving thereabout, and configured for allowing axial displacement of each of the riding modules along an operative portion of length L of the drive screw, said dynamic spacing mechanism (2) further comprising:

    - a dynamic guide member (50) extending, at least in part, parallel to and along the drive screw (5), configured for engaging at least some of said riding modules so as to allow rotational displacement thereof with respect to the drive screw (5);
    - a restricting arrangement (170) configured for restricting rotational movement of those of the riding modules, which are not engaged with the dynamic guide member, entailing axial movement thereof along the drive screw;

    said dynamic guide member being configured for displacement parallel to the longitudinal axis to define various positions of the dynamic guide member with respect to the drive screw, in at least some of which positions, the dynamic guide member has a working portion juxtaposing a part of the operative portion of the drive screw, in which the riding modules are spaced from one another by said first distance, and wherein in the remainder of the operative portion of the drive screw, the riding modules are spaced from one another by said second distance, the length of the working portion of said dynamic guide member varying with said displacement;
    characterized in that the spacing mechanism comprises a static module (20_0) configured for providing engagement between the drive screw (5) and the dynamic guide member (50), said static module being disposed at an end of the drive screw (5) is in constant engagement with the dynamic guide member (50).

2. The dynamic spacing mechanism (2) according to Claim 1, wherein the static module (20_0) is affixed to a predetermined location on the drive screw (5) and configured for revolving together with the drive screw (5).

3. The dynamic spacing mechanism (2) according to Claim 2, wherein revolution of the drive screw (5) entails revolution of the static module (20_0), which, in turn, causes displacement of the dynamic guide member (50).

4. The dynamic spacing mechanism (2) according to any one of the preceding claims, wherein the static module (20_0) is engaged directly with the dynamic guide member (50).

5. The dynamic spacing mechanism (2) according to any one of the preceding claims, wherein the static module (20_0) is of a similar design to that of the riding modules.

6. The dynamic spacing mechanism (2) according to any one of the preceding claims, wherein the static module (20_0) has a thread with the same pitch P_2 corresponding to that of the dynamic guide member.

7. The dynamic spacing mechanism (2) according to any one of the preceding claims, the restricting arrangement (170) comprising a transition member (174) having a ridge with a first height (H) at an end closer to the restricting arrangement, and a second height (h) less than said first height and being closer to the dynamic guide member, wherein the transition member includes a relief portion having a height no greater than said second height in which a body of the riding module is not engaged only with the thread or a portion thereof, without engaging the ridge.

8. The dynamic spacing mechanism (2) according to any one of the preceding claims, wherein the restricting arrangement (170) comprises a first restriction member for fixed positioning with respect to the drive screw and a second restriction member configured for displacement along the longitudinal axis with respect to the first restriction member to define said various positions of the restricting arrangement (170).

9. The dynamic spacing mechanism (2) according to claim 8, wherein the second restriction member is in the form of a flexible chain comprising a plurality of restricting elements, constituting a dynamic restricting arrangement.

10. The dynamic spacing mechanism (2) according to Claim 9, wherein:

(a) the restricting elements of the second restriction member are configured to form together a rigid-like restricting member;
(b) the restricting elements are slidable along a rail having a front portion juxtaposed with the drive screw and a rear portion, wherein those restricting elements located at the front portion mimic the restriction member, while the remainder of the restricting elements are disposed on the rear portion; and
(c) the second restriction member has a first portion which is linear and is configured for engaging the riding modules to prevent them from revolving and a second portion which is at least angled to the first portion and which is inoperative.

11. The dynamic spacing mechanism (2) according to Claim 10, wherein the dynamic restricting arrangement comprises a bridge element (192) overlapping said interface, and wherein, once a riding module disengages from the bridge element, it transfers to the first, operative portion of the second restricting arrangement.

12. The dynamic spacing mechanism (2) according to any one of claims 9 through 11, wherein each of the elements of the second restriction member are formed, at one axial end thereof with a male part (171) and at the other, opposite axial end thereof with a female port (179) so that two neighboring elements, once linearly aligned, can be engaged via a male-female connection.

13. The dynamic spacing mechanism (2) according to any one of the preceding claim, constituting a portion of a shading system (1) comprising a plurality of slats (3) configured for at least partially covering an opening, said slats being configured for assuming a first, closed position **characterized by** a first spacing (S1) between the slats and in which said opening is maximally covered by the slats and a second, open position **characterized by** a second spacing (S2) between the slats, smaller than the first, and in which said opening is minimally covered by the slats, each of the slats being associated with one of said riding modules.

14. The dynamic spacing mechanism (2) according to claim 13, wherein the shading system further comprises a tilting arrangement configured for tilting each of the slats about an axis transverse to the longitudinal axis of said drive screw (5).

Patentansprüche

1. Dynamischer Abstandsmechanismus (2) für einen Rolladen oder eine Jalousienvorrichtung mit Jalousienlamellen, wobei der Mechanismus eine Antriebsschraube (5) und eine Vielzahl von daran gelagerten Reitermodulen (20a, 20b, 20c, 20d, 20e) aufweist, welche mit den Jalousienlamellen verbunden sind, wobei der dynamische Abstandsmechanismus (2) zum dynamischen Ändern des Abstandes zwischen den Reitermodulen zwischen einem ersten Abstand und einem zweiten Abstand (S1, S2) ausgebildet ist, und die Antriebsschraube (5) eine Längsachse (X_M) hat und zum drehenden Antreiben hierum und zum Ermöglichen eines axialen Verstellens von jedem Reitermodul entlang einem Betriebsabschnitt der Länge L der Antriebsschraube ausgebildet ist, wobei der dynamische Antriebsmechanismus (2) weiterhin aufweist:

- ein dynamisches Führungselement (50), welches sich zumindest teilweise parallel und entlang der Antriebsschraube (5) erstreckt und zum Beaufschlagen von zumindest einigen der Reitermodulen ausgebildet ist, um so eine Drehverstellung dieser in Bezug auf die Antriebsschraube (5) zu ermöglichen,
- eine Begrenzungsanordnung (170), welche zum Begrenzen einer Drehbewegung der Reitermodule ausgebildet ist, welche nicht von dem dynamischen Führungselement beaufschlagt werden, wobei eine Axialbewegung dieser entlang der Antriebsschraube bewirkt wird,

wobei das dynamische Führungselement zu einem Verstellen parallel zu der Längsachse ausgebildet ist, um verschiedene Positionen des dynamischen Führungselementes in Bezug auf die Antriebsschraube vorzugeben, wobei bei zumindest einigen der Positionen das dynamische Führungselement einen Arbeitsabschnitt aufweist, welcher neben einem Teil des Betriebsabschnitts der Antriebsschraube liegt, in welchem die Reitermodule voneinander mit einem ersten Abstand beabstandet sind, und wobei in dem Rest des Betriebsabschnitts der Antriebsschraube die Reitermodule voneinander mit dem zweiten Abstand beabstandet sind, wobei die Länge des Arbeitsabschnitts des dynamischen Führungselementes sich mit der Verstellung verändert,
dadurch gekennzeichnet,
dass der Abstandsmechanismus ein statisches Modul (20_0) aufweist, welches ausgebildet ist, eine Beaufschlagung zwischen der Antriebsschraube (5) und dem dynamischen Führungselement (50) zu schaffen, wobei das statische Modul an einem Ende der Antriebsschraube (5) angeordnet und in konstantem Eingriff mit dem dynamischen Führungselement (50) ist.

2. Dynamischer Abstandsmechanismus (2) nach Anspruch 1, wobei das statische Modul (20_0) an einer vorgegebenen Stelle der Antriebsschraube (5) befestigt und ausgebildet ist, um sich mit der Antriebsschraube (5) zu drehen.

3. Dynamischer Abstandsmechanismus (2) nach Anspruch 2,
wobei eine Umdrehung der Antriebsschraube (5) eine Umdrehung des statischen Moduls (20_0) verursacht, welches wiederum eine Verstellung des dynamischen Führungselementes (50) bewirkt.

4. Dynamischer Abstandsmechanismus (2) nach einem der vorhergehenden Ansprüche,
wobei das statische Modul (20_0) direkt mit dem dynamischen Führungselement (50) in Eingriff steht.

5. Dynamischer Abstandsmechanismus (2) nach einem der vorherigen Ansprüche,
wobei das statische Modul (20_0) eine ähnliche Form wie die Reitermodule aufweist.

6. Dynamischer Abstandsmechanismus (2) nach einem der vorhergehenden Ansprüche,
wobei das statische Modul (20_0) ein Gewinde mit der gleichen Gewindesteigerung P_2 wie das des dynamischen Führungselementes hat.

7. Dynamischer Abstandsmechanismus (2) nach einem der vorhergehenden Ansprüche,
wobei die Begrenzungsanordnung (170) ein Übergangselement (174) mit einem Rücken mit einer ersten Höhe (H) an einem Ende näher zu der Begrenzungsanordnung und eine zweite Höhe (h) aufweist, welche kleiner als die erste Höhe (H) ist und näher zu dem dynamischen Führungselement liegt, wobei das Übergangselement einen Ausnehmungsabschnitt mit einer Höhe aufweist, welche nicht größer als die zweite Höhe ist, bei der ein Körper eines Reitermoduls nicht nur mit dem Gewinde oder einem Teil hiervon ohne Beaufschlagung des Rückens in Eingriff steht.

8. Dynamischer Abstandsmechanismus (2) nach einem der vorhergehenden Ansprüche,
wobei die Begrenzungsanordnung (170) ein erstes Begrenzungsglied für ein festes Positionieren in Bezug auf die Antriebsschraube und ein zweites Begrenzungsglied aufweist, welches zu einem Verstellen entlang der Längsachse mit Bezug auf das erste Begrenzungsglied ausgebildet ist, um verschiedene Positionen der Begrenzungsanordnung (170) zu definieren.

