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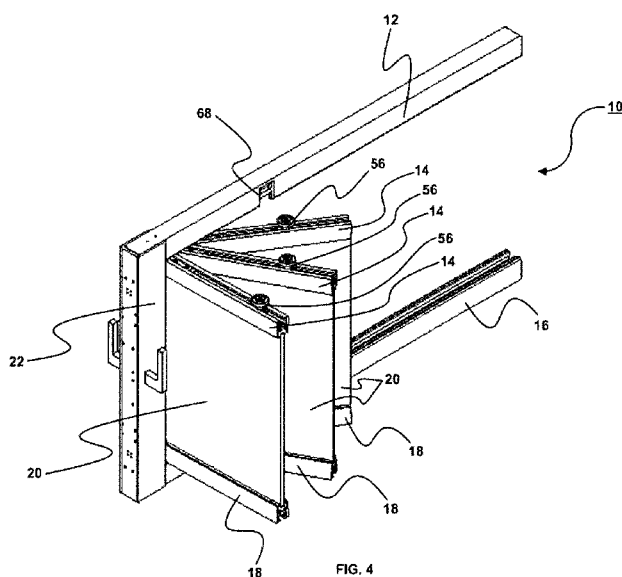
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(54) **Title:** SCREEN SYSTEM



(57) **Abstract:** A screen system (10) is provided. The screen system (10) includes a first guide member (12), a plurality of first frame members (14), each of the first frame members (14) being moveably coupled to the first guide member (12), a second guide member (16), and a plurality of second frame members (18), each of the second frame members (18) being moveably coupled to the second guide member (16). Corresponding pairs of the first and second frame members (14, 18) are operable to releasably engage a screen (20) when in use.

## SCREEN SYSTEM

### Field of the Invention

The present invention relates, in general, to screen systems.

### Background of the Invention

5 Various types of screens are employed in window, door and partition systems. Examples include glass screens, louvre screens, screens with mosquito netting, window grilles, screens with switchable film and screens with motorized blinds. A drawback of conventional window, door and partition systems is that once such a system is installed, it is not possible to change the  
10 type of screen employed. In view of this constraint, it is desirable to provide a screen system that can accommodate interchangeable screens.

### Summary of the Invention

Accordingly, the present invention provides a screen system including a first guide member, a plurality of first frame members, each of the first frame  
15 members being moveably coupled to the first guide member, a second guide member, and a plurality of second frame members, each of the second frame members being moveably coupled to the second guide member. Corresponding pairs of the first and second frame members are operable to releasably engage a screen when in use.

20 Other aspects and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

### Brief Description of the Drawings

Embodiments of the invention will now be described, by way of example  
25 only, with reference to the accompanying drawings, in which:

FIG. 1 is a schematic perspective view of a section of a screen system in accordance with an embodiment of the present invention;

FIGS. 2A through 2D are schematic perspective views of various screen assemblies for use with a screen system in accordance with an embodiment of  
5 the present invention;

FIG. 3 is a schematically exploded view showing various elements of the screen system of FIG. 1;

FIG. 4 is a schematic perspective view of the screen system of FIG. 1 with screens in various orientations;

10 FIG. 5 is a schematically exploded view of a damping mechanism of the screen system of FIG. 1;

FIG. 6 is a schematic cross-sectional view of the damping mechanism of FIG. 5;

15 FIG. 7 is a schematic top perspective view of a section of a screen system in accordance with an embodiment of the present invention;

FIG. 8 is a schematic cutaway view of a section of a guide member of a screen system in accordance with an embodiment of the present invention;

FIGS. 9A and 9B are schematic cross-sectional views of a locking mechanism of the screen system of FIG. 1 in a locked position and an unlocked  
20 position; and

FIG. 10 is a schematically exploded view of a first frame member of a screen system in accordance with another embodiment of the present invention.

#### Detailed Description of Exemplary Embodiments

25 The detailed description set forth below in connection with the appended drawings is intended as a description of presently preferred embodiments of the

invention, and is not intended to represent the only forms in which the present invention may be practiced. It is to be understood that the same or equivalent functions may be accomplished by different embodiments that are intended to be encompassed within the scope of the invention.

5 Referring now to FIG. 1, a section of a screen system 10 is shown. The screen system 10 includes a first guide member 12, a plurality of first frame members 14, a second guide member 16, and a plurality of second frame members 18. Each of the first frame members 14 is moveably coupled to the first guide member 12 and each of the second frame members 18 is moveably  
10 coupled to the second guide member 16. Corresponding pairs of the first and second frame members 14 and 18 are operable to releasably engage a screen 20 when in use. In the present embodiment, a locking mechanism 22 is coupled between the first and second guide members 12 and 16 to lock and unlock the screen system 10.

15 The screen system 10 is shown to be in a closed position in FIG. 1.

Although the first and second guide members 12 and 16 are shown to be formed in a straight line in FIG. 1, it should be appreciated that the first and second guide members 12 and 16 are not limited to a straight-line formation and may in fact be configured according to a desired layout. For example, the first  
20 and second guide members 12 and 16 may be configured as an L-shape arrangement, a U-shape arrangement, a curved-shape arrangement or an arrangement in some other shape in alternative embodiments depending on site requirements. The second guide member 16 may be embedded in flooring (not shown).

25 In the present embodiment, a plurality of screens 20 is releasably attached to the corresponding pairs of the first and second frame members 14 and 18. Advantageously, because the screens 20 are releasably and not permanently attached to the first and second frame members 14 and 18, the screens 20 are interchangeable with minimal or no change to other components of the screen

system 10. This provides greater design flexibility and also helps reduce wastage as depending on personal requirements, the screens 20 may be changed from one to another type with minimal or no change to other components of the screen system 10.

5 In the embodiment shown, the screens 20 are glass screens. However, it should be understood by those of ordinary skill in the art that the present invention is not limited to glass screens. Various other types of screens 20 may be used with the screen system of the present invention. Examples include  
10 louvre screens, screens with mosquito netting, window grilles, screens with a switchable film and screens with motorized blinds. Referring now to FIGS. 2A through 2D, various screen assemblies having different types of screens for use with the screen system of the present invention are shown. More particularly, FIG. 2A shows a screen assembly 24 with a louvre screen 26, FIG. 2B shows a screen assembly 28 with mosquito netting 30, FIG. 2C shows a screen assembly  
15 32 with grilles 34, and FIG. 2D shows a screen assembly 36 with a motorized blind 38.

Referring again to FIG. 1, the screens 20 are able to slide along the first and second guide members 12 and 16 when in a closed position as shown in FIG. 1.

20 Although three (3) screens 20 are shown in FIG. 1, it should be understood by those of ordinary skill in the art that the present invention is not limited by the number of screens 20 used. Fewer or more screens 20 may be used depending on site requirements.

In the present embodiment, the locking mechanism 22 is provided to lock  
25 the screens 20 in position when all the screens are in closed positions.

Referring now to FIG. 3, a schematically exploded view showing various elements of the screen system 10 of FIG. 1 is shown.

In the embodiment shown, the first guide member 12 is formed with an extended external-facing surface 40. This additional flap helps prevent ingress of water into the screen system 10.

One or more wear strips 42 may be attached to one of or both the first and second guide members 12 and 16. In the embodiment shown, a plurality of wear strips 42 is attached to both the first and second guide members 12 and 16. Advantageously, the wear strips 42 help reduce wear on the first and second guide members 12 and 16 as the screens 20 slide along the first and second guide members 12 and 16.

In the present embodiment, each of the first and second frame members 14 and 18 includes a slot 44 for receiving the screen 20 and a removable stopper 46 to secure the screen 20 in the slot 44. More particularly, each of the first and second frame members 14 and 18 in the present embodiment includes a rail 48 in which the slot 44 is defined, the rail 48 being received in and secured to a mounting frame 50. In the embodiment shown, a fixed stopper 52 is attached to a first end of each of the rails 48. During assembly, the screen 20 is slid into the top and bottom rails 48 and prevented from sliding out of the rails 48 by the fixed stoppers 52. The screen 20 is secured to the first and second frame members 14 and 18 by the removable stoppers 46 attached to second ends of the rails 48. With such an arrangement, different types of screens 20 may be mounted to or removed from the screen system 10 by simply sliding the screens 20 in or out of the first and second frame members 14 and 18 and securing or releasing the screens 20 by applying or removing the removable stoppers 46, without changing the main structure of the screen system 10.

