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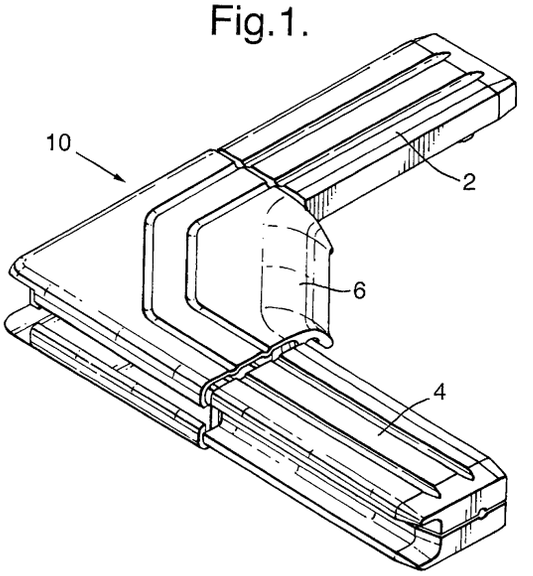
(54) Perimeter frame and flexible sheet assembly and corner assembly

(57) Perimeter frame and flexible sheet assembly forming a substantially flat polygonal framed panel, said assembly including a plurality of elongate frame members, each having a generally rectangular tubular cross-section and an outwardly open longitudinal spline groove on an exterior side thereof; a plurality of nodal connectors, each engaging a longitudinal end of at least two adjacent ones of said plurality of elongate frame members to form a polygonal perimeter frame, with the longitudinal spline grooves positioned inwardly of the perimeter of said frame, a flexible sheet having a perimeter engaged in said spline grooves and at least one elongate flexible spline fitted in said spline grooves for retaining said flexible sheet, wherein said flexible spline is substantially U-shaped in cross-section, having yieldable sides and a detend edge, wherein said spline groove is inwardly contoured to offer an undercut edge and wherein said detent edge engages behind said undercut edge for retaining said flexible sheet and a comer assembly for joining elongate legs of a frame for mounting adjacent an architectural opening, the comer assembly including end portions for fitment to respective elongate legs, at least front and back surfaces extending between the end portions, walls defining an internal cavity for receiving an insert, and an aperture through at least one of the front and back surfaces allowing operation of the insert.

Fig.1.



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Description

[0001] The present invention relates to a perimeter frame and flexible sheet assembly forming a substantially flat polygonal framed panel, preferably a framed insect screen. It also relates to a corner assembly for joining elongate legs of the or a frame which can be mounted adjacent an architectural opening. The comer assembly may find particular use in the frame of an insect screen to be mounted over a window or door opening.

[0002] Assemblies are known, which include a plurality of elongate frame members, each having a generally rectangular tubular cross-section and an outwardly open longitudinal spline groove on an exterior side thereof; a plurality of nodal connectors or corner assemblies, each engaging a longitudinal end of at least two adjacent ones of said plurality of elongate frame members to form a polygonal perimeter frame, with the longitudinal spline grooves positioned inwardly of the perimeter of said frame, a flexible sheet having a perimeter engaged in said spline grooves and at least one elongate flexible spline fitted in said spline grooves for retaining said flexible sheet. Such an assembly is described in patent document US 2 897 889, entitled: "Screen spline with direct frictional engagement means".

[0003] Corner assemblies of frames that can be used to removably mount framed insect screens and other sheet-panels on windows and doors are known for example from US 5,431,211 and GB-A-2,236,134. US 5,431,211 describes an insect screen that has a frame with a corner assembly having a retaining protrusion which is slidably held within the comer assembly and can be slid outwardly of a longitudinal side of the corner assembly and into a suitable recess provided in the window frame to hold the screen on the window.

[0004] EP-A-0,942,141 discloses another corner assembly in which an arm with a flange at its end protrudes from a corner assembly. The flange may be secured over the lip of part of the window opening so as to secure the frame in place.

[0005] In the known panel assemblies comprising a perimeter frame and a flexible sheet, the flexible sheet is retained within the spline groove by a round spline strip. Since the spline strip has to be pressed home into the spline groove together with an edge portion of the flexible sheet this operation requires some kind of implement with which pressure can be applied locally on a small area at the time. While working around the circumference of the perimeter frame with such an implement, great care is needed in centering the implement on the spline strip, so as not to damage or mar any of the sheet material directly surrounding the spline groove. With a round spline strip this has not always been an easy task.

[0006] The known assemblies have also been hampered by a sometimes indeterminate fit of the round splines strip in a generally rectangular spline groove. Nevertheless the known assemblies have generally performed satisfactorily as long as the spline groove in respect to the direction of spline strip insertion has been kept perpendicular to the plane of the flexible sheet. A less favourable appearance on one side of the panel has thereby been accepted in compromise.

[0007] There is a problem with the previous corner assemblies when the window opening is not provided with a suitable recess or lip on which to attach them.

[0008] It is also possible to provide corner assemblies with hinges, pivots and the like. However, the requirements for these hinges and pivots vary according to the particular installation. Furthermore, corner assemblies provided with such hinges or pivots are unsuitable for use in installations where a suitable recess or lip is provided for attaching the frame as mentioned above.

[0009] There is thus a problem of providing a frame which can be fitted in a wide range of different installations.

[0010] Accordingly it is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art. It is also an object of the present invention to provide alternative structures which are less cumbersome in assembly and operation and which moreover can be made relatively inexpensively.

[0011] To this end the present invention provides a perimeter frame and flexible sheet assembly forming a substantially flat polygonal framed panel, said assembly including a plurality of elongate frame members, each having a generally rectangular tubular cross-section and an outwardly open longitudinal spline groove on an exterior side thereof; a plurality of nodal connectors, each engaging a longitudinal end of at least two adjacent ones of said plurality of elongate frame members to form a polygonal perimeter frame, with the longitudinal spline grooves positioned inwardly of the perimeter of said frame, a flexible sheet having a perimeter engaged in said spline grooves and at least one elongate flexible spline fitted in said spline grooves for retaining said flexible sheet, wherein said flexible spline is substantially U-shaped in cross-section, having yieldable sides and a detend edge, wherein said spline groove is inwardly contoured to offer an undercut edge and wherein said detent edge engages behind said undercut edge for retaining said flexible sheet.

[0012] According to the present invention, there is also provided a method of constructing a frame for mounting adjacent an architectural opening, the method comprising:

providing elongate legs; and
joining the elongate legs using corner sections so as to form the frame;
providing the comer sections with respective internal cavities for receiving inserts and apertures allowing operation of the inserts; and
providing a selection of inserts allowing the corner

sections to mount the frame in different ways.

[0013] In this way, as discussed below, various different inserts may be provided to enable the corner assembly to be mounted against an architectural opening.

[0014] According to the present invention, there is also provided a corner assembly for joining elongate legs of a frame for mounting adjacent an architectural opening, the corner assembly including:

end portions for fitment to respective elongate legs;
at least front and back surfaces extending between the end portions;
walls defining an internal cavity for receiving an insert; and
an aperture through at least one of the front and back surfaces allowing operation of the insert.

[0015] In this way, a single type of corner assembly may be used for joining elongate legs to form a frame and, by varying the type of insert, the frame may be mounted in a variety of different ways.

[0016] Preferably, guide surfaces are provided which are aligned with respective end portions such that the insert can be guided so as to be movable by operation through the aperture to and from one of the end portions or can be guided so as to be movable by operation through the aperture to and from the other of the end portions.

[0017] In this way, the comer assembly can be provided with an insert which is movable in a predefined direction so as to secure or detach the frame from the architectural opening.

