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US 20130257252 A1

(58) Field of Search:
INT CL **A47B**
Other: **WPI, EPODOC**

(54) Title of the Invention: **Adjustment unit**
Abstract Title: **Fastening unit for mounting a drawer front and adjustment in three directions**

(57) A fastening unit 20 operable to mount a drawer front (10, Figure 2) with a connection piece 32 pre-mounted thereon to a drawer frame (12, Figure 2). The fastening unit comprises an anchor unit 30 operable to be attached to the drawer frame. An adjustment unit, including a catch plate 36, operable to receive said connection piece is further provided. The adjustment unit being operable to move said catch plate in three directions and translate said movement to said connection piece. The three directions may comprise a vertical displacement, a horizontal shift, and a vertical tilt. The adjustment unit may comprise three separate respective means to action each of said three directions. The drawer frame may comprise a runner (14, Figure having a top surface (16, Figure 2), to which the anchor unit may be attached. The vertical tilt direction may be actioned about a single pivot point 52. The adjustment unit may comprise a pair of outer plates 34,40. Further disclosed is a fastening unit comprising a catch plate moveable between a first and second position to respectively receive and secure a connection piece.

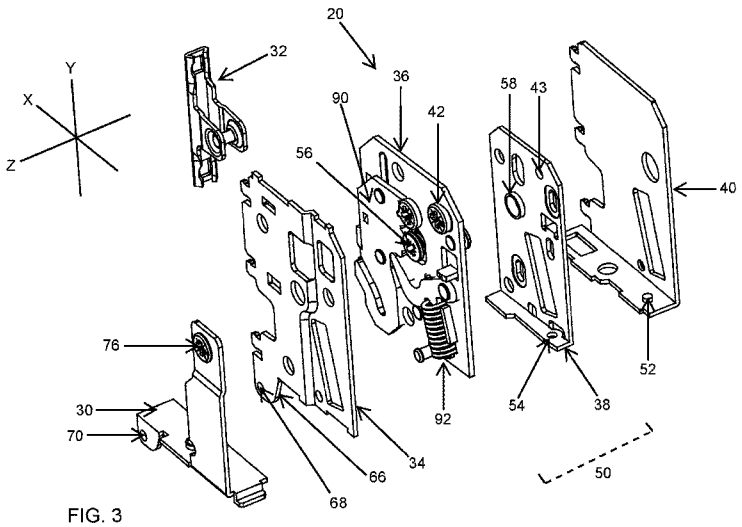

FIG. 3

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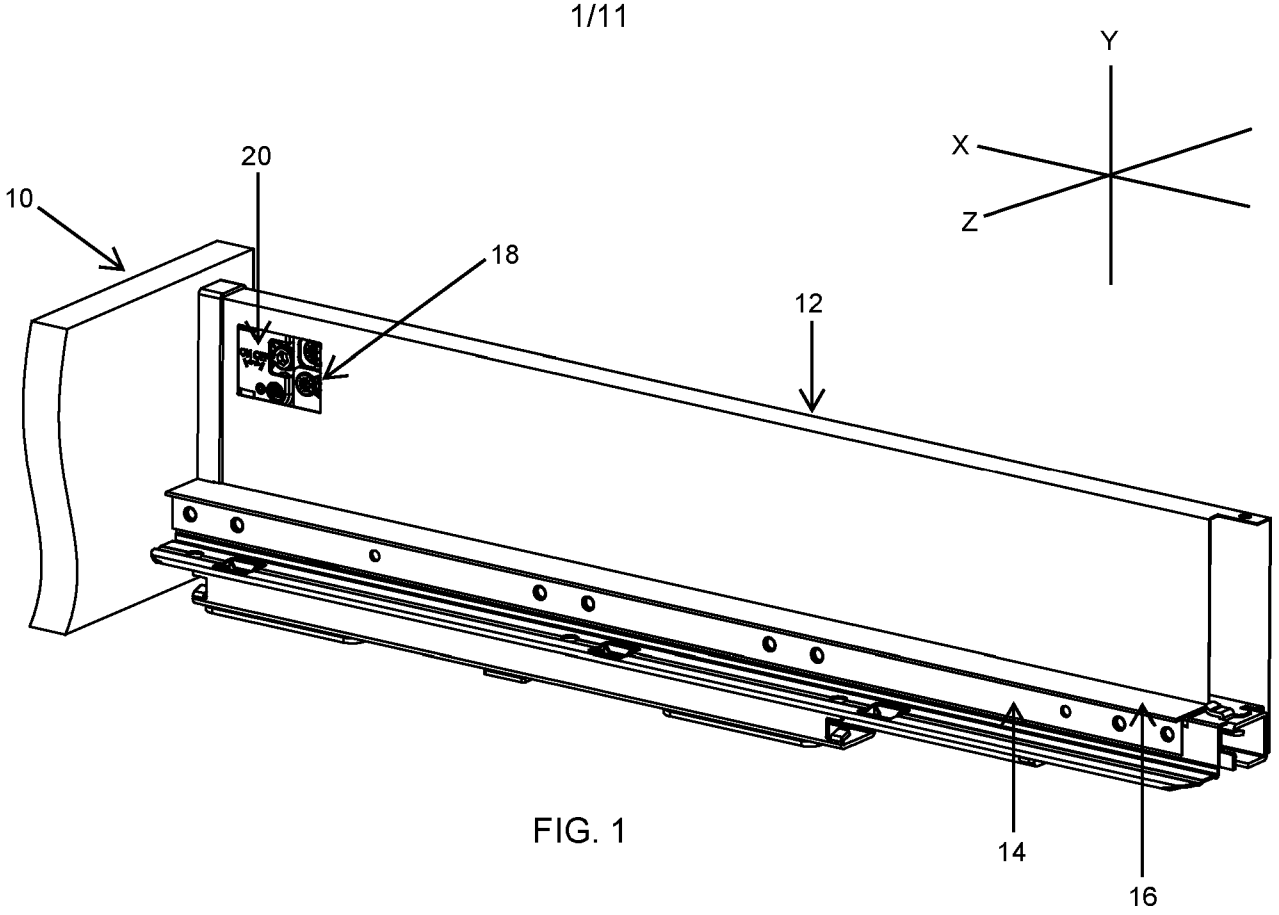

FIG. 1

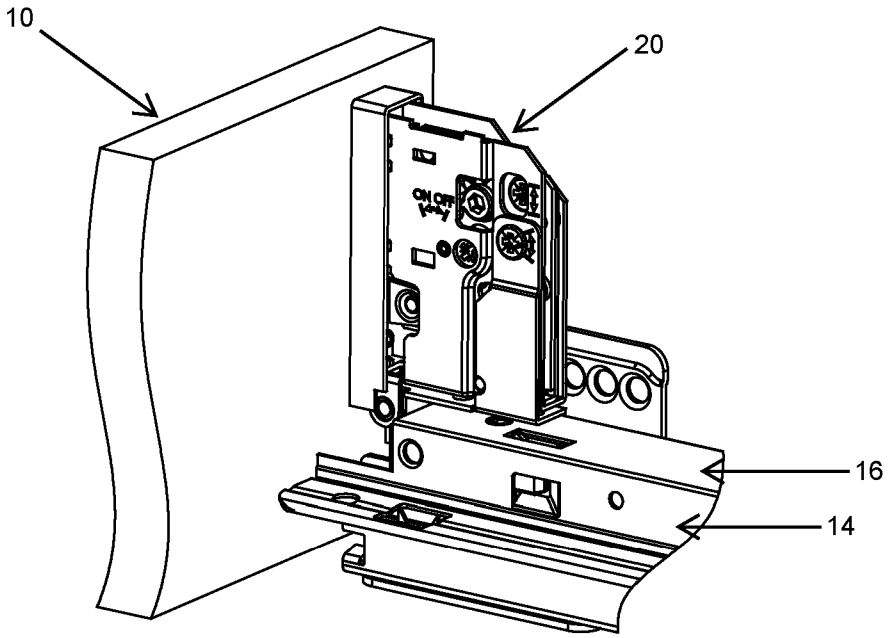

FIG. 2

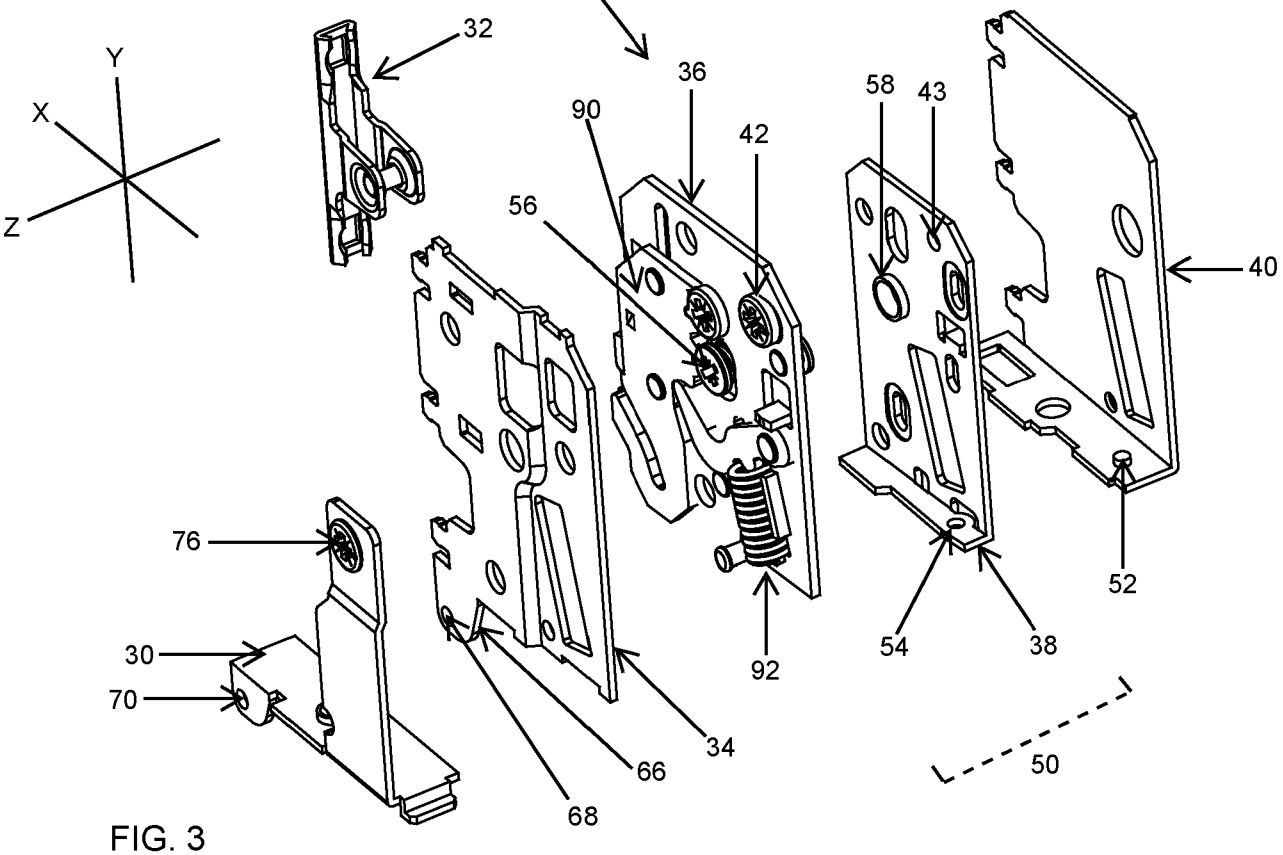
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FIG. 3