In the embodiment shown, first and second rotatable hinges 54 and 56 moveably couple each of the first frame members 14 to the first guide member 12 and a third rotatable hinge 58 moveably couples each of the second frame members 18 to the second guide member 16. The first and second rotatable hinges 54 and 56 are adapted to be received in a first track or channel 60 formed

in the first guide member 12 and the third rotatable hinge 58 is adapted to be received in a first track or channel 62 formed in the second guide member 12. In this manner, the first, second and third rotatable hinges 54, 56 and 58 serve to guide the screen 20 as the screen 20 moves or slides along the first and second  
5 guide members 12 and 16. In the present embodiment, each of the first, second and third rotatable hinges 54, 56 and 58 is provided with a base or holder 64 that is mounted to the first and second frame members 14 and 18, respectively.

Stoppers 66 may be provided at an end of the first and second guide members 12 and 16 to prevent the screens 20 from sliding off.

10 In the present embodiment, an opening 68 is formed in the first guide member 12 to allow decoupling of the second rotatable hinge 56 from the first guide member 12. This allows the screens 20 to be moved into an open position. Referring now to FIG. 4, the screen system 10 is shown in an open position with the screens 20 opened to various degrees. In a fully open position, the screens  
15 20 may be parked side by side (like a pack of vertical cards) at a corner or a designated location.

Referring again to FIG. 3, a first damping mechanism 70 is coupled to the first rotatable hinge 54 and a second damping mechanism 72 is coupled to the third rotatable hinge 58 in the embodiment shown. In the present embodiment,  
20 the first damping mechanism 70 is adapted to be received in a second track or channel 74 formed in the first guide member 12 and the second damping mechanism 72 is adapted to be received in a second track or channel 76 formed in the second guide member 12. The first and second damping mechanisms 70 and 72 are thus compactly formed and generally hidden from view. This helps  
25 improve the aesthetic appearance of the screen system 10.

The first and second damping mechanisms 70 and 72 are operable to resist movement of the screen 20 from an open position to a closed position. By resisting closing forces applied to the screens 20, the first and second damping mechanisms 70 and 72 help retain the screens 20 in open or collapsed positions,

instead of swinging freely without any resistance. This provides some measure of control against swinging of the screens 20 when in an open position in response to external forces, for example, wind. Additionally, by dampening the closing movement, the first and second damping mechanisms 70 and 72 also  
5 serve as a safety feature, helping prevent the screens 20 from slamming inadvertently and possibly injuring users.

To provide appropriate damping resistance according to the size and mass of the screens 20, the first and second damping mechanisms 70 and 72 may be sized accordingly.

10 Referring now to FIGS. 5 and 6, a schematically exploded view of one of the first and second damping mechanisms 70 and 72 of the screen system 10 of FIG. 1 is shown in FIG. 5 and a schematic cross-sectional view of the damping mechanism 70 and 72 of FIG. 5 is shown in FIG. 6. In the embodiment shown, the damping mechanism 70 and 72 includes a one-way bearing 78 rotatable in a  
15 first direction, a holder 80 in which the one-way bearing 78 is received, a biasing element 82, and a retainer 84 against which the biasing element 82 is biased. The holder 80 is adapted to engage with the biasing element 82 when the first or second damping mechanism 70 or 72 is rotated in a second direction. The elements of the damping mechanism 70 and 72 may be held together by a screw  
20 86 threaded through a retainer cap 88 and into a shaft 90 extending through the damping mechanism 70 and 72.

In the present embodiment, the biasing element 82 comprises a spring-biased friction ring. More particularly, the biasing element 82 is formed of two (2) halves of a friction ring 92 separated by two (2) compression springs 94. The  
25 halves of the friction ring 92 come together when the halves of the friction ring 92 and the compression springs 94 are received in the retainer 84. When housed in the retainer 84, the compression springs 94 push or bias the halves of the friction ring 92 against an internal wall of the retainer 84. With such an arrangement, the compact design of the damping mechanism 70 and 72 may be maintained by

selection of suitable compression springs 94 to provide an optimum resistance force based on the size and mass of the screens 20. In other words, the overall size of the damping mechanism 70 and 72 need not be changed even when a larger resistance force is required as this may be provided by using different  
5 compression springs 94.

In the embodiment shown, the retainer 84 includes an engagement portion 96 arranged to engage with one of the first and second guide members 12 and 16 to prevent rotation of the retainer 84 relative to the first or second guide member 12 or 16. In the present embodiment, the engagement portion 96 is  
10 provided in the form of an extended protrusion that is to be received in a corresponding slot formed along a length of the first or second guide member 12 or 16.

A catch mechanism 98 is also provided in the embodiment shown. In the present embodiment, the catch mechanism 98 includes a spring-biased plunger  
15 100 housed in a shaft 102 of one of the first and third rotatable hinges 54 and 58, the spring-biased plunger 100 having a tip 104 that is biased to engage with one of a plurality of recesses 106 formed in a base 108 of the retainer 84. Advantageously, the catch mechanism 98 helps to restrict movement or rotation of the screen 20 when the screen 20 is at a certain position such as, for example,  
20 an open or a closed position. The catch mechanism 98 also helps keep the engagement portion 96 of the retainer 84 aligned with the screen 20 when the engagement portion 96 of the retainer 84 disengages from the first or second guide member 12 or 16. In the present embodiment, four (4) recesses 106 (two (2) of which are shown in FIG. 6), spaced circumferentially 90 degrees (°) apart,  
25 are provided in the base 108 of the retainer 84. Although four (4) recesses 106 are provided in the present embodiment, it should be understood by those of ordinary skill in the art that the present invention is not limited by the number of recesses 106 provided. Fewer or more recesses 106 may be provided in alternative embodiments.

In use, the one-way bearings 78 rotate freely in the first direction when the screen 20 is moved from a closed position to an open position. In the present embodiment, two (2) one-way bearings 78 are provided as shown. However, it should be understood by those of ordinary skill in the art that the present invention is not limited by the number of one-way bearings 78 employed. Fewer or more one-way bearings 78 may be used depending on the requirements of a specific screen system 10.

The holder 80 does not rotate along with the one-way bearings 78 as the holder 80 is held in place by the halves of the friction ring 92 which are pressed against the internal wall of the retainer 84 by the biasing force from the compression springs 94. The retainer 84 is in turn prevented from rotating when the engagement portion 96 of the retainer 84 is received in the corresponding slot formed along the length of the first or second guide member 12 or 16.

When the screen 20 is moved from an open position to a closed position, the one-way bearings 78 resist rotation, forcing the holder 80 and the halves of the friction ring 92 to rotate together around the one-way bearings 78 in the second direction, the halves of the friction ring 92 sliding along the internal wall of the retainer 84. Because the compression springs 94 bias or push the halves of the friction ring 92 against the internal wall of the retainer 84 as the halves of the friction ring 92 rotate, a resistive force is generated when the screen 20 is being closed and this dampens the speed of rotation when the first or second damping mechanism 70 or 72 is rotated in the second direction.

In the closed position, the tip 104 of the spring-biased plunger 100 of the catch mechanism 98 is received in one of the recesses 106 in the base 108 of the retainer 84 and the recess 106 in which the tip 104 is received and an opposing recess 106 are in line with the screen 20. When the screen 20 is moved or rotated from the closed position to the open position or from the open position to the closed position, the tip 104 of the spring-biased plunger 100 retracts and slides along the base 108 of the retainer 84 until the tip 104 re-

engages an adjacent recess 106 (not shown). As the tip 104 of the spring-biased plunger 100 slides along the base 108 of the retainer 84, the retainer 84 is held in place and prevented from rotating as the engagement portion 96 of the retainer 84 is received in the corresponding slot formed along the length of the first or  
5 second guide member 12 or 16.

Referring now to FIGS. 6 and 7, operation of the engagement portion 96 of the retainer 84 and the catch mechanism 98 as the screen 20 moves around a bend will now be described. In the embodiment shown in FIG. 7, the first guide member 12 includes a guide element 110 having a slot 112 in which the  
10 engagement portion 96 of the retainer 84 is received. As the screen 20 travels along this portion of the first guide member 12, the retainer 84 is prevented from rotating relative to the first guide member 12 as the engagement portion 96 of the retainer 84 is being held in a particular orientation by the slot 112 of the guide element 110. The retainer 84 is also prevented from rotating by the catch  
15 mechanism 98.