[0018] Preferably, the internal cavity includes first and second pairs of parallel walls forming the guide surfaces.

[0019] In this way, the parallel walls themselves can guide the insert for movement.

[0020] Preferably, the corner assembly further includes wells extending from the internal cavity towards the end portions and suitable for housing compression springs for biassing the insert away from the end portions.

[0021] In this way, the insert and any features associated with it for securing the comer assembly to the architectural opening can be biassed towards one particular position. This arrangement can be used to ensure that the corner assembly remains in its secured position unless a user intervenes to overcome the bias of the compression spring.

[0022] Preferably, the corner assembly further includes passageways extending parallel to the respective guide surfaces from the internal cavity to and through respective edge surfaces of the comer assembly such that the insert can be provided with a protrusion extending into one of the passageways and, by operation through the aperture, selectively out of the respective edge surface.

[0023] In this way, the protrusion extending out of the edge surface may be used to secure the corner assembly in place. By operating the insert through the aperture so as to move it against the bias of the compression spring, the protrusion can be withdrawn into its passageway so as to release the corner assembly.

[0024] Preferably, the corner assembly further includes an undercut channel running along at least one edge surface such that additional components can be attached to the corner section by sliding into the channel.

[0025] In this way, a range of different components may be provided with an appropriate profile to slide into the undercut channel and be secured there. By also providing an appropriate recess in the profile for receiving the protrusion, the biassed insert and protrusion can be used to prevent the additional component from sliding out of the channel.

[0026] The corner assembly can be provided with an insert which has a magnetic portion extending through the aperture generally flush with the respective surface of the corner assembly.

[0027] This type of insert allows a frame to be mounted adjacent the architectural opening by means of magnetic attraction.

[0028] An insert can be provided for fitting into the cavity together with a compression spring for insertion into one of the wells so as to bias the insert away from the respective end portion. An arm with a flange can then be provided for attachment to the insert so as to extend through the aperture, the flange being for mounting to the lip of a previously installed frame of the architectural opening.

[0029] In this way, the flange and arm can be used to secure the comer assembly in place, but can be moved against the bias of the compression spring so as to move the flange clear of the lip and allow mounting and demounting of the corner assembly.

[0030] Preferably, the insert includes a detachable stop, the insert being prevented from movement in the cavity when the stop is still attached and being movable against the bias of the compression spring when the stop has been detached.

[0031] In this way, immovable arms and flanges can easily be provided in the corner assembly.

[0032] Preferably, the arm is adjustably mounted to the insert so that the distance between the flange and the corner assembly can be varied.

[0033] In this way, the mounting flange can be adapted to different installations.

[0034] An insert can be provided which has a control key positioned in the aperture and a protrusion extending laterally for insertion into one of the passageways and selectively out of the respective edge surface, together with a compression spring for insertion into one of the wells so as to bias the insert with the protrusion extending out of the respective edge surface.

[0035] In this way, as mentioned above, the insert can

be used to secure additional components in place.

[0036] A mounting component can be provided for sliding into the undercut channel of the corner assembly and for mounting the corner assembly, the mounting component having a recess for receiving the protrusion through the respective edge surface such that the mounting component is prevented from sliding within the undercut channel and is held in place.

[0037] Suitable mounting components include a pivot pin to extend out of the undercut channel and pivot in a bearing surface of a mounting bracket, a hinge and a support slider having a rotatable support surface for fitting into a guide track for slidably mounting the frame.

[0038] The panel assembly defined above preferably uses the corner assembly defined above.

[0039] The invention will be more clearly understood from the following description, given by way of example only, with reference to the accompanying drawings, in which:

Figure 1 illustrates an assembled corner assembly;
Figure 2 illustrates the end of an elongate leg for use with the corner assembly of Figure 1;
Figure 3 illustrates the two halves of the corner assembly of Figure 1;
Figures 4 and 5 illustrate a corner assembly with a magnetic insert;
Figure 6 illustrates an assembled frame having magnetic inserts;
Figures 7 and 8 illustrate a corner assembly with an insert having a mounting arm and flange;
Figure 9 illustrates an assembled frame with mounting arms and flanges;
Figures 10 and 11 illustrate a comer assembly with a movable insert having an extending protrusion;
Figures 12(a) to (e) illustrate a corner assembly with a mounting pivot assembly;
Figure 13 illustrates a corner assembly with a mounting pivot assembly;
Figures 14(a) illustrates a hinge for mounting to the corner assembly;
Figure 14(b) illustrates the bottom half of a corner assembly fitted with the hinge of Figure 14(a);
Figure 14(c) illustrates the edge of a comer assembly fitted with the hinge of Figure 14(a);
Figure 14(d) illustrates the hinge of Figure 14(a) fitted to an elongate leg;
Figure 15 illustrates a hinge for mounting to an elongate leg;
Figure 16 illustrates a hinge assembly mounted to the comer assembly;
Figure 17 illustrates a support slider mounted to a corner assembly;
Figures 18(a) to (e) illustrate the support slider of Figure 17 mounted to a corner assembly;
Figure 19 shows a perspective detail view of a flexible sheet, a frame member and a spline of the present invention in an exploded arrangement;
Figure 20 is a head-on end view of a detail showing the spline, the sheet and the spline groove in an assembled condition;
Figure 21 is an isometric representation of a length of frame member used in the present invention; and
Figure 22 is a partial view of an assembled panel edge detail in a corner of the panel showing a nodal connector between two adjacent frame members.

[0040] In the preferred embodiment, as illustrated in Figure 1, a corner assembly 10 is provided with end portions 2 and 4 which extend either end from a main body 6. This embodiment is intended for use with elongate legs 8 having the cross-section illustrated in Figure 2. The outer cross-section of the end portions 2 and 4 are arranged to fit securely into the inner cross-section of the elongate legs 8 with the outer cross-sections of the elongate legs 8 and the main body 6 lying flush with one another.

[0041] In this way, elongate legs 8 and corner assemblies 10 may be assembled together to provide frames of any desired size and with a very neat appearance at the corners.

[0042] Figure 3 illustrates the corner assembly of Figure 1 separated into its two component parts, namely a top half 10a and a bottom half 10b. Within the body 6, walls define a cavity 12 in which an insert may be placed. Furthermore, an aperture 14 is provided in the bottom half 10b so as to provide access to the cavity 12. The bottom half 10b as illustrated may form either the front or the back surface of the corner assembly. Similarly, an additional corresponding aperture may be formed in the top half 10a.

[0043] As illustrated in Figures 4 and 5, an insert 50 may be provided to fit into the cavity 12.

[0044] In the illustrated embodiment, the cavity is formed from a first pair of parallel walls 16a,16b and a second pair of parallel walls 18a and 18b. The insert 50 includes a plate-like member 52 which fills the space between the parallel walls 16a,16b and 18a,18b such that the insert 50 is held securely in place and cannot move laterally.

[0045] The insert 50 also includes a magnetic portion 54 which extends at least into the aperture 14 of the corner assembly 10, preferably completely filling the aperture 14. Furthermore, the outer surface of the magnetic portion 54 preferably lies flush with the outer surface of the corner assembly 10.

[0046] Thus, as illustrated in Figure 6, a frame may be provided with magnets at each of its corners such that it can be secured to a window or door frame by magnetic attraction.

[0047] As illustrated in Figure 4, the magnetic portion 54 can extend either side of the plate-like member 52. This can be used to provide additional stability to the insert 50 or additional space for magnetic material. Alternatively, of course, where both halves 10a,10b of the corner assembly 10 are provided with apertures 14, the

corner assembly can be provided with a magnetic portion flush with both the front and back surfaces.

