

JOINING AND LEVELLING SYSTEM FOR PARTS OF FURNITURE AND
FURNISHING ITEMS WITH MINIMUM ENCUMBRANCE

The present invention relates to a joining and
levelling system for parts of furniture and furnishing
5 items with minimum encumbrance.

Various joining and levelling systems for parts of
furniture and furnishing items are known, which involve
the formation of a series of visible holes and spaces
destined for actuating the junctions and in particular
10 availing of a certain free space beneath the furniture
for adjusting the rear feet of the furniture and rear
joints.

Solutions are also known in which the joining and
levelling systems for parts of furniture and furnishing
15 items are contained in confined spaces below the
furniture and propose a generally front actuation that
involves both the device for joining a bottom to a
shoulder and also the levelling device of the piece of
furniture.

20 In all these cases there is an arrangement of the
piece of furniture in which the shoulder or shoulders
rest on the floor and the bottom or lower shelf is
raised with respect to the underlying floor.

Furthermore, in all these cases, there are front
25 supporting feet and rear supporting feet and it must

therefore be possible to have access to both in order to obtain joints between the shoulder and bottom and also to adjust the leveller, when present.

It should also be pointed out that an actuation
5 from above, in particular for the rear joints and levellers, is not always easy, in the presence of limited spaces between the shelves or minimum distances from the bottom of the piece of furniture or from the rear wall of the furniture.

10 This requirement is even greater if said furniture in the form, for example, of modular kitchens incorporating built-in dishwashers, refrigerators, ovens and other appliances, cannot provide feet adjustable from the inside of the furniture that is
15 occupied by the appliance.

All of these solutions or problems are also increased if, for structural requirements and for the arrangement of the parts, there is a piece of furniture for which the shoulder or shoulders or the bottom or
20 lower shelf must not rest on the floor and a really minimal distance of the bottom or lower shelf and the floor is required.

The solution in this case must be such as to sustain the entire weight of the furniture - shoulders,
25 bottom and shelves - as well as the additional contents

without any support except for that of the feet, allowing the junctions and adjustments between the parts to be effected in truly minimal spaces and without forming any visible holes.

5 The general objective of the present invention is to provide a joining and levelling system for parts of furniture and furnishing items that solves the problems and drawbacks indicated above.

10 A further objective of the present invention is to provide a joining and levelling system for parts of furniture and furnishing items that is particularly simple, compact and capable of supporting the entire weight of the furniture with its additional contents when in use.

15 Another objective of the present invention is to provide a joining and levelling system for parts of furniture and furnishing items that allows a front connection and adjustment, also for rear joints and levelling feet.

20 Yet another objective of the present invention is to provide a joining and levelling system for parts of furniture and furnishing items that is also accessible when said furniture has an extremely restricted space below the bottom and with serious difficulty of access.

25 The above objectives are achieved by a system

having the features specified in the enclosed claim 1 and sub-claims.

The structural and functional characteristics of the invention and the advantages with respect to the known art can be clearly understood from the following description, referring to the attached drawings, which illustrate various embodiments of the invention itself.

In the drawings:

- figure 1 is a perspective view illustrating a first example of a joining and levelling system for parts of furniture and furnishing items with minimum encumbrance produced according to the present invention designed for joining a shoulder and a base or bottom of a piece of furniture with a front foot unit and a rear foot unit positioned beneath both the shoulder and the bottom of the piece of furniture, neither of which rests on the floor;
- figure 1a is a view from below of the joining and levelling system shown in figure 1;
- figure 2 is a raised sectional view obtained according to the line II-II of figure 1a of the front foot unit with a joining and levelling device with the addition of the bottom and a shoulder;
- figure 3 is a raised sectional view obtained according to the line III-III of figure 1a of the front

- foot unit with a joining and levelling device with the addition of the bottom and a shoulder;
- figures 4 and 5 are perspective views according to different directions of a front and/or rear foot unit provided with the joining device and leveller inserted therein;
 - figures 6 and 7 are plan views from above and below of the foot unit of figures 4 and 5;
 - figures 8, 9 and 10 are raised views from the two long sides and from a short side of the foot unit of figures 4 and 5;
 - figure 11 is a perspective view similar to that of figure 4 with a joining device and leveller exploded from the foot unit;
 - figures 12 and 13 are perspective views with partially exploded parts of the joining device alone and of the levelling device alone as shown in figure 11;
 - figures 14 to 17 are perspective views that show consecutive insertion phases of the front and rear foot units into the bottom, the transmission rods therein, the blockage in position of said transmission rods and the assembly of the shoulder with respect to the bottom provided with foot units;
 - figure 18 is a perspective view illustrating a

second example of a simplified joining system for parts of furniture and furnishing items with minimum encumbrance produced according to the present invention designed for joining a shoulder and a base or bottom of
5 a piece of furniture with a front foot unit and a rear foot unit positioned beneath both the shoulder and the bottom of the furniture, neither of which rests on the floor;

- figure 18a is a view from below of the joining and
10 levelling system shown in figure 18;

- figure 19 is a raised sectional view obtained according to the line XIX-XIX of figure 18a of the front foot unit with a joining and levelling device with the addition of the bottom and a shoulder;

15 - figures 20 and 21 are perspective views according to different directions of a front and/or rear foot unit provided with the joining device inserted therein;

- figures 22 and 23 are plan views from above and below of the foot unit of figures 20 and 21;

20 - figures 24, 25 and 26 are raised views from the two long sides and from a short side of the foot unit of figures 20 and 21;

- figure 27 is a perspective view similar to that of figure 20 with a joining device exploded from the foot
25 unit;

- figure 28 is a perspective view with partially exploded parts of the joining device alone as shown in figure 27;
- figure 29 is a perspective view from above of the joining and levelling system of figure 1 which also shows a tool-guiding device suitable for being used in the assembly and adjustment phase of furniture or furniture items.

With reference in general to the drawings, it can be noted that the figures partially illustrate a piece of furniture M provided with a shoulder 11 (in the examples side walls) (only one of which is shown) and a bottom 12.

A front foot unit 14 and a rear foot unit 15 positioned beneath both the bottom 12 and the shoulder 11, are also shown. Neither the bottom 12 nor the shoulder(s) 11 rests on a floor P (figure 2) and in this example, the shoulder 11 and the bottom 12 are aligned and raised with respect to the underlying floor P.

As can be seen, in furniture of this type, a truly minimum space is defined beneath the bottom 12 and the shoulder 11. The furniture M must, in this case, sustain its entire weight (shoulders, bottom and shelves) in addition to that of the additional contents

without any support, except for that of the foot units.

The height h of the space between the bottom 12 and the shoulder 11, aligned, and the floor, makes it difficult for the operator to have access to the front
5 and above all the rear foot units.

In this way, it is extremely difficult to provide for the joining and above all for each adjustment in situ due to the small distance between the floor P and the bottom 12 and the shoulder 11 of the furniture M
10 both raised from the floor P.

Figures 1 to 17 show how, in a first example of the system of the invention, at least one front foot unit 14 and one rear foot unit 15 are fixed to the bottom or base 12 to provide a completely innovative joining and
15 levelling system.

Both of the foot units 14 and 15 incorporate joining devices between the parts of the furniture and furnishing items and levelling devices with respect to the floor P.

20 Figures 1 to 13 show how a generic foot unit 14 and 15 of the joining and levelling system for parts of furniture and furnishing items according to the invention comprises a body 16, for example prismatic, that can be associated beneath both the bottom 12 and
25 the shoulder 11. In particular, a side extension or

shelf 17, protruding along a short side of the body 16, forms a support for the lower end of the shoulder 11, bringing it and thus keeping it at the same level as the bottom 12.

5 The body 16, for example moulded in zamak or plastic or in another material suitable for the purpose, provides voids and ribs for lightening and/or stiffening. In particular, it provides a first recessed seat or housing 18 for a blocking group GB of a joining
10 device and a second recessed seat or housing 20 for a levelling device 21.

Figure 2 shows how the blocking group GB of the blocking device is at least partially housed in a blind hole 22 formed in the lower surface 23 of the bottom
15 12. Furthermore, the joining device provides a connection group GC associated with the blocking group GB. In particular, the connection group GC is inserted aligned in axis with a symmetry axis X of the thickness of the bottom 12. More specifically, it can be seen how
20 the shoulder 11 provides a seat S1 in the form of a horizontal blind hole 24, a threaded end 25 of a pin 26 protruding from the shoulder 11, being positioned in said hole 24.

The pin 26, in axis with the thickness of the
25 bottom, is housed in a horizontal hole 27 of the bottom

12 itself. It can also be noted that the hole 27 is aligned with the hole 24 of the shoulder 11 of the furniture M. The pin 26 in its protruding part, provides a housing 28 for a tip of a blocking grub
5 screw 29 of the blocking group GB of the joining device.

The blocking group GB of the joining device provides a cylindrical casing, formed, for example, by a pair of half-shells 31, 32. A hole 33 for actuating
10 the blocking group GB of the joining device is formed below in one of the half-shells 31 of the casing. The hole 33 provides access to movement means of the grub screw 29 previously mentioned. The grub screw 29 is in fact caused to slide inside the casing 31, 32 by means
15 of a pinion-toothed crown bevel 34, 35. A pinion 34 is rotatably positioned inside the casing 31, 32, and engages with a toothed crown 35, formed as the head of a threaded screw 36. The toothed crown 35 is only rotatable inside the casing 31, 32 in a seat 37, but
20 not translatable. The threaded screw 36 is in turn positioned in an axial threaded hole 38 inside the grub screw 29. The rotation of the threaded screw 36 causes the movement of the grub screw 29 between an engagement position and a disengagement position.

25 With these means, the blocking of the pin 26 is

obtained, which passes through openings 41, 42 of the half-shells 31, 32 and therefore the bottom 12 with respect to the shoulder 11 of the furniture M for the foot unit 14 or 15.

5 A tool (not shown), by means of its tip, controls the pinion 34 passing through both a front opening 39 of the body 16 and the hole 33 of the half-shell 31 of the casing. A ring 40 blocks the two half-shells 31, 32 containing the mechanism between the same.

10 Figure 3 shows how a part of the levelling device 21 is inserted in a blind hole 43 formed in the lower surface 23 of the bottom 12 downwards.

The levelling device 21 provides a cylindrical casing, formed for example by means of a pair of half-
15 shells 44, 45 blocked together by means of a base cap or lid 53. In the half-shell 44 of the casing, a hole 46 is provided below for actuating the levelling device 21. The hole 46 provides access to movement means of the leveller. A pinion-toothed crown bevel is in fact
20 positioned inside the casing 44, 45. A pinion 47 is rotatably positioned inside the casing 44, 45, and engages with a toothed crown 48, formed as the head of a threaded screw 49. The toothed crown 48 is rotatable inside a housing 50 of the casing 44, 45, free to
25 rotate but not to translate. The threaded screw 49 is

in turn positioned in a threaded hole 51 inside a hollow pusher element 52, in the form of an overturned cup. The hollow pusher element 52 is positioned coaxially with respect to the outside of the casing 44, 45. The rotation of the threaded screw 49 causes the upward and/or downward movement of the hollow pusher element 52 and the adjustment of the leveller by means of a thrust engagement inside a blind hole 43 formed in the bottom 12.

With these means the positioning and levelling of the furniture M are obtained with respect to the floor P.

A tool (not shown) controls, through its tip, the pinion 47 passing through both a front opening 64 of the body 16 and the hole 46 of the half-shell 44 of the casing.

Figure 14 shows how a front foot unit 14 and a rear foot unit 15 provided with a joining device and a levelling device, are inserted in the respective holes 22 and 43 formed below the bottom 12.

Figure 15 shows how, once positioned in this way, the front foot unit 14 and the rear foot unit 15, complete with joining device and levelling device, are provided with two transmission (return) rods 54. Said transmission rods 54 are arranged passing through

openings 55, 56 and channels 57, 58 of the body 16 of the front foot unit 14 to reach and engage their ends in pinions 34 and 47 of the joining device and levelling device of the rear foot unit 15.

5 The following figure 16 shows how blocking pegs 59 are inserted in a housing 60 of the body 16 to cause the blockage in this operative position, of the transmission rods 54.

10 Finally, figure 17 shows the final phase in which the shoulder 11 is assembled on the bottom 12.

For this purpose, the pins 26, protruding from the shoulder 11, are inserted in the holes 27 which are formed horizontally in the bottom 12 in a direction parallel to the floor P.

15 It can also be seen how figure 1 or figures 16, 17 show that actuating points of the connection group GC and levelling group GL of both the front and rear foot units 14, 15 are arranged adjacently on a horizontal plane parallel to the floor P. The encumbrance of the
20 body 16 of the foot units 14, 15 is therefore minimized.

From the plan view of figure 6 and perspective views of figures 4 and 11, it can also be seen how the first recessed seat or housing 18 for the blocking
25 group GB of the joining device and the second recessed

seat or housing 20 for the levelling device 21 are formed offset in the plane of the body 16 so as to occupy the smallest possible space and allow the actuation of both.