As can be seen from FIG. 7, the guide element 110 ends before a corner portion of the first guide member 12 as the screen 20 approaches a turn. The guide element 110 thus guides the damping mechanism 70 until a turning position where the catch mechanism 98 takes over. At the turning position, the  
20 engagement portion 96 of the retainer 84 is free of the slot 112 of the guide element 110, but is nevertheless still held in alignment with a width of the screen 20 as the spring-biased plunger 100 is caught in one of the recesses 106 on the base 108 of the retainer 84 to lock the position of the damping mechanism 70 relative to the screen 20 as the screen 20 moves across the corner portion of the  
25 first guide member 12. In this manner, the spring-biased plunger 100 holds the engagement portion 96 of the damping mechanism 70 aligned with the screen 20 as the screen 20 rotates along the bend in the first guide member 12. This helps ensure that the engagement portion 96 of the retainer 84 is re-engaged with the slot 112 of the guide element 110 after rotation around the bend.

Advantageously, these features allow the screen system 10 to be designed in various configurations as the catch mechanism 98 helps keep the engagement portion 96 of the damping mechanism 70 aligned with the screen 20.

5 Referring now to FIG. 8, a schematic cutaway view of a section of a guide member 12 or 16 of the screen system 10 is shown. In the embodiment shown, a rotation limiter 114 is coupled to one of the first and third rotatable hinges 54 and 58, the rotation limiter 114 being adapted to engage with one of a plurality of stopper edges 116 formed in a corresponding one of the first and second guide  
10 members 12 or 16 to limit an angle of rotation of the one of the first and third rotatable hinges 54 and 58.

In the present embodiment, the rotation limiter 114 and the first or second guide member 12 or 16 are formed with a 90 degree (°) stop edge. This prevents the screen 20 from rotating more than 90° when in an open position.

15 Referring now to FIGS. 9A and 9B, schematic cross-sectional views of the locking mechanism 22 of the screen system 10 of FIG. 1 in a locked position and an unlocked position are shown in FIGS. 9A and 9B, respectively. As can be seen from FIGS. 9A and 9B, the locking mechanism 22 is operable to move between an extended position to lock the screen system 10 and a retracted  
20 position to unlock the screen system 10. In the embodiment shown, the locking mechanism 22 includes a bar 118 and a lever assembly 120 coupled to the bar 118. The lever assembly 120 is operable to move the bar 118 between the extended position shown in FIG. 9A and the retracted position shown in FIG. 9B. In the extended position, the bar 118 of the locking mechanism 22 pushes  
25 against the screens 20 to lock the screens 20 in position. The screens 20 may be released from the locked position by rotating a handle 122 (shown in FIG. 1) of the locking mechanism 22 in a counter-clockwise direction by 180°. When the handle 122 is rotated counter-clockwise direction by 180°, the top and bottom linkages retract and the bar 118 is pulled back. This creates a gap for the

screens 20 to open up. Conversely, the locking mechanism 22 is activated to lock the screens 20 in position by turning the handle 122 in a clockwise direction by 180° as this causes the top and bottom linkages to become extended, pushing the bar 118 outwards against the screens 20.

5 Referring now to FIG. 10, a schematically exploded view of the first frame member 14 of the screen system 10 in accordance with another embodiment of the present invention is shown. In the embodiment shown, a first electrical connector 124 is coupled to the first rotatable hinge 54, a second electrical connector 126 is coupled to the second rotatable hinge 56, and a third electrical  
10 connector 128 is electrically connected to the first and second electrical connectors 124 and 126. The third electrical connector 128 is operable to engage with an electrical connector 130 coupled to a screen 20. The first electrical connector 124 is operable to engage with an adjacent second electrical connector (not shown) on an adjacent first frame member (not shown) and the  
15 second electrical connector 126 is operable to engage with an adjacent first electrical connector (not shown) on an adjacent first frame member (not shown). In the present embodiment, a closed loop power circuit is formed when the screen system 10 is in a closed position.

In this manner, the screen system 10 may be used with electrically-  
20 powered screens such as, for example, screens to which a switchable film 132 is applied as shown in FIG. 10 and screens incorporating motorised blinds (shown in FIG. 2D). Again, this provides greater design flexibility. A further advantage is that because the screen system 10 may be connected to a main power supply, battery issues may be eliminated.

25 In the embodiment shown, the first and second electrical connectors 124 and 126 are received in the mounting frame 50 of the first frame member 14 and the third electrical connector 128 is received in the rail 48 of the first frame member 14. The first electrical connector 124 is electrically connected to the third electrical connector 128 by first wires 134 and the second electrical

connector 126 is electrically connected to the third electrical connector 128 by second wires 136. The electrical connector 130 coupled to the screen 20 is electrically connected to switchable film contacts 138 on the switchable film 132 by third wires 140.

5 In the present embodiment, the electrical wiring is hidden from view when assembled. When the screens 20 are all in a closed position and are joined up, all the screens 20 become electrically interlinked and a series connection is thus formed. Power may thus be supplied from one screen 20 to another until the very last screen 20, thereby forming the closed loop power circuit.

10 When a change of screens 20 is required, only the electrical connector 130 coupled to the screen 20 is removed together with the screen 20 and the switchable film 132. The third electrical connector 128 remains attached to the rail 48 of the first frame member 14.

15 In the present embodiment, the first electrical connector 124 is a female-ended connector and the second electrical connector 126 is an outwardly-biased male-ended connector. Advantageously, the outwardly-biased male-ended connector helps to maintain electrical contact between the screens 20.

20 As is evident from the foregoing discussion, the present invention provides a screen system with interchangeable screens and that can also accommodate electrically-powered screens. The screen system of the present invention may be provided in various configurations, making it adaptable to various site conditions. Further advantageously, the screen system of the present invention may also be provided with a safety feature in the form of a damping mechanism to prevent the screens from slamming by accident.

25 While preferred embodiments of the invention have been illustrated and described, it will be clear that the invention is not limited to these embodiments only. Numerous modifications, changes, variations, substitutions and equivalents

will be apparent to those skilled in the art without departing from the scope of the invention as described in the claims.

Further, unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise", "comprising" and the like are to  
5 be construed in an inclusive as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

## CLAIMS

1. A screen system, comprising:
  - a first guide member;
  - 5 a plurality of first frame members, wherein each of the first frame members is moveably coupled to the first guide member;
  - a second guide member;
  - a plurality of second frame members, wherein each of the second frame members is moveably coupled to the second guide member;
  - 10 wherein corresponding pairs of the first and second frame members are operable to releasably engage a screen when in use.
2. The screen system of claim 1, wherein each of the first and second frame members comprises:
  - 15 a slot for receiving the screen; and
  - a removable stopper to secure the screen in the slot.
3. The screen system of claim 1, further comprising first and second rotatable hinges moveably coupling each of the first frame members to the first guide member and a third rotatable hinge moveably coupling each of the second frame members to the second guide member.
- 20 4. The screen system of claim 3, further comprising a rotation limiter coupled to one of the first and third rotatable hinges, the rotation limiter being adapted to engage with one of a plurality of stopper edges formed in a corresponding one of the first and second guide members to limit an angle of rotation of the one of the first and third rotatable hinges.
- 25 5. The screen system of claim 3, further comprising an opening formed in the first guide member to allow decoupling of the second rotatable hinge from the first guide member.
- 30

6. The screen system of claim 3, further comprising a first damping mechanism coupled to the first rotatable hinge and a second damping mechanism coupled to the third rotatable hinge, wherein the first and second  
5 damping mechanisms are operable to resist movement of the screen from an open position to a closed position.

7. The screen system of claim 6, wherein one of or both the first and second damping mechanisms comprise:  
10 a one-way bearing rotatable in a first direction;  
a holder in which the one-way bearing is received;  
a biasing element; and  
a retainer against which the biasing element is biased,  
wherein the holder is adapted to engage with the biasing element when  
15 the first or second damping mechanism is rotated in a second direction.

8. The screen system of claim 7, wherein the biasing element comprises a spring-biased friction ring.

20 9. The screen system of claim 7, wherein the retainer comprises an engagement portion arranged to engage with one of the first and second guide members to prevent rotation of the retainer relative to the first or second guide member.