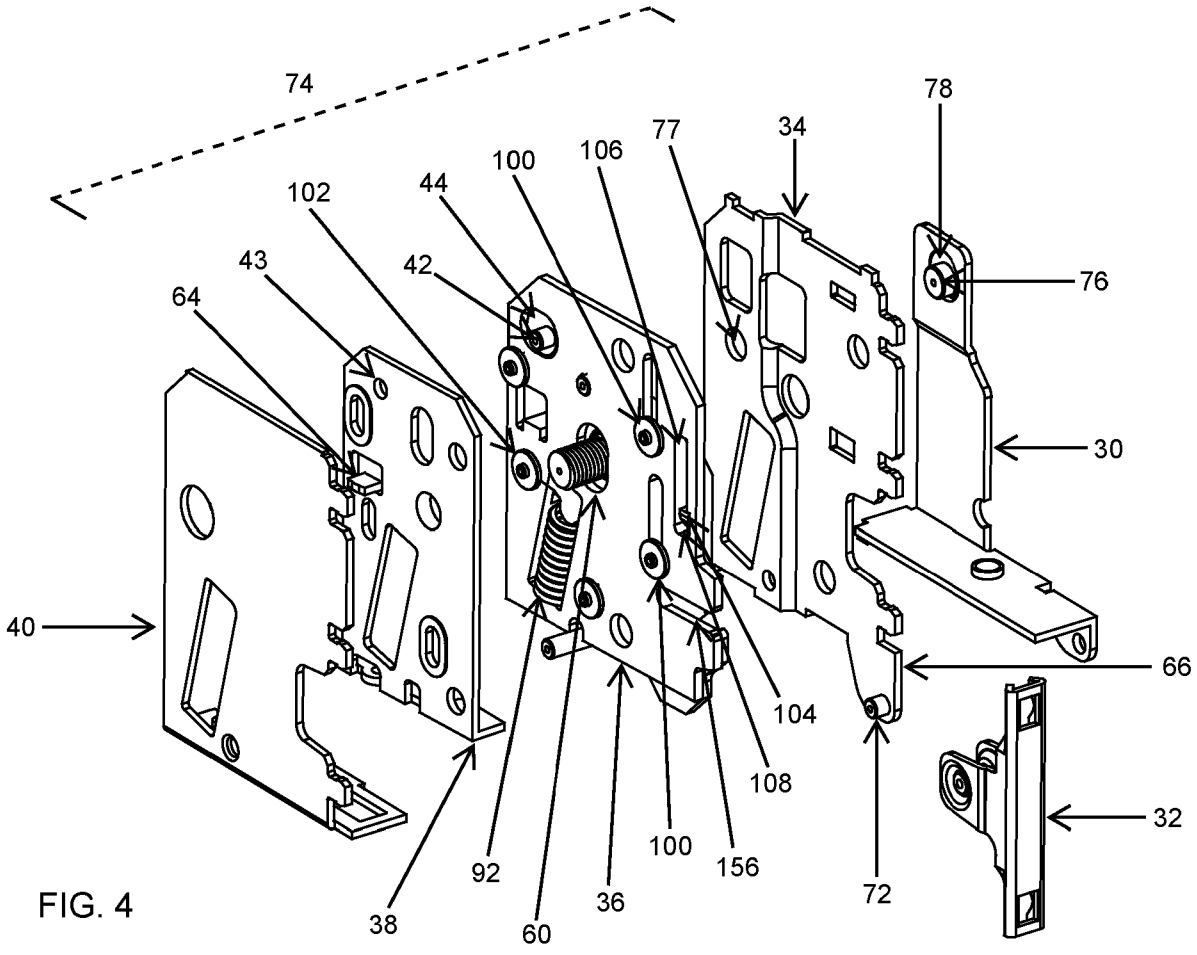
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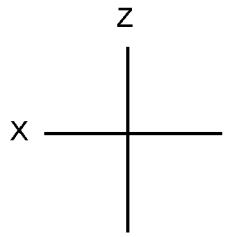
FIG. 4