5 Figures 18 to 28 show a simplified embodiment of the system according to the invention.

 In this example, in fact, there is the provision that a joining device alone is present in the foot units for parts of furniture and furnishing items. In
10 any case, a minimum encumbrance of the foot units is created also in this example, together with the complete support of the furniture on the foot units positioned beneath it.

 The same elements are indicated with the same
15 reference numbers and for similar elements the number "1" is added in front.

 A body 116 of the front foot unit 114 and rear foot unit 115 is therefore provided, which contains only the joining device comprising a connection group GC
20 associated with a blocking group GB. The body 116 provides, instead of the second recessed seat or housing 20 for the levelling device 21 of the first example, an extension 180 protruding above the body 116. This extension 180 is housed in a hole (not shown)
25 formed in the bottom 12 and cooperating to form a

stable coupling between the foot units 114, 115 and the bottom 12. In this example, in fact, there is also a blind hole 22, formed in the lower surface 23 of the bottom 12, where the blocking group GB of the positioned joining device 18 is arranged. Said blocking group GB of the joining device is positioned in a recessed seat or housing 18 of the body 116.

A single transmission rod 54 is also provided. This transmission rod 54 is arranged passing through an opening 156 and a channel 158 of the body 116 of the front foot unit 114 to reach and engage its end in the pinion 34 of the joining device of the rear foot unit 115.

The maneuvering of the blocking group GB of the front foot unit 114 is effected by passing from a front opening 139 formed in the body 116.

This simplified example also has the same advantages previously indicated for the first example of the system of the invention.

The functioning of the joining and levelling system for parts of furniture and furnishing items with minimum encumbrance previously described is simple and can be easily understood from what has just been indicated and shown in the accompanying drawings.

A joining and levelling system of this type for

parts of furniture and furnishing items with minimum
encumbrance according to the invention enables there to
be no visible holes, also allowing both the shoulders
and the bottom not to be flush with the floor, detached
5 from it.

In spite of this, once it has been correctly
prepared, it allows an easy connection and enables the
piece of furniture to be levelled.

It is fixed to the bottom of the furniture and
10 allows its front actuation with respect to the
furniture through the space between the bottom or
shoulder and the floor even when the space between the
bottom and shoulder and floor is extremely limited.

It should also be noted that a system of this type
15 according to the invention contains both the connection
group GC and the blocking group GB and also the
levelling group.

Any actuation drawback is eliminated as it is
possible to act both in connection and above all in
20 levelling from the front part of the furniture without
any visible hole in the furniture itself.

Figure 1 shows how by acting with a tool, passing
from the opening 39 of the body 16, on the pinion 34 of
the blocking group GB of the front foot unit 14, the
25 grub screw 29 is caused to become engaged in the seat

28 of the pin 26 causing the connection between the shoulder 11 and bottom 12 thanks to the presence of the connection group GC.

To implement the engagement of the connection unit
5 GC of the rear foot unit 15, the same tool operates on the head of the transmission rod 54. Said head of the transmission rod 54 is housed in the opening 56 of the body 16 of the front foot unit 14. The opposite end of the transmission rod 54 thus acts on the pinion 34 of
10 the blocking group GB of the rear foot unit 15. This action causes the engagement of the grub screw 29 in the seat 28 of the pin 26, obtaining the connection between the shoulder 11 and the bottom 12 thanks to the presence of the connection group GC also in the rear-
15 foot unit 15.

A similar operation is also effected for the levelling.

Again from Figure 1 for example, it can be seen how, by acting with a tool, passing from the opening 64
20 of the body 16, on the pinion 47 of the levelling device 21 of the front foot unit 14, part of the correct levelling is effected. This takes place thanks to the movement of the hollow pusher element 52 inside the blind hole 43 of the bottom 12 which, by pushing
25 the bottom, causes its upward movement and the

adjustment of the leveller.

This levelling operation is completed by acting with a tool on the head of the relative transmission rod 54. Said transmission rod 54 is housed in the opening 55 of the body 16 of the front foot unit 14. The opposite end of the transmission rod 54 thus acts on the pinion 47 of the levelling device 21 of the rear foot unit 15. This action identically causes the engagement of the hollow pusher element 52 inside the blind hole 43 of the bottom 12. The raising or lowering of the bottom allows the adjustment of the leveller also present in the rear foot unit 15.

Figure 29 is a perspective view from above of the joining and levelling system of figure 1 which also shows a tool-guiding device 200 suitable for being used in the assembly phase.

This type of tool-guiding device 200 allows the blocking and adjustment operations previously described to be facilitated.

The above-mentioned tool-guiding device 200, in fact, comprises a parallelepiped body 201 within which, in the example, four guiding housings A, B, C and D are hollowed out for a rod with a tip of a tool (not shown). There can also be fewer housings and in any number depending on the application for which the tool-

guiding device is destined.

In each of the housings A, B, C and D, a recessed channel extends in the upper part of the body 201 which protrudes from a rear surface of the body in
5 correspondence with respective openings. These openings in the body 201 can be positioned aligned towards the front body 14 containing at least one joining group or device and also, if present, a levelling group. Furthermore, they are produced in such a way that they
10 can be directed towards the ends of transmission rods 54 for actuating a joining group or device and a levelling group of the rear body.

To facilitate the positioning of the tool-guiding device 200, on one side its body 201 provides rear
15 hooking extensions 217 cooperating with seats 216 suitable for receiving the hooking extensions 217 of the device with respect to the front body 14.

This should also be repeated identically with respect to the simplified example of figures 18 to 28
20 in which the previous functioning considerations only relate to the joining device i.e. the connection group GC and the blocking group GB.

In this way, a stable and final blocking is obtained between the shoulder 11 and the bottom 12 of
25 the furniture and in addition also the correct level

positioning.

In view of the various embodiments previously illustrated and described, the characteristics of the system of the present invention are therefore repeated.

5 A joining and levelling system of this type for parts of furniture and furnishing items allows there to be no visible hole, once it has been correctly assembled for connecting and levelling the furniture, thus giving the furniture a high functional and
10 aesthetic characteristic.

This type of system with reduced encumbrance makes it possible to have front and rear foot units capable of supporting the whole piece of furniture and its contents in the presence of a minimum encumbrance
15 between shoulder and bottom with respect to the floor.

Furthermore, even in the presence of such a reduced encumbrance, it is possible to effect both the connection and blocking between the parts of the furniture (shoulder and bottom) together with
20 adjustment of the level, when provided.

This is all achieved with a front actuation with respect to the furniture through the minimum space between the bottom and shoulder and the floor, in an extremely limited space between the bottom, shoulder
25 and floor and generally considered by an operator as

being very restricted.

Advantageously, with the system of the present invention, both the connection or joining group with relative blocking and also the levelling group beneath
5 the thickness of the bottom and shoulder of the furniture are particularly compact and easy to actuate on the part of any operator.

Any actuation drawback is eliminated as it is possible to act both in connection and above all in
10 levelling from the front part of the furniture without any visible hole in the furniture itself.

This provision also allows the elimination of any further element that serves for guaranteeing the correct direction or orientation of the screwdriver
15 that must be present in the known additional systems in the form of a guide or similar item fixed to the bottom of the furniture.

The objectives mentioned in the preamble of the description have thus been achieved.

20 The protection scope of the present invention is defined by the enclosed claims.

CLAIMS

1. A joining and levelling system suitable for being used in furniture and furnishing items (M) with a bottom (12) and at least one shoulder (11) positionable
5 with respect to a floor (P), said system comprising, in combination, at least one front foot unit (14,114) and at least one rear foot unit (15,115), wherein each front and rear foot unit (14,15; 114,115) comprises at least one connection group (GC) and a blocking group
10 (GB) of a joining device for stably interconnecting said bottom (12) and said at least one shoulder (11), wherein said connection group (GC) and said blocking group (GB) of the joining device can be actuated from the front of the furniture, wherein said at least one
15 front foot unit (14,114) and said at least one rear foot unit (15,115) are positionable beneath both said bottom (12) and said at least one shoulder (11), wherein said bottom (12) and said at least one shoulder (11) do not rest on the floor, said system being
20 characterized in that each front and rear foot unit (14,15) also comprises a levelling device (GL) with a height adjustment mechanism manoeuvrable by means of a tool, wherein said levelling device (GL) of said front and rear foot units (14,15) can be actuated from the
25 front of the furniture.

2. The system according to claim 1, characterized in that actuation points of said connection group (GC) and blocking group (GB) and said levelling group (GL) of said front and rear foot units (14,15; 114,115) are
5 arranged on a horizontal plane parallel to said floor adjacent to each other.

3. The system according to claim 2, characterized in that said blocking group (GB) and levelling group (GL) of said rear foot units (15) are connected to said
10 front foot unit (14) by means of return rods (54).

4. The system according to any of the previous claims, characterized in that each front and rear foot unit (14,114; 15,115) comprises a body in zamak or plastic or another material, which provides voids and
15 lightening and/or stiffening ribs.

5. The system according to claim 4, characterized in that said body (16,116) of the prismatic type can be associated beneath both the bottom (12) and said at least one shoulder (11) and provides, from at least one
20 short side, a protruding side extension or shelf (17) which forms a support for the lower end of the at least one shoulder (11).

6. The system according to any of the previous claims, characterized in that each front and rear foot unit
25 (14,15) provides a plurality of openings (64,39, 55, 56)

for a manoeuvring actuation tool of the connection group (GC), blocking group (GB) and levelling group (GL).

7. The system according to claim 6, characterized in that at least two of said openings (55, 56) also provide pass-through channels (57, 58) in the body (16) of each front and rear foot unit (14,15).

8. The system according to one or more of the claims from 4 to 7, characterized in that said body (16) provides a first hollow seat or housing (18) for the blocking group (GB) of the joining device and a second hollow seat or housing (20) for the levelling device (21).

9. The system according to claim 8, characterized in that said first hollow seat or housing (18) and said second hollow seat or housing (20) are formed offset in the plane of the body (16) so as to occupy the minimum space possible and allow a front actuation of the connection group (GC), the blocking group (GB) and the levelling group (GL).

10. The system according to one or more of the previous claims, characterized in that said blocking group (GB) of the joining device of each front foot unit (14) and rear foot unit (15) comprises a pin (26), positioned integrally in a shoulder (11), and said blocking group

(GB) of the joining device comprises a grub screw (29) caused to slide by means of a pinion-toothed crown bevel (34,35), rotatingly positioned in a casing (31,32), wherein said pinion (34) is engaged with a toothed crown (35), formed as the head of a threaded screw (36), wherein said threaded screw (36) is in turn positioned in an axial threaded hole (38) and inside the grub screw (29), the rotation of the threaded screw (36) causes the movement of the grub screw (29) between an engagement position and a disengagement position with said pin (26).

11. The system according to one or more of the claims from 1 to 10, characterized in that said levelling device (21) comprises a cylindrical casing (44,45) containing in its interior a pinion-toothed crown bevel (47,48), wherein said pinion (47) is rotatingly positioned inside the casing (44,45) and is engaged with said toothed crown (48), formed as the head of a threaded screw (49), said toothed crown (48) being rotatable inside the casing (44,45), not movable, wherein said threaded screw (49) is in turn positioned in a threaded hole (51) inside a hollow pusher element (52), positioned coaxially with respect to the outside of the casing (44,45), wherein the rotation of the threaded screw (49) causes the upward and/or downward

movement of the hollow pusher element (52) and the adjustment of the leveller by means of a thrust engagement inside a blind hole (43) formed in said bottom (12).