[0048] A second arrangement is illustrated in Figures 7 and 8. In this arrangement, an insert 70 is provided for receiving through the aperture 14 an arm 72 having a flange 74 at its end. The insert 70 is provided with a plate-like member 76 similar to the plate-like member 52 of the insert described with reference to Figure 4. However, unlike the plate-like member 52, the plate-like member 76 does not completely fill the space between the parallel walls 16a,16b and 18a,18b. In this respect, a detachable stop 78 is provided on the edge of the plate-like member 76. This abuts with the walls of the cavity so as to prevent movement of the insert 70.

[0049] With the detachable stop 78 removed from the insert 70, the plate-like member 76 fills the cavity 12 in such a way that the insert 70 may slide towards or away from one of the ends 2 and 4. For example, as illustrated in Figure 7, with the stop 78 removed, the insert 70 can slide to and from the end 4 guided by the walls 18a and 18b. Of course, alternative means can be provided to guide the insert such as dedicated protrusions and grooves.

[0050] As illustrated, the corner assembly 10 is also provided with wells 20 which extend from the cavity 12 towards the ends 2 and 4. These wells 20 are provided to accommodate compression springs such as spring 80 illustrated in the figures.

[0051] Thus, a compression spring may be located in a well 20 and act between an end wall of the well 20 and the insert 70 so as to bias the insert 70 away from the respective end 2,4 of the corner assembly 10.

[0052] As illustrated, the spring 80 biases the insert 70 away from the end 4, but allows the insert 70 to slide towards the end 4 against the resistance of the spring 80. In order to hold the spring more securely in relation to the insert 70, a guide extension 82 is provided to fit into the well 20 within the spring 80.

[0053] It will be appreciated that by providing wells 20 extending towards each of the ends 2 and 4, it is possible for the comer assembly 10 to be used with inserts which are biassed either away from the first end 2 or the second end 4.

[0054] As mentioned above, an arm 72 is secured to the insert 70. In this way, a frame may be provided as illustrated in Figure 9 with flanges extending from the corners at the top and bottom. Each flange 74 may fit over a lip in the architectural opening, for instance a previously installed window frame of the architectural opening. In this way, the frame of Figure 9 can be secured over the architectural opening.

[0055] By leaving the stop 78 attached to the insert 70 for the corner assemblies 10 at the bottom of the frame, the insert 70 is prevented from moving such that the corresponding arms 72 and flanges 74 are held rigidly in place with respect to the frame. In contrast, by removing the stop 78 of the inserts 70 in the top corner assemblies 10, the inserts 70 are able to be moved against the resistance of their compression springs away from the edges of the corner assembly 10. In particular, with the flanges 74 aligned with the direction of movement, they can slide to and away from the lip over which they are to extend.

[0056] Thus, in operation, a user would place the flanges 74 of the upper comer assemblies 10 over the appropriate lips and then push the frame upwardly against the resistance of the compression springs. The bottom of the frame can then be swung into place with the flanges 74 of the lower corner assemblies brought over their corresponding lips. By releasing the frame in this position, the compression springs of the upper corner assemblies 10 cause the frame to be moved down and secured against the rigid arms 72 of the lower corner assemblies 10.

[0057] As illustrated in Figures 7 and 8, the arm 72 may be adjustably mounted to the insert 70. In particular, a side of the arm 72 is formed with teeth 84 by means of indentations or perforations. Only the back of the teeth 84 are visible in Figure 8. A helical body 86 such as a grub screw is then provided in an aperture 88 of the insert 70 adjacent a slot 90 for receiving the arm 72. Thus, the arm 72 is inserted into the slot 90 adjacent the helical body 86. By rotating the helical body 86, it is possible to adjust the amount by which the arm 72 extends from the insert 70. Thus, it is possible to adjust the distance between the flange 74 and the insert 70 in accordance with different installation requirements.

[0058] Figures 10 and 11 illustrate a further arrangement which may be used in a number of different ways to be described below. An insert 100 is provided with a plate-like member 102 and detachable stop 104 similar to the plate-like member 76 and stop 78 described above. In particular, the insert 100 can be secured in place by retaining the stop 104 or can be allowed to slide within the cavity 12 by removing the stop 104.

[0059] As illustrated, the insert 100 is intended to slide to and from the first end 2 guided by the walls 16a,16b. Also, like the insert 70, the insert 100 is provided with a compression spring 106 to be fitted in a well 20 so as to bias the insert 100 away from the first end 2. An extension 108 is also provided to help guide the spring 106.

[0060] It will be appreciated that an equivalent insert could alternatively be provided with a spring in the other well 20 so as to bias the insert away from the second end 4.

[0061] As illustrated, the corner assembly 10 is also provided with passageways 22 which extend from the cavity 12 out through the edges of the comer assembly 10. The insert 100 is provided with a protrusion 110 which extends generally parallel to the direction of movement of the insert 100 and into a passage 22. As illustrated in Figure 11, the insert 100 is also provided with a button or key 112 which extends into the aperture 14. By means of this key 112, it is possible for the user to slide the insert 100 against the bias of the compression spring 106 towards the respective end of the corner

assembly 10. As a result of this, the protrusion 110 is moved within the passageway 22. The protrusion 110 is arranged to have a length such that it normally protrudes into a channel 28 formed in the edge of the corner assembly 10, but, can be withdrawn from the channel 28 into the passage 22 by moving the insert 100 with the key 112 against the bias of the spring 106.

[0062] A secondary protrusion 111 is provided perpendicular to the protrusion 110. As illustrated, walls 23 (including the walls 16a and 18a) define the cavity 12 and the passages 22. These walls include sections 23a extending from the passages 22 in which the wall height is reduced. In this way, elongated slotted openings 23b (illustrated in Figure 14c) are provided in the sides of the corner assembly 10. The width of these openings corresponds to the diameter of the secondary protrusion 111 and is smaller than the diameter of the protrusion 110 and passageways 22. In this way, the secondary protrusion 111 can slide along its corresponding slotted opening as the protrusion 110 moves axially in its passageway. However, the protrusion 110 is unable to slide (perpendicular to its axis) in its corresponding slotted opening. By means of the secondary protrusion 111 and its slotted opening, it is possible to reach the insert from outside and move it.

[0063] This mechanism can be used to lock various additional components to the corner assembly 10. Some of these are described below.

[0064] The corner assembly 10 is provided with undercut channels 28 along its edges. As illustrated in Figure 3, walls 24 are provided along the edges of each half 10a,10b of the corner assembly 10 so as to form the undercut space 28.

[0065] Additional components having an appropriate profile may thus slide into the undercut channels 28 from their ends at the corner 26 of the corner assembly 10. By providing these components with recesses for receiving the end of the protrusion 110, it is possible to lock them in place. In particular, with the insert 100 moved towards the respective end 2,4 of the corner assembly 10 and the protrusion 110 withdrawn within the respective passageway 22, an additional component may freely be slid into the corresponding channel 28. When appropriately positioned within the channel 28, the bias of the spring 106 may be allowed to move the insert 100 and protrusion 110 such that the end of the protrusion 110 fits into the recess of the additional component. In this way, the additional component is prevented from sliding within the channel 28 and is mounted securely to the corner assembly 10.

[0066] Figures 12(a) to (e) illustrate an additional component comprising a pivot pin assembly 120 and a bearing block 122.

[0067] The bearing block 122 has screw holes 124 for mounting it to an architectural opening and a bearing 126.

[0068] The arrangement of Figures 12(a) to (c) may be used for the bottom hinge of the frame, whereas the arrangement of Figures 12(d) and (e) may be used for the top hinge of the frame.