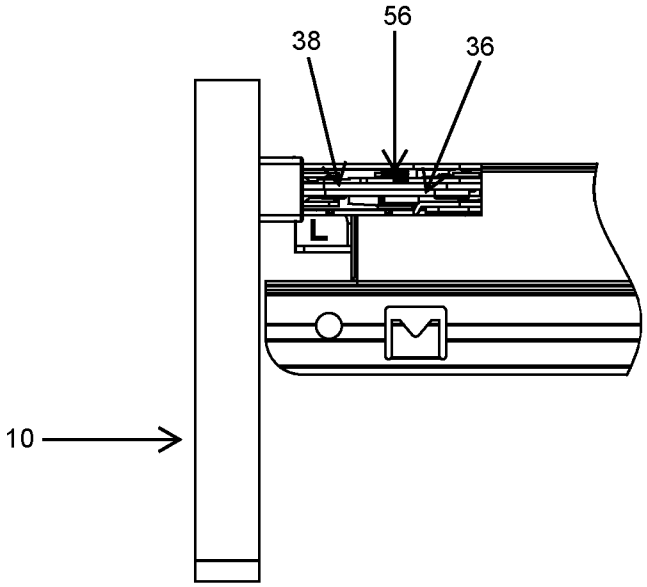


FIG. 5a

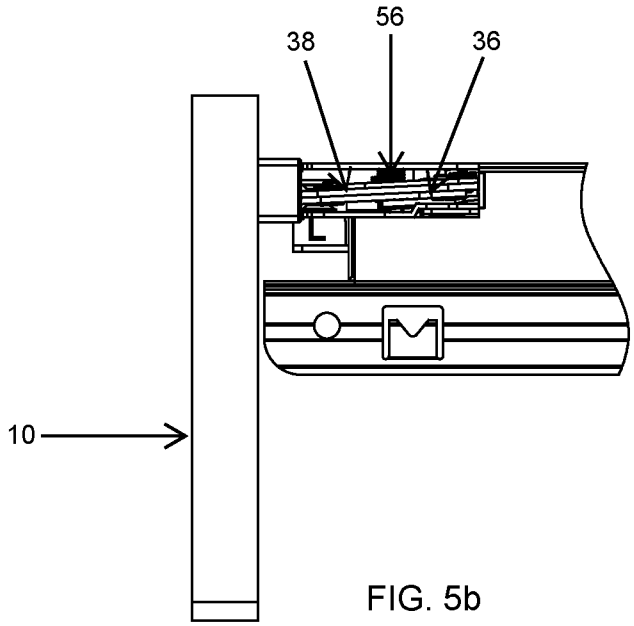


FIG. 5b

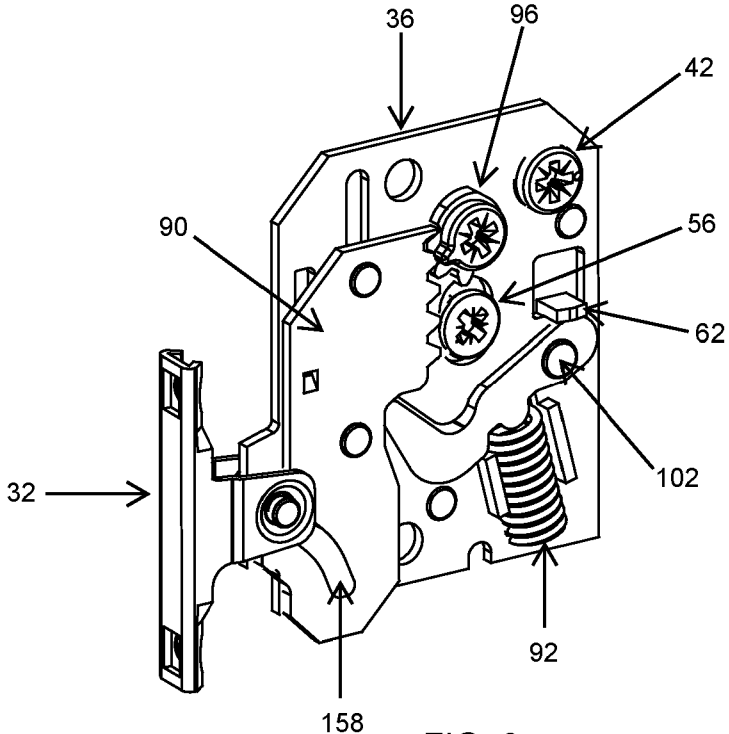


FIG. 6a

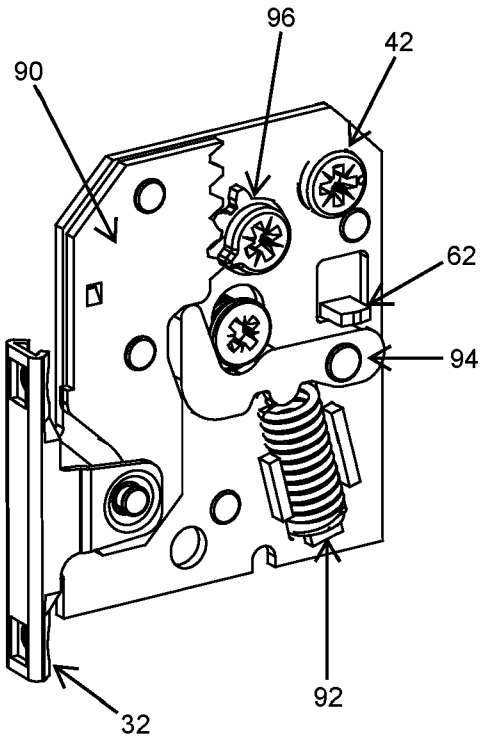


FIG. 6b

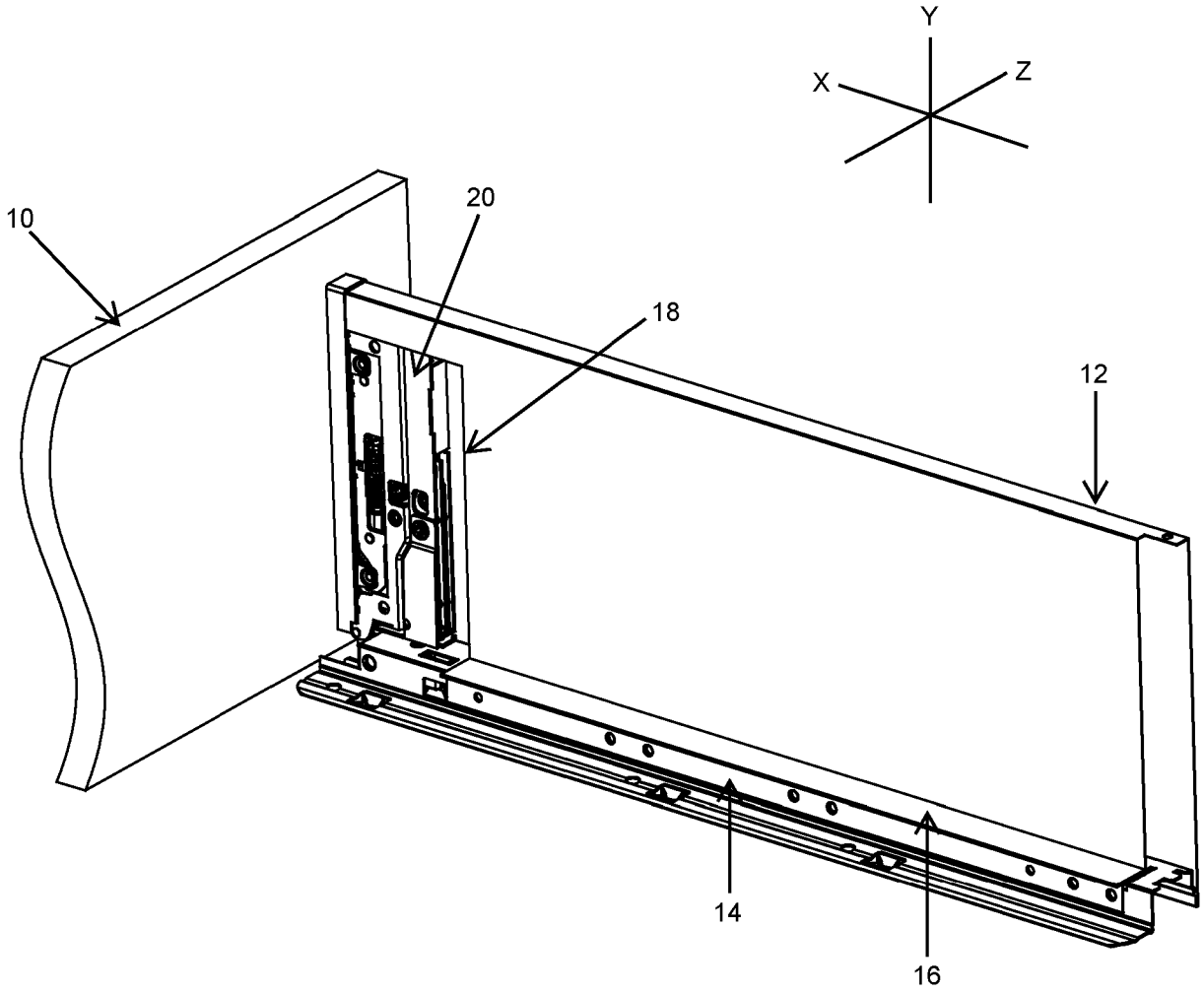

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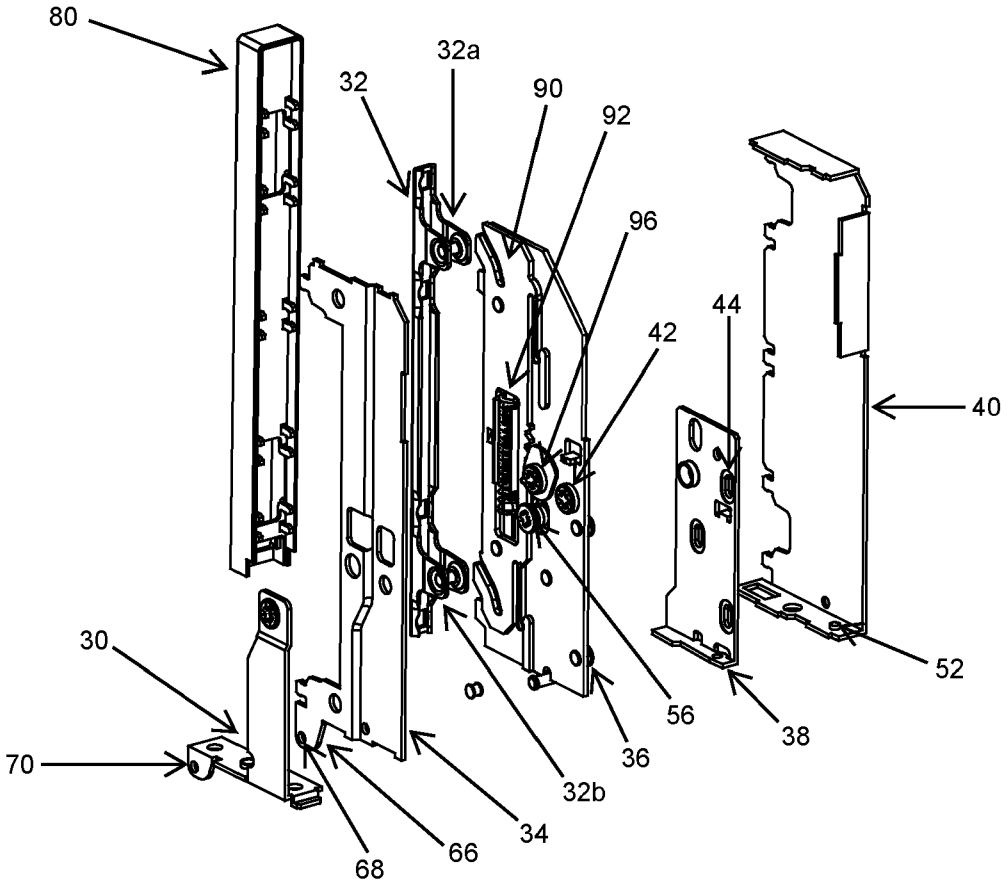
FIG. 7


80
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32b
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FIG. 8