25 10. The screen system of claim 9, further comprising a catch mechanism comprising a spring-biased plunger housed in a shaft of one of the first and third rotatable hinges, the spring-biased plunger having a tip that is biased to engage with one of a plurality of recesses formed in the retainer.

30 11. The screen system of claim 1, wherein the first guide member is formed with an extended external-facing surface.

12. The screen system of claim 1, further comprising one or more wear strips attached to one of or both the first and second guide members.

5 13. The screen system of claim 1, further comprising a locking mechanism coupled between the first and second guide members, the locking mechanism being operable to move between an extended position to lock the screen system and a retracted position to unlock the screen system.

10 14. The screen system of claim 13, wherein the locking mechanism comprises:

a bar; and

a lever assembly coupled to the bar and operable to move the bar between the extended position and the retracted position.

15

15. The screen system of claim 3, further comprising:

a first electrical connector coupled to the first rotatable hinge;

a second electrical connector coupled to the second rotatable hinge; and

a third electrical connector electrically connected to the first and second

20 electrical connectors, wherein the third electrical connector is operable to engage with an electrical connector coupled to a screen, and

wherein the first electrical connector is operable to engage with an adjacent second electrical connector,

25 wherein the second electrical connector is operable to engage with an adjacent first electrical connector, and

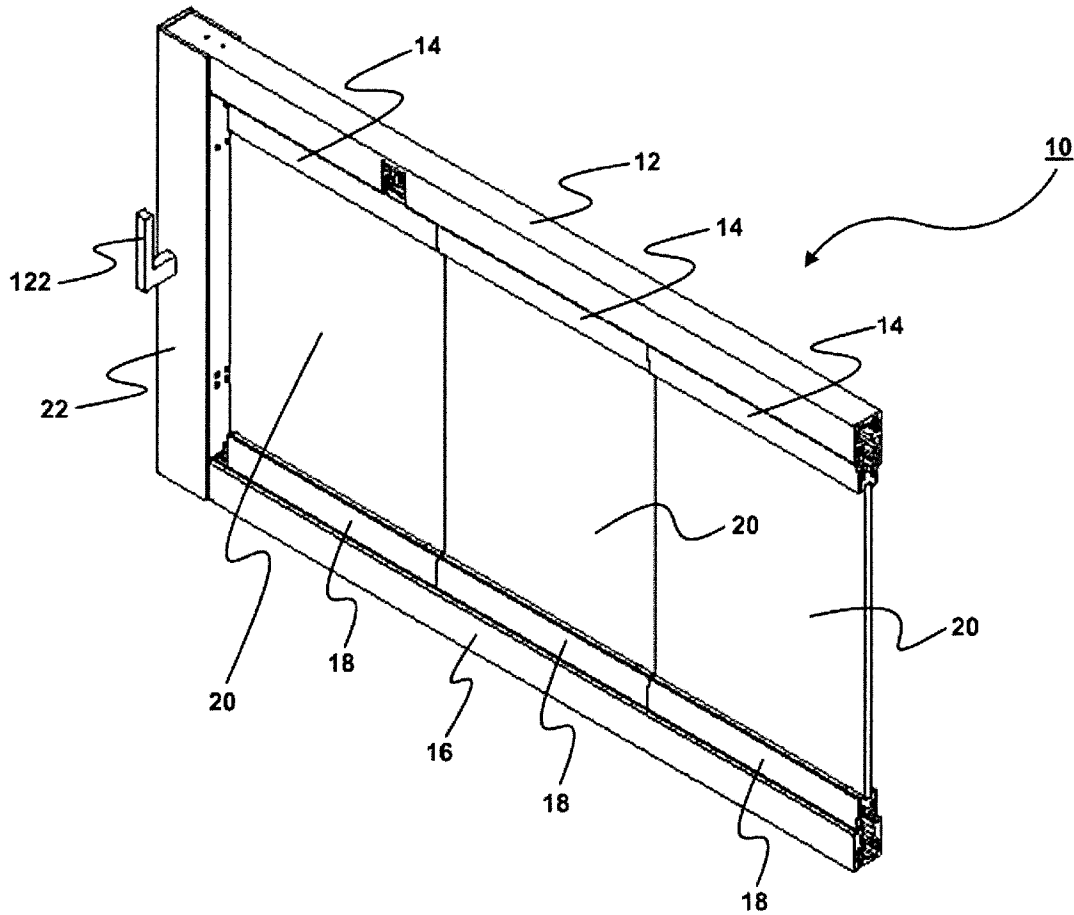
wherein a closed loop power circuit is formed when the screen system is in a closed position.

30 16. The screen system of claim 15, wherein the first electrical connector is a female-ended connector and the second electrical connector is an outwardly-biased male-ended connector.

17. The screen system of claim 1, further comprising a plurality of screens releasably attached to the corresponding pairs of the first and second frame members.

5

18. The screen system of claim 17, wherein the screens are selected from a group consisting of glass screens, louvre screens, screens with mosquito netting, window grilles, screens with a switchable film and screens with motorized blinds.



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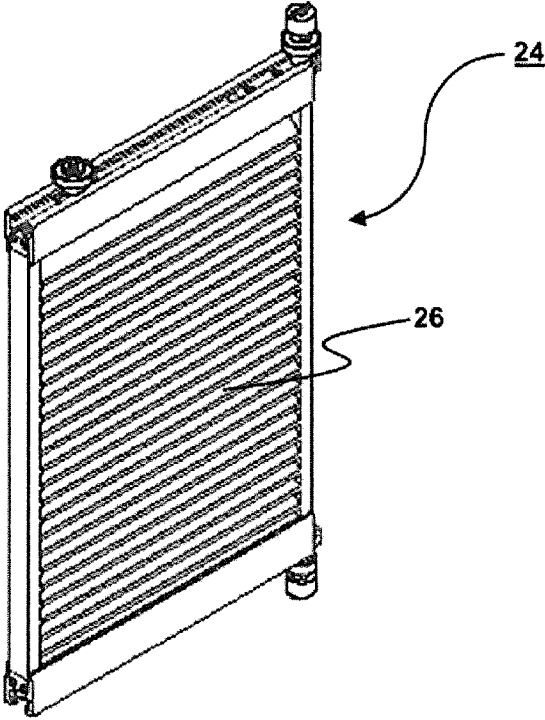


FIG. 2A

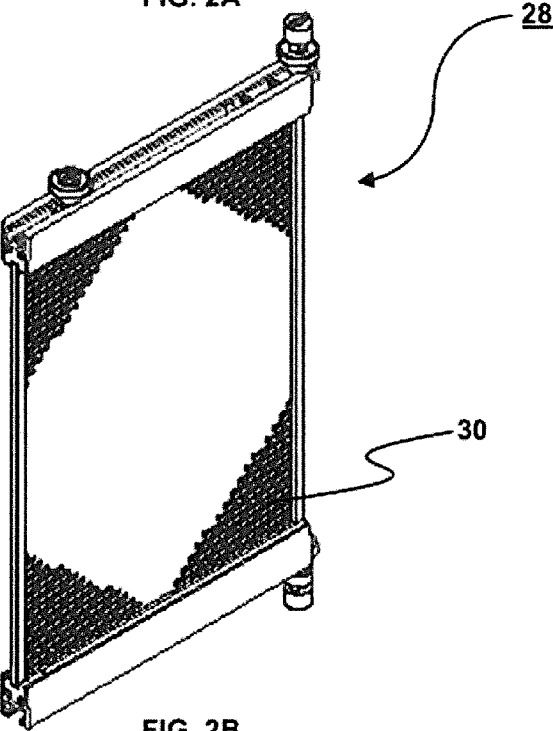


FIG. 2B

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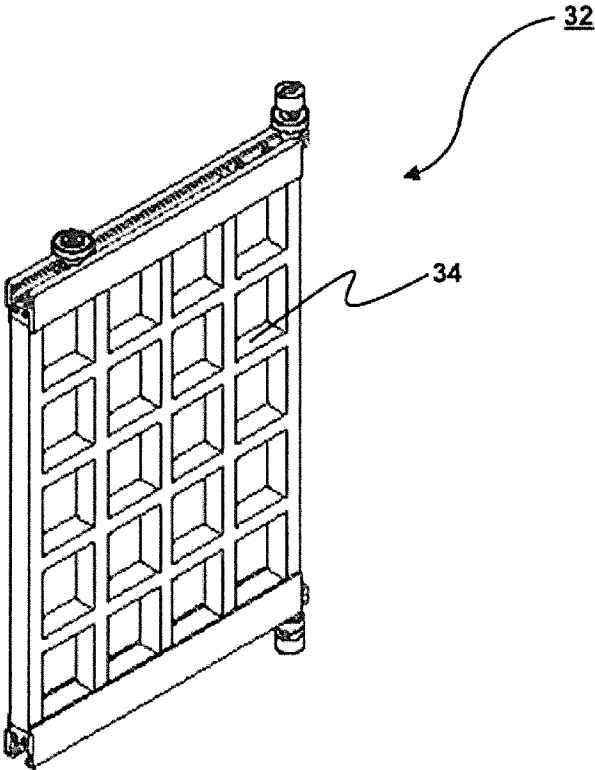