9. Dynamischer Abstandsmechanismus (2) nach Anspruch 8,
wobei das zweite Begrenzungsglied die Form einer flexiblen Kette mit einer Vielzahl von Begrenzungselementen ist, wobei eine dynamische Begrenzungsanordnung gebildet ist.

10. Dynamischer Abstandsmechanismus (2) nach Anspruch 9,
wobei:

a) die Begrenzungselemente des zweiten Begrenzungsgliedes ausgebildet sind, zusammen ein etwa starres Begrenzungsglied zu bilden,
b) die Begrenzungselemente entlang einer Schiene mit einem Vorderabschnitt, welche neben der Antriebsschraube liegt, und einem Rückabschnitt verschiebbar sind, wobei diese Begrenzungselemente, welche an dem Vorderabschnitt angeordnet sind, das Begrenzungsglied imitieren, während der Rest der Begrenzungselemente an dem Rückabschnitt angeordnet sind, und
c) das zweite Begrenzungsglied einen ersten Abschnitt, welcher linear und zum Beaufschlagen der Reitermodule ausgebildet ist, um diese am Drehen zu hindern, und einen zweiten Abschnitt aufweist, welcher zumindest an dem ersten Abschnitt angelenkt und außer Betrieb ist.

11. Dynamischer Abstandsmechanismus (2) nach Anspruch 10,
wobei die dynamische Begrenzungsanordnung ein Brückenelement (192) aufweist, welches ein Zwischenstück überlappt, und
wobei, wenn ein Reitermodul von dem Brückenelement außer Eingriff steht, dieses auf den ersten Betriebsabschnitt der zweiten Begrenzungsanordnung fördert.

12. Dynamischer Abstandsmechanismus (2) nach einem der Ansprüche 9 bis 11,
wobei jedes der Elemente des zweiten Begrenzungsgliedes an einem axialen Ende mit einem vorspringenden Steckteil (171) und an dem anderen, gegenüberliegenden axialen Ende mit einer Steckaufnahme (179) gebildet ist, so dass zwei benachbarte Elemente über eine Steckverbindung in Eingriff stehen können, wenn diese linear ausgerichtet sind.

13. Dynamischer Abstandsmechanismus (2) nach einem der vorhergehenden Ansprüche, welcher einen Teil eines Abschattungssystems (1) mit einer Vielzahl von Lamellen (3), welche zum zumindest teilweisen Abdecken einer Öffnung ausgebildet sind, wobei die Lamellen zum Einnehmen einer ersten geschlossenen Position, welche durch einen ersten Abstand S1 zwischen den Lamellen gekennzeichnet ist und in welcher die Öffnung durch die Lamellen maximal abgedeckt ist, und zum Einnehmen einer zweiten geöffneten Position ausgebildet sind, welche durch einen zweiten Abstand S2 zwischen den Lamellen gekennzeichnet ist, welcher kleiner als der erste Abstand ist, und in welcher die Öffnung minimal durch die Lamellen abgedeckt ist, wobei jede Lamelle mit einem der Reitermodule verbunden ist.

14. Dynamischer Abstandsmechanismus (2) nach Anspruch 13,
wobei das Abschattungssystem weiter eine Kippanordnung aufweist, welche zum Kippen jeder Lamelle um eine Achse ausgebildet ist, welche quer zu der Längsachse der Antriebsschraube (5) ist.

Revendications

1. Mécanisme d'espacement dynamique (2) pour un ensemble de jalousie ou de store comprenant des lamelles de store, le mécanisme comprenant une vis d'entraînement (5) et une pluralité de modules autoportés (20_a, 20_b, 20_c, 20_d, 20_e) configurés pour être montés sur cette dernière et associés avec les lamelles de store, le mécanisme d'espacement dynamique (2) étant configuré pour modifier dynamiquement la distance entre les uiteuite entre une première distance et une seconde distance (S1, S2), ladite vis d'entraînement (5) ayant un axe longitudinal (X_M) et étant configurée pour tourner autour de ce dernier, et configurée pour permettre le déplacement axial de chacun des modules autoportés le long d'une partie opérationnelle de la longueur L de la vis d'entraînement, ledit mécanisme d'espacement dynamique (2) comprenant en outre :

un élément de guide dynamique (50) s'étendant, au moins en partie, parallèlement à et le long de la vis d'entraînement (5), configuré pour mettre en prise au moins certains desdits modules autoportés afin de permettre son déplacement de rotation par rapport à la vis d'entraînement (5) ;
un agencement de restriction (170) configuré pour limiter le mouvement de rotation de ces modules autoportés, qui ne sont pas mis en prise avec l'élément de guidge dynamique, entraînant son mouvement axial le long de la vis d'entraînement ;
ledit élément de guide dynamique étant configuré pour le déplacement parallèle à l'axe longitudinal afin de définir différentes positions de l'élément de guide dynamique par rapport à la vis d'entraînement, dans au moins certaines desquelles positions, l'élément de guide dynamique a une position de travail se juxtaposant à une partie de la partie opérationnelle de la vis d'entraînement, dans laquelle les modules autoportés sont espacés les uns des autres par ladite première distance, et dans lequel, dans le reste de la partie opérationnelle de la vis d'entraînement, les modules autoportés sont espacés les uns des autres par ladite seconde distance, la longueur de la partie de travail dudit élément de guide dynamique variant avec ledit déplacement ;
caractérisé en ce que ledit mécanisme d'espacement comprend un module statique (20_0) configuré pour fournir la mise en prise entre la vis d'entraînement (5) et l'élément de guide dynamique (50), ledit module statique qui est disposé à une extrémité de la vis d'entraînement (5) est en mise en prise constante avec l'élément de guide dynamique (50).

2. Mécanisme d'espacement dynamique (2) selon la revendication 1, dans lequel le module statique (20_0) est fixé sur un emplacement prédéterminé sur la vis d'entraînement (5) et configuré pour tourner conjointement avec la vis d'entraînement (5).

3. Mécanisme d'espacement dynamique (2) selon la revendication 2, dans lequel la révolution de la vis d'entraînement (5) entraîne la révolution du module statique (20_0) qui, provoque à son tour le déplacement de l'élément de guide dynamique (50).

4. Mécanisme d'espacement dynamique (2) selon l'une quelconque des revendications précédentes, dans lequel le module statique (20_0) est directement mis en prise avec l'élément de guide dynamique (50).

5. Mécanisme d'espacement dynamique (2) selon l'une quelconque des revendications précédentes, dans lequel le module statique (20_0) a une conception similaire à celle des modules autoportés.

6. Mécanisme d'espacement dynamique (2) selon l'une quelconque des revendications précédentes, dans lequel le module statique (20_0) a un filetage avec le même pas P_2 correspondant à celui de l'élément de guide dynamique.

7. Mécanisme d'espacement dynamique (2) selon l'une quelconque des revendications précédentes, l'agencement de restriction (170) comprenant un élément de transition (174) ayant une crête avec une première hauteur (H) au niveau d'une extrémité plus à proximité de l'agencement de restriction, et une seconde hauteur (H) inférieure à ladite première hauteur et étant plus proche de l'élément de guide dynamique, dans lequel l'élément de transition comprend une partie de relief ayant une hauteur non supérieure à ladite seconde hauteur dans laquelle un corps du module autoporté n'est pas mis en prise uniquement avec le filetage ou une partie de ce dernier, sans mettre en prise la crête.

8. Mécanisme d'espacement dynamique (2) selon l'une quelconque des revendications précédentes, dans lequel l'agencement de restriction (170) comprend un premier élément de restriction pour se positionner de manière fixe par rapport à la vis d'entraînement et un second élément de restriction configuré pour le déplacement le long de l'axe longitudinal par rapport au premier élément de restriction pour définir lesdites différentes positions de l'agencement de restriction (170) .

9. Mécanisme d'espacement dynamique (2) selon la revendication 8, dans lequel le second élément de restriction se présente sous la forme d'une chaîne flexible comprenant une pluralité d'éléments de restriction, constituant un agencement de restriction dynamique.

10. Mécanisme d'espacement dynamique (2) selon la revendication 9, dans lequel :

(a) les éléments de restriction du second élément de restriction sont configurés pour former ensemble un élément de restriction de type rigide ;
(b) les éléments restriction peuvent coulisser le long d'un rail ayant une partie avant juxtaposée avec la vis d'entraînement et une partie arrière, dans lequel ces éléments de restriction positionnés au niveau de la partie avant imitent l'élément de restriction, alors que le reste des éléments de restriction est disposé sur la partie arrière ; et
(c) le second élément de restriction a une première partie qui est linéaire et est configurée pour mettre en prise les modules autoportés pour les empêcher de tourner et une seconde partie qui est au moins coudée par rapport à la première partie et qui est non opérationnelle.

11. Mécanisme d'espacement dynamique (2) selon la revendication 10, dans lequel l'agencement de restriction dynamique comprend un élément de pont (192) recouvrant ladite interface et dans lequel, une fois qu'un module autoporté se dégage de l'élément de pont, il se transfère dans la première partie opérationnelle du second agencement de restriction.

12. Mécanisme d'espacement dynamique (2) selon l'une quelconque des revendications 9 à 11, dans lequel chacun des éléments du second élément de restriction est formé, au niveau de son extrémité axiale, avec une partie mâle (171) et au niveau de son autre extrémité axiale opposée, avec un orifice femelle (179) de sorte que les deux éléments voisins, une fois alignés de manière linéaire, peuvent être mis en prise via un raccordement mâle - femelle.