Fig. 1

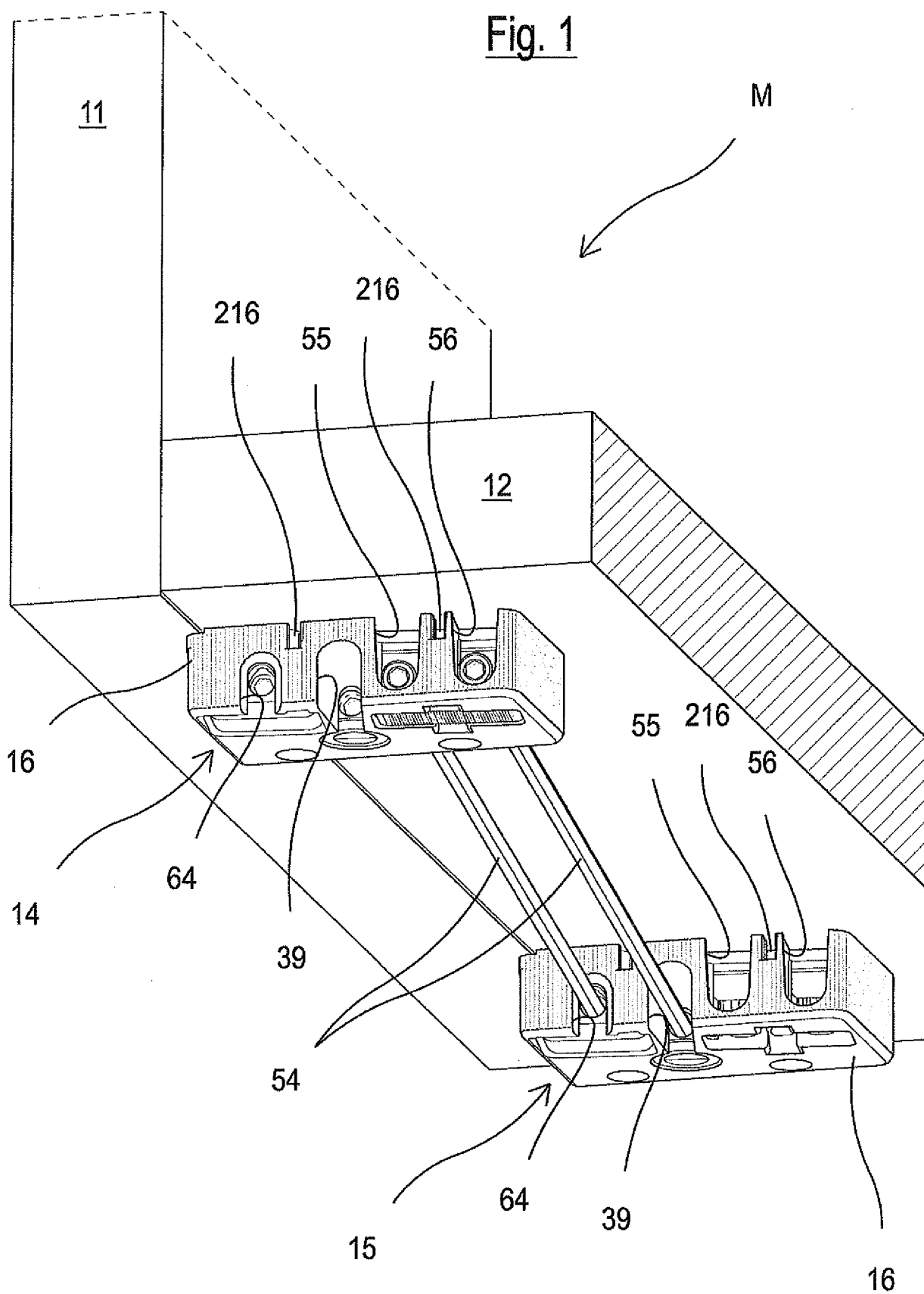


Fig. 1a

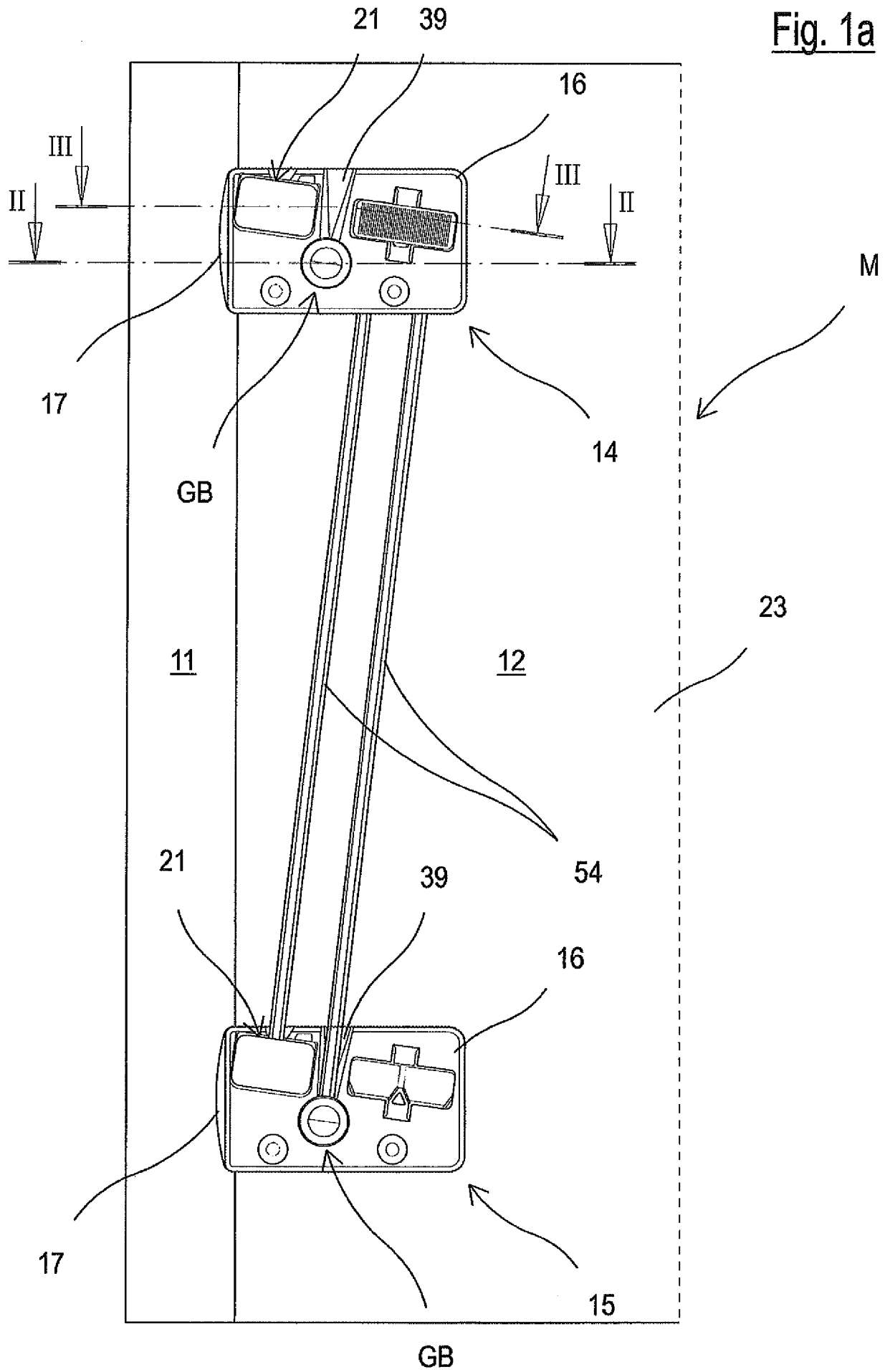


Fig. 2

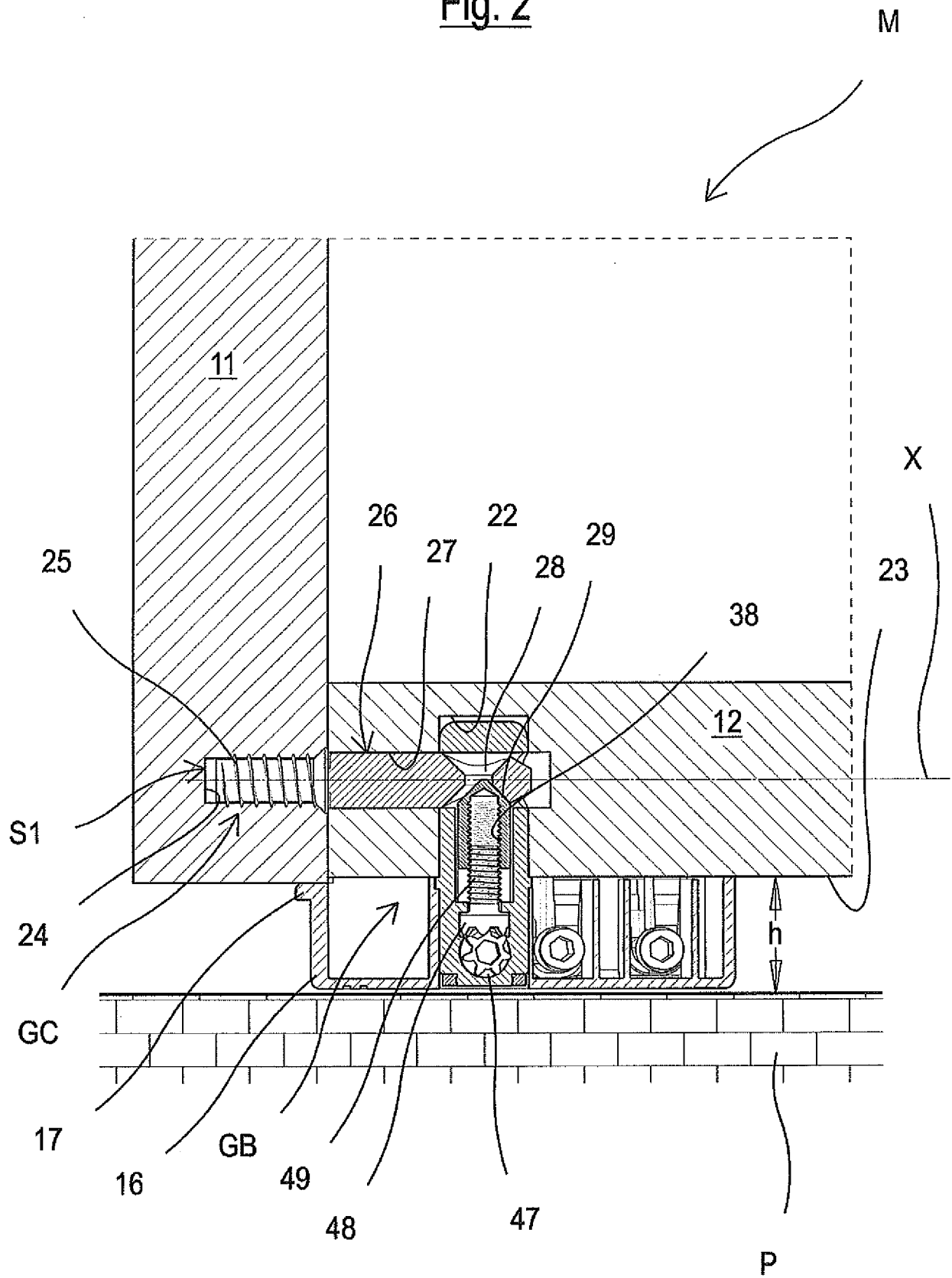
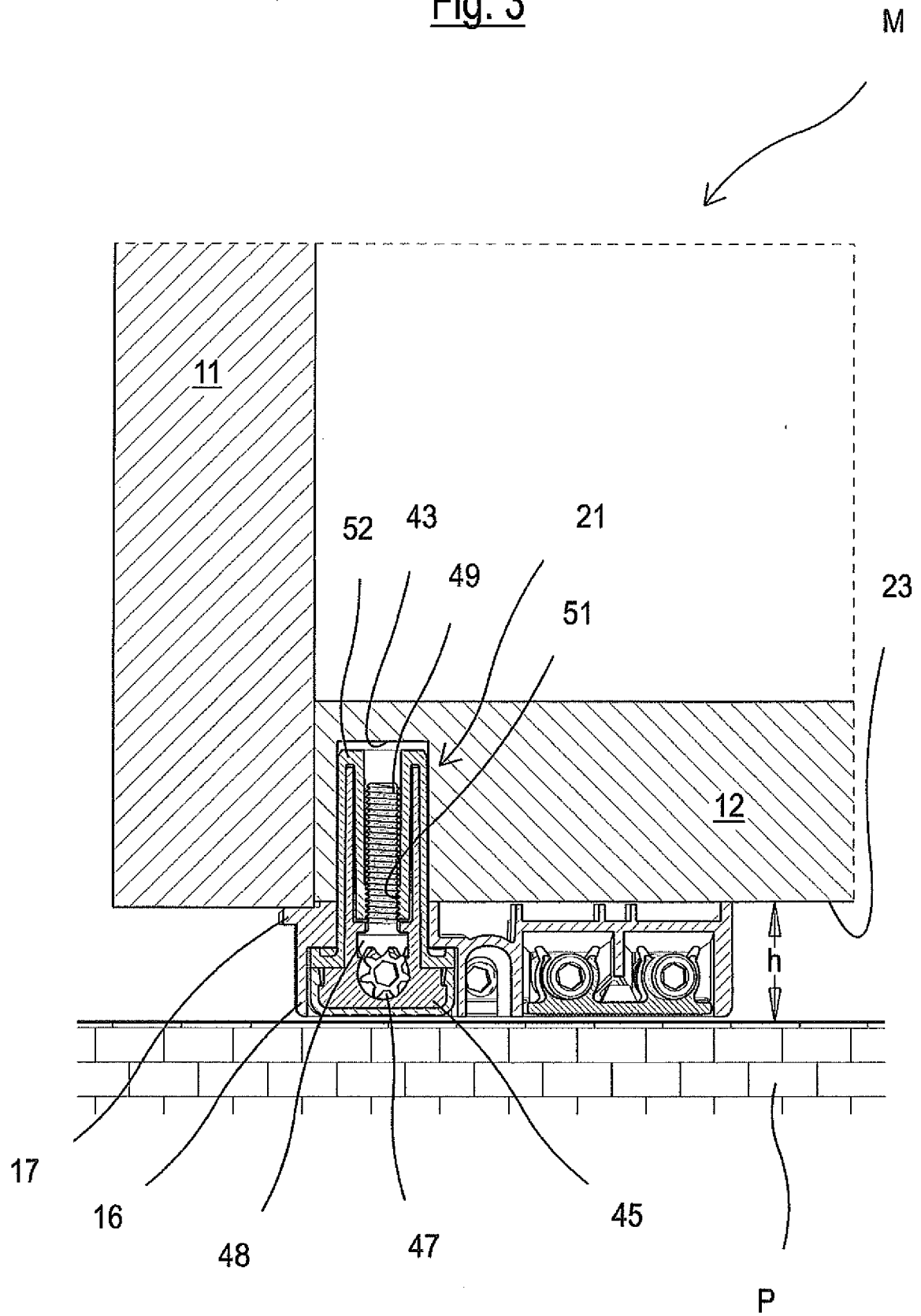