FIG. 2C

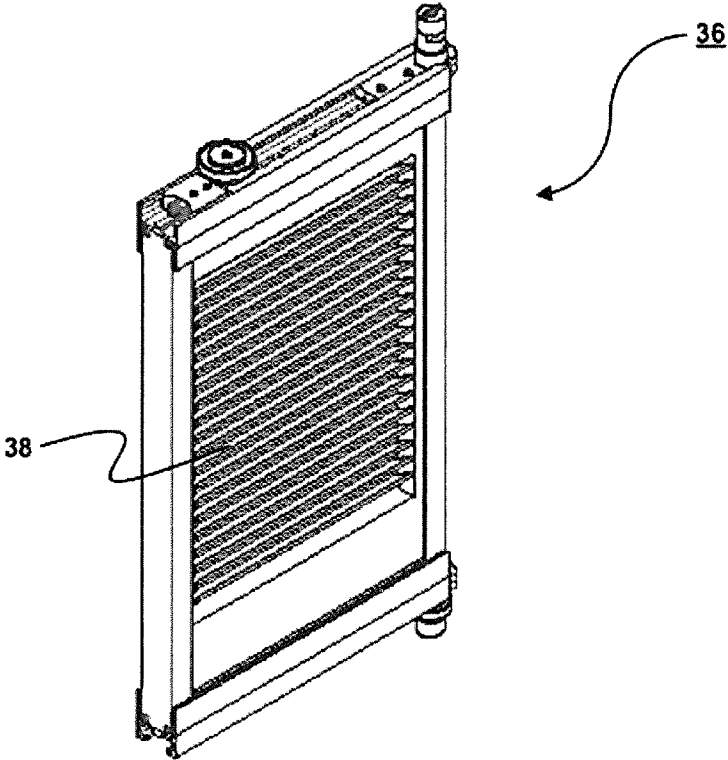


FIG. 2D

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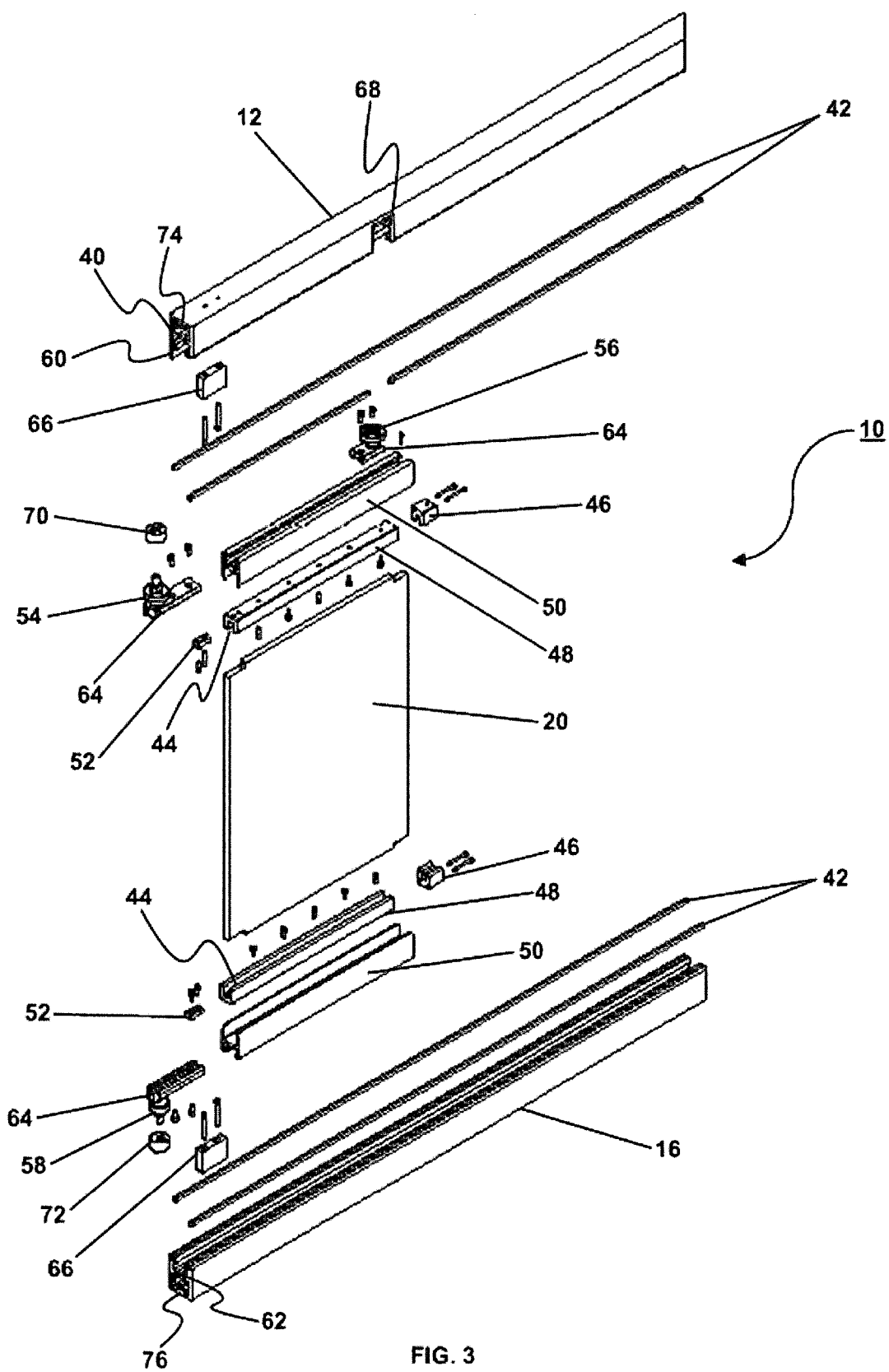
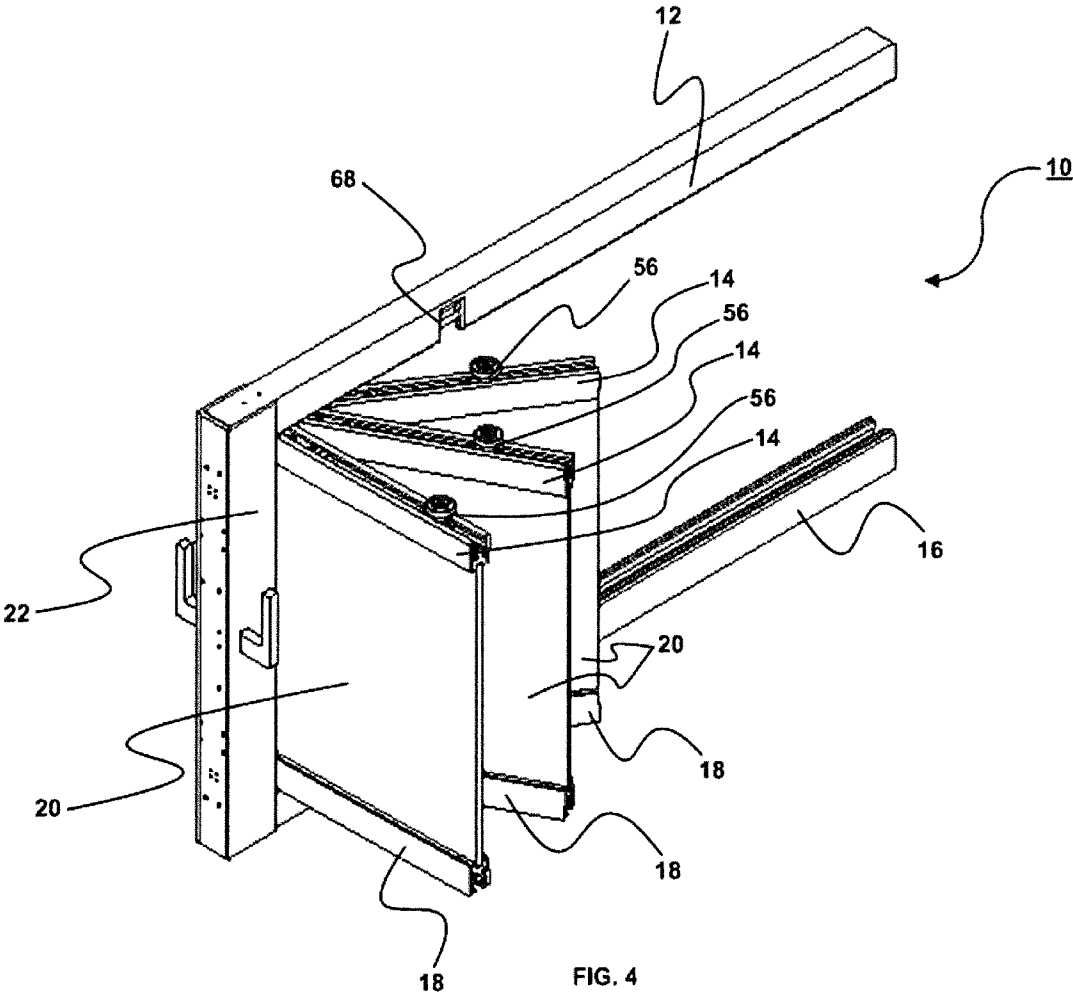