13. Mécanisme d'espacement dynamique (2) selon l'une quelconque des revendications précédentes, constituant une partie d'un système d'ombrage (1) comprenant une pluralité de lamelles (3) configurées pour recouvrir au moins partiellement une ouverture, lesdites lamelles étant configurées pour adopter une première position fermée **caractérisée par** un premier espacement (S1) entre les lamelles et dans lequel ladite ouverture est couverte au maximum par les lamelles et une seconde position ouverte **caractérisée par** un second espacement (S2) entre les lamelles, plus petit que le premier, et dans lequel ladite ouverture est couverte au minimum par les lamelles, chacune des lamelles étant associée avec l'un desdits modules autoportés.

14. Mécanisme d'espacement dynamique (2) selon la revendication 13, dans lequel le système d'ombrage comprend un outre un agencement d'inclinaison configuré pour incliner chacune des lamelles autour d'un axe transversal à l'axe longitudinal de ladite vis d'entraînement (5).

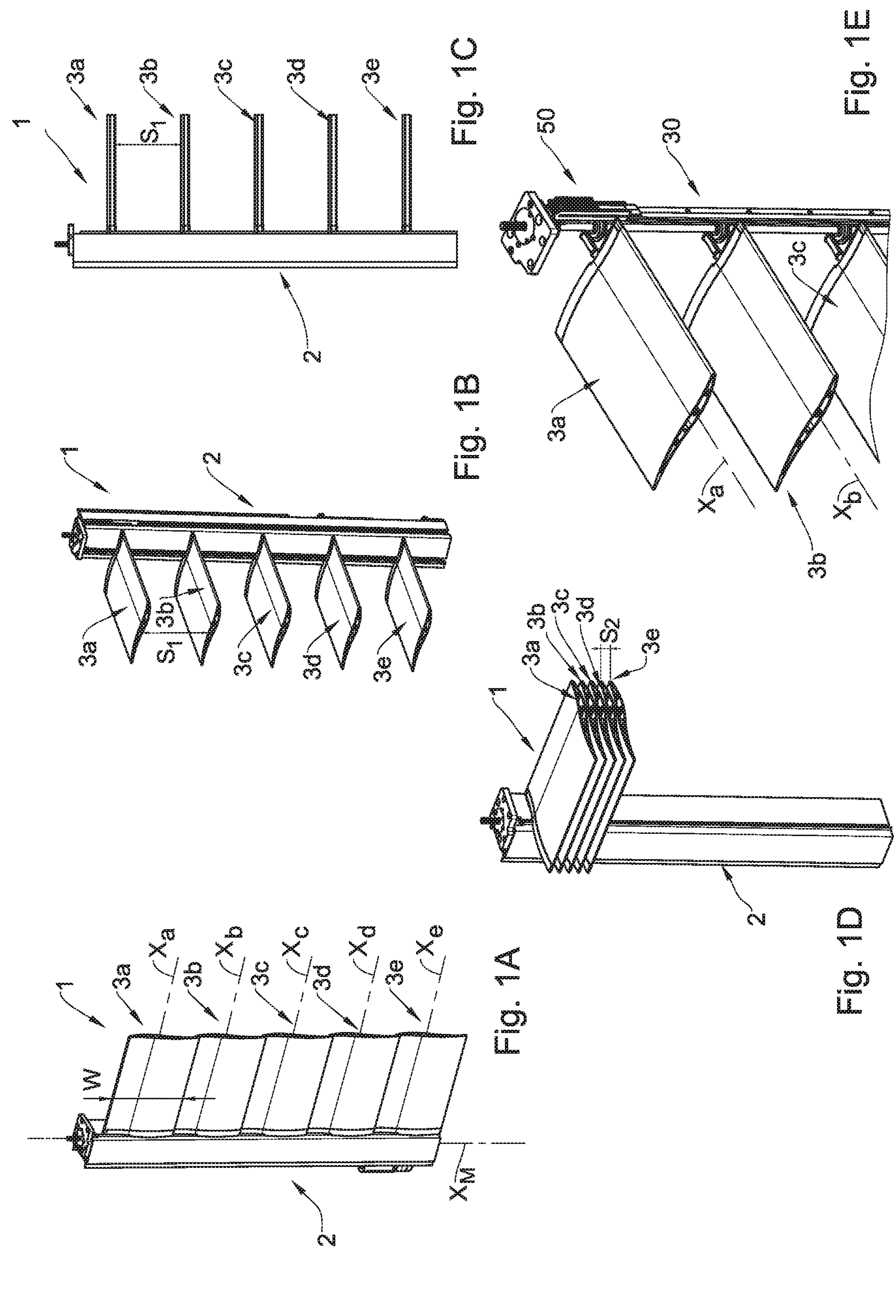
Fig. 1A
Fig. 1B
Fig. 1C
Fig. 1D
Fig. 1E
1
2
3a
3b
3c
3d
3e
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X_M
X_a
X_b
X_c
X_d
X_e
S_1
S_2
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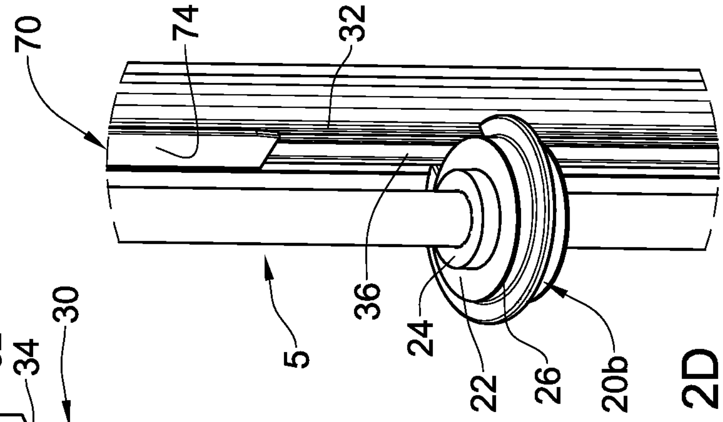


Fig. 2D

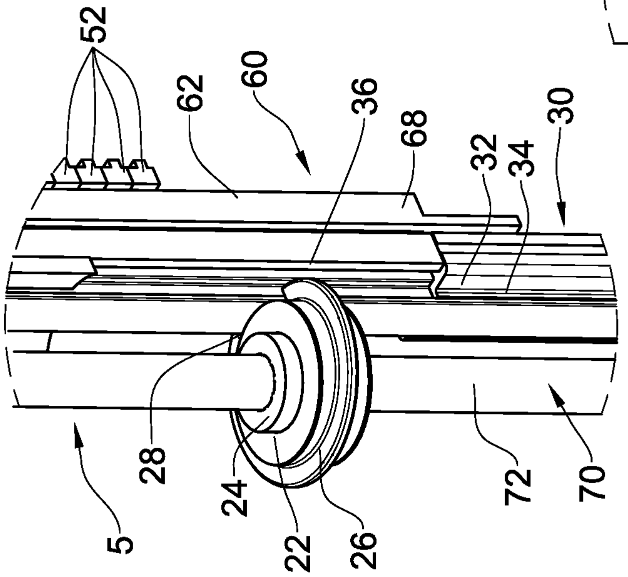


Fig. 2C

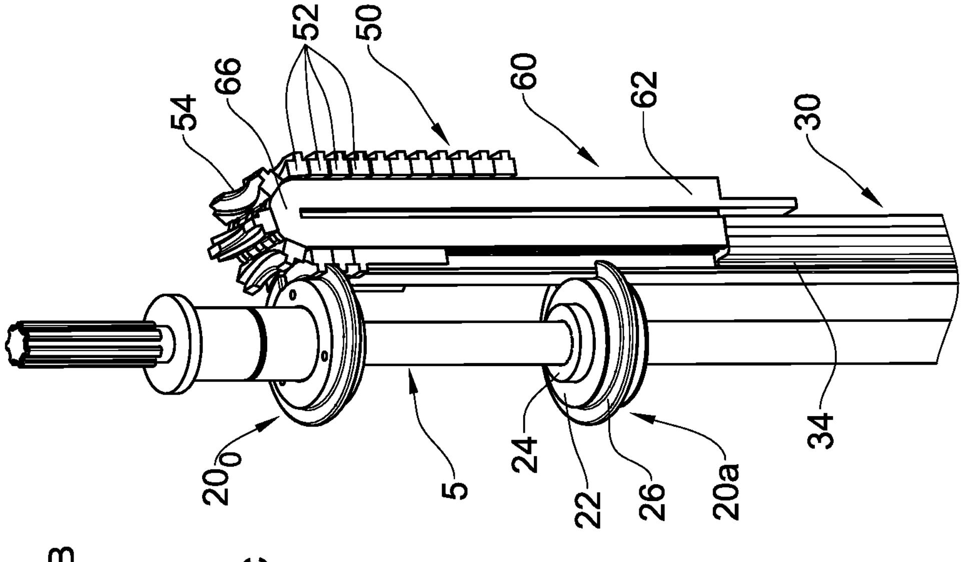
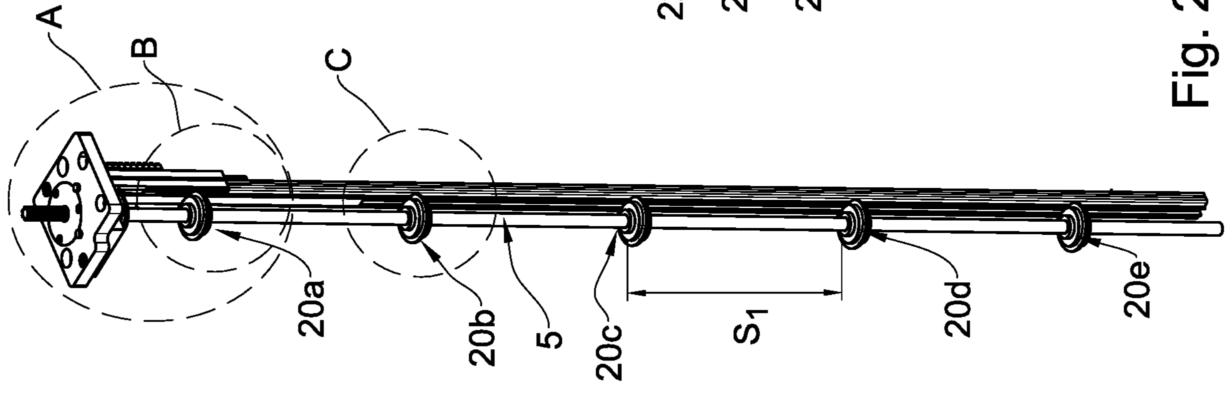