Fig. 3



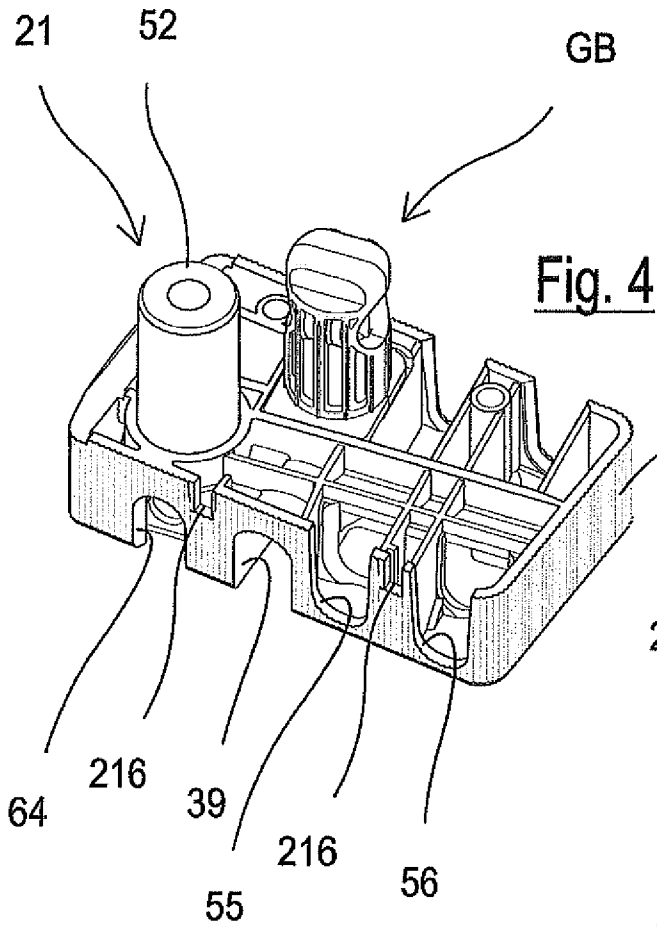


Fig. 4

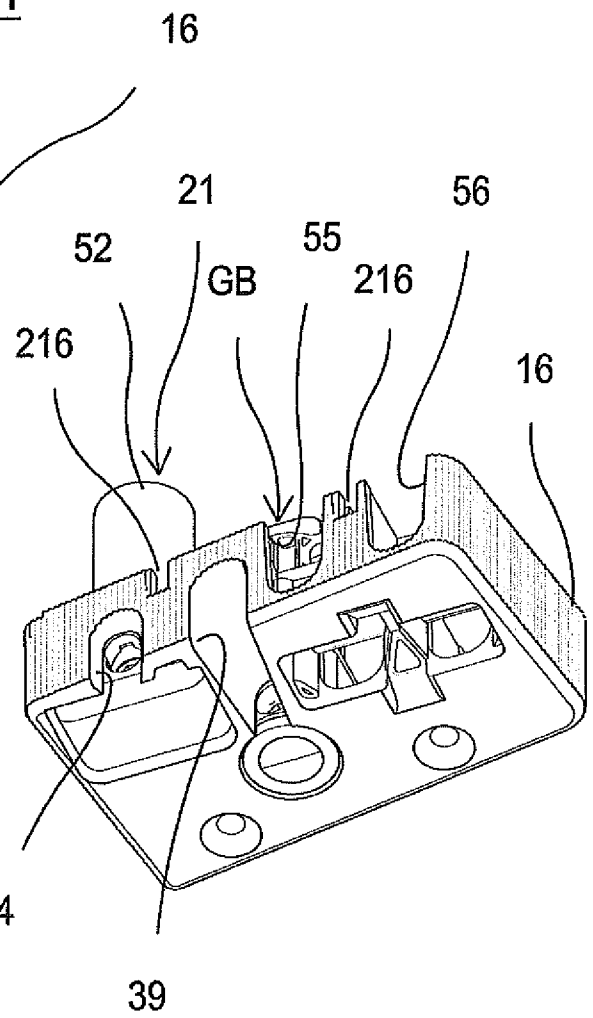


Fig. 5

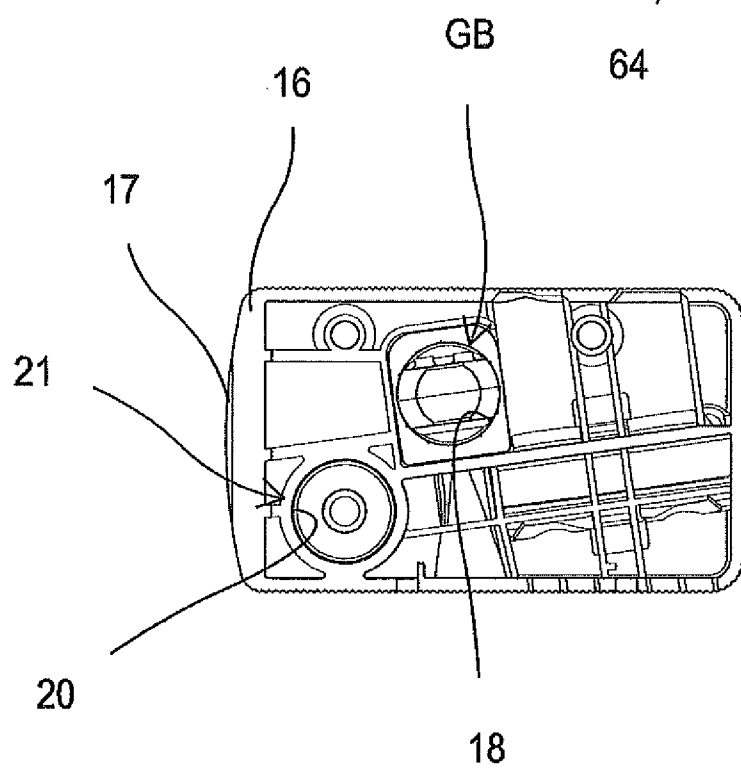


Fig. 6

Fig. 7

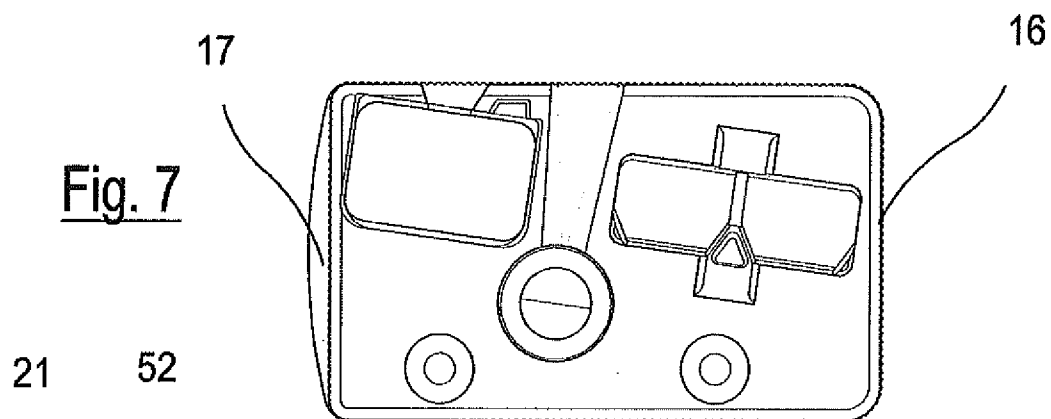


Fig. 8

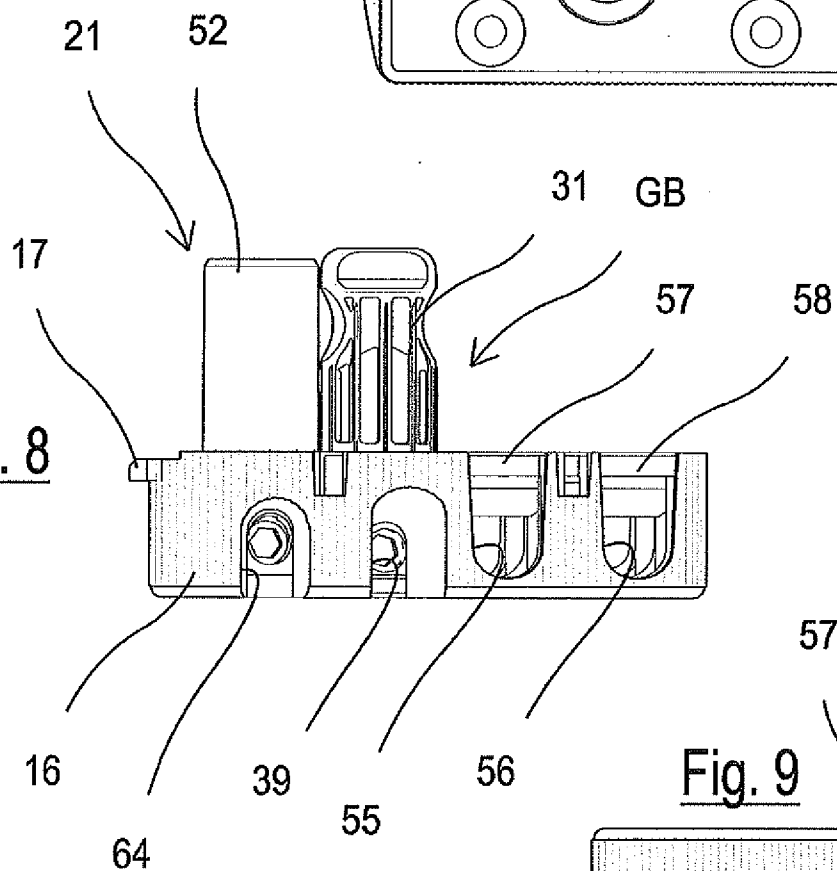