FIG. 3



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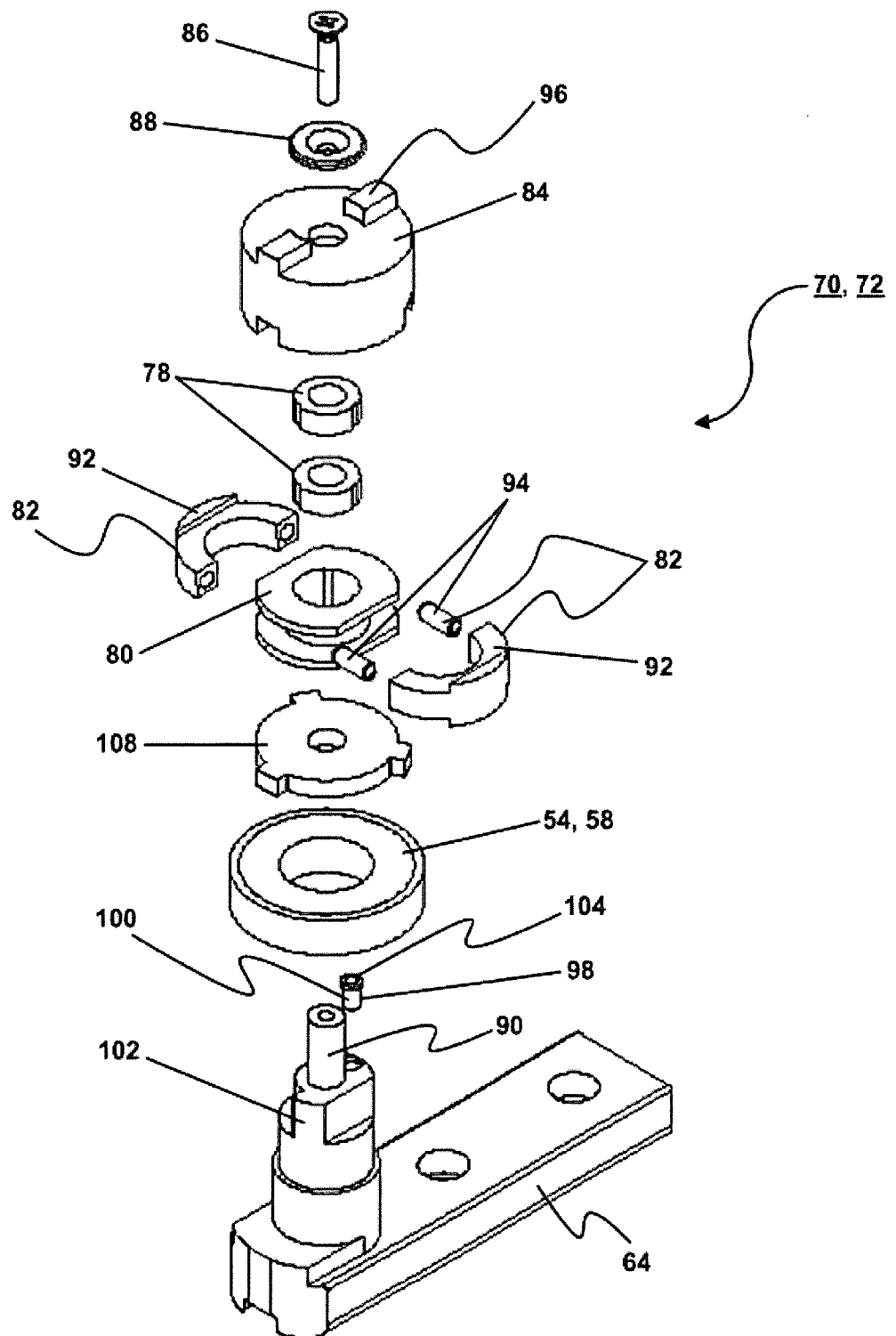