Fig. 2B



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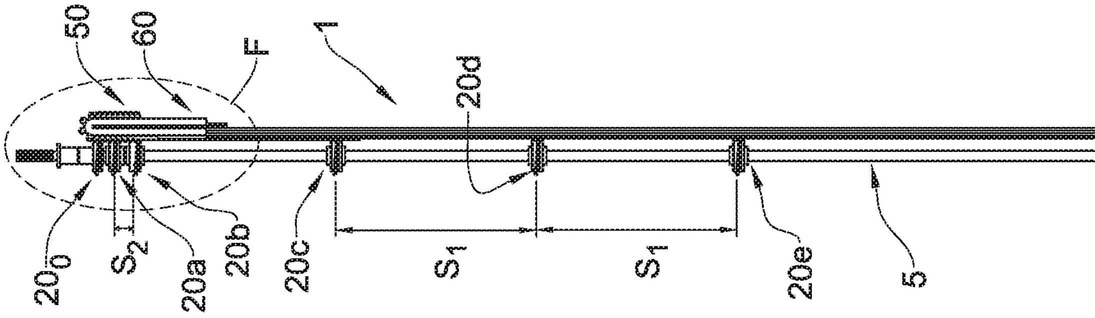


Fig. 3C

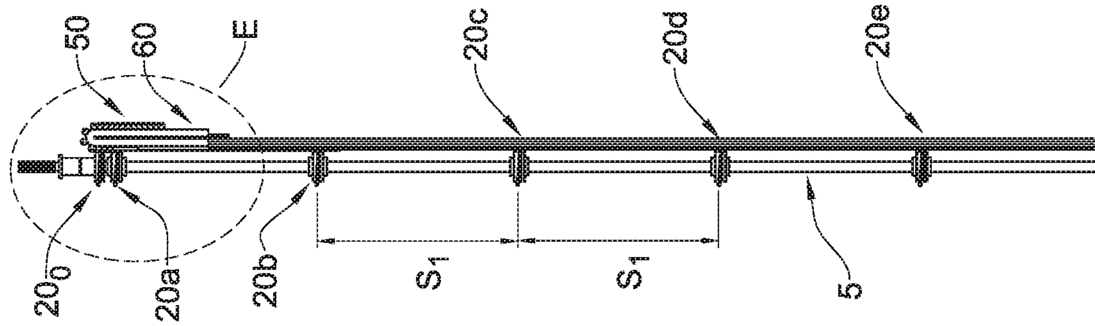
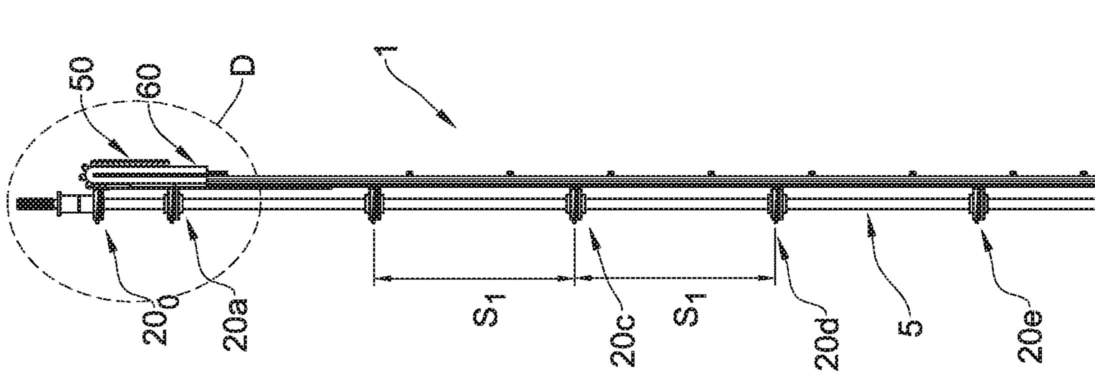


Fig. 3B



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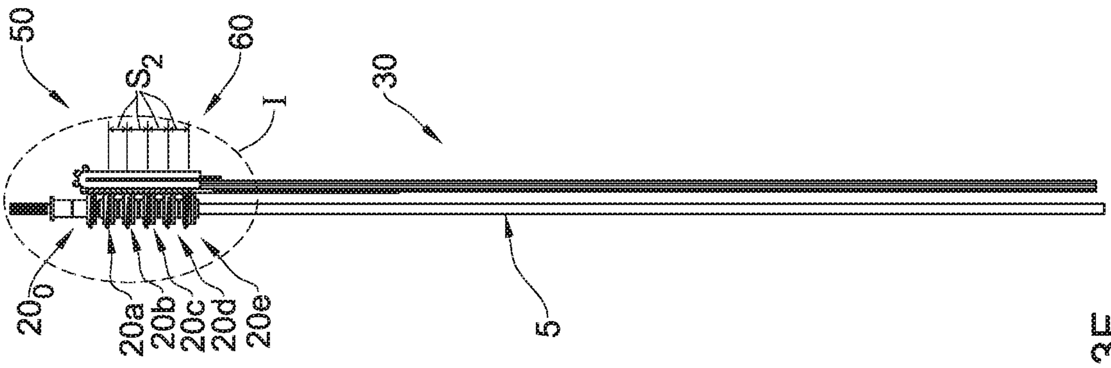


Fig. 3F

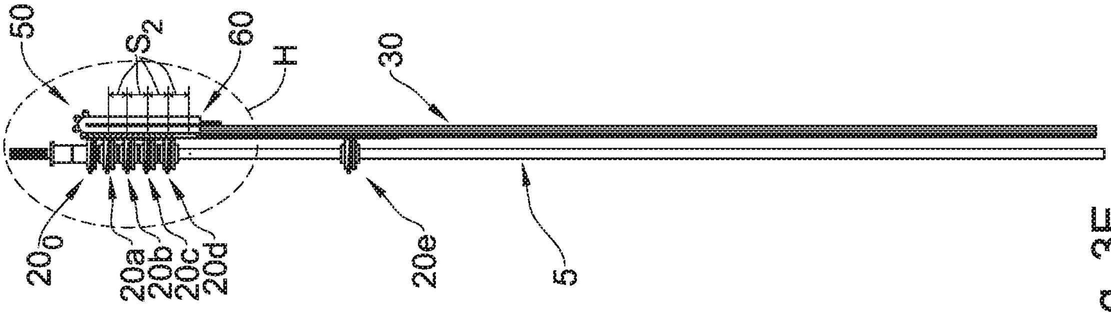


Fig. 3E

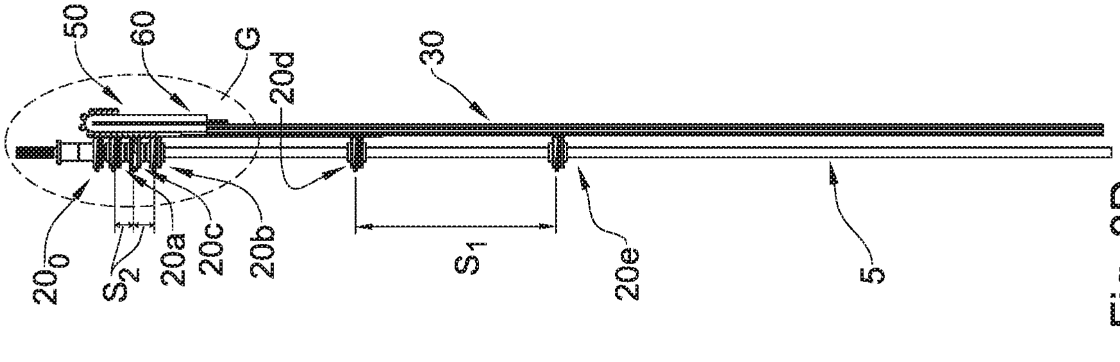


Fig. 3D

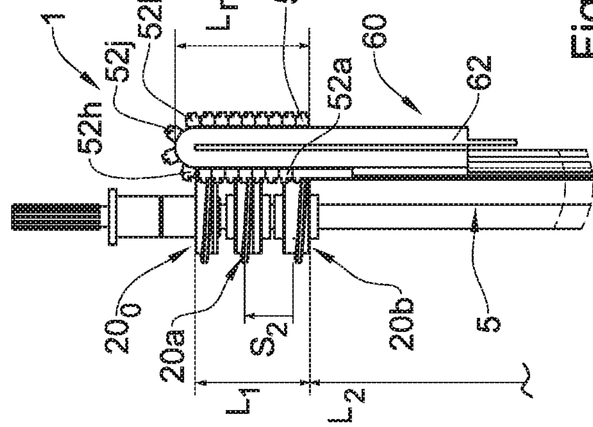
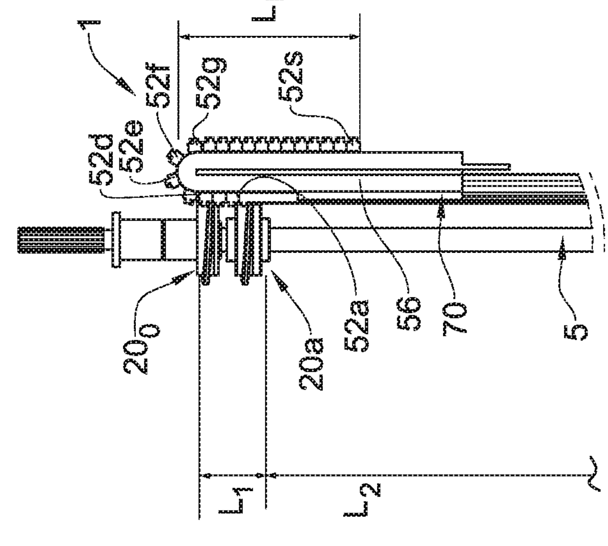