Fig. 9

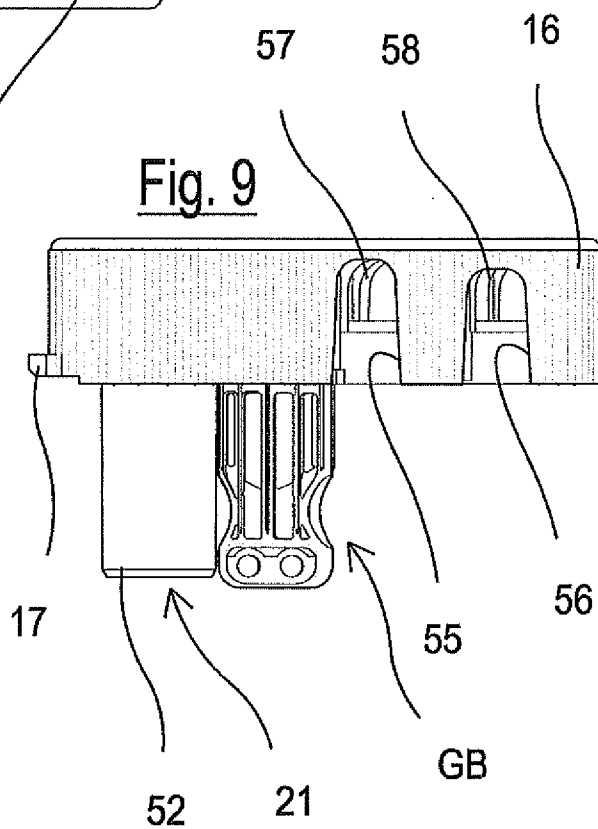


Fig. 10

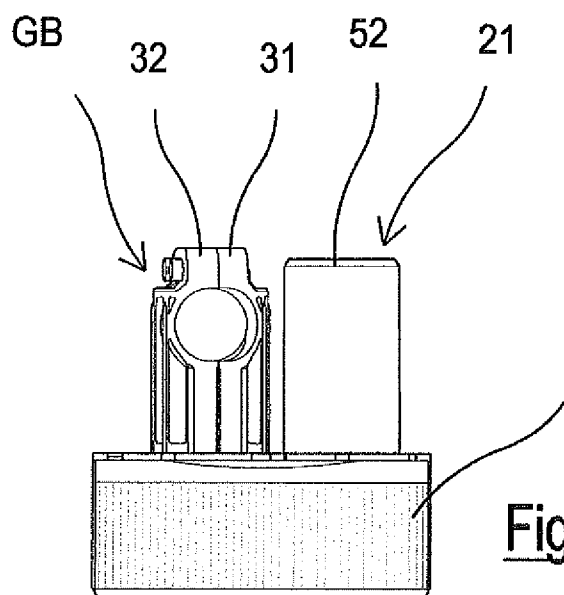


Fig. 11

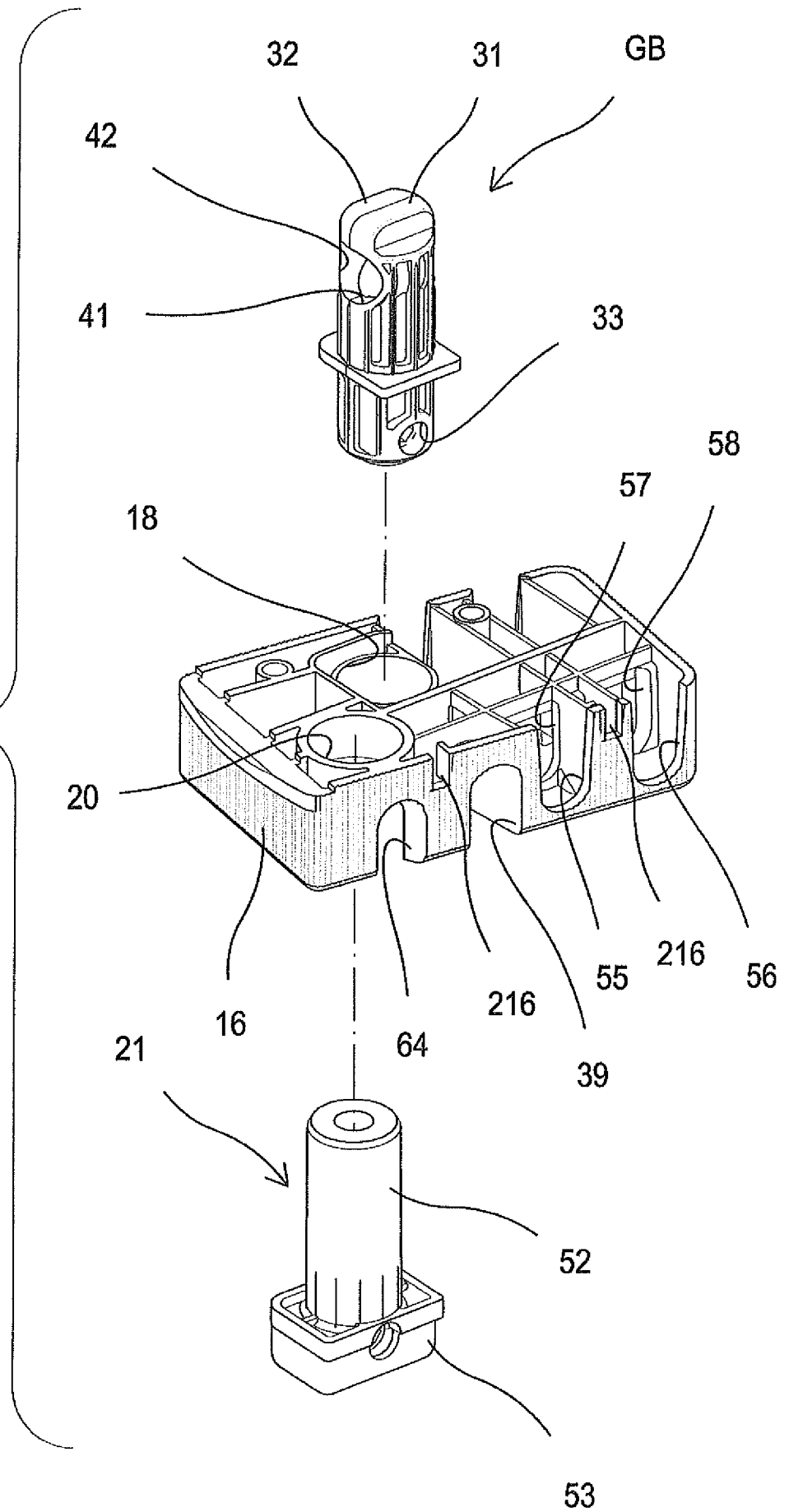


Fig. 12

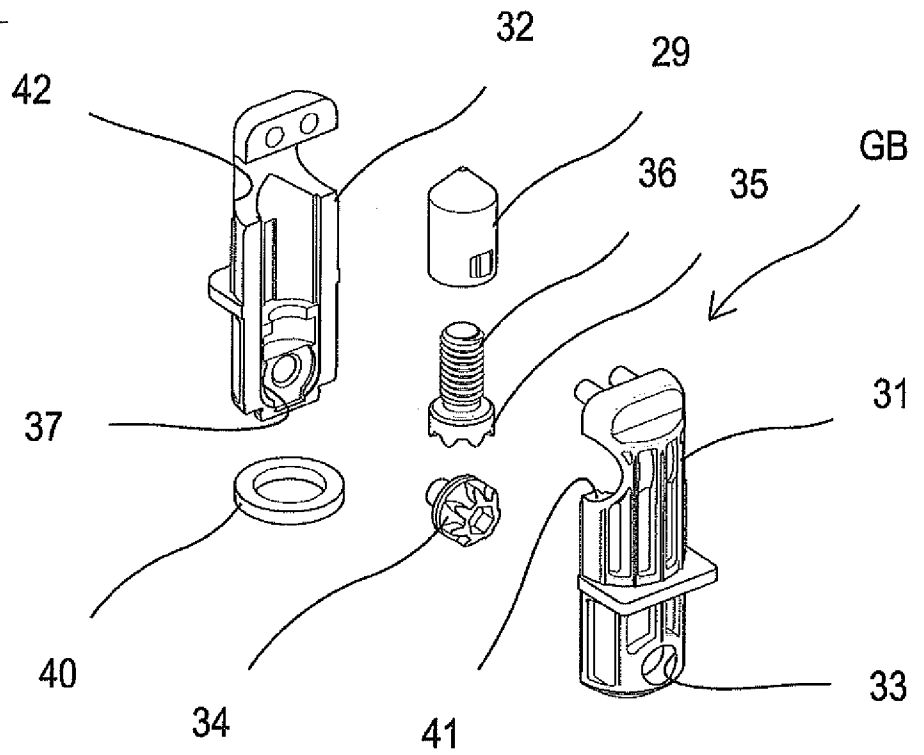


Fig. 13

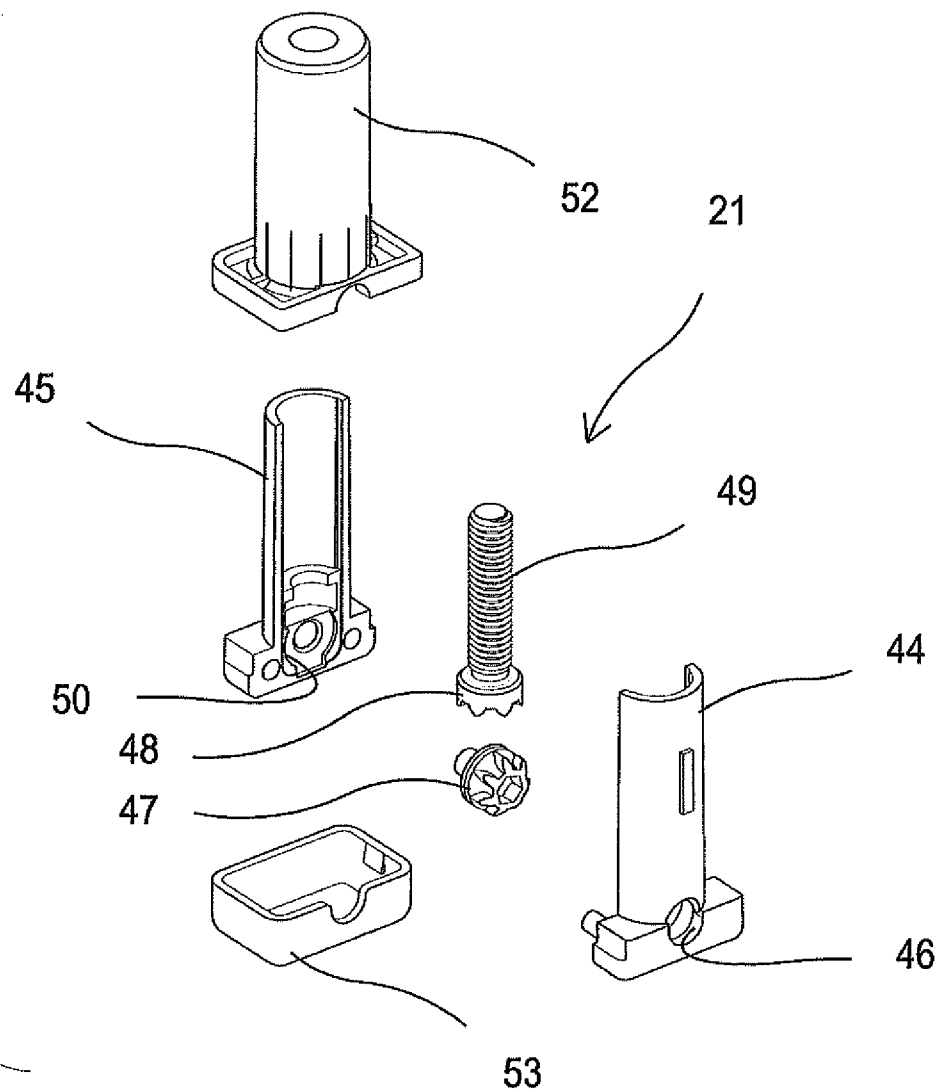