[0069] As illustrated in Figure 12 (c), the insert 100 may be moved against the bias of the spring 106 so as to withdraw the protrusion 110. The pivot pin assembly 120 may then be slid within the channel 28. With the pivot pin in position as illustrated in Figure 12(b), the protrusion of the internal insert 100 is allowed to engage a recess (not shown) of the pivot pin assembly 120 so as to secure it in place.

[0070] The corner assembly may then be positioned as illustrated in Figure 12(b) so as to engage the pivot pin in the bearing 126 of the bearing block 120.

[0071] Alternatively, the pivot pin assembly 120 of the corner assembly 10 may first be slid fully within the channel 28 such that the frame may be positioned immediately adjacent the bearing block 122. The pivot pin assembly 120 can then be slid outwardly until it engages in the bearing 126 of the bearing block 122. At this point, the protrusion 110 of the internal insert 100 is allowed to engage in the recess of the pivot pin assembly 120 so as to secure it in place.

[0072] With the arrangement of Figures 12(d) and (e), the pivot pin assembly 120 is engaged by the secondary protrusion 111 of the insert and, hence, slides along the channel 28 as the insert is moved back and forth against the bias of the spring 106. In the position of Figure 12 (d), the pivot pin extends beyond the side of the corner assembly so that it can be supported in an external bearing surface, such as the bearing 126 of bearing block 126. By retracting the pivot pin assembly 120 as illustrated in Figure 12(e), the pivot pin is retracted from the bearing surface so as to release the corner assembly 10.

[0073] Thus, with the arrangement of Figures 12(b) and (c), the pivot pin assembly 120 is selectively engaged by the protrusion 110 so as to secure it and prevent axial movement. This makes this arrangement suitable for a bottom hinge where the weight of the frame is taken by the pivot pin assembly 120. On the other hand,.with the arrangement of Figures 12(d) and (e), the pivot pin assembly is engaged by the secondary protrusion 111 and, hence, is moveable axially against the bias of the spring 106.

[0074] Figure 13 illustrates a similar arrangement using an angled bearing block 128 in which the pivot is arranged perpendicular to the mounting screws of the angled bearing block 128.

[0075] Figures 14(a), (b), (c) and (d) and 15 illustrate alternative hinge components, themselves having profiled sections for fitting into parts of the overall frame.

[0076] The hinge component of Figures 14(a), (b) and (c) is provided with a profiled section 130 and two additional profiled sections 131 extending either side of the profiled section 130. As illustrated in Figures 14(a) and (b), the additional profiled sections are dimensioned so as to fill the channel 28 formed in the corner assembly 10. Thus, the profiled sections of the hinge component

can be slid through the corner 26 and along the channel 28 of the corner assembly so as to secure the hinge component to the corner assembly. Although not illustrated, the hinge component can be provided with an aperture to receive the protrusion 110 such that it is then held in place similar to as described with reference to Figures 12(a) to (c).

[0077] As illustrated in Figure 14(d), if the additional profiled sections 131 are broken away from the profiled section 130, the profiled section 130 can then be fitted into a channel 9 of the elongate legs 8. The channel 9 has a tapered cross-section such that the profiled section 130 may secured within it, whilst being able to slide along its length. In this way, hinge components may be attached to a frame other than at the corner assemblies 10, in particular inwardly of the corner assemblies.

[0078] Apertures 132 (or at least guides for drilling) are provided such that fasteners, such as screws or rivets, may be provided through the profiled section 130 into the channel 9 so as to secure the profiled section 130 from sliding along the channel 9.

[0079] Figure 15 illustrates another form of hinge component. As illustrated, it is provided only with the profiled section 130. However, it could be provided with the additional profiled sections 131.

[0080] The hinge components of Figures 14 and 15 differ in that, with the hinge component of Figure 14, the two halves of the hinge are not secured to one another. Hence, by sliding one half relative to the other along the pivot axis, the two halves may be separated. This may be useful when the hinge component is used with its pivots oriented vertically since the frame can be lifted off the architectural opening to which it is mounted. In contrast, the two halves of the hinge component of Figure 15 are not separable.

[0081] Figure 16 illustrates an arrangement similar to that of Figures 12(a) and (b) or 13 wherein the bearing block 122 or 128 is replaced by a bearing block 142. The bearing block 142 has a bearing 146 equivalent to bearing 126 in which the pivot pin assembly 120 engages. In contrast to the bearing block 122 however, the screw holes are orientated perpendicular to the axis of the pivot. In this way, the bearing block 142 can be attached to the side face of a window sill.

[0082] Figure 17 illustrates a support slider 200 mounted to a corner assembly 10. The support slider 200 includes a profile which is slid into the channel 28 behind the walls 24. As illustrated, the support slider 200 includes a rotatable support surface or wheel 202 in the form of a rotatable wheel. This is intended to rest in a channel above or below an architectural opening so as to support the frame such that it can slide over the architectural opening.

[0083] As illustrated in Figures 18(a) to (c), the support slider 200 includes a profile 204 which slides into the channel 28 of the corner assembly 10.

[0084] The profile 204 is provided with a recess 206 corresponding to the protrusion 110. A compression spring 208 is provided within the channel 28.

[0085] As illustrated, with the insert 100 retracted against the bias of the compression spring 106, the profile 204 of the support slider 200 may be slid within the channel 28 so as to compress the compression spring 208. When the profile 204 has been fully inserted in the channel 28, as illustrated in Figure 18(c), the protrusion 110 moves into the recess 206 so as to secure the support slider 200 in place. To remove the support slider 200, a user merely operates the key 112 (or the secondary protrusion 111) so as to move the insert 100 against the bias of the compression spring 106 such that the protrusion 110 is removed from the recess 206. The spring 208 then relaxes so as to eject the support slider 200 from the channel 28.

[0086] Often, the channels from which a sliding frame will be hung are not perfectly horizontal. In order to compensate for this, the support slider 200 is provided with an additional feature as illustrated in Figures 18(d) and (e). In particular, the rotatable wheel 202 is mounted on a body 210 which itself is adjustably mounted to the profile portion or section 204. In particular, as illustrated in Figures 18(d) and (e) the profile portion or section 204 includes a first section 204a and a second section 204b.

[0087] The second section 204b is formed integrally with (or at least fixedly attached to) the body 210. A top surface 212 of the second profile portion 204b is inclined with respect to the bottom surface. Thus, the cross section of the second profile portion 204b does not fill the channel 28 along its length and, as illustrated in Figures 18(d) and (e) can be inclined within the channel 28. Thus, as also illustrated in Figures 18(d) and (e), the body 210 may be tilted with respect to the corner assembly 10.

[0088] The first profile portion 204a has a cross section to fill the channel 28 and has a cavity 214 at its end so as to house a thumb wheel 216.

[0089] A screw threaded shank 218 extends upwardly from the thumb wheel 216 through the first profile portion 204a and engages with a portion of the body 210. In the illustrated embodiment, this comprises a square bolt head or nut 220 which is engaged in a corresponding mating slot 222.

[0090] Thus, by rotating the thumb wheel 216, the screw threaded shank 218 is rotated in the nut 220 so as to adjust the distance between the body 210 and the first profile portion 204a.

[0091] In this way, the body 210 may be adjustably tilted and rotated about the far end of the second profile portion 204b. Since the rotatable wheel 202 is positioned above the first profile portion 204a, this allows the distance between the rotatable wheel 202 and the corner assembly 10 to be adjusted.