Fig. 4C



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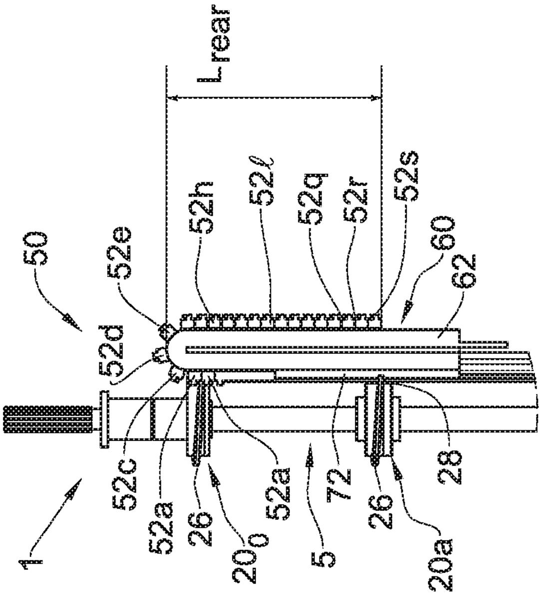

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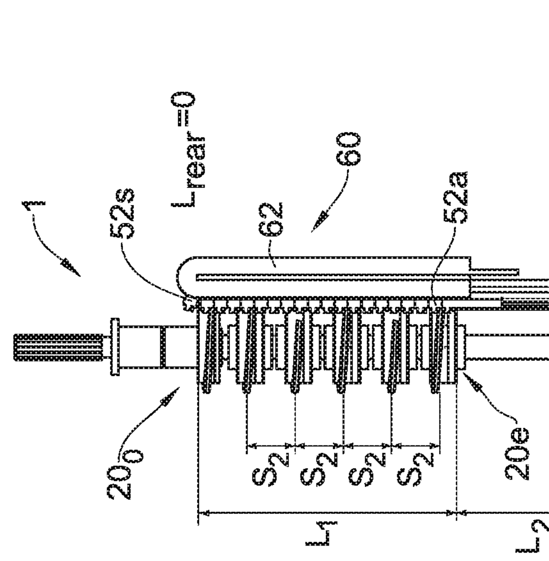

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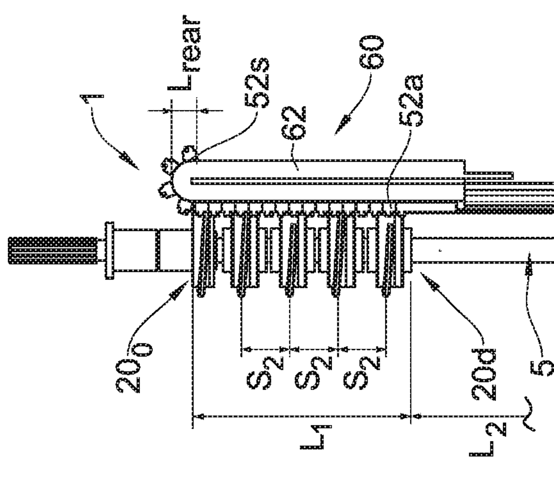

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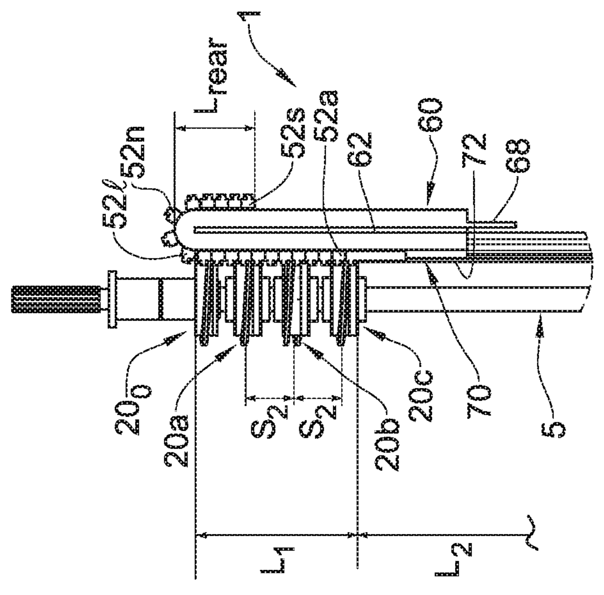

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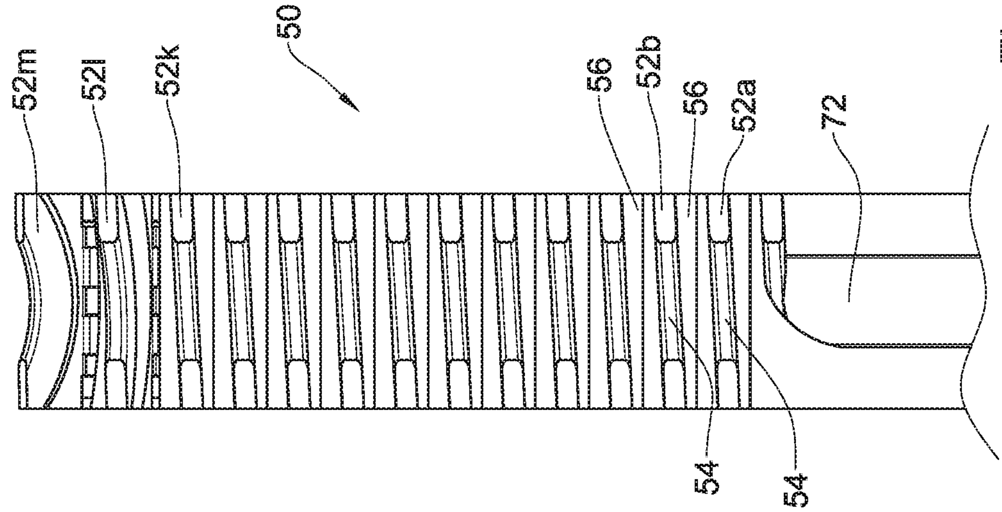
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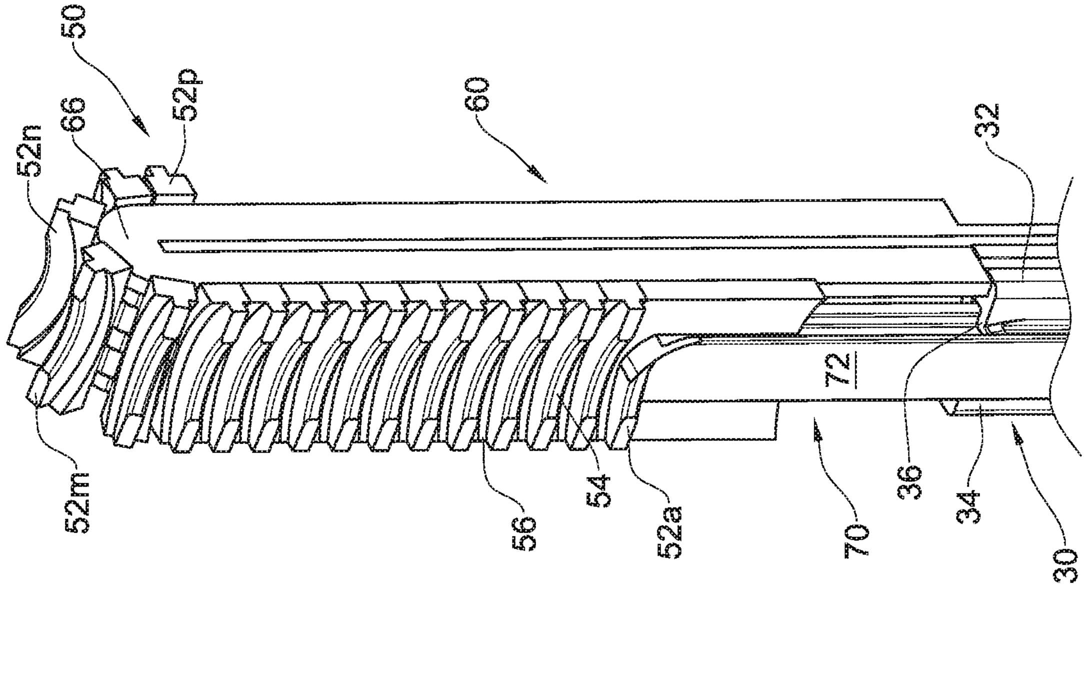
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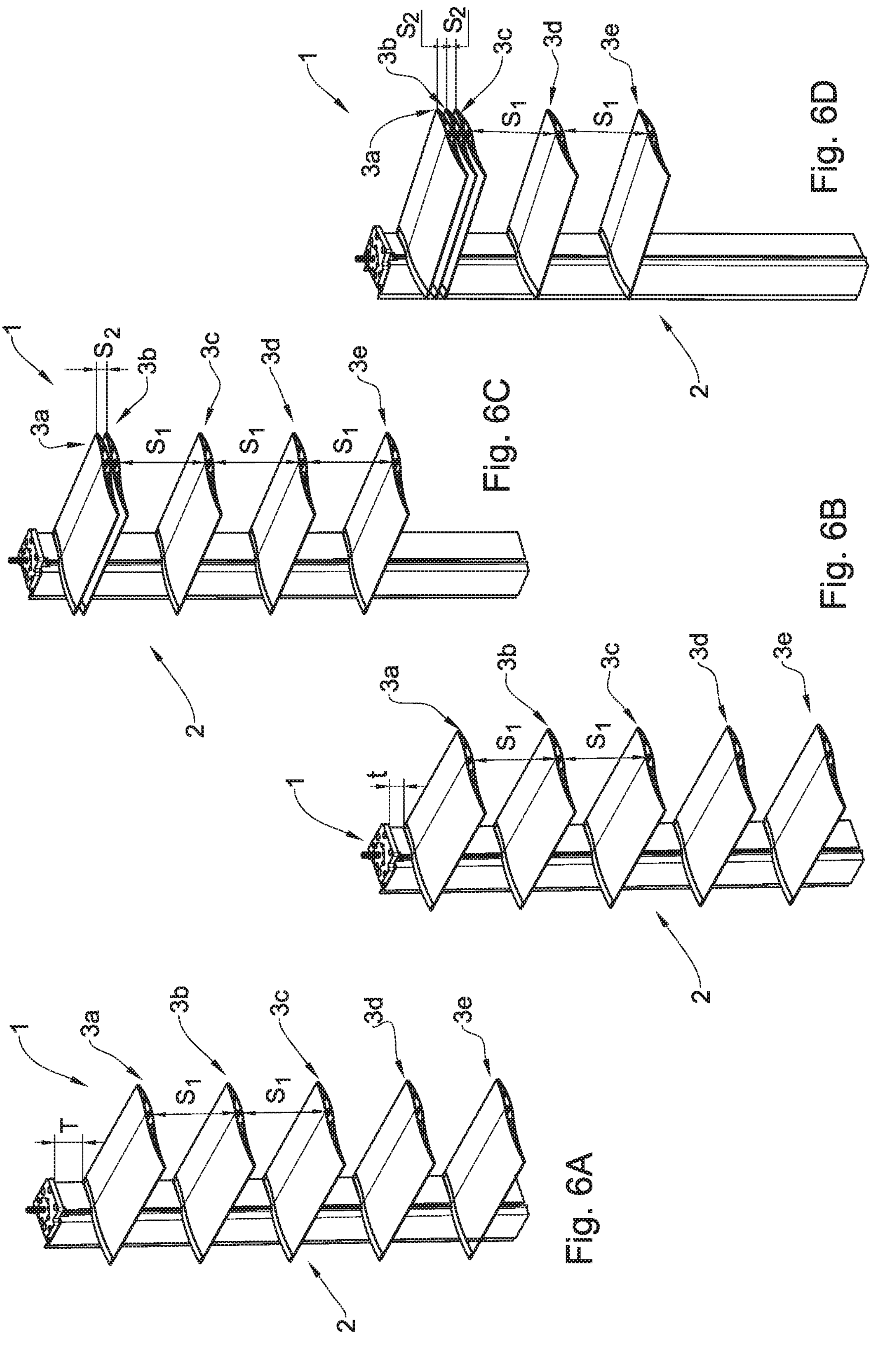