Fig. 14

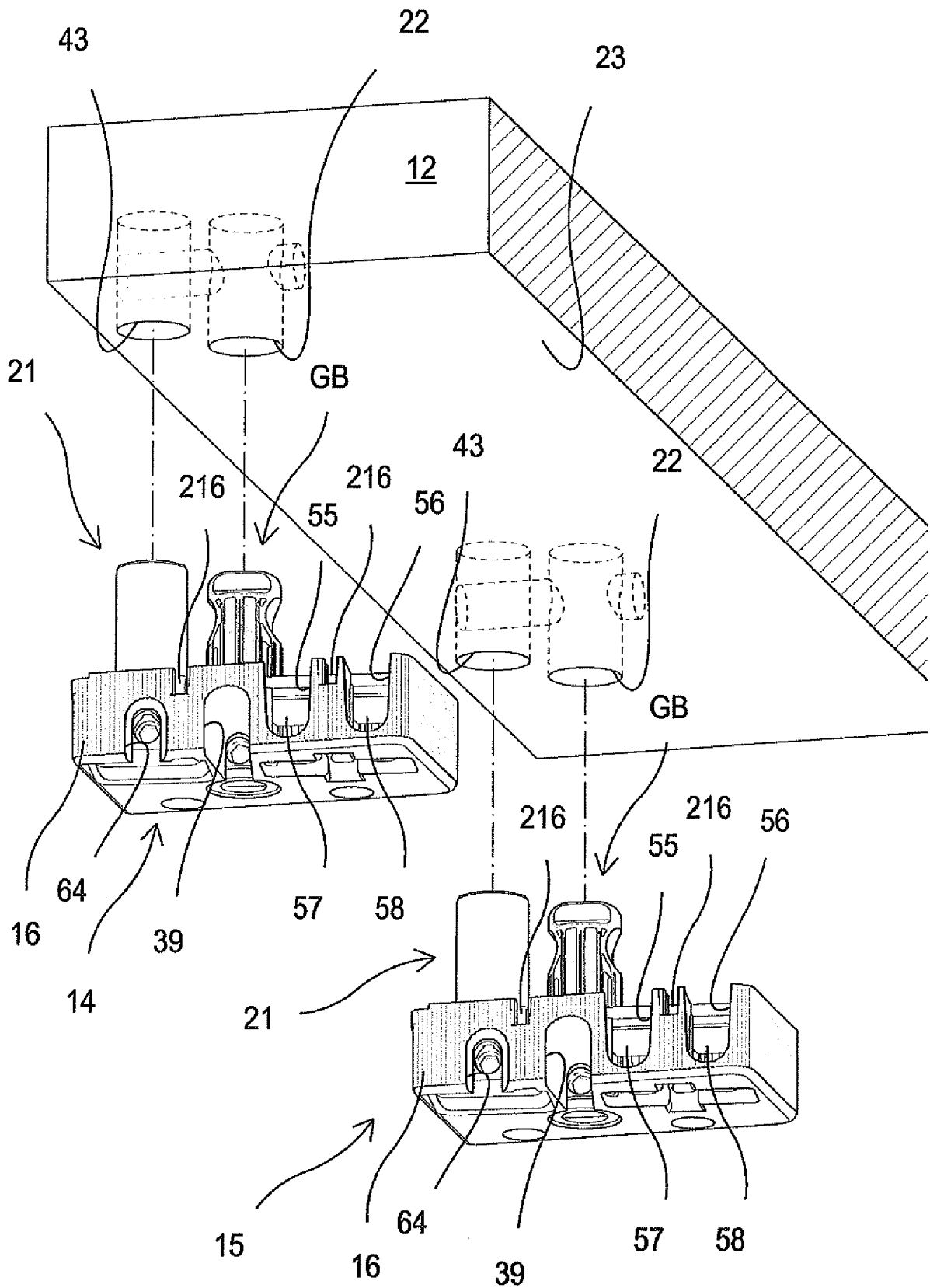


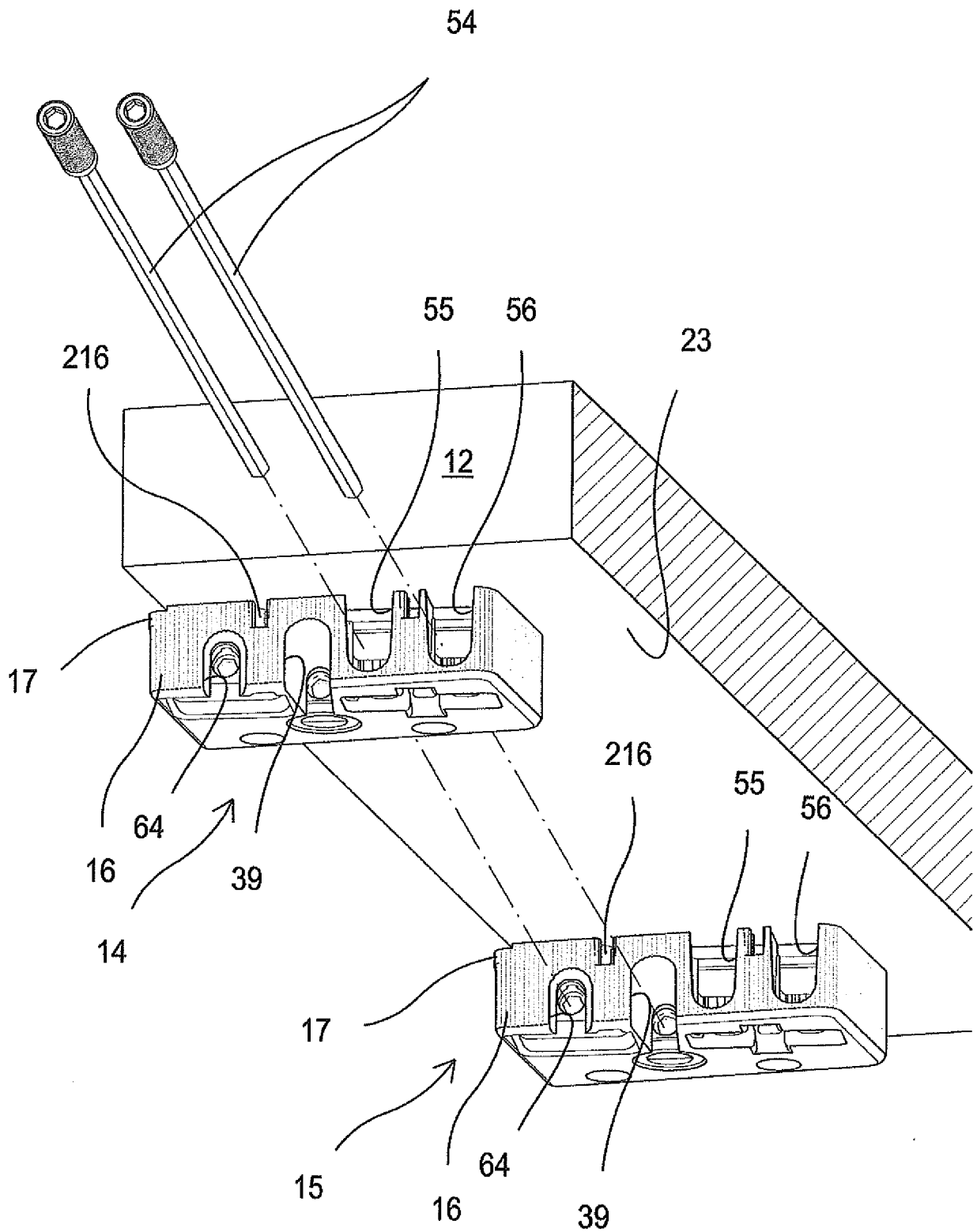
Fig. 15

Fig. 17

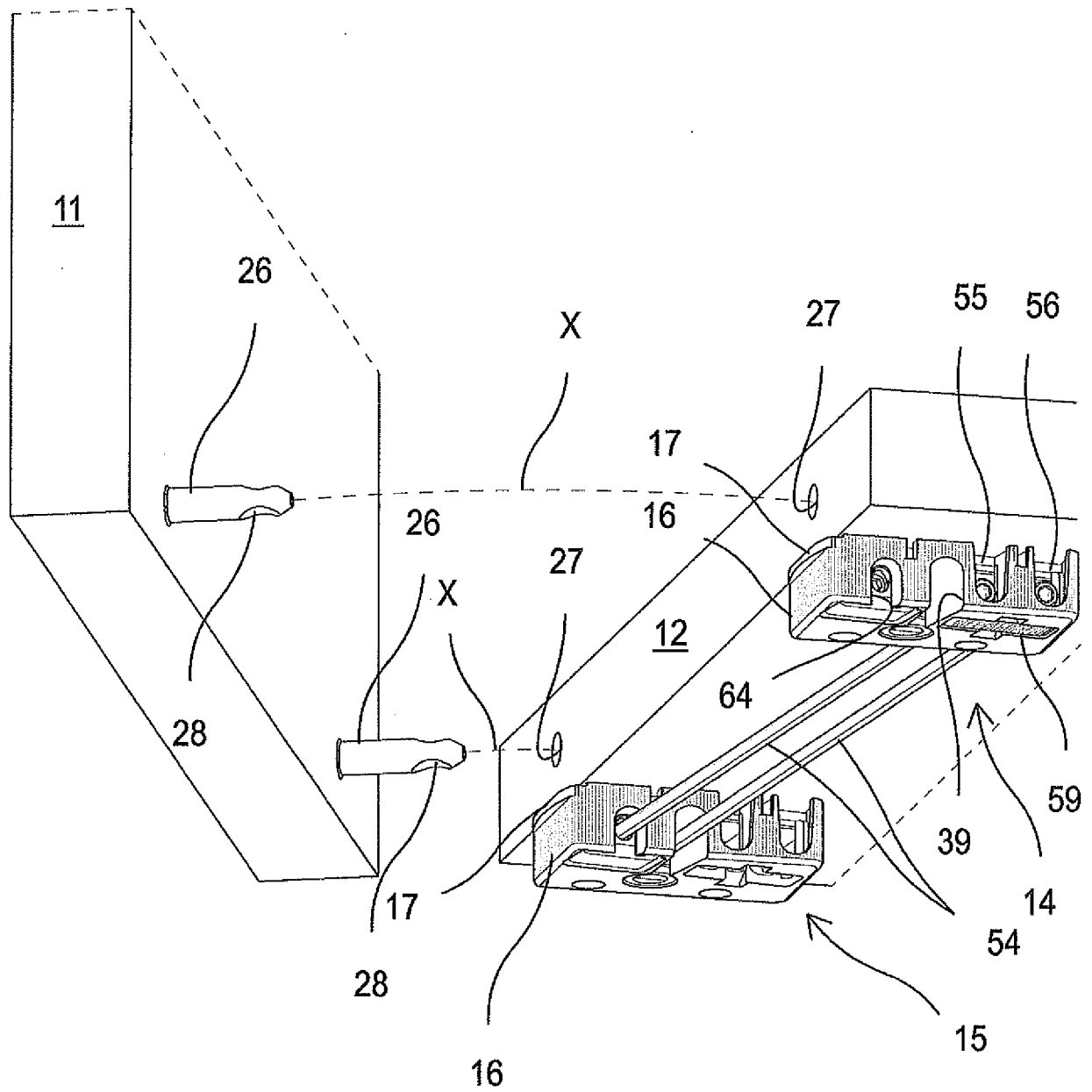


Fig. 18

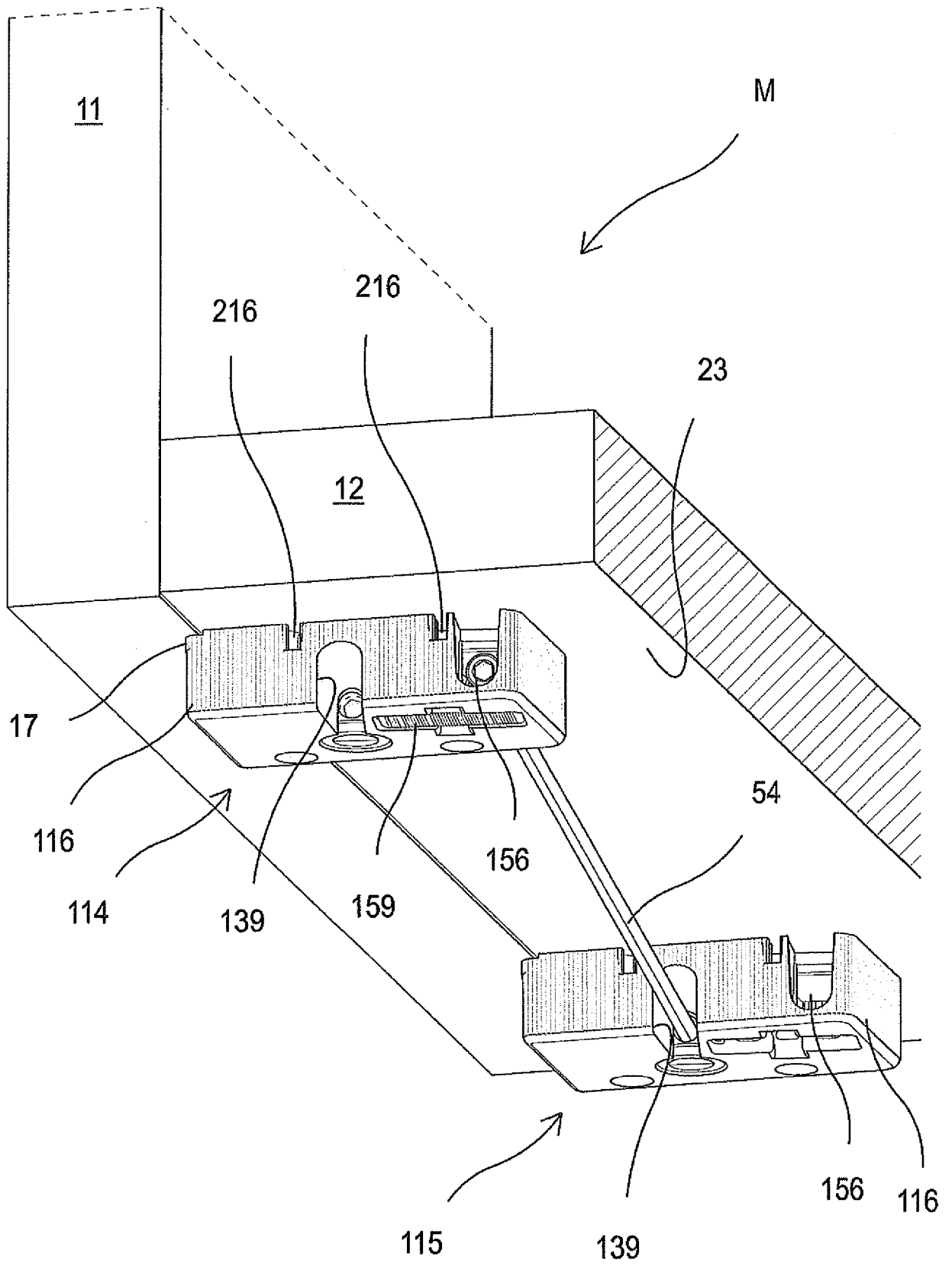
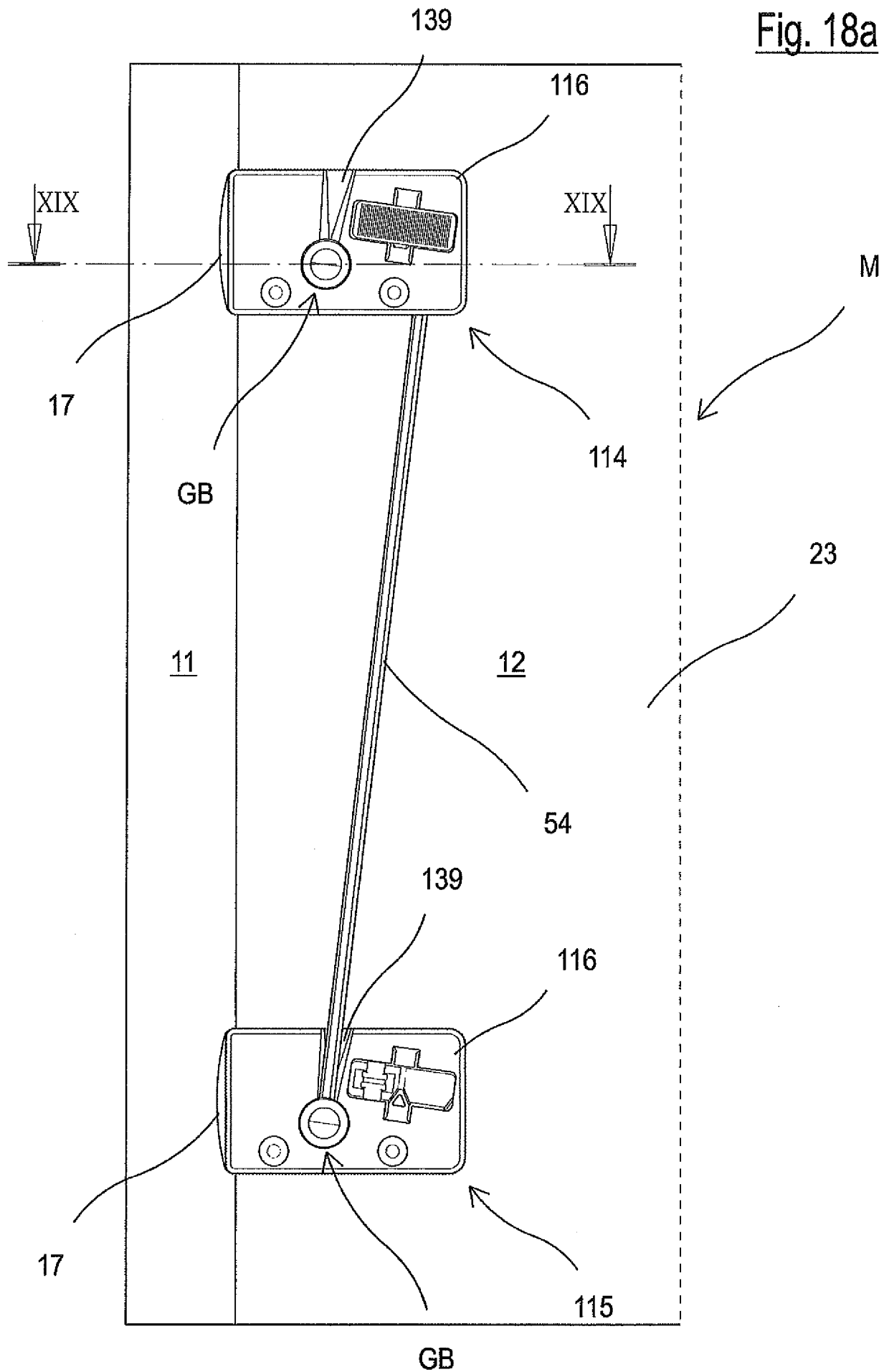