[0092] In Figure 19 shows a perspective detail view of an assembly according to the present invention in an exploded arrangement. The assembly includes a plurality of elongate frame members or legs, such as frame member 301. Frame member 301 has a generally rec-

tangular tubular cross-section and an outwardly open longitudinal spline groove 305 on an exterior side thereof. Figure 22 is a partial view of an assembled panel edge detail in a corner of the panel showing a nodal connector or corner assembly 307 between two adjacent frame members 301 and 303. A plurality of nodal connectors 307, which each engage a longitudinal end of two adjacent elongate frame members, such as 301 and 303 together form a polygonal perimeter frame 310, with the longitudinal spline grooves 305 positioned inwardly of the perimeter of said frame. End portions of the nodal connector 307 can have any suitable outer cross-section arranged to fit securely into a complementary hollow inner cross-section of the frame members 301, 303 as is known to the skilled person.

[0093] Advantageously the outer cross-sections and contours of the frame members 301, 303 and the nodal connector 307 blend with one another so that their outer surfaces are flush. A flexible sheet 311 has its perimeter engaged in the surrounding spline grooves 305. At least one elongate flexible spline 313 is subsequently fitted into the spline grooves for retaining the flexible sheet 311. The flexible spline 313 is substantially U-shaped in cross-section and has first and second yieldable sides 316, 317 and a detend edge 319. The spline groove 305 is inwardly contoured to offer an undercut edge 321 and the detent edge 319 engages behind said undercut edge 321 to retain the flexible sheet 311 within the perimeter frame 310. The assembled perimeter frame 310 and the flexible sheet 311 together form a substantially flat rectangularly framed panel useful as an insect screen, a storm window or like structures. Such a panel assembly can be mounted adjacent an architectural opening, for instance in the same way as described above.

[0094] Figure 20 shows a head-on end view of a detail of the assembled panel showing the spline 313, the sheet 311 in an assembled condition in the spline groove 305. It will be apparent from this view that the spline groove 305 is in an oblique position with respect to a plane through the sheet 311 of the assembly. This centers the sheet material or insect screen mesh 311 with respect to the front and rear walls 323,325 of the frame member 301. This is aesthetically more attractive, but also reduces the angular deflection at which the sheet 311 extends from the groove 305. This is of particular importance with insect screen material, which frequently consists of glass fiber filaments coated with Polyvinylchloride resin. Glass fibre filaments can easily lose their integrity when deflected through acute angles as in the conventional arrangement, where the spline groove is perpendicular to the plane of the sheet. The oblique angle of the present arrangement also helps to make the assembly less furnerable to the sheet material tearing at its root i.e. where it leaves the groove. The spline 313 basically derives its flexibility from its U-shaped cross-section and thus can be made from a relatively rigid material, so that it retains its shape sufficiently well for the detent edge 319 to stay engaged behind the undercut edge 321 once positioned with the sheet material 311 sandwiched therebetween. As shown the spline 313 is positioned in the groove 305 with its hollow interior exposed to the exterior. This not only results in a less obtrusive appearance of the spline in its groove, but also offers a central groove engageable by an implement for fitting the spline in the groove. Thereby damaging or marring any of the sheet material directly surrounding the spline groove can be successfully prevented, while working around the circumference of the perimeter frame with such an implement.

[0095] Figure 21 is an isometric representation of a length of frame member 301, 303 as used in the present invention. As shown the frame member 301, 303 is preferably obtained from sheet metal through roll forming. By arranging the seam of the sheet metal marginal edges to coincide with the groove 305, as shown in more detail in Figure 20, the undercut edge 321 can be conveniently obtained by one of the metal sheet margins folding back over the opposite metal sheet margin. Also illustrated in Figure 21, as well as in figures 19 and 22, is how the frame member could be provided with an undercut groove 327 on a side which ends up outwardly of the assembled frame. Such a groove 327, in particular when it also continues over the nodal elements 307, is useful in the mounting of additional accessories, such as flexible sealing elements (brushes or the like) or hinge elements for insect screen doors etc.

[0096] It is thus believed that the operation and construction of the present invention will be apparent from the foregoing description. Although the embodiment described uses roll formed metal frame members, it goes without saying that such frame members could also be formed as extrusions. The term comprising when used in this description or the appended claims should not be construed in an exclusive or exhaustive sense but rather in an inclusive sense. Features which are not specifically or explicitly described or claimed may be additionally included in the structure according to the present invention without deviating from its scope.

[0097] The invention is further not limited to any embodiment herein described and, within the purview of the skilled person, modifications are possible which should be considered within the scope of the appended claims. Equally all kinematic inversions are to be considered within the scope of the present invention.

[0098] Reference to either axially, radially or tangentially if used in the above is generally in relation to rotatable or cylindrical bodies of elements described.

[0099] Where in the above reference is made to longitudinal or lateral this is in reference to the length or width directions respectively of elements which have an oblong appearance in the accompanying drawings. This interpretation however has only been used for ease of reference and should not be construed as a limitation of the shape of such elements.

Expressions, such as right, left, horizontal, vertical,

above, below, upper, lower, top, bottom or the like if used in reference to the construction as illustrated in the accompanying drawings are relevant to the relative positions and in a different orientation of the construction should be interpreted in accordance with such comparable relative positions.

Claims

1. Perimeter frame and flexible sheet assembly forming a substantially flat polygonal framed panel, said assembly including a plurality of elongate frame members, each having a generally rectangular tubular cross-section and an outwardly open longitudinal spline groove on an exterior side thereof; a plurality of nodal connectors, each engaging a longitudinal end of at least two adjacent ones of said plurality of elongate frame members to form a polygonal perimeter frame, with the longitudinal spline grooves positioned inwardly of the perimeter of said frame, a flexible sheet having a perimeter engaged in said spline grooves and at least one elongate flexible spline fitted in said spline grooves for retaining said flexible sheet, wherein said flexible spline is substantially U-shaped in cross-section, having yieldable sides and a detend edge, wherein said spline groove is inwardly contoured to offer an undercut edge and wherein said detent edge engages behind said undercut edge for retaining said flexible sheet.

2. Panel assembly according to claim 1, wherein said flexible sheet is a screen material, preferably an insect screen.

3. Panel assembly according to claim 1 or 2, wherein said polygonal framed panel has a rectangular perimeter.

4. Panel assembly according to claim 1, 2 or 3, wherein said spline groove is in an oblique position with respect to a plane through the sheet of the assembly.

5. Panel assembly according to any one of the preceding claims, wherein the frame member is of roll-formed sheet metal.

6. Panel assembly according to any one of the preceding claims, wherein said frame member includes an undercut groove for receiving auxiliary accessories, such as a brush profile.

7. A corner assembly for joining elongate legs of a frame for mounting adjacent an architectural opening, the corner assembly including:

end portions for fitment to respective elongate legs;
at least front and back surfaces extending between the end portions;
walls defining an internal cavity for receiving an insert; and
an aperture through at least one of the front and back surfaces allowing operation of the insert.

8. A corner assembly according to claim 7 further including wells extending from the internal cavity towards the end portions and suitable for housing compression springs for biassing the insert away from the end portions.

9. A corner assembly according to claim 7 or 8 further including:

guide surfaces aligned with respective end portions such that the insert may be guided so as to be movable by operation through the aperture to and from one of the end portions or may be guided so as to be movable by operation through the aperture to and from the other of the end portions.

10. A corner assembly according to claim 9 wherein the internal cavity includes first and second pairs of parallel walls forming said guide surfaces, each pair aligned with a respective end portion such that the insert can be shaped so as to be guided by the first pair and be movable by operation through the aperture to and from one of the end portions or be shaped so as to be guided by the second pair and be movable by operation through the aperture to and from the other of the end portions.