FIG. 5

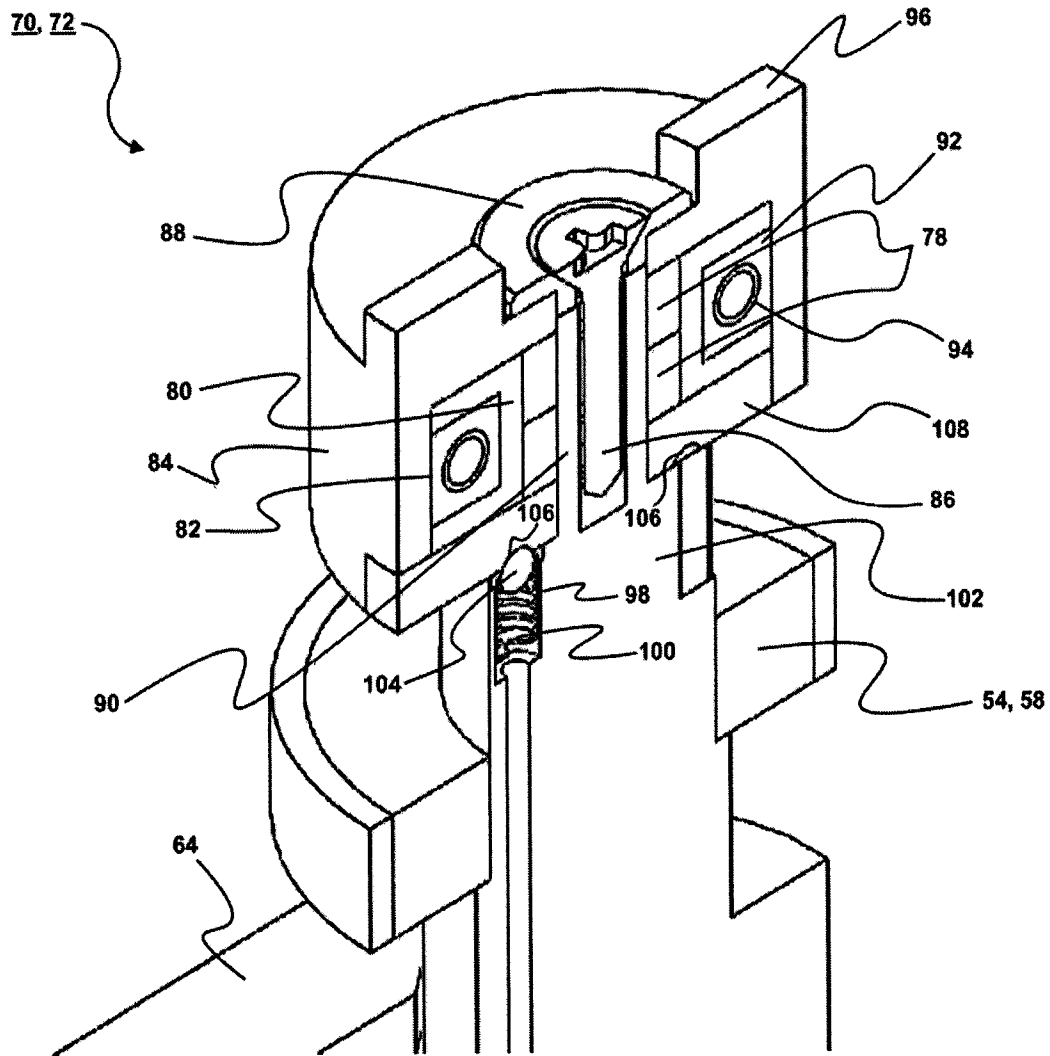
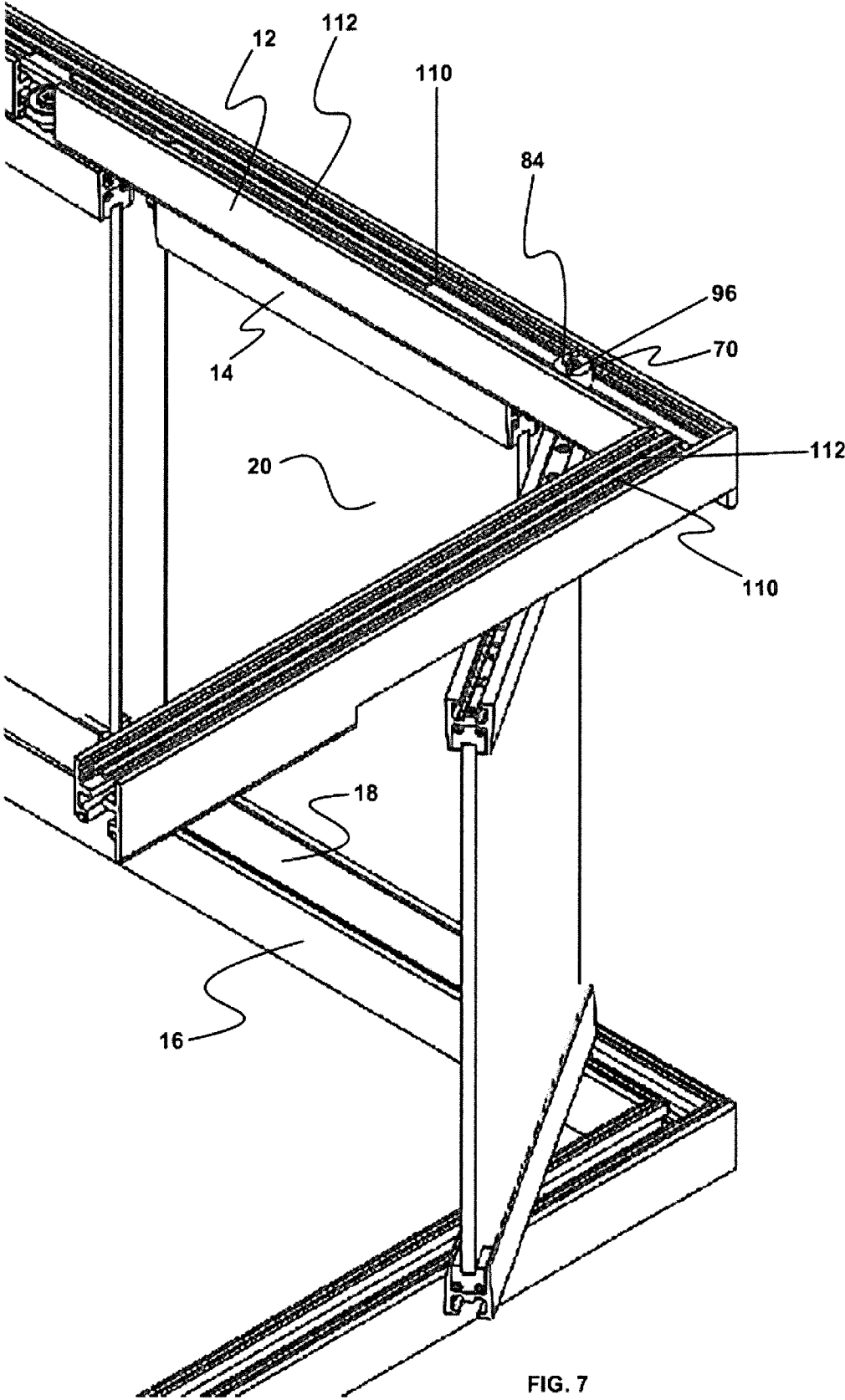


FIG. 6

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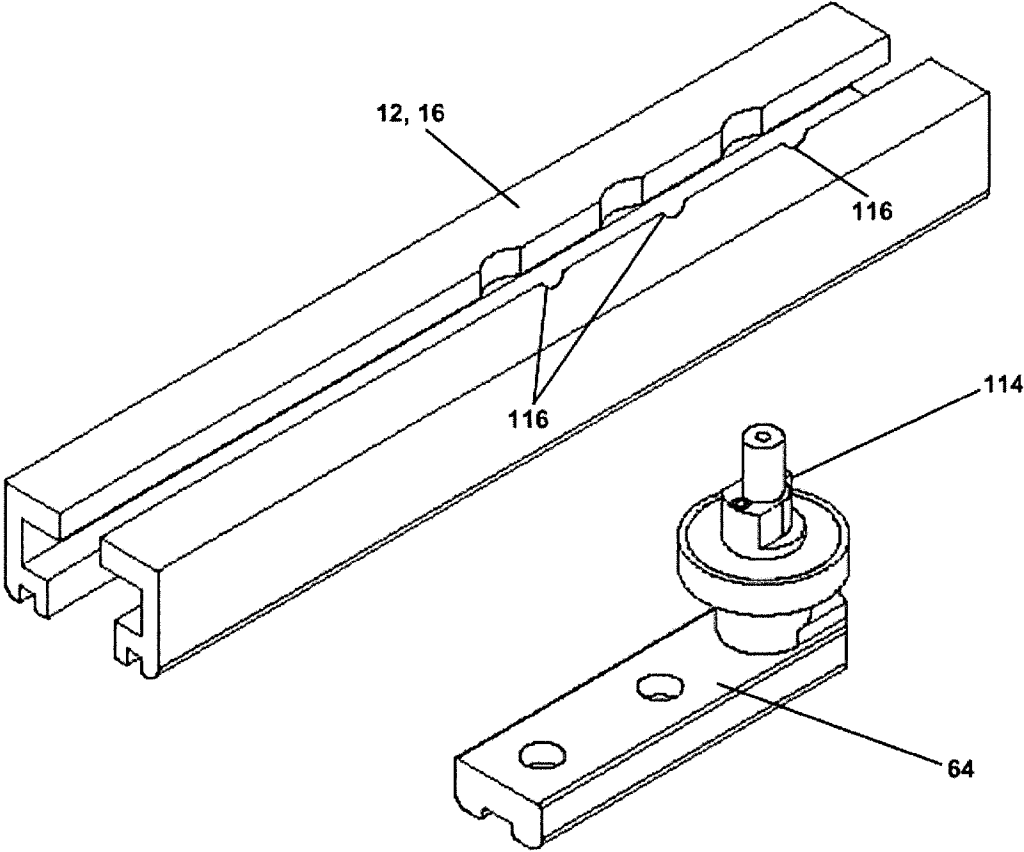