Fig. 6A

Fig. 6B

Fig. 6C

Fig. 6D

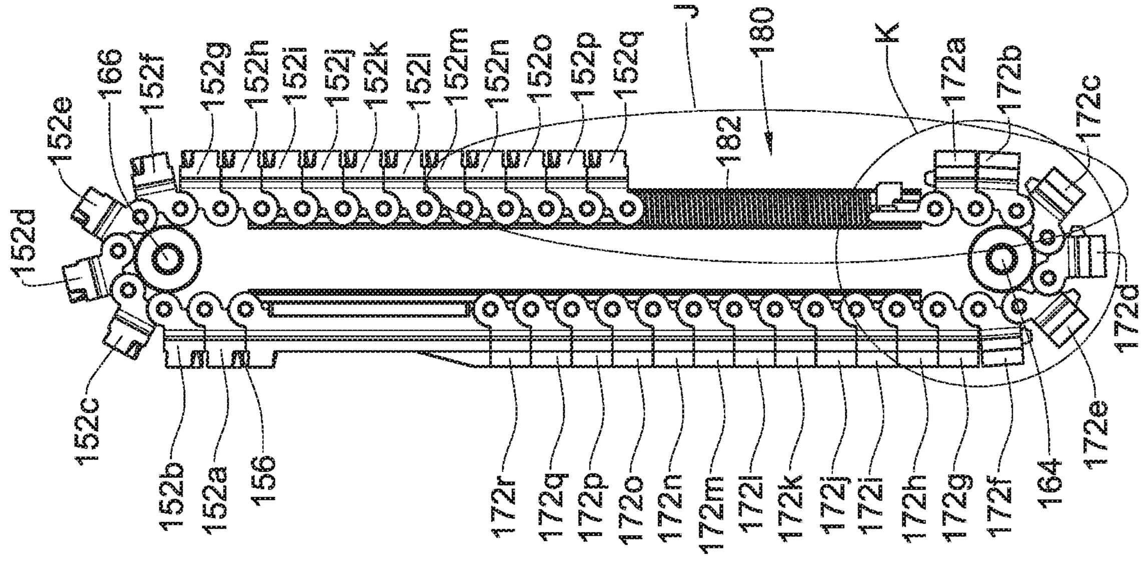
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Fig. 7B

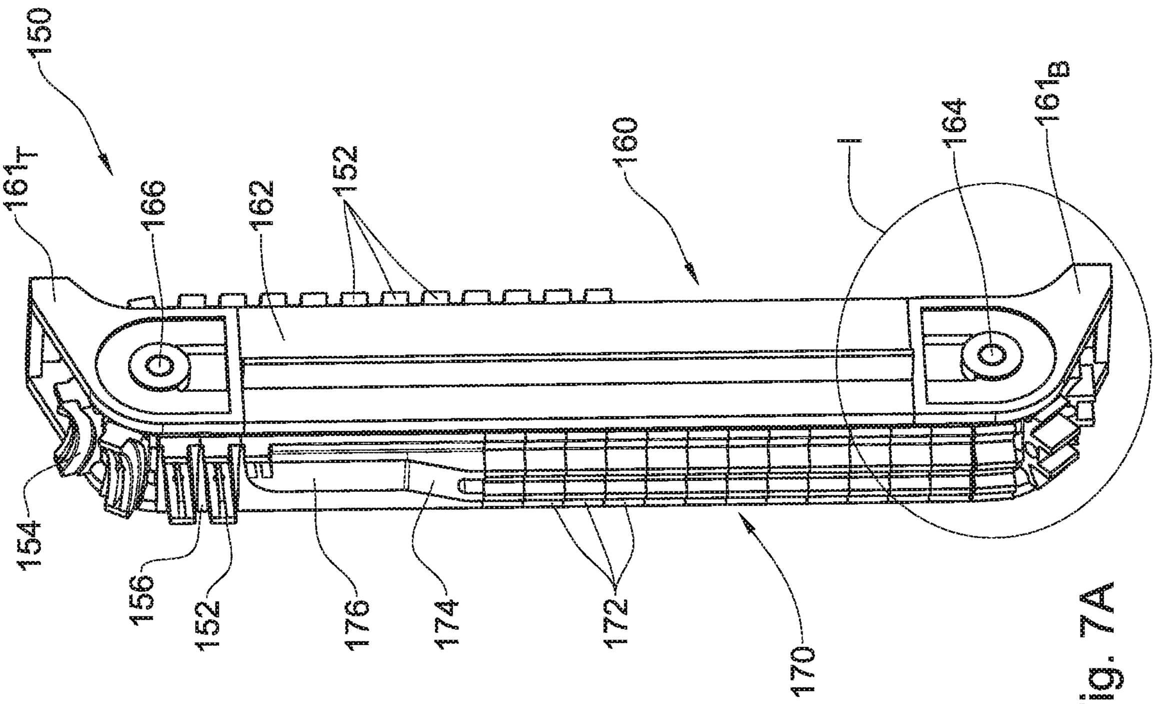
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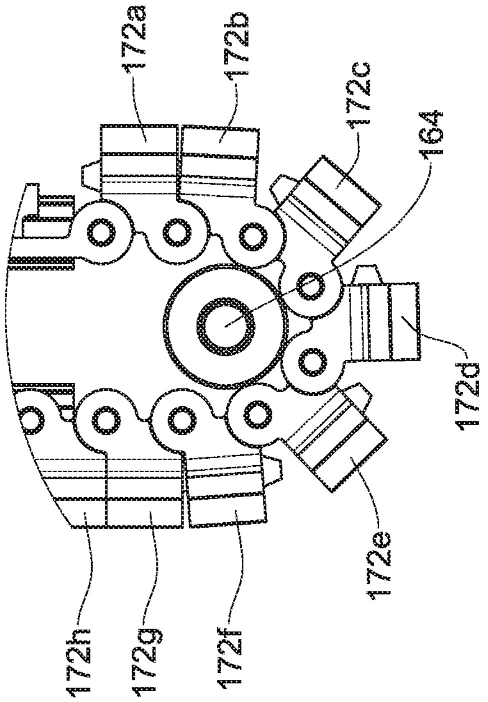
Fig. 7A