Fig. 18a



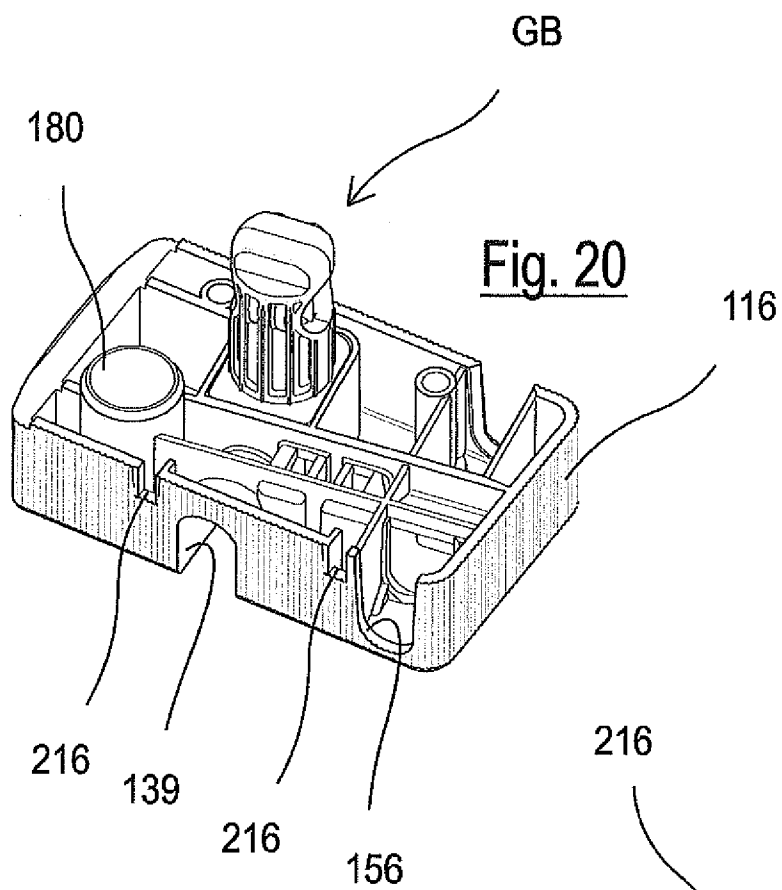


Fig. 21

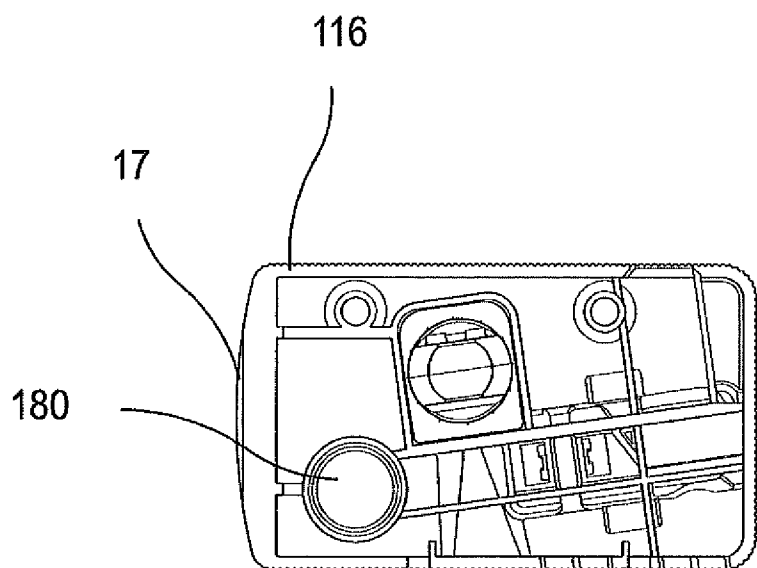
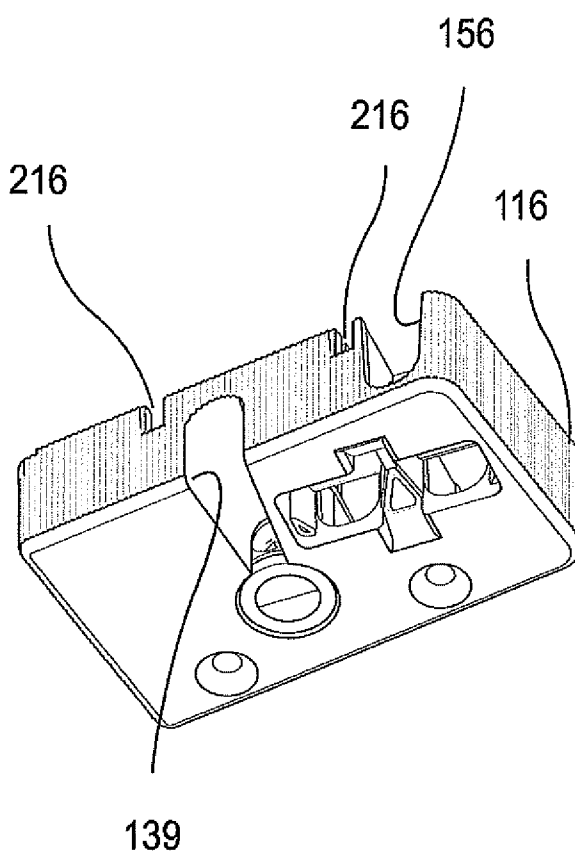


Fig. 22

Fig. 23

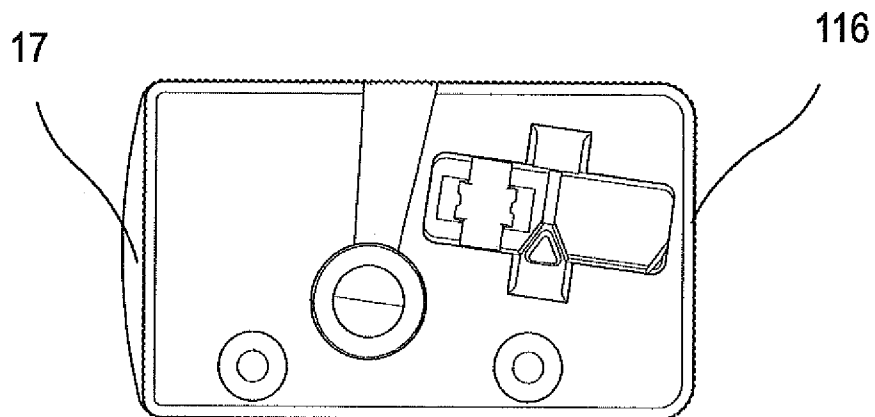


Fig. 24

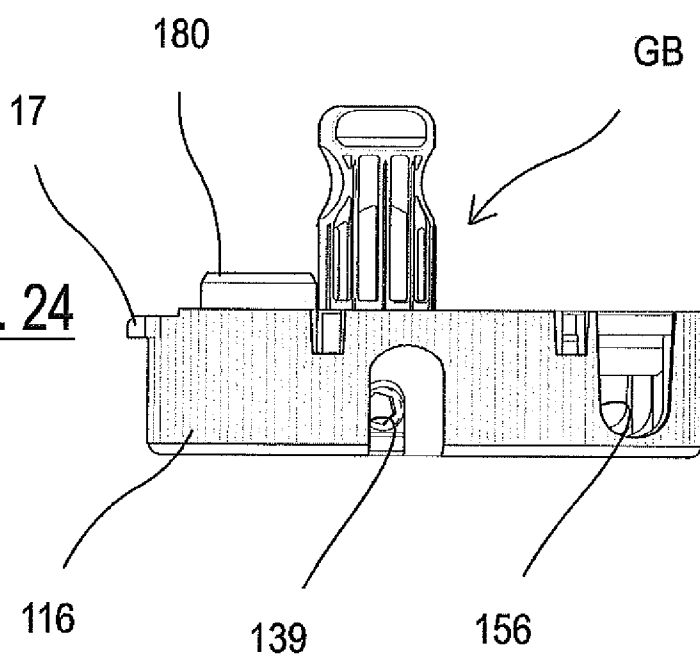


Fig. 25

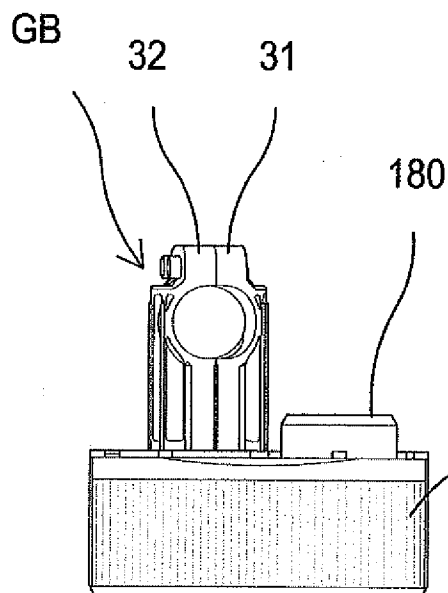
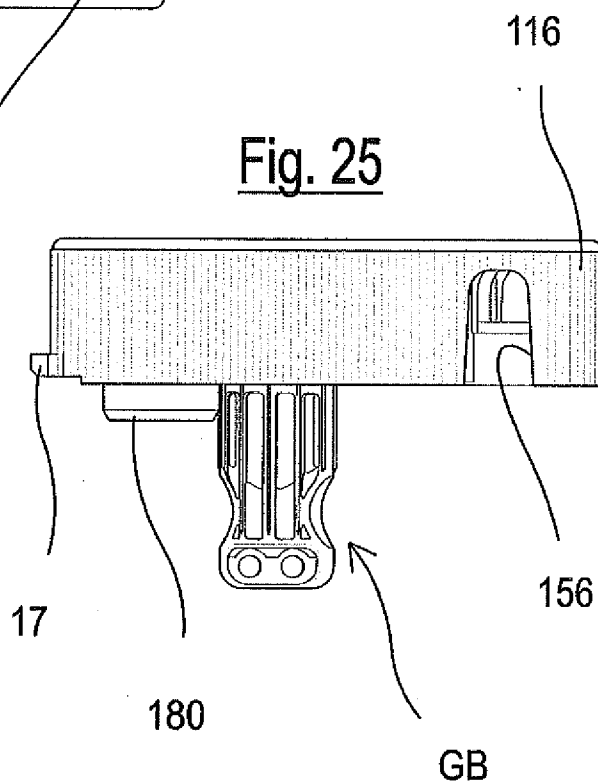