FIG. 8

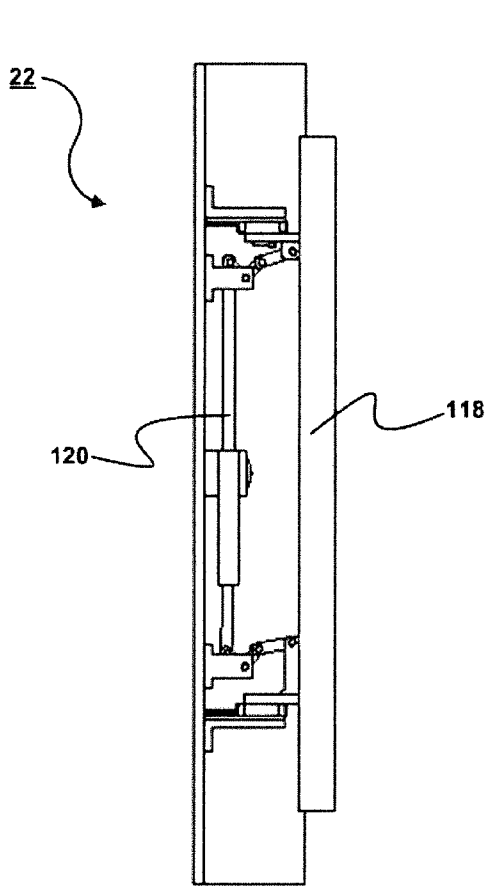


FIG. 9A

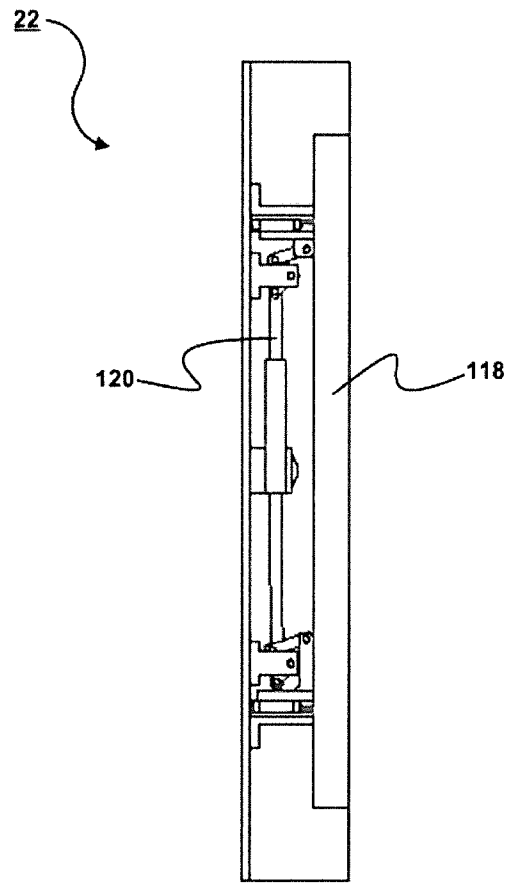


FIG. 9B

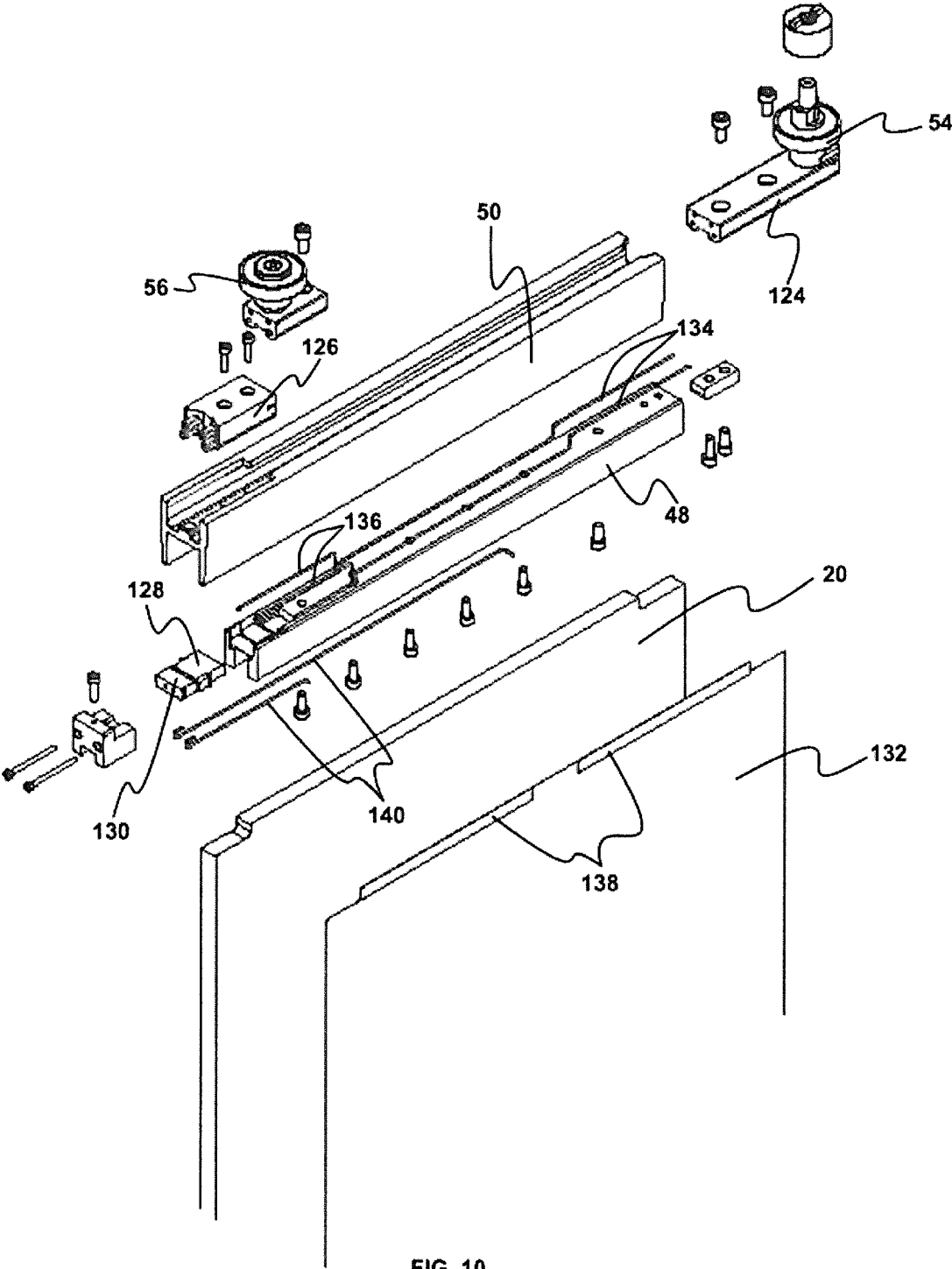


FIG. 10

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SG2016/050108

## A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. E05D15/00 (2006.01) i, E06B3/50 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. E05D15/00, E06B3/50, E06B3/70-3/88

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996  
 Published unexamined utility model applications of Japan 1971-2016  
 Registered utility model specifications of Japan 1996-2016  
 Published registered utility model applications of Japan 1994-2016

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                     | Relevant to claim No.                      |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Y<br>A    | JP 2014-520224 A (ALLGLASS CONFORT SYSTEMS S.L.)<br>2014.08.21, Whole document, Whole drawing<br>& US 2014/0326419 A1, Whole document, Whole<br>drawing & WO 2012/175754 A1 & CN 103492655 A &<br>KR 10-2014-0066688 A | 1-3, 5, 11-13,<br>17, 18<br>4, 6-10, 14-16 |
| Y         | JP 2009-13767 A (NISHIMURA PLASTICS PACKAGING)<br>2009.01.22,<br>Whole document, Whole drawing (family none)                                                                                                           | 1-3, 5, 11-13,<br>17, 18                   |
| Y         | Microfilm of the specification and drawings<br>annexed to the written application of Japanese<br>Utility Model Application<br>No.197631/1985 (Laid-open No.103986/1987)<br>(MATSUSHITA ELECTRIC WORKS LTD)             | 5                                          |



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

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special reason (as specified)"O" document referring to an oral disclosure, use, exhibition or other  
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be considered novel or cannot be considered to involve an  
inventive step when the document is taken alone"Y" document of particular relevance; the claimed invention cannot  
be considered to involve an inventive step when the document is  
combined with one or more other such documents, such  
combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

18.05.2016

Date of mailing of the international search report

31.05.2016

Name and mailing address of the ISA/JP

**Japan Patent Office**

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SG2016/050108

| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                |                       |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------|
| Category*                                             | Citation of document, with indication, where appropriate, of the relevant passages             | Relevant to claim No. |
|                                                       | 1987.07.02, Whole document, Whole drawing (family none)                                        |                       |
| Y                                                     | JP 5-3514 B2 (YOSHIDA KOGYO KK) 1993.01.14, Whole document, Whole drawing (family none)        | 13                    |
| A                                                     | JP 3375680 B2 (MISAWA HOMES CO., LTD.) 2003.02.10, Whole document, Whole drawing (family none) | 4, 6-10               |