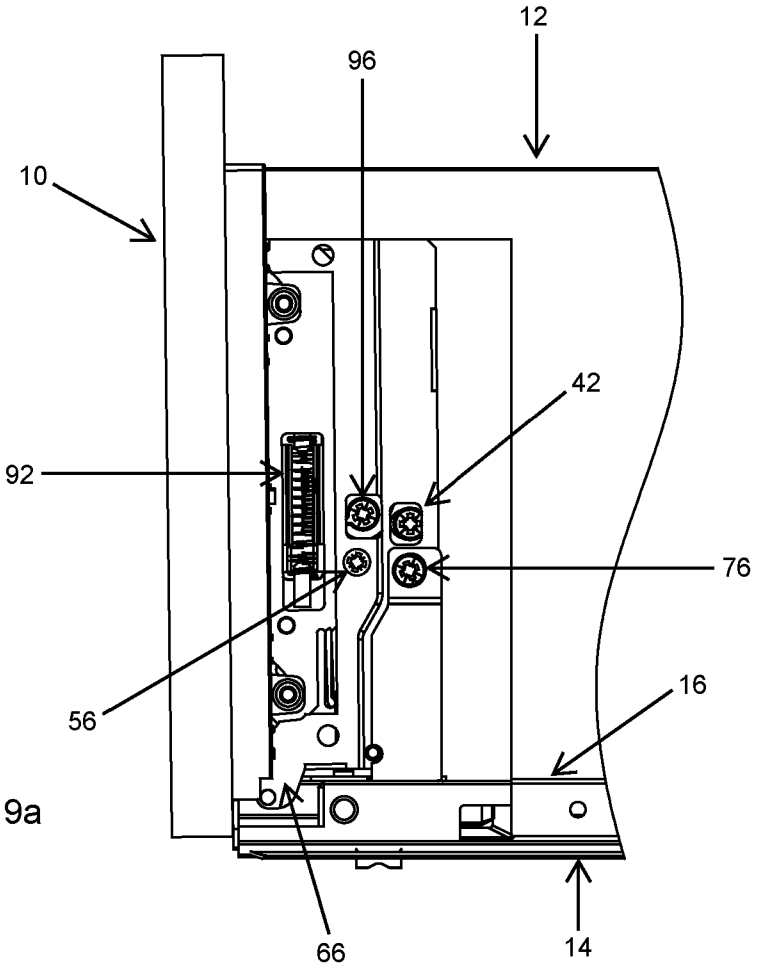

FIG. 9a

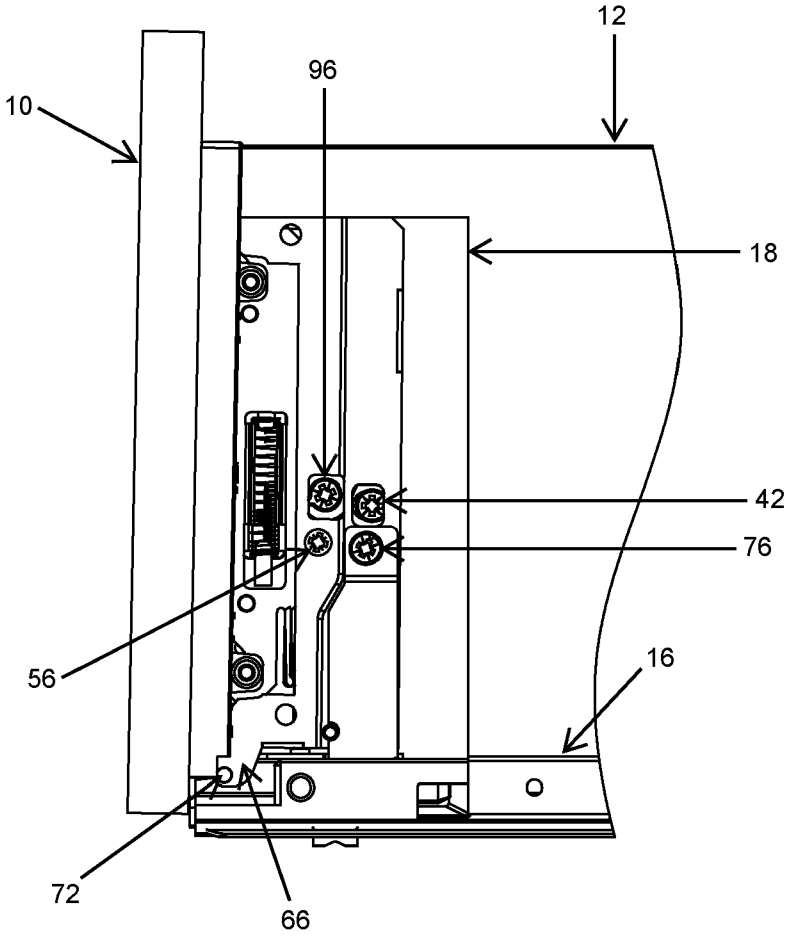

FIG. 9b

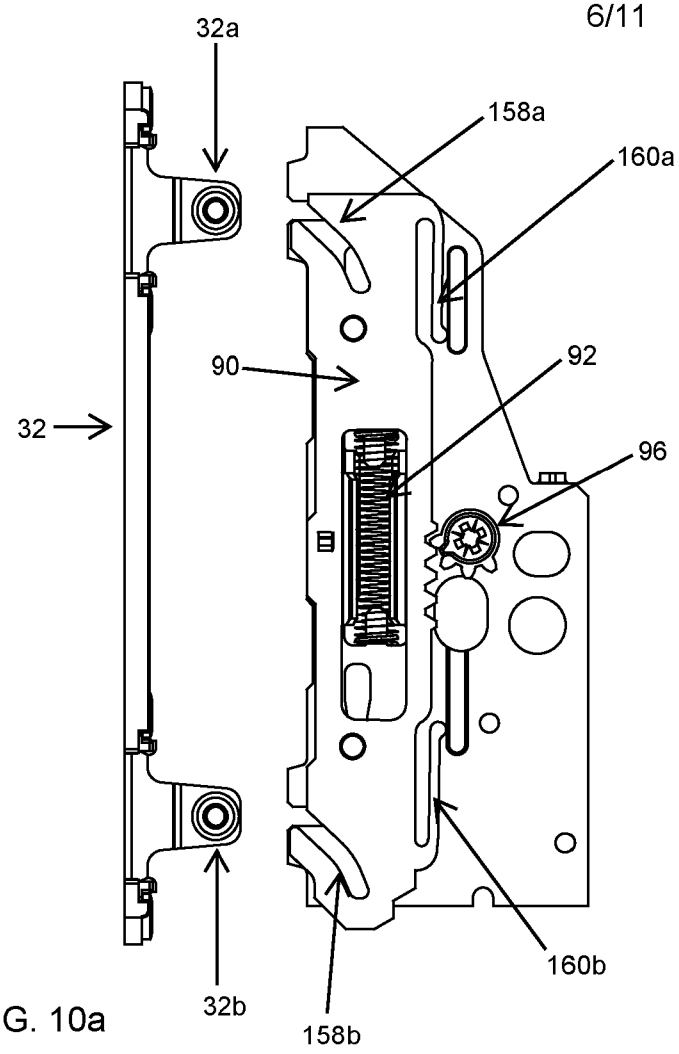

FIG. 10a

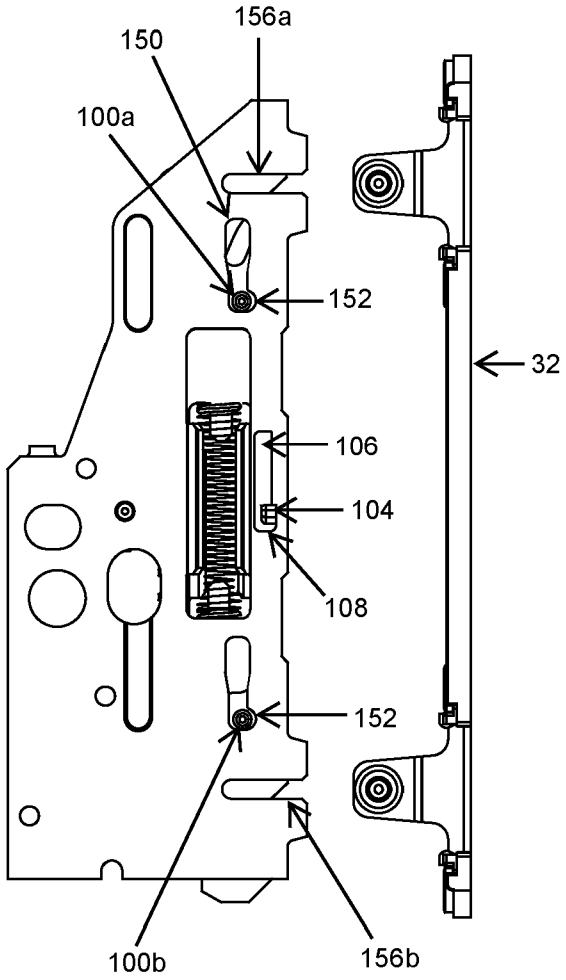

FIG. 10b

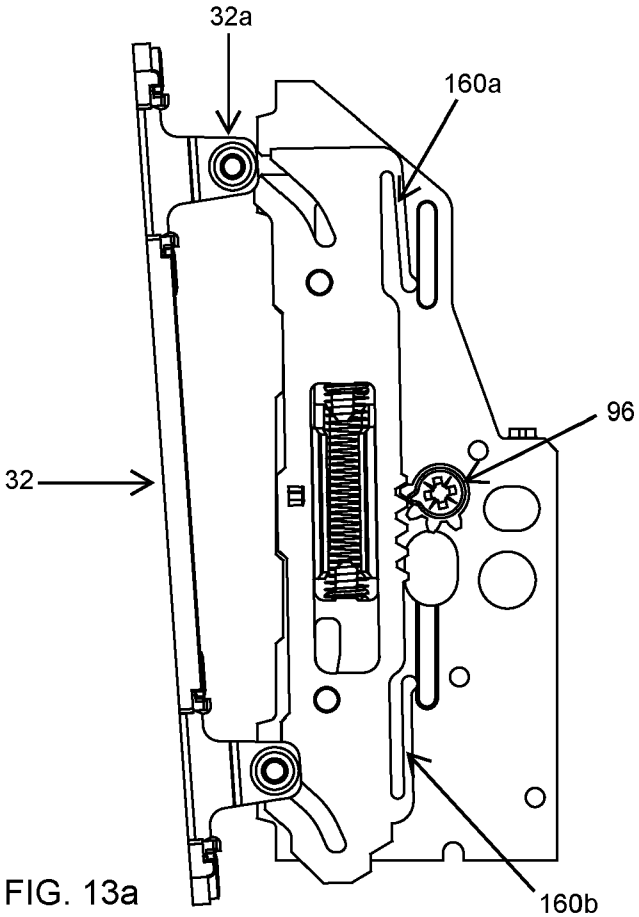

FIG. 13a

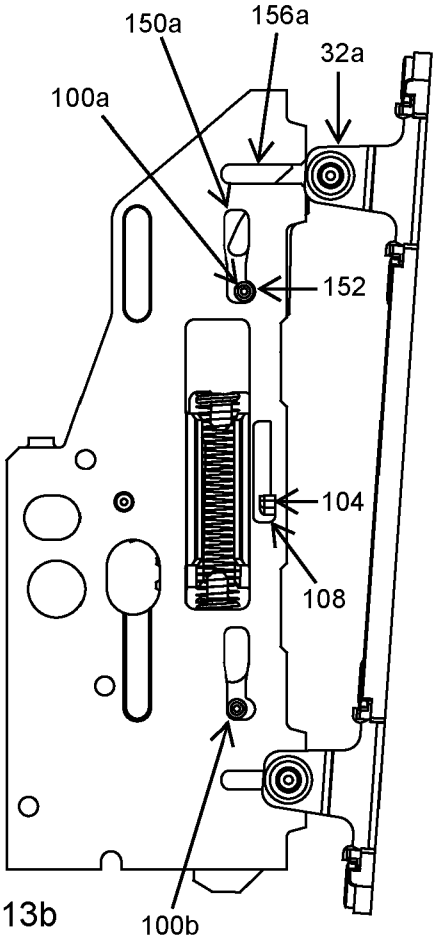

FIG. 13b

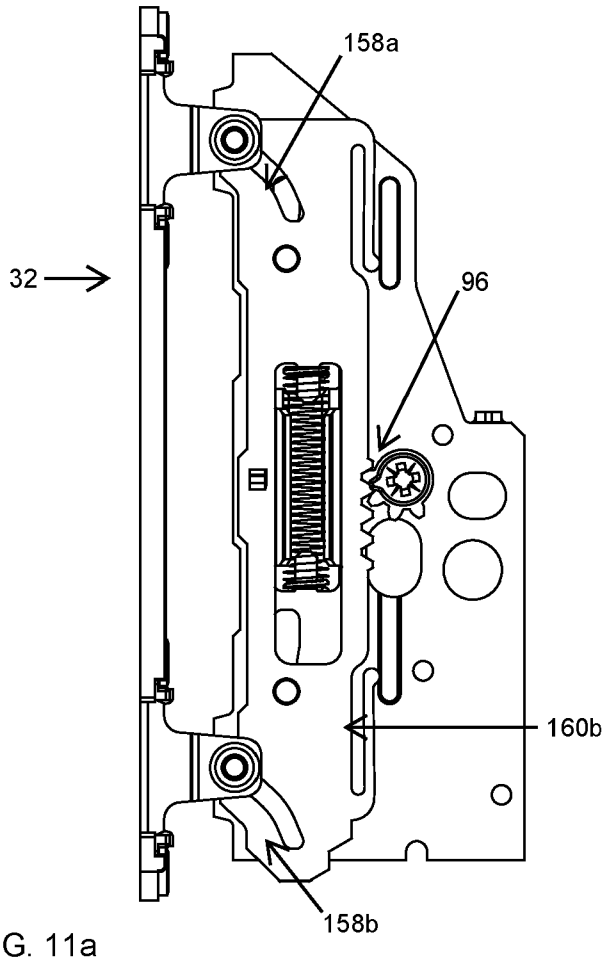

FIG. 11a

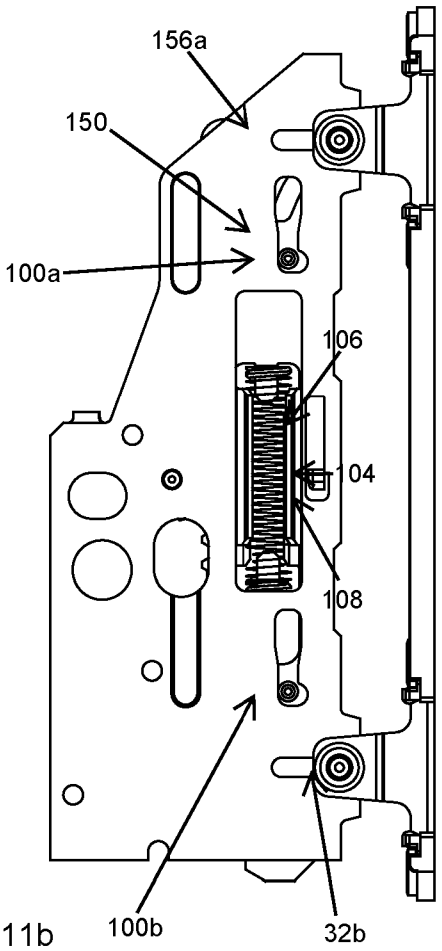

FIG. 11b

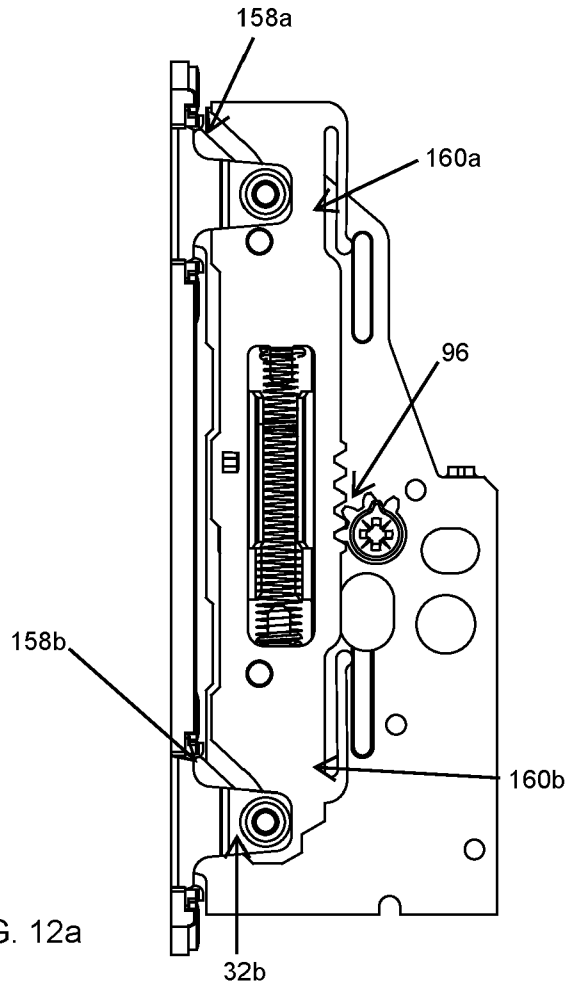

FIG. 12a

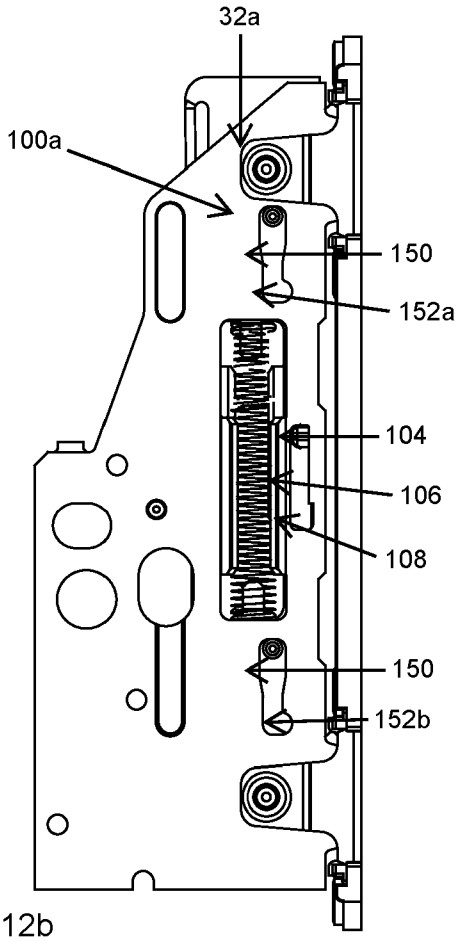

FIG. 12b