Fig. 26

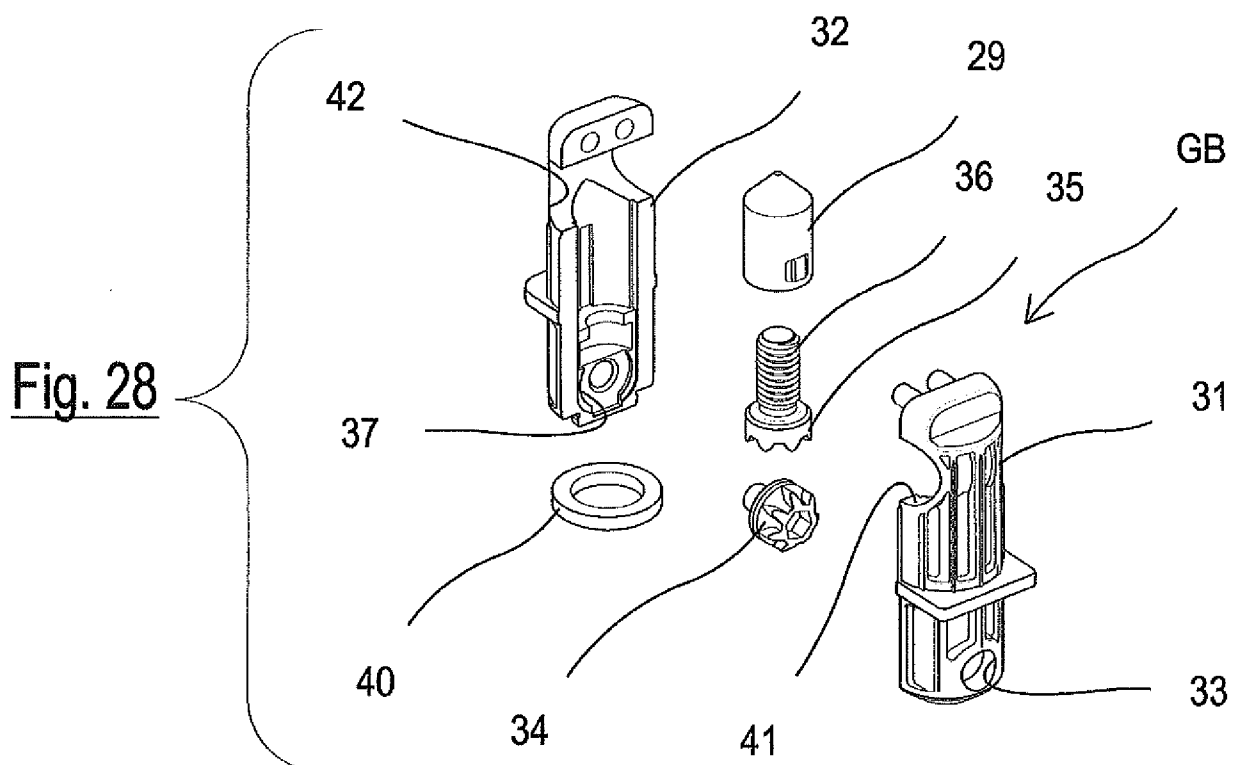
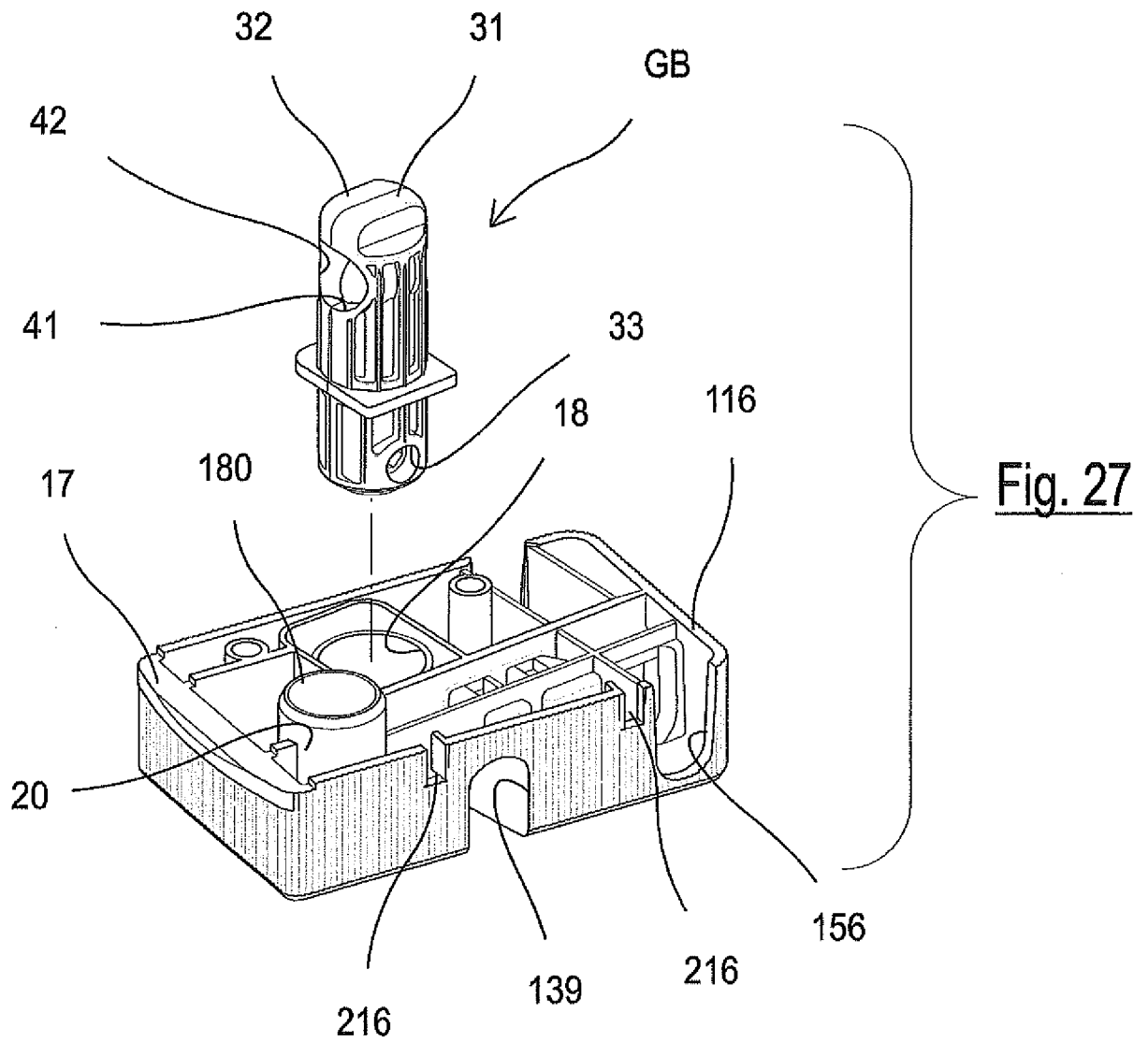
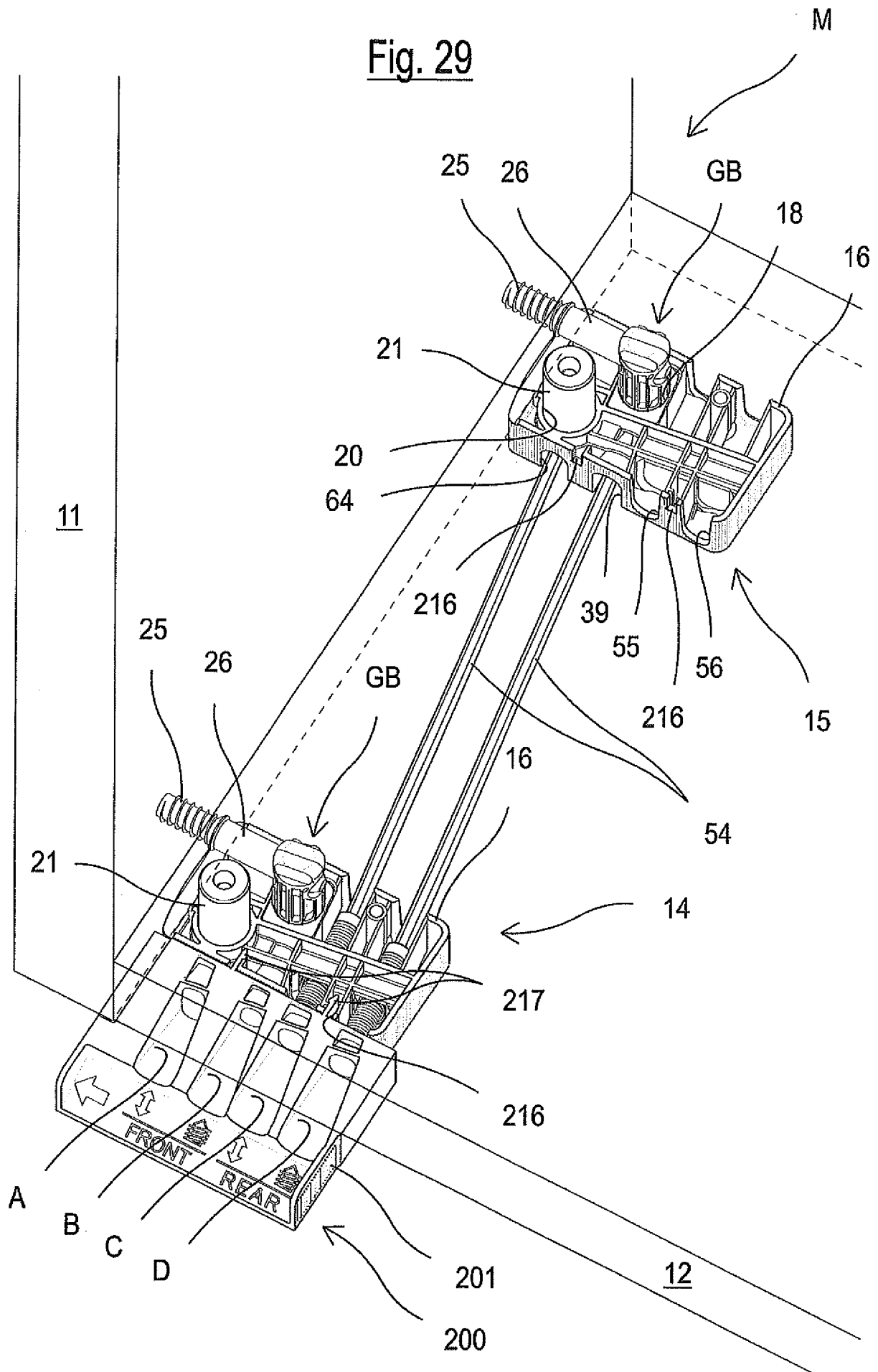


Fig. 29



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/056663

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16B12/20 A47B91/02 A47B91/00
ADD.

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)
F16B A47B

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

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

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 92/03663 A1 (TITUS INT LTD [GB]) 5 March 1992 (1992-03-05) the whole document -----	1-11
A	EP 2 653 068 A1 (LEONARDO SRL [IT]) 23 October 2013 (2013-10-23) the whole document -----	1-11
A	DE 87 07 258 U1 (FRANKE GMBH & CO, BALINGEN) 9 July 1987 (1987-07-09) page 5, line 20 - page 8, line 25; figures -----	1-11
A	JP 2002 085176 A (SYSTEC KYOWA KK) 26 March 2002 (2002-03-26) abstract; figures ----- -/--	1-11



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See patent family annex.

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Date of the actual completion of the international search

19 October 2018

Date of mailing of the international search report

26/10/2018

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Ottesen, Rune

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/056663

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AU 2009 227 484 A1 (ROMANY MARK) 6 May 2010 (2010-05-06) page 15, line 8 - page 27, line 33; figures -----	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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