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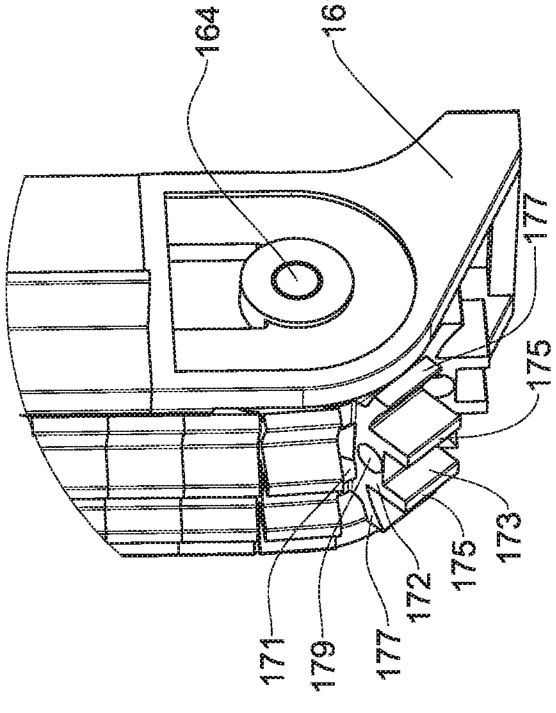

Fig. 8C

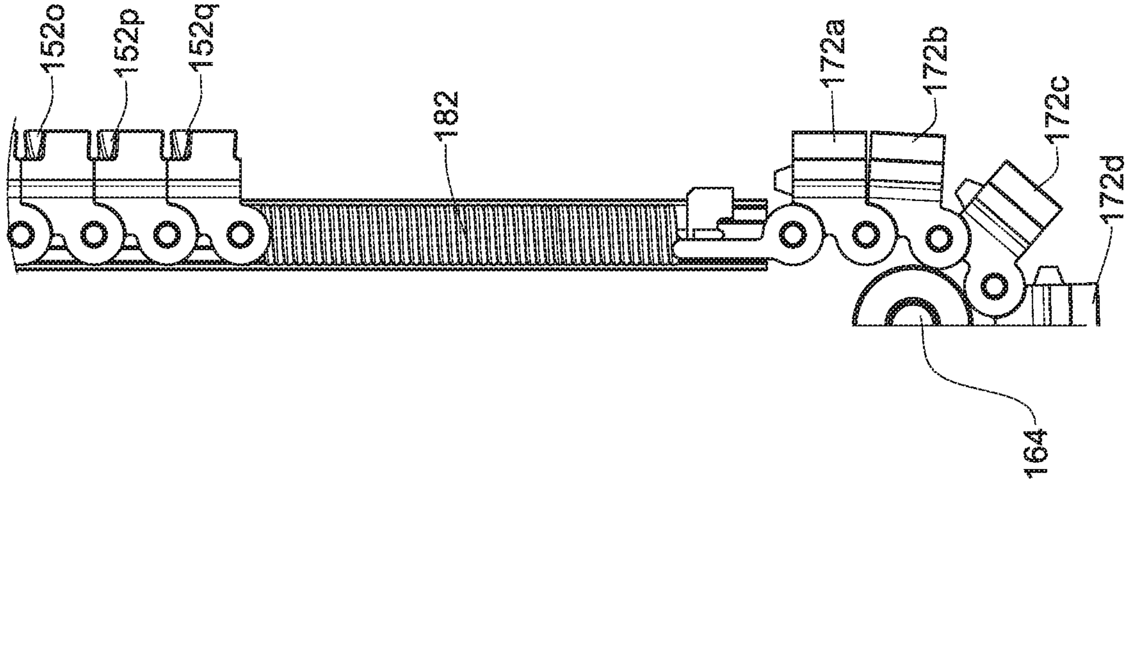

Fig. 8A

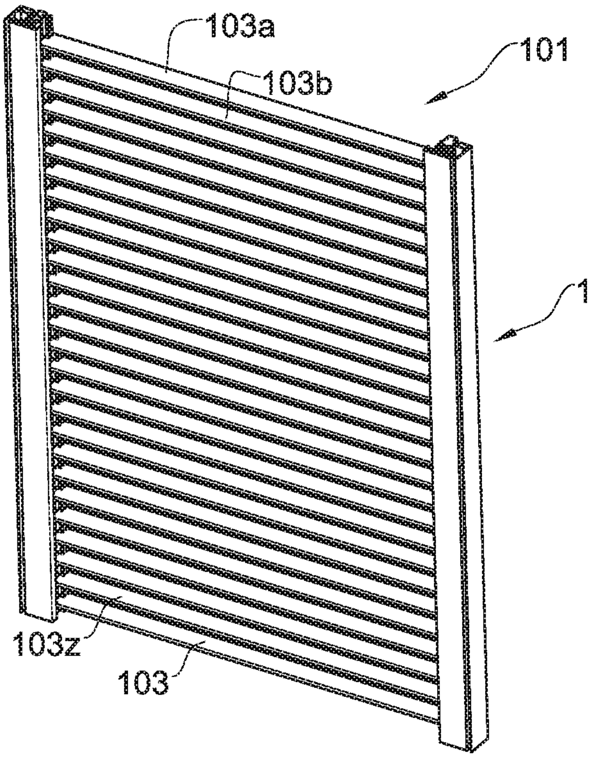
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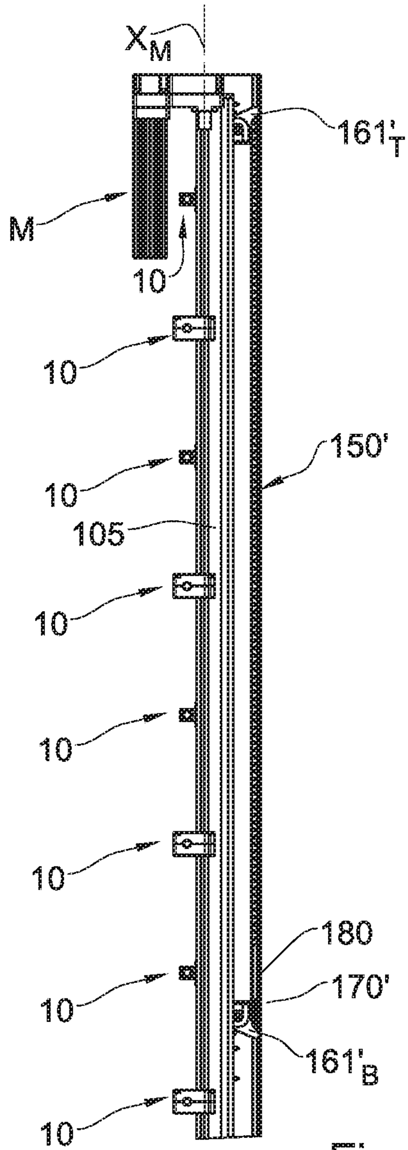
Fig. 9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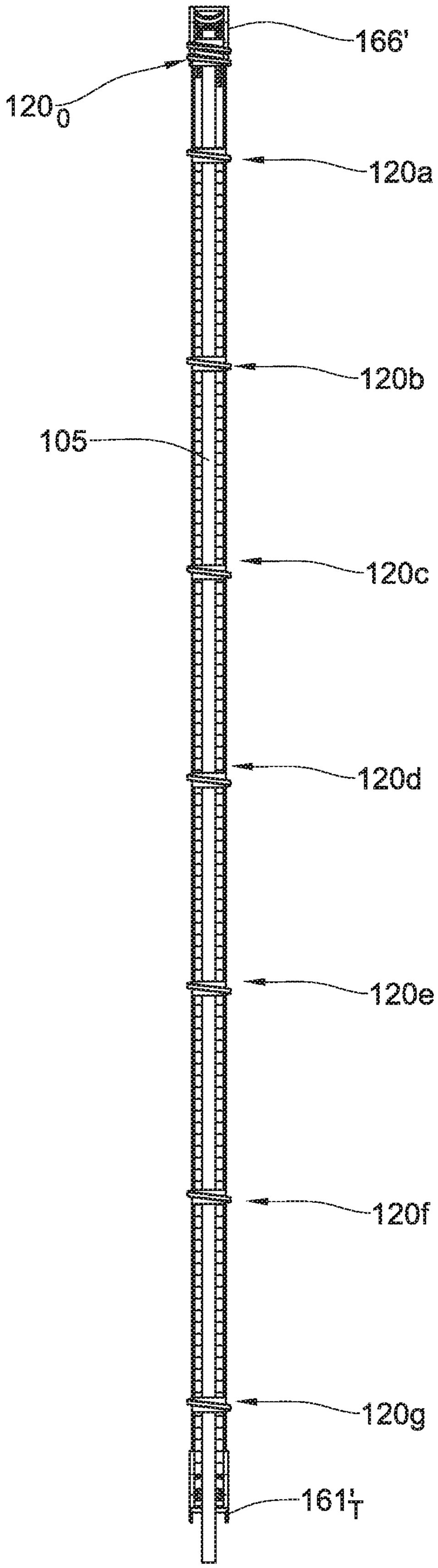
10
161'_B
10