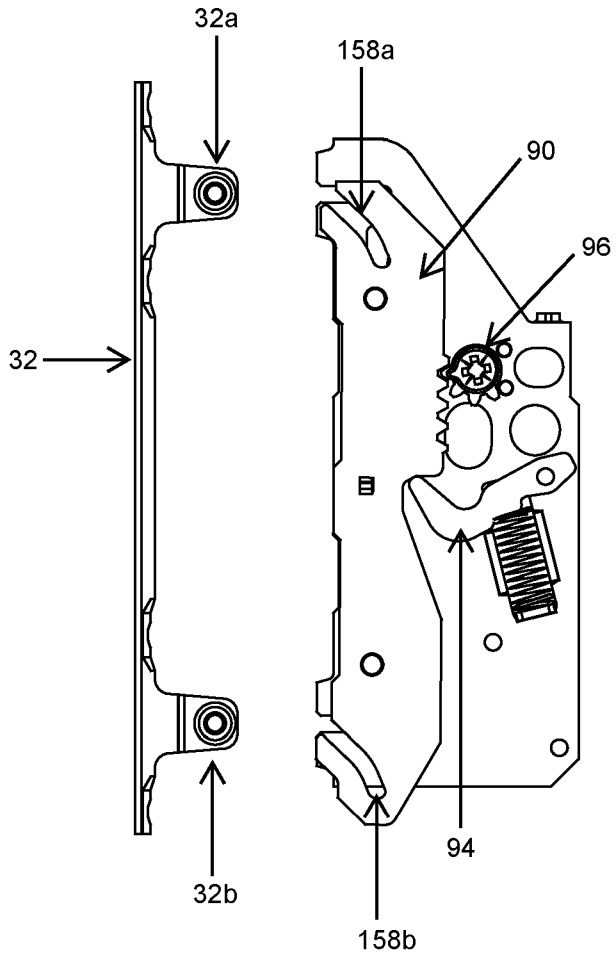

FIG. 14a

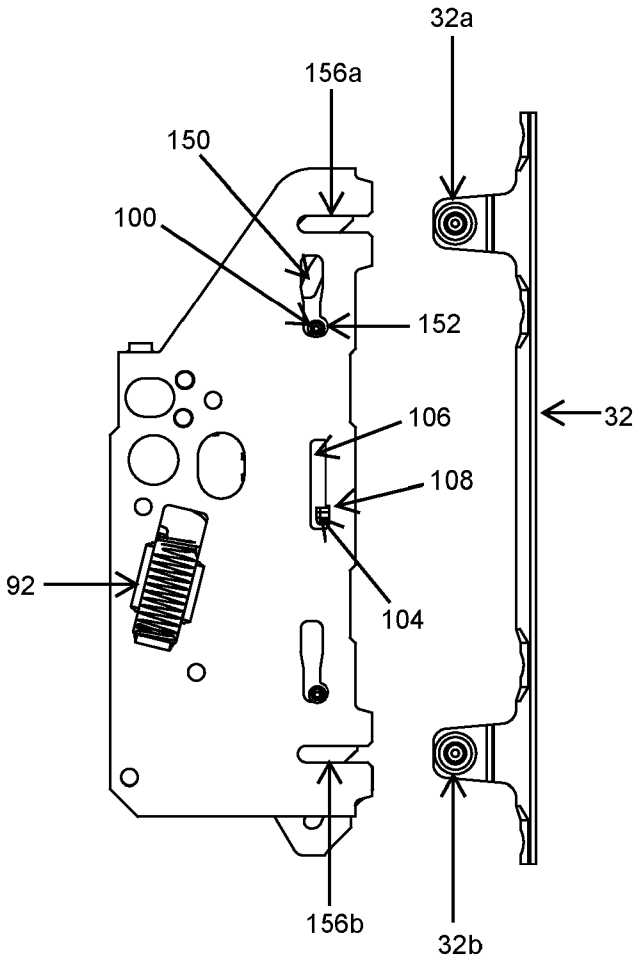

FIG. 14b

FIG. 17

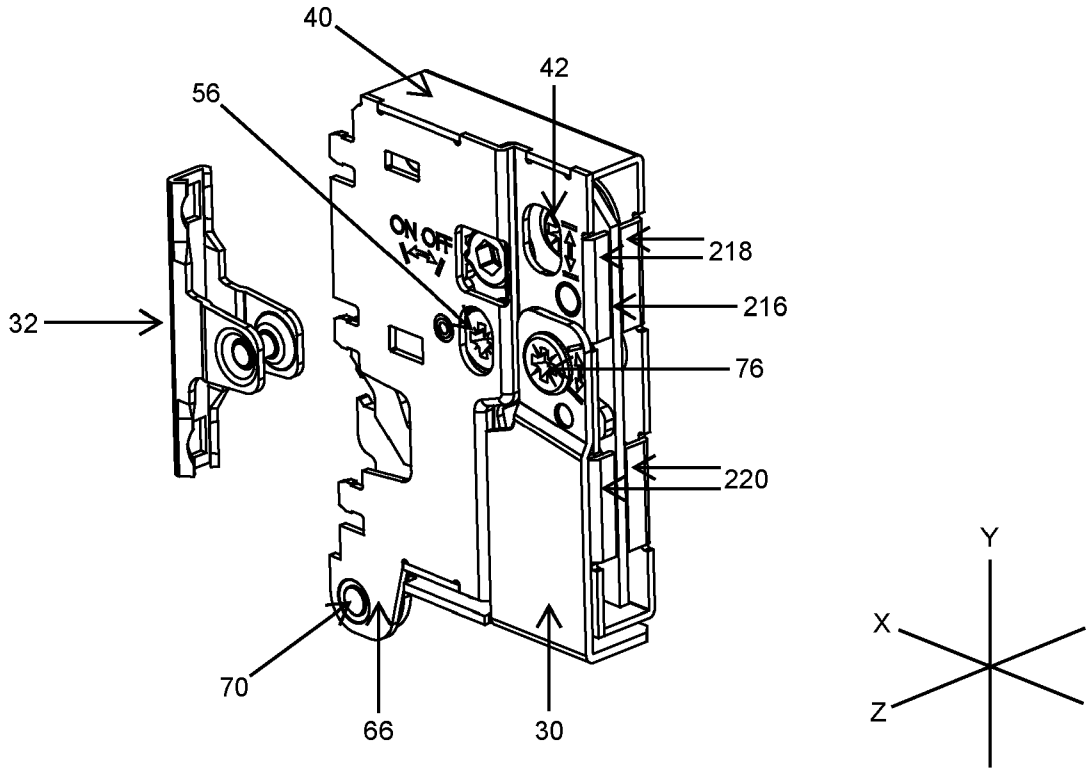
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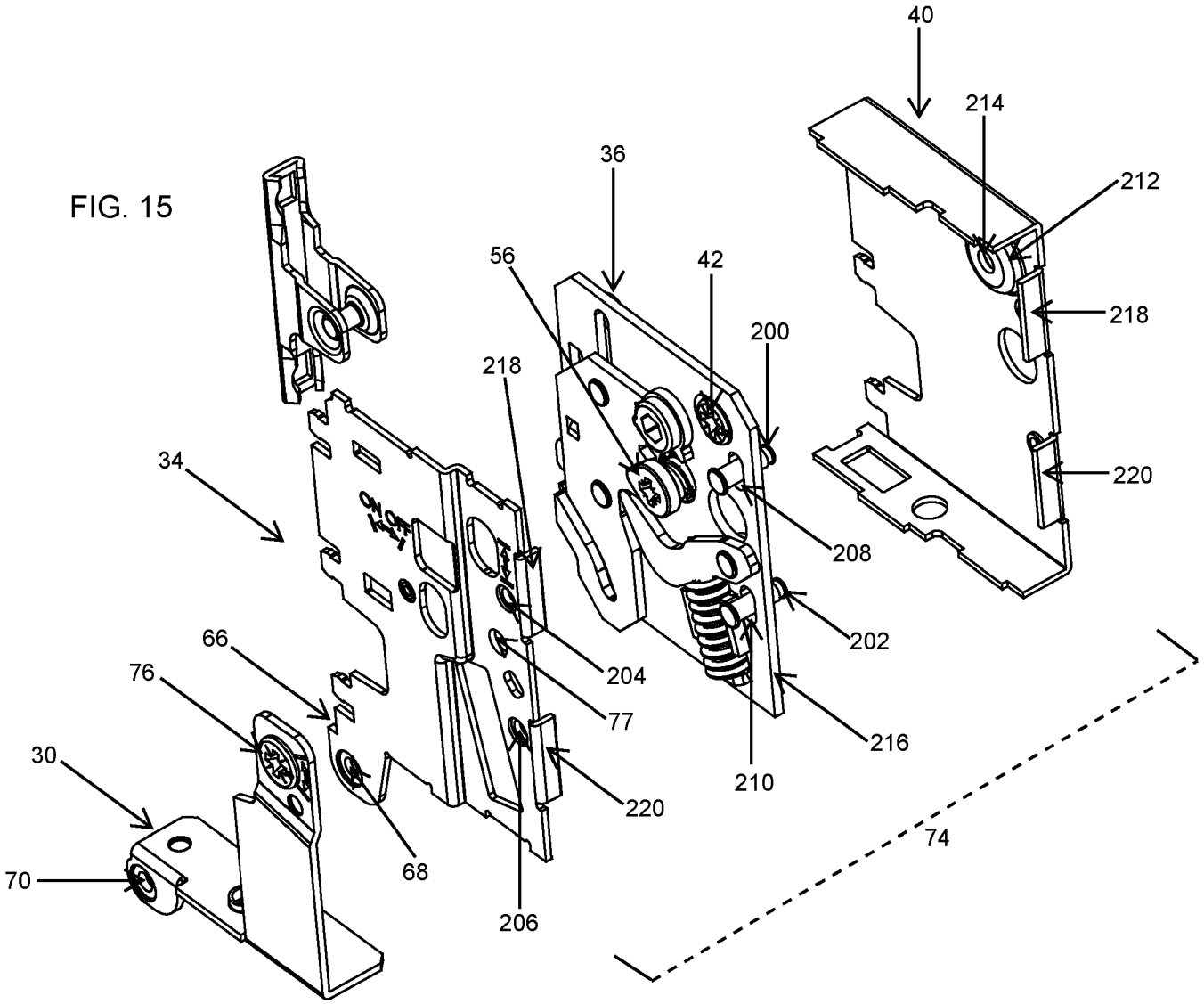
FIG. 15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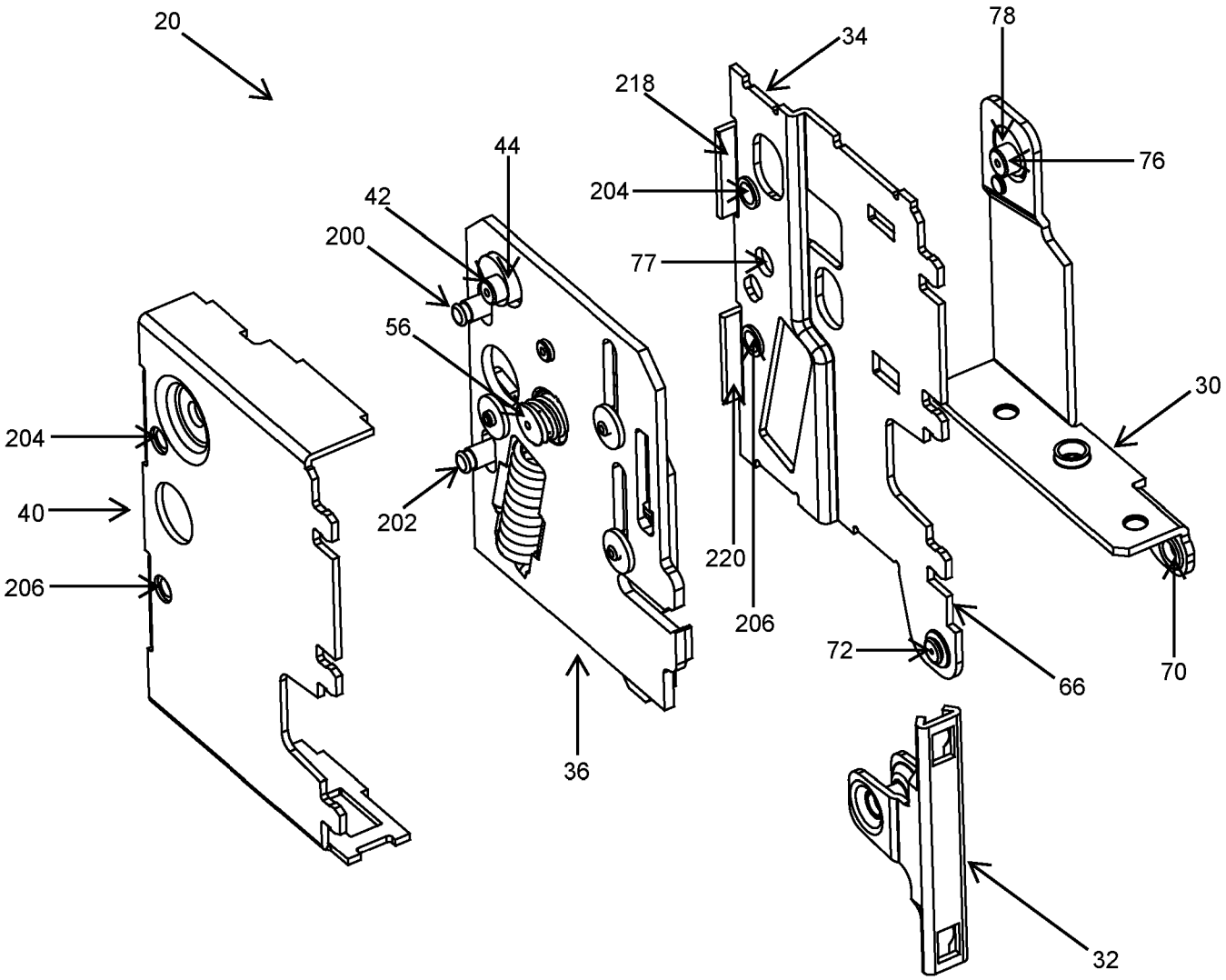
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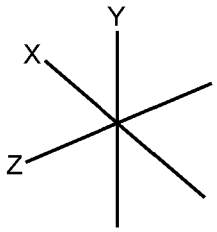
FIG. 16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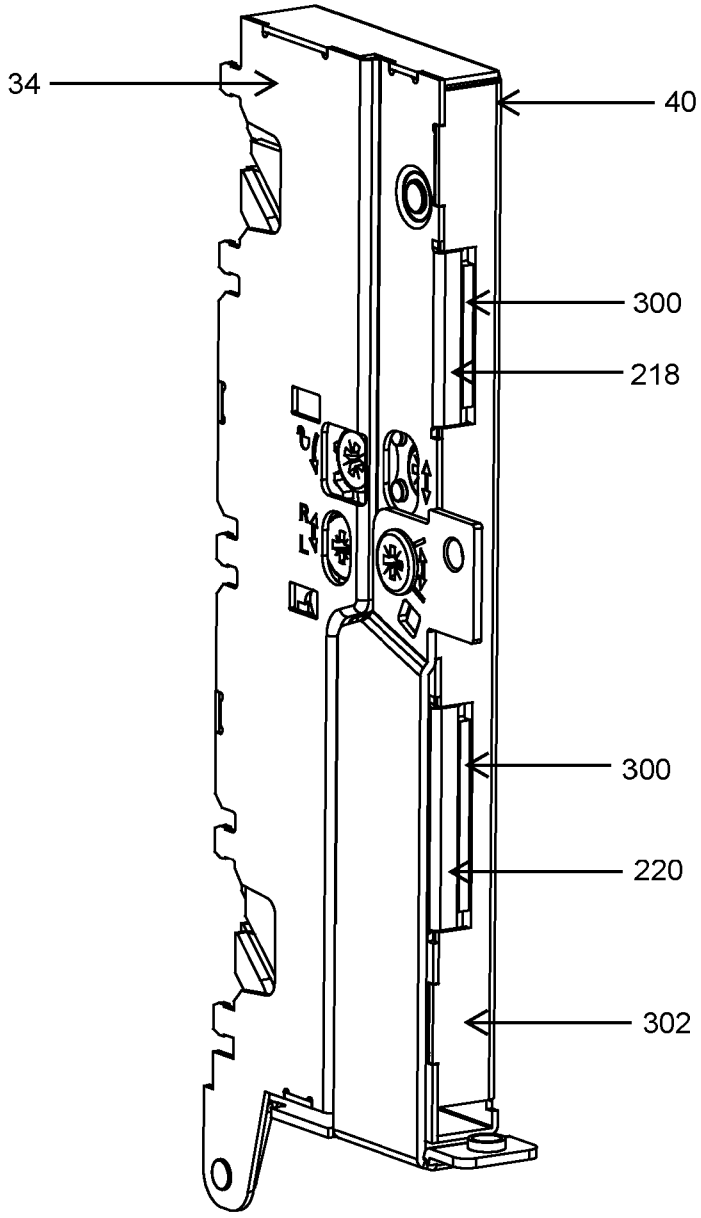