11. A comer assembly according to claim 8, 9 or 10 further including:

edge surfaces joining the front and back surfaces.

12. A corner assembly according to claim 11 further including:

passageways extending parallel to respective guide surfaces from the internal cavity to and through respective edge surfaces such that the insert can be provided with a protrusion extending into one of the passageways and, by operation through the aperture selectively out of the respective edge surface.

13. A corner assembly according to claim 11 or 12 further including:

an undercut channel running along at least one

edge surface such that additional components can be attached to the corner section by sliding into the channel.

14. A corner assembly according to any preceding claim in combination with an insert for fitting into the cavity with a magnetic portion extending through the aperture generally flush with the respective surface of the corner assembly.

15. A comer assembly according to any preceding claim in combination with an insert for fitting into the cavity, a compression spring for insertion into one of said wells so as to bias the insert away from the respective end portion and an arm having a flange for attachment to the insert so as to extend through the aperture, the flange being for mounting to the lip of a previously installed frame of an architectural opening.

16. A corner assembly according to claim 9 wherein the insert includes a detachable stop, the insert being prevented from movement in the cavity when the stop is still attached and being movable against the bias of the compression spring when the stop has been detached.

17. A comer assembly according to claim 10 wherein the arm is adjustably mounted to the insert so that the distance between the flange and the corner assembly can be varied.

18. A corner assembly according to any preceding claim in combination with an insert for fitting in the cavity with a control key positioned in the aperture and a protrusion extending laterally for insertion into one of said passageways and selectively out of the respective edge surface and a compression spring for insertion into one of said wells so as to bias the insert with the protrusion extending out of the respective edge surface.

19. A corner assembly according to claim 18 when appendant to claim 13 further including:

a mounting component for sliding into the undercut channel and for mounting the corner section, the mounting component having a recess for receiving said protrusion through the respective edge surface such that the mounting component is prevented from sliding in the undercut channel and is held in place.

20. A corner assembly according to claim 19 wherein the mounting component comprises one of:

a pivot pin to extend out of the undercut channel and pivot in a bearing surface of a mounting bracket;
a hinge; and
a support slider having a rotatable support surface for fitting into a guide track for slidably mounting the frame.

21. A panel assembly according to any one of claims 1 to 6 wherein the nodal connector is a corner assembly according to any one of claims 7 to 20.

22. A method of constructing a frame for mounting adjacent an architectural opening, the method comprising:

providing elongate legs; and
joining the elongate legs using corner sections so as to form the frame;
providing the corner sections with respective internal cavities for receiving inserts and apertures allowing operation of the inserts; and
providing a selection of inserts allowing the corner sections to mount the frame in different ways.

Fig.1.

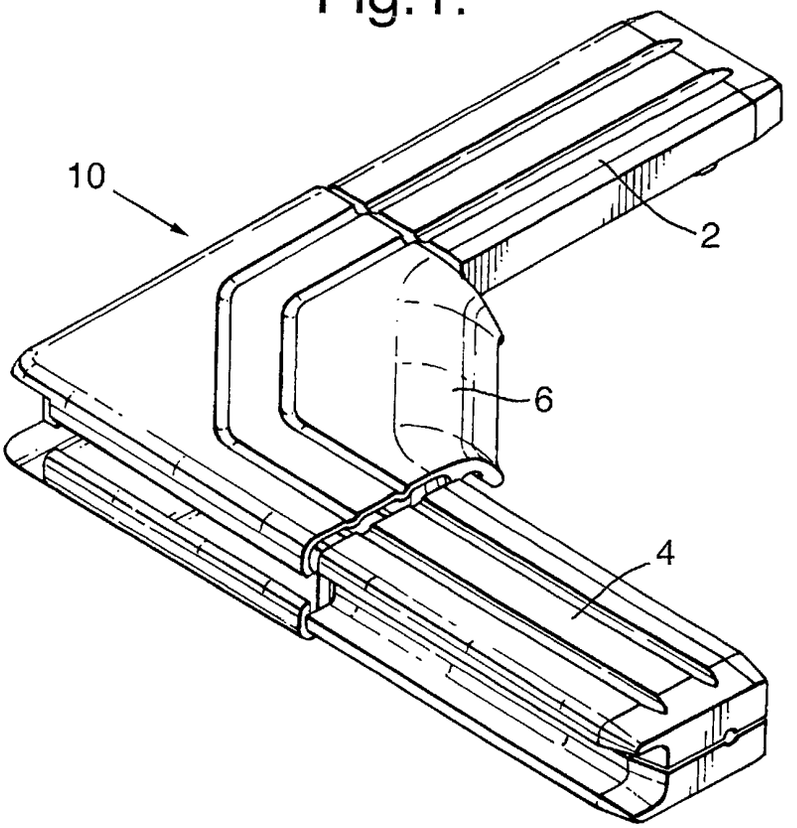


Fig.2.

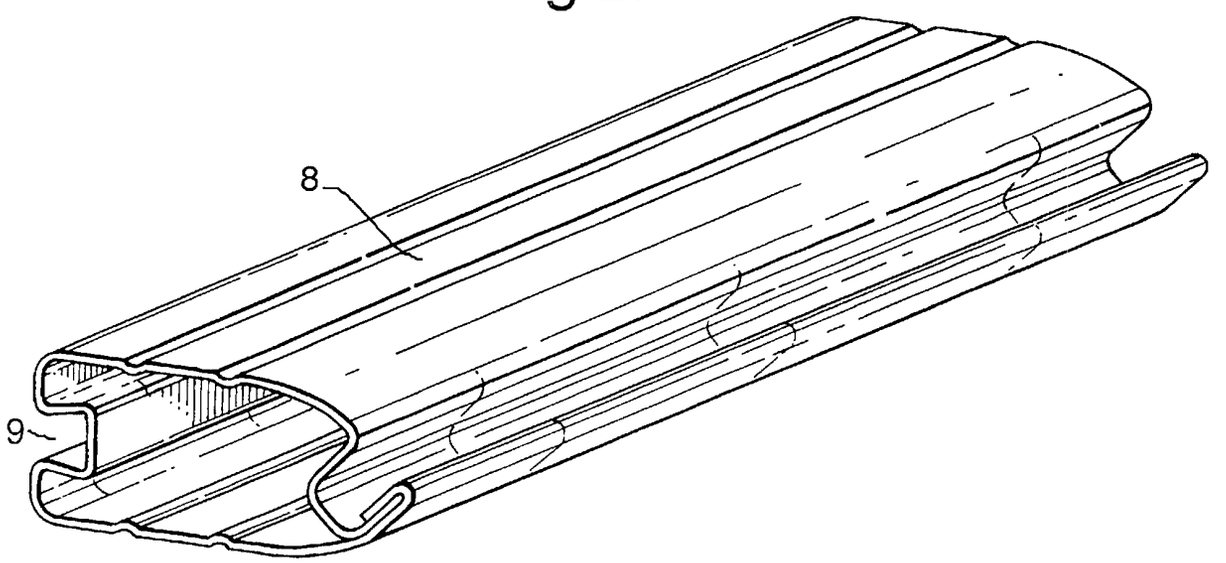


Fig.3.