Fig. 10



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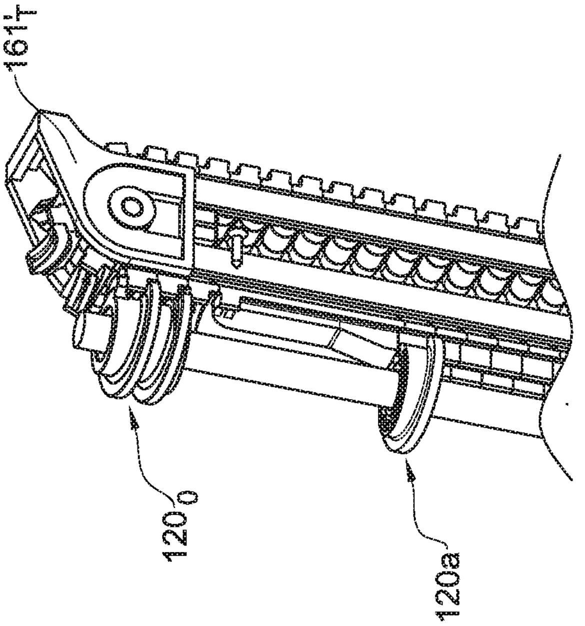


Fig. 11C

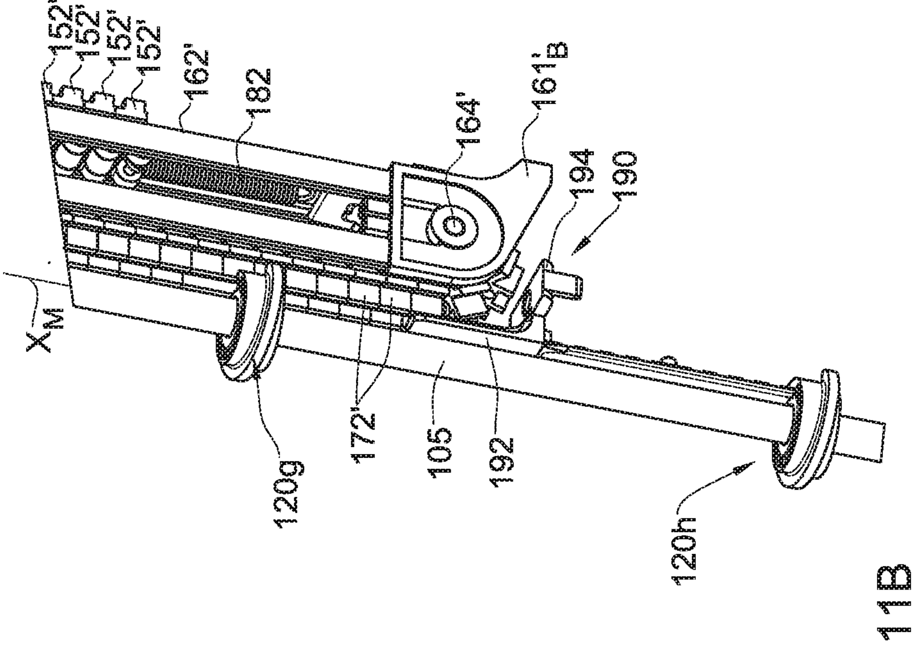
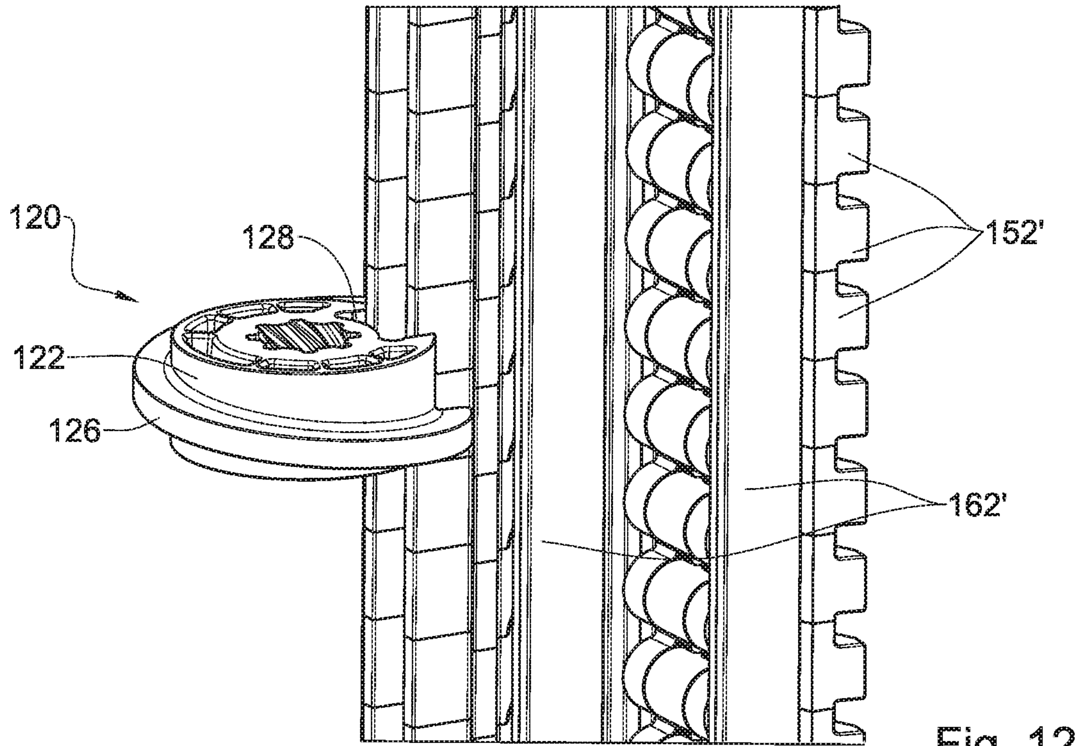


Fig. 11B



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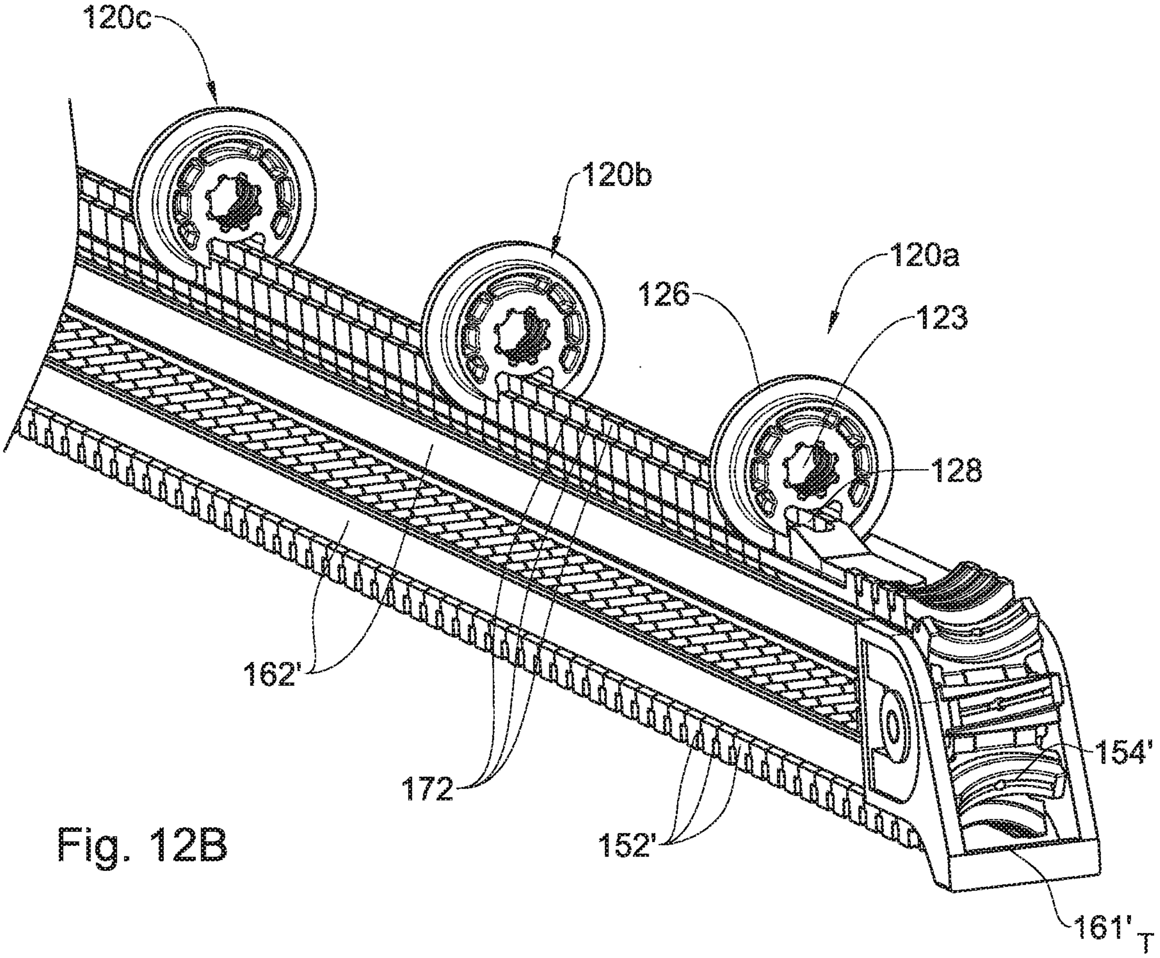

Fig. 12B

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7681620 B **[0008]**
- EP 2850260 A **[0009]**