FIG. 18

Adjustment Unit

Field of the invention

The present invention relates to an adjustment unit, and particularly, although not exclusively, to an adjustment unit to assist the hanging of a drawer front on to a drawer frame. The invention also relates to a means to allow the drawer front to be more efficiently hung on the drawer frame.

Background

It is aesthetically pleasing to provide an array of drawers that are symmetrically aligned. In order so to do, it can be necessary to ensure that each individual drawer front is carefully mounted, and adjusted with respect to the drawer frame.

EP 2699123 discloses means to adjust the height and side tilt of a drawer front. However, this solution is disadvantageous in that the front panel needs to be adjusted using separate adjustment means for both directions. This can be cumbersome, particularly for a non-skilled technician.

EP2643892 discloses means to adjust a lateral tilt of a drawer front. This means uses a series of pins positioned perpendicular to the axis of rotation.

It would be advantageous to provide means to allow adjustment to be achieved efficiently, and without the user requiring significant skill.

It is also an aim of the present arrangement to allow a drawer front to be hung quickly and efficiently on a drawer frame, and specifically to provide a means to enable such a rapid engagement of drawer front to drawer frame that is reliable and straightforward to manufacture.

Summary of the Invention

According to the present invention there is provided a fastening unit operable to mount a drawer front with a connection piece pre-mounted thereon to a drawer frame, the fastening unit comprising: an anchor unit operable to be attached to the drawer frame; an adjustment unit including a catch plate operable to receive said connection plate, said adjustment unit operable to move said catch plate in three directions, and translate said movement to said connection piece.

Preferably the three directions comprise a vertical displacement; a horizontal shift, and a vertical tilt. Such multi-directional adjustment allows a drawer front to be exactly mounted on a drawer frame.

It is preferred that the adjusting unit comprises three separate respective means to action each of said three directions. Accordingly, each directional change may be adjusted separately to ensure exact placement of the drawer front with respect to the drawer frame.

Preferably the three separate means are located proximate to one another on the fastening unit. In use, the adjusting means will typically be contained within a cover. By providing all three adjusting means is close proximity, it is possible to provide a small window in the cover to allow access to the adjusting means. Such an arrangement makes it straightforward for a user to perform all adjustments.

In preferred embodiments the drawer frame comprises a runner, said runner comprising a top surface, wherein the anchor unit is attached to the runner.

Preferably the vertical tilt direction is actioned about a single pivot point. It is particularly preferred that the single pivot point is below the top surface of the runner. This arrangement advantageously allows for a wide adjustment arc at the top of the drawer.

Preferably the horizontal shift is about a single pivot that is co-axial with the axis of rotation of the horizontal tilt. The single pivot is advantageously a pin about which at least part of the adjustment unit can rotate.

It is preferred that the adjustment unit comprises a secondary plate abutted against the catch plate, wherein the catch plate is operable to move in a vertical direction with respect to the secondary plate. In preferred embodiments only the catch plate moves to effect vertical movement.

Preferably the catch plate and the secondary plate are operable to collectively horizontally shift about said single pivot. It is preferred that the single pivot is a pin. Ideally the pin is located at the lower end of the adjustment unit. Such an arrangement provides stability of the unit.

According to a second aspect of the present invention there is provided a fastening unit operable to mount a drawer front onto a drawer frame, the fastening unit comprising:

a connection piece operable to be pre-mounted on the drawer front;

a base plate with a catch member operable to engage with the connection piece, wherein the engagement is via at least two engagement points, wherein,

the base plate comprises a catch plate operable to move from a first position operable to receive the connection piece and a second position operable to secure the connection piece, wherein,

the catch plate is moved between the first position and the second position under the force of a single spring.

Engagement via two points is advantageous for larger or deeper drawers. Additional stability is provided. Furthermore, the provision of a single spring is advantageous in that the fastening unit can be manufactured, and particularly assembled, in a much more straightforward way than an arrangement relying on a plurality of springs.

It is preferred that the at least two engagement points are substantially identical.

Preferably the catch plate is maintained in the first position by a primary locking means, and it is particularly preferred that the primary locking means is maintained in place by a secondary locking means.

It is particularly preferred that the secondary locking means comprises at least one lock associated with each of the engagement points.

Preferably, both secondary locking means need to be released to unlock the primary locking means. Such an arrangement is advantageous in that the connection piece needs to be correctly aligned to the base plate to allow engagement.

It is preferred that the secondary locking means are balanced by one or more springs. In a specific embodiment, the secondary locking means comprises one or more leaf springs.

According to an aspect of the present invention there is provided a fastening unit operable to mount a drawer front with a connection piece pre-mounted thereon to a drawer frame, the fastening unit comprising: an anchor unit operable to be attached to the drawer frame; an adjustment unit comprising a catch plate operable to receive said connection plate and a pair of outer plates positioned either side of said catch plate, said adjustment unit operable to move said catch plate in three directions, and translate said movement to said connection piece.

It is preferred that said catch plate is retained between said outer plates.

In mechanical systems there are six degrees of freedom (vertical, horizontal and forward, and rotational movement about each of X, Y and Z axes). It is preferred that the catch plate has two degrees of movement with respect to the outer plates.

It is preferred that the catch plate can perform a horizontal shift/tilt with respect to the outer plates, and more preferably that the catch plate comprises a rear edge operable to engage with at least part of one or both of the outer plates to define a pivot line.

It will be appreciated that the pivot line need not be continuous. For example, the rear edge could comprise one or more tabs, or that the line could be crenelated.

In order that the present invention be more readily understood, specific embodiments will now be described with reference to the accompanying drawings.

Description of drawings

Figure 1 shows a perspective view of a drawer side, and its connection to a drawer front. A runner on which the drawer moves with respect to a cabinet is also visible.

Figure 2 shows a close-up of the connection between the drawer side and drawer front, with a section of the drawer side removed so that the connection means is visible.

Figure 3 shows a rear perspective view of a connection means, shown in an exploded manner for ease of viewing, in accordance with a first embodiment.

Figure 4 shows a front perspective view of a connection means, shown in an exploded manner for ease of viewing, in accordance with the first embodiment.

Figure 5a shows a top view of the intersection of the drawer front and the draw side with the connection means in a first position.

Figure 5b shows a top view of the intersection of the drawer front and the draw side with the connection means in a second position.

Figure 6a shows a portion of the connection means in a first position.

Figure 6b shows a portion of the connection means in a second position.

Figure 7 shows a perspective view of a drawer side, and its connection to a drawer front in accordance with a second embodiment. A runner on which the drawer moves with respect to a cabinet is also visible.

Figure 8 shows a rear perspective view of a connection means, shown in an exploded manner for ease of viewing, in accordance with a second embodiment.

Figure 9a shows a side view of the embodiment of figure 7, with the connection means presenting the front drawer panel in a first position.

Figure 9b shows a side view of the embodiment of figure 7, with the connection means presenting the front drawer panel in a second position.

Figures 10a and 10b show, respectively, a right hand side view and a left hand side view of a fastening unit according to an embodiment of the present invention, wherein a connection piece and a base plate are fully disengaged.

Figures 11a and 11b show, respectively, a right hand side view and a left hand side view of a fastening unit according to an embodiment of the present invention, wherein a connection piece and a base plate are at the engagement point.

Figures 12a and 12b show, respectively, a right hand side view and a left hand side view of a fastening unit according to an embodiment of the present invention, wherein a connection piece and a base plate are fully engaged.

Figures 13a and 13b show, respectively, a right hand side view and a left hand side view of a fastening unit according to an embodiment of the present invention, wherein a connection piece and a base plate are in a faulty engagement.

Figures 14a and 14b show, respectively, a right hand side view and a left hand side view of a fastening unit according to a variant embodiment of the present invention, wherein a connection piece and a base plate are fully disengaged.

Figure 15 shows a rear perspective view of a connection means, shown in an exploded manner for ease of viewing, in accordance with a third embodiment.

Figure 16 shows a front perspective view of a connection means, shown in an exploded manner for ease of viewing, in accordance with the third embodiment.

Figure 17 shows a rear perspective view of a fully assembled connection means of the third embodiment.

Figure 18 shows an embodiment of a fully assembled connection means with a non-continuous pivot line.

Description of preferred embodiments

The present arrangement provides an integrated three-way adjustment means to allow a drawer front to be mounted on a drawer frame, and be adjusted in height, horizontal shift and vertical tilt. Said means is a single unit that may typically be fastened on the drawer frame (either directly, or via some other means), or mounted on a runner on said drawer frame. Advantageously, combining all three directions on movement in a single adjusting unit allows for straightforward adjustment of the drawer front when it is being mounted on the drawer frame.

Figure 1 shows a drawer front 10 connected to a drawer frame 12 via a fastening unit 20. The drawer frame 12 comprises a runner 14 to allow the drawer to slide in and out of a cabinet (not shown). The drawer frame 12 may have a window 18 to allow access to the fastening unit 20. For ease of reference, an orthogonal set of axes are shown. When the fastening unit 20 is in use, the Y-axis is the vertical axis, the X-axis is the direction in which the drawer moves (opens and closes), and the Z-axis is parallel to the front face of the drawer front 10.

Figure 2 shows a close up of the fastening unit 20, the runner 14 and the drawer front 10. The fastening unit is mounted substantially above the top surface 16 of the runner 14.

Figure 3 shows a rear perspective view of a fastening unit 20, shown in an exploded manner for ease of viewing, in accordance with a first embodiment. Said fastening unit 20 comprises a multi-piece component operable to allow a drawer to be hung on a drawer frame. Said multi-piece component is assembled to form a single unit. Specifically, an anchor frame 30 is provided that is fixed to the drawer frame 12. Typically, the anchor frame 30 is fixed on the drawer runner. It may be fixed on the top surface 16 of the runner 14. The anchor frame 30 is stationary with respect to the drawer frame 12 during all adjustments of the drawer front 10.

A connecting piece 32 is pre-attached to the inside of the drawer front 10. Said connection piece 32 is stationary with respect to the drawer front 10 during adjustment.

The fastening unit 20 further comprises, as seen from left-to-right in figure 3, a first tertiary adjusting plate 34, a primary adjusting plate 36, a secondary adjusting plate 38 and a second tertiary adjusting plate 40.

Figure 4 shows a front perspective view of fastening unit 20, shown in an exploded manner for ease of viewing, in accordance with the first embodiment. In this figure, the connecting piece 32 is shown at the front, and, from left-to-right are illustrated the second tertiary adjusting plate 40, the secondary adjusting plate 38, the primary adjusting plate 36, the first tertiary adjusting plate 34 and the anchor frame 30.