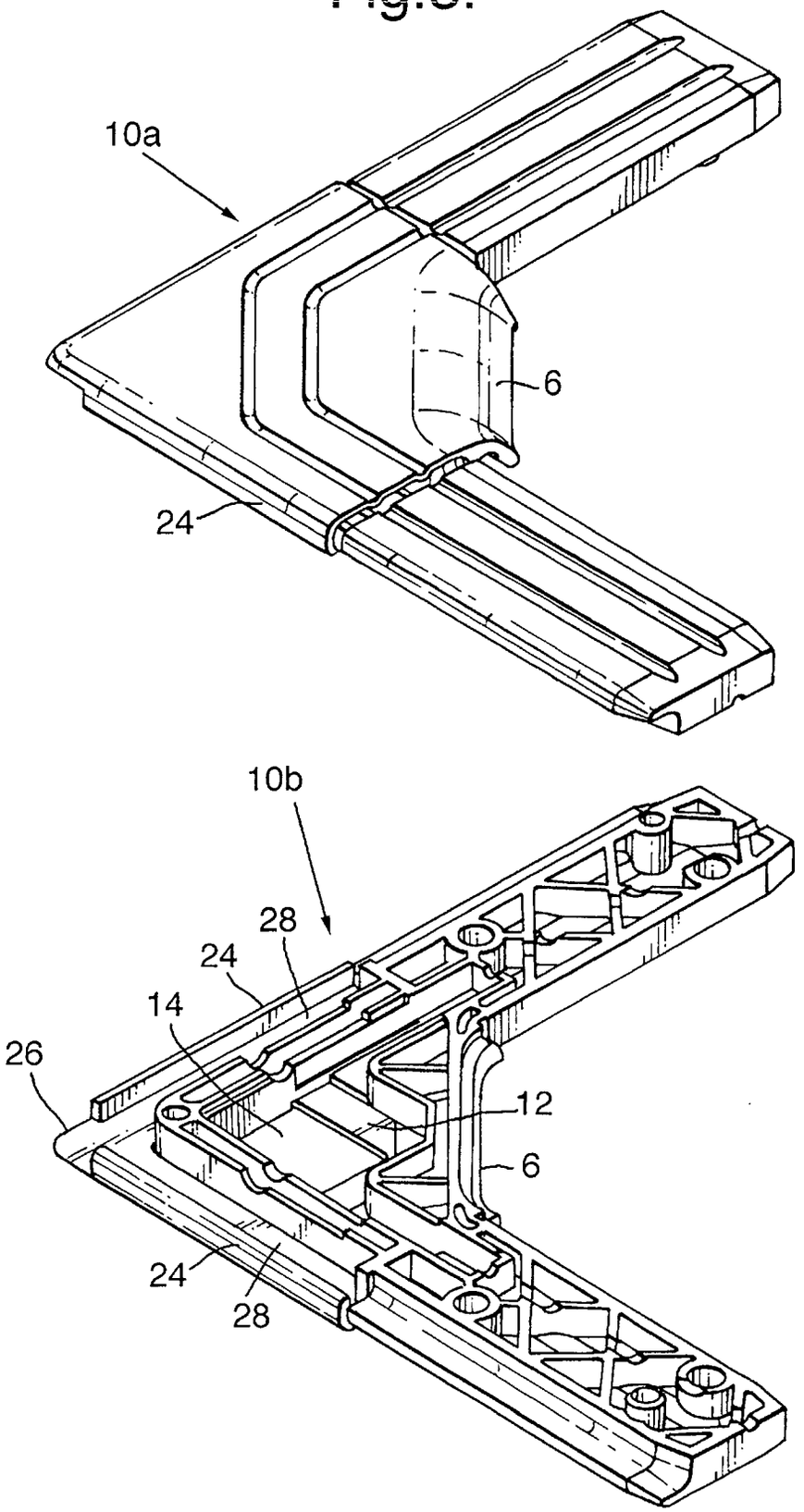


Fig.4.

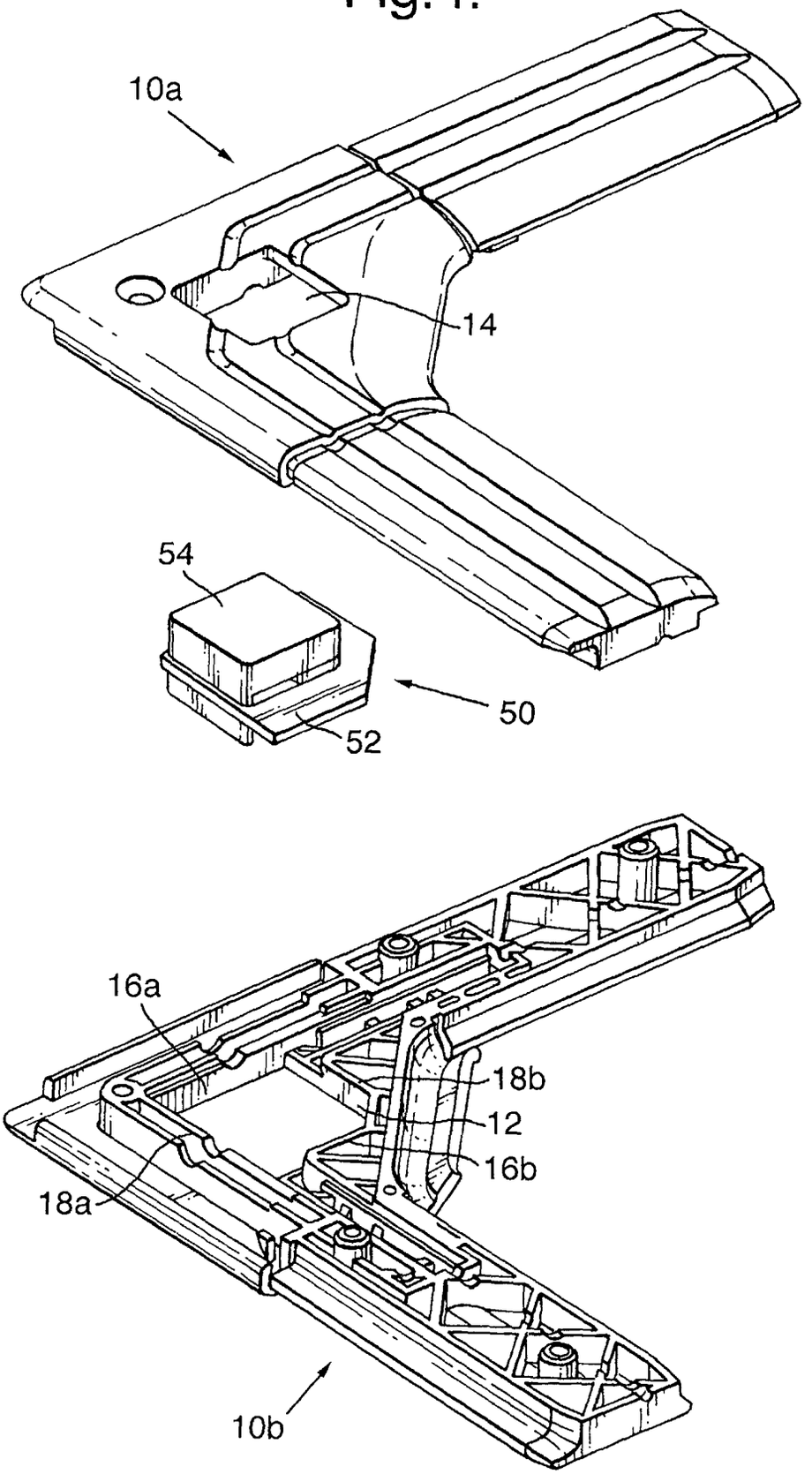


Fig.5.