Both figures 3 and 4 illustrate the orthogonal axes shown in figure 1. When the fastening unit 20 is in use, the Y-axis is the vertical axis, the X-axis is the direction in which the drawer moves (opens and closes), and the Z-axis is parallel to the front face of the drawer front 10.

In use, the primary adjusting plate 36 is operable to engage and secure the connecting piece 32. The connection process is described later.

The primary adjusting plate 36 is secured to, and operable to slide in the Y-direction with respect to, the secondary adjusting plate 38. A cam 42 mounted on the primary adjusting plate 36 functions as a transmission element to cause relative movement between the first and the second adjusting plates, 36, 38. The cam 42 engages camming surface 44 on plate 36. The cam 42 comprises a protrusion that engages with an aperture 43 on secondary plate 38. The cam 42 comprises means to allow adjustment. Typically, this would be a slot or cross to receive a screwdriver, or similar tool. Turning the cam 42 causes the cam 42 to engage with the camming surface 44, and allow movement of the primary adjusting plate 36 with respect to the secondary adjusting plate 38. When the connecting piece 32 is engaged with the primary adjusting plate 36 the movement of the first adjusting plate 36 causes movement of the connecting piece 32. In this manner, a drawer front 10 may be adjusted in a vertical direction with respect to a drawer frame 12.

The primary and secondary adjusting plates 36, 38 collectively form a horizontal shift unit 50. This unit 50 is operable to rotate about the Y-axis with respect to the first and second tertiary plates 34, 40. Second tertiary plate 40 comprises a pin 52. The second adjusting plate 38 comprises an aperture 54 that is complementary to the pin 52. When the aperture is mounted on the pin 52, the horizontal shift unit 50 is operable to rotate with respect to the first and second tertiary plates 34, 40. As the drawer front 10 will be mounted at both drawer frame sides, the drawer front 10 is operable to be shifted in the horizontal direction.

A transmission means 56 is mounted on the secondary adjusting plate 38. The transmission means 56 is typically a screw. Said screw 56 passes through the secondary adjusting frame 38 via aperture 58. Aperture 58 comprises a screw thread to engage with screw 56.

It will be noted from figure 4 that the screw passes through the primary adjusting frame 36 via an elongate aperture 60. Such elongate aperture allows the primary adjusting frame 36 to travel vertically with respect to the secondary adjusting frame 38.

The screw 56 can be moved with respect to the horizontal shift unit 50. The screw has a length of approximately the gap between the first and second tertiary plates 34, 40. Whilst a small interference or gap is permissible, the screw 56 is typically in constant engagement with the two tertiary plates.

The horizontal shift unit 50 comprises first and second camming surfaces 62, 64 (camming surface 62 is indicated on figs 6a and 6b. Camming surface 64 is indicated on figure 4). The first camming surface 62 is formed on the primary adjusting plate 36, and is operable to engage with the first tertiary adjusting frame 34. The second camming surface 64 is formed on the secondary adjusting plate 38, and is operable to engage with the second tertiary adjusting frame 40.

The screw 56 comprises means to receive a tool, such as a screwdriver, to rotate the screw. The means to receive the screw driver is very preferably formed on the same side of the primary adjusting plate 36 and the height adjusting screw/cam 42.

As the screw 56 is rotated engagement with the relevant tertiary adjusting plate causes the horizontal shift unit 50 to rotate about the pin 52. The first and second camming surface 62, 64 control the rotation, and provide stability to the horizontal shift unit 50.

Operation of the transmission means thus allows the drawer front to be shifted horizontally with respect to the drawer frame.

The first and second tertiary frames 34, 40, and the horizontal shift unit 50 collectively form a tilting unit 74 operable to tilt about the Z-axis. When the fastening module 20 is assembled, the first and second tertiary plates are secured together such that there is substantially no relative movement between the two plates. The first tertiary plate 34 comprises a tab 66 that comprises an aperture 68. The anchor frame 30 comprises an aperture 70. Apertures 68 and 70 are positioned to receive a pin when the fastening unit 20 is assembled ready for use. The pin 72 allows the tilting unit 74 to tilt about the Z-axis relative to the anchor frame 30.

The anchor frame 30 comprises a cam 76 operable to engage with a camming surface 78 on the anchor frame 30. The cam 76 comprises a protrusion that engages with an aperture 77 on the first tertiary adjusting plate 34. The cam 76 comprises means to receive a tool, such as a screwdriver, to turn the cam 76. Turning the 76 causes the cam to engage with the camming surface 78, and tilt the tilting unit 74.

The tool receiving part of the transmission means 56, and cams 42 and 76 are accessible via window 18 in the drawer side mount 18.

Figures 5a and 5b show an example of the drawer during the horizontal shift. The figures illustrate the drawer front from above (i.e. looking down along the Y-axis). Figure 5a shows in a first orientation. The primary adjusting plate 36 (the catch plate) and secondary adjusting plate 38 are visible, as is transmission means 56. By rotating the transmission means 56 clockwise the screw 56 will engage with the second tertiary plate 40, and due to camming surface 64, cause the horizontal shift unit 50 to move to the right (when looking front on at the drawer) along the Z-axis. Rotating the screw 56 the other way would cause a horizontal shift in the counter direction.

Figures 6a and 6b show perspective views of the primary adjustment plate 36 – also termed the catch plate. The connecting piece 32 is shown in a disengaged state in figure 6a and an engaged state in figure 6b. The primary adjusting plate 36, as shown in figure 6a, comprises a catch member 90, a spring 92, a transmission arm 94 and a reset mechanism 96. The catch member 90 comprises a shaped groove 158. Note that figure 6a shows the primary adjusting plate 36 is a different perspective to figure 3.

With respect to figure 4, it will be noted that the primary adjustment plate 36 comprises sliders 100 that run in grooves to allow the catch member 90 to move vertically (when the adjusting unit is in situ in a cabinet) with respect to the primary adjustment plate 36. A pivot 102 is provided to allow the transmission arm 94 to rotate there-about.

A tab 104 formed on the catch member 90 is located in a groove or runner 106. One end of the runner 106 comprises a recess 108. Collectively, the tab 104, groove 106 and recess 108 define a primary locking means.

The primary adjusting plate 36 comprises a groove 156. Said groove 156 is orientated substantially in the X-direction (see figure 4).

In figure 6a, the catch member 90 is locked in a disengaged position. The tab 104 is located in the recess 108. The spring 92 is compressed, and maintained in a compressed state via the catch member 90 bearing on the transmission arm 94, which in turn presses against the spring 92.

As the connection piece 32 is pushed towards the groove 158, the catch member 90 is pushed inwards to an extent that the tab 104 is pushed out of recess 108. At this point, the spring 92 is no longer contained and expands, urging the transmission arm 94 upwards. Thus, the catch member, constrained by the sliders 100, is pushed upwards. The connection piece 32 is thus secured between the intersection of the groove 158 and the groove 156.

The reset mechanism 96 comprises a screw with an integral rack-and-pinion connection to the catch member 90. Rotating the reset mechanism 96 urges the catch member downwards allowing the connection piece to be released and the tab 104 to be engaged in the recess 108.

It will be appreciated that each of the secondary plate 38 and the first and second tertiary plates 34, 40 comprises a recess or cut-out to allow the spring 92 to be accommodated.

Figures 7 and 8 show a second embodiment. The same reference numerals will be used as in the first embodiment, for ease of reference. Figure 7 corresponds to figure 1 of the first embodiment, whilst figure 8 corresponds to figure 3 in the first embodiment. The second embodiment is relevant for larger (deeper) drawers. As such the primary adjusting plate 36 that acts as the catch plate 36 for the connecting piece 32, together with the connecting piece itself are both elongate. It will be noted that the connecting piece 32 and the catch plate 36 have two points of engagement, 32a, 32b.

The second embodiment comprises, akin to the first embodiment, an anchor frame 30 is provided that is fixed to the drawer frame 12. Typically, the anchor frame 30 is fixed on the drawer runner. It may be fixed on the top surface 16 of the runner 14. The anchor frame 30 is stationary with respect to the drawer frame 12 during all adjustments of the drawer front 10.

A connecting piece 32 is pre-attached to the inside of the drawer front 10. Said connection piece 32 is stationary with respect to the drawer front 10 during adjustment.

The fastening unit 20 further comprising, as seen from left to right in figure 8, a first tertiary adjusting plate 34, a primary adjusting plate 36, a secondary adjusting plate 38 and a second tertiary adjusting plate 40. The second embodiment further comprises a cover 80 that fits about the connecting piece 32.

It should be noted that the primary adjusting plate and the secondary adjusting plate operate a vertical shift in the same manner as in the first embodiment. Furthermore, the equivalent second tertiary plate 40 comprises a pin 52, with the primary adjusting plate and the secondary adjusting plate operable to rotate about the pin 52 to allow horizontal shift, as per the first embodiment. The

arrangement shown in Figures 5a and 5b in relation to the first embodiment is mirrored in the second embodiment.

Figures 9a and 9b show a vertical tilt operation in relation to the second embodiment. It will be appreciated that the operation is equally applicable to the first embodiment.

The anchor plate 30 is mounted on the top surface 16 of the runner 14. The first tertiary plate 34 is mounted on the anchor plate 30 via pin 72, and supported by cam 76. The second tertiary plate 40 is secured to the first tertiary plate 34, with the primary adjusting plate and secondary adjusting plate 38 beginning mounted therein.

Rotating cam 76 causes rotation of the fastening unit 20 about pin 72. Figure 9a shows a first position, with figure 9b showing the drawer front 10 angled with respect to the drawer frame.

The pin 72 is position below the top surface 16 of the runner 14. Such an arrangement allows for a large range of motion of the drawer front 10.

An embodiment of a base plate with a catch member is shown in figures 10 to 13. Such a plate may advantageously be used in the three-way adjusting unit described above. The base plate comprises the primary adjusting plate, and is operable to engage with a connection piece. Such a connection piece may be similar to that described above.

Figures 10a and 10b show a base plate 36 with a catch member 90. The catch member is operable to move between a first position and a second position under the force of a spring 92. A reset means 96 is provided to return the catch member 90 from the second position to the first position. The reset means 96 comprises a rack-and-pinion screw operable to engage with the catch member. The reset means is operable to receive a screw driver or similar tool. By turning the reset means 96, the rack-and-pinion urges the catch member against the force of the spring 92 to the first position.

The catch member 90 comprises first and second sliders 100 that are operable to move in grooves 150. The grooves 150 each comprise a recess 152. Collectively, sliders 100, grooves 150 and recesses 152 define a secondary locking means. Note that slider 100a, groove 150a and recess 152a refer to the upper secondary locking means, associated with the upper point of engagement. Slider 100b, groove 150b and recess 152b refer to the lower secondary locking means, associated with the lower point of engagement.

The catch member 90 further comprises a tab 104 that is operable to move within a groove 106. The groove 106 comprises a recess 108 at one end operable to receive the tab 104.

When the catch member 90 is located at the first position with respect to the base plate 36, the first and second sliders 100 are located in recesses 152. Similarly, tab 104 is maintained in the recess in groove 108. Thus the spring is in held in compression by the sliders 100 and tab 104. Collectively, the tab 104, groove 106 and recess 108 define a primary locking means.

Connection piece 32 may be pre-mounted onto a drawer front 10. The connection piece comprises two engagement points 32a, 32b. Said engagement points typically comprise a bar.

Base plate 36 comprises a pair of open grooves 156, spaced apart so as to receive the engagement points 32a, 32b on the connection piece 32. The grooves 156 are most clearly shown in figure 10b.

Said grooves are oriented along the same axis as the drawer moves in and out of the cupboard. Using the earlier coordinate system (that is reproduced on figures 10a and 10b), this is in the X-direction.

Catch member 90 comprises first and second grooves 158a, 158b. Said catch member grooves 158 are positioned at an angle with respect to the open grooves 156 on the base plate. Said catch member grooves 158 are typically positioned at an angle in the X-Y plane with respect to the open grooves 156.

It will be appreciated that that two open grooves are substantially identical, and the two angled grooves 158 are substantially identical.

When the catch member 90 is retained in the first position, the open ends of the base plate grooves 156 and the open ends of the catch member grooves are substantially aligned, as shown in figures 10a and 10b.

The secondary locking means are preferably balanced by one or more springs. In a preferred arrangement, the catch member 90 comprises first and second leaf springs 160. The first leaf spring 160a is operable to act upon the first slider 100a, whilst the second leaf spring 160b is operable to act upon the second slider 100b.

Figures 11a and 11b show the connection piece 32 ready for engagement with the fastening unit. The connection piece pushes on the catch member which forces the catch member towards the base plate. The tab 104 is urged out of the recess on groove 108. The first and second leaf springs 160 urge, respectively, the first and second sliders 100 from the recesses 152. Thus, the spring 90 is operable to urge the catch member 90 to its second position. As a consequence, the catch member grooves 158 move with respect to the base plate grooves 156, such that the bars of the respective engagement points are secured in the intersection of the base plate grooves and the catch member grooves 158. This position is shown in figures 12a and 12b. In this arrangement the connection piece 32 is secured to the fastening unit.

The present arrangement is advantageous in that a single spring 92 is used to action the connection operation. By providing a single spring, the fastening unit can be manufactured, and particularly assembled, in a much more straightforward way than an arrangement relying on a plurality of springs.

Figures 13a and 13b show an example of a safeguard of the connection operation not activating if both engagement points are not simultaneously presented to the base plate 36.

In the example shown, the lower engagement point (as illustrated) is presented to the base plate, but the upper engagement point is not. The lower leaf spring 160b urges the lower slider 100b out of lower recess 152b. However, slider 100a is not urged out of recess 152a, and hence tab 104 is not urges out of its recess in groove 108. As such, the catch member 90 is prevented from moving to the second position.

Figures 14a and 14b show a variant embodiment. In this arrangement, the secondary locking means is push directly by the connection piece 32. There are no leaf springs. As the connection piece is urged towards the fastening unit, the connection piece forces the tab 104 out of the recess 108, and

sliders 100 are pushed out of recesses 152. Thus the spring 92 urges the catch member 90 into its second position.

If the connection piece 32 is not appropriately angled, for example if only one of the connection points is engaged, then the slider at the unengaged point will not be pushed from recess 152, and hence the catch member will not be actioned. In this manner, the secondary locking means also tilt around the central primary locking means, if attaching the connection element not aligned in the catching member.

A further embodiment of a fastening module 20 is shown in figures 15 to 17. In this embodiment the secondary adjustment plate is eliminated. Where possible, for ease of comparison and understanding, the same reference numerals will be used as in earlier embodiments. A connecting piece 32 is pre-attached to the inside of the drawer front 10. Said connection piece 32 is stationary with respect to the drawer front 10 during adjustment.

The fastening unit 20 further comprises, as seen from left-to-right in figure 15, a first adjusting plate 34, a second adjusting plate 36, and a third adjusting plate 40.

Figure 16 shows a front perspective view of fastening unit 20, shown in an exploded manner for ease of viewing, in accordance with the first embodiment. In this figure, the connecting piece 32 is shown at the front, and, from left-to-right are illustrated the third adjusting plate 40, the second adjusting plate 36, the first adjusting plate 34 and the anchor frame 30.

Both figures 15 and 16 illustrate the same orthogonal axes shown in figure 1. When the fastening unit 20 is in use, the Y-axis is the vertical axis, the X-axis is the direction in which the drawer moves (opens and closes), and the Z-axis is parallel to the front face of the drawer front 10.

In use, the second adjusting plate 36 is operable to engage and secure the connecting piece 32. The connection process is as described earlier with respect to the other embodiments.

It should be noted that an elongate embodiment akin to figures 8 to 14 is contemplated for this arrangement.

Figure 17 shows the present embodiment in assembled form. In use, the first adjusting plate 34, a second adjusting plate 36, and a third adjusting plate 40 collectively form a tilting unit 74 operable to tilt about the Z-axis. When the fastening module 20 is assembled, the first and third plates are secured together such that there is substantially no relative movement between the two plates. The first plate 34 comprises a tab 66 that comprises an aperture 68. The anchor frame 30 comprises an aperture 70. Apertures 68 and 70 are positioned to receive a pin when the fastening unit 20 is assembled ready for use. The pin 72 allows the tilting unit 74 to tilt about the Z-axis relative to the anchor frame 30. This operation is similar to embodiments described earlier.

The anchor frame 30 comprises a cam 76 operable to engage with a camming surface 78 on the anchor frame 30. The cam 76 comprises a protrusion that engages with an aperture 77 on the first tertiary adjusting plate 34. The cam 76 comprises means to receive a tool, such as a screwdriver, to turn the cam 76. Turning the 76 causes the cam to engage with the camming surface 78, and tilt the tilting unit 74. Again, such operation is similar to embodiments described earlier.

The second plate 36 is operable to both horizontally tilt and vertical shift with respect to the first and third plates 34, 40.

The second plate 36 comprises first and second lugs 200, 202. Each of the first and third plates 34, 40 comprise respectively first and second holes 204, 206. In use, holes 204 and lug 200 align, and holes 206 and lug 202 align. The lugs 200, 202 are secured in the holes 204, 206.

The second plate 36 comprises elongate apertures 208, 210. When assembled, the respective lugs 200, 202 pass through respective elongate apertures 208, 210. The second plate 36 is thus maintained between the first and third plates, but has degrees of movement with respect thereto.

The third plate 40 comprises a raised member 212 comprising an inner hollow defined by an inner camming surface 214. The raised member 212 may be considered as a grommet.

As in earlier embodiments, the adjusting plate – the second plate 36 – comprises a cam 42 mounted thereon that functions as a transmission element.

The cam 42 engages with a camming surface 44 on plate 36. The cam 42 comprises a protrusion that engages with the camming surface 214 of the raised member 212 on the third plate 40. The cam 42 comprises means to allow adjustment. Typically, this would be a slot or cross to receive a screwdriver, or similar tool. Turning the cam 42 causes the cam 42 to engage with the camming surface 214, and allow movement of the second plate 36 with respect to the third plate 38. When the connecting piece 32 is engaged with the second plate 36 the movement of the second plate 36 causes movement of the connecting piece 32. In this manner, a drawer front 10 may be adjusted in a vertical direction with respect to a drawer frame 12.

The elongate apertures 208, 210 allow movement of the second plate in a vertical direction with respect to the lugs 200, 202.

The second plate 36 is operable to be tilted about the Y axis by actioning transmission means 56. Specifically, transmission means passes through an aperture in second plate 36. The inside surface of the aperture, and the transmission means comprises complementary screw threads to allow the transmission means 56 to be accurately positioned with respect to the second plate 36.

When the fastening module 20 is in its assembled state, the second plate 36 resides between the first and third plates 34, 40. The transmission means 56 is operable to engage with either of the first plate 34, or the third plate 40, depending on its position with respect to the second plate 36. By urging the transmission means against either the first or third plate, the intermediate second plate 36 can be made to tilt about the Y-axis. It will be appreciated that the second plate 36 – the catch plate – comprises a rear edge 216. The second plate 36 is operable to pivot about its rear edge 216.

The rear edge need not be continuous. One or more tabs may be provided, or the rear edge may have a crenelated shape.

Outer plates 34, 40 each comprise respective tabs 218, 220. As will be seen from figure 17, when the fastening unit 20 is assembled tabs 218, 220 engage with the rear edge 216 of the catch plate 36. In this arrangement the catch plate 36 is operable to pivot about the rear edge, due to it being held in position by the tabs 218, 220.

It will be appreciated that the tabs could be replaced with a continuous section. Any arrangement, such that the rear edge is maintained substantially in position such that the catch plate is operable to pivot there about is contemplated. Figure 18 shows an example of such an arrangement. The pivot line 216 is formed by a pair of tabs 300. In this arrangement outer plate 34 comprises an upper tab 218 and lower tab 220. Outer plate 40, in this arrangement, comprises a shaped plate 302. The shaped plate 302 comprises two cut-out sections that are operable to receive tabs 300, and upper tab 218 and lower tab 220. In this arrangement, the tabs 300 are sandwiched between the shaped plate 302 and respective upper tab 218 and lower tab 220. Accordingly, the second plate 36 – the catch plate 36 – is operable to pivot against shaped plate 302, and upper tab 218 and lower tab 220.

Connecting piece 32 is engaged with the catch plate as described above with respect to the above embodiments.

The present arrangement thus provides an integral fastening and adjusting unit that is operable to rapidly mount the drawer front onto a drawer frame, and provide means to adjust the position of the drawer front in three discrete directions.

The above described embodiments are for reference only, and many variation and modifications are possible within the scope of the appended claims.

CLAIMS

1. A fastening unit operable to mount a drawer front with a connection piece pre-mounted thereon to a drawer frame, the fastening unit comprising:

   an anchor unit operable to be attached to the drawer frame;

   an adjustment unit including a catch plate operable to receive said connection piece, said adjustment unit operable to move said catch plate in three directions, and translate said movement to said connection piece.

2. A fastening unit according to claim 1, wherein the three directions comprise:

   a vertical displacement;

   a horizontal shift; and

   a vertical tilt.

3. A fastening unit according to either claim 1 or 2, wherein the adjusting unit comprises three separate respective means to action each of said three directions.

4. A fastening unit according to claim 3, wherein said three separate means are located proximate to one another on the fastening unit.

5. A fastening unit according to any preceding claim, wherein the drawer frame comprises a runner, said runner comprising a top surface, wherein the anchor unit is attached to the runner.

6. A fastening unit according to any of claims 2 to 5, wherein the vertical tilt direction is actioned about a single pivot point.

7. A fastening unit according to claim 6, when dependent on claim 5, wherein the single pivot point is below the top surface of the runner.

8. A fastening unit according to any of claims 2 to 7, wherein the horizontal tilt is about a single pivot that is co-axial with the axis of rotation of the horizontal tilt.

9. A fastening unit according to any preceding claim, wherein the adjustment unit comprises a secondary plate abutted against the catch plate, wherein the catch plate is operable to move in a vertical direction with respect to the secondary plate.

10. A fastening unit according to claim 9, when dependent on claim 8, wherein the catch plate and the secondary plate are operable to collectively horizontally shift about said single pivot.

11. A fastening unit according to any of claims 1 to 7, wherein the adjustment unit comprises a pair of outer plates, wherein said catch plate is retained between said outer plates.

12. A fastening unit according to claim 11, wherein said catch plate has two degrees of movement with respect to the outer plates.

13. A fastening unit according to either claim 11 or 12, wherein the catch plate comprises a rear edge, and wherein the rear edge engages with at least part of one or more of the outer plates to define a pivot line.

14. A fastening unit according to claim 13, wherein the rear edge is non-continuous.

15. A fastening unit according to claim 14, wherein the rear edge comprises one or more tabs.

16. A fastening unit according to any of claims 2 to 15, wherein the entirety of the adjusting unit tilts with respect to the anchor unit during a vertical tilt operation.

17. A fastening unit operable to mount a drawer front onto a drawer frame, the fastening unit comprising:

a connection piece operable to be pre-mounted on the drawer front;

a base plate with a catch member operable to engage with the connection piece, wherein the engagement is via at least two engagement points, wherein,

the base plate comprises a catch plate operable to move from a first position operable to receive the connection piece and a second position operable to secure the connection piece, wherein,

the catch plate is moved between the first position and the second position under the force of a single spring.

18. A fastening unit according to claim 17 wherein the at least two engagement points are substantially identical.

19. A fastening unit according to claim 17 or 18, wherein the catch plate is maintained in the first position by a primary locking means, and particularly wherein the primary locking means is maintained in place by a secondary locking means.

20. A fastening unit according to claim 19, wherein the secondary locking means comprises at least one lock associated with each of the engagement points.

21. A fastening unit according to claim 20, wherein both secondary locking means are required to be released to unlock the primary locking means.

22. A fastening unit according to claim 20 or 21, wherein the secondary locking means are balanced by one or more springs.

Intellectual Property Office

Application No:	GB2304808.5	**Examiner:**	Hari Fletcher
Claims searched:	1-16	**Date of search:**	19 September 2023

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 & 3-5	WO 2020/140594 A1 (GUANGDONG HEGU HARDWARE PREC MANUFACTURING CO LTD) See whole document.
A	-	WO 2013/075152 A1 (BLUM GMBH JULIUS) See whole document.
A	-	US 2013/0257252 A1 (HOLZAPFEL et al.) See whole document.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

Worldwide search of patent documents classified in the following areas of the IPC

A47B

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
A47B	0088/956	01/01/2017
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