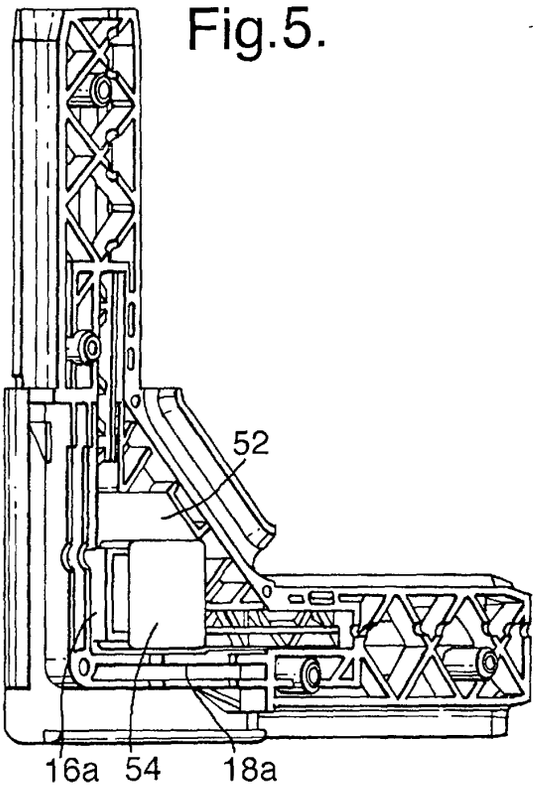


Fig.6.

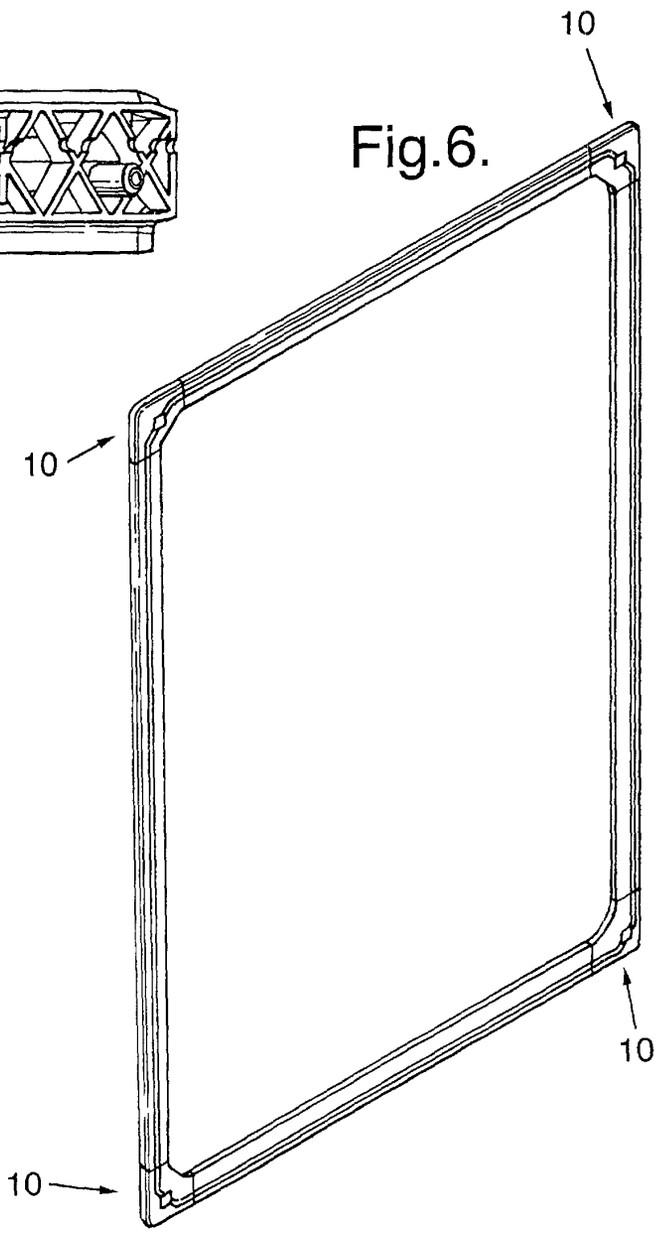


Fig.7.

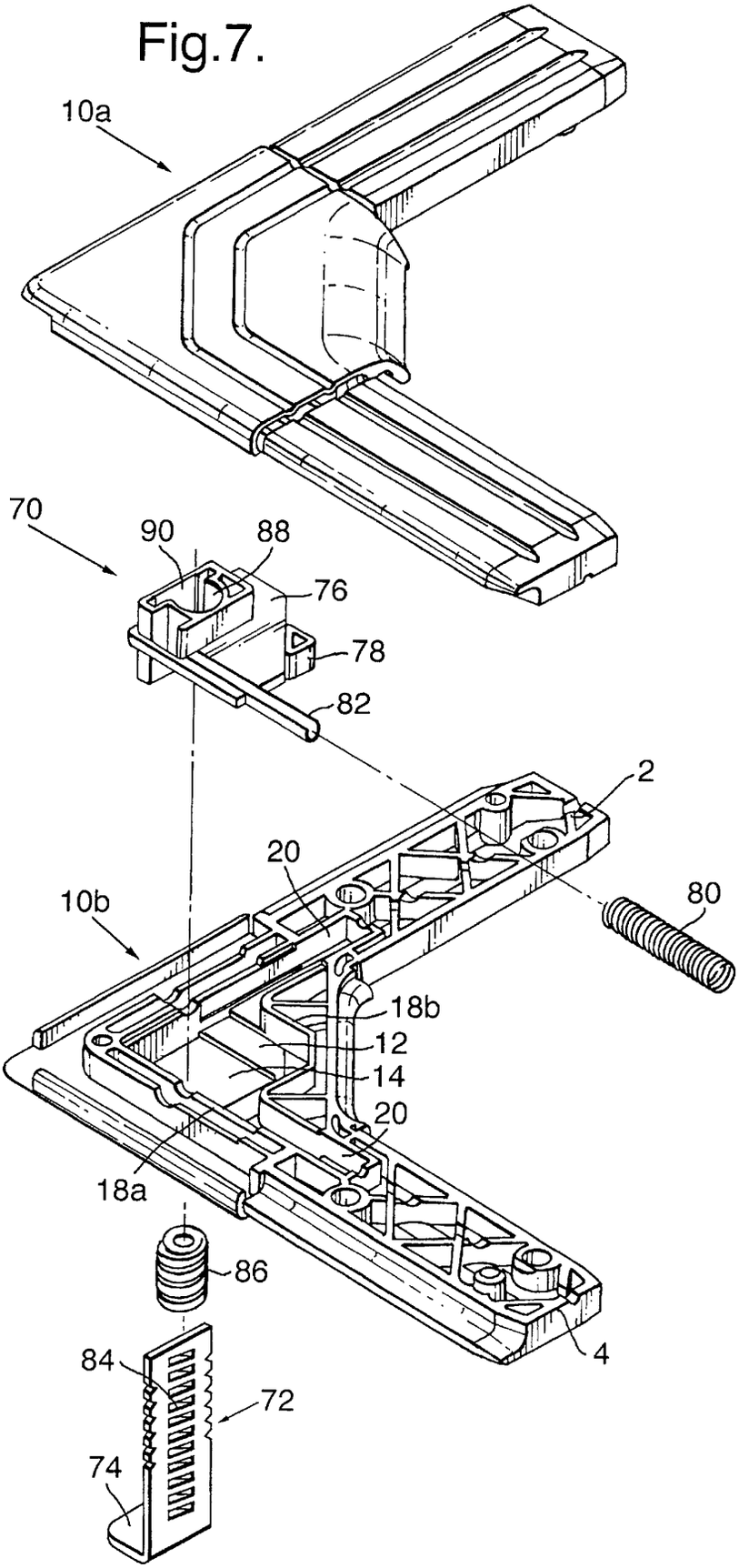


Fig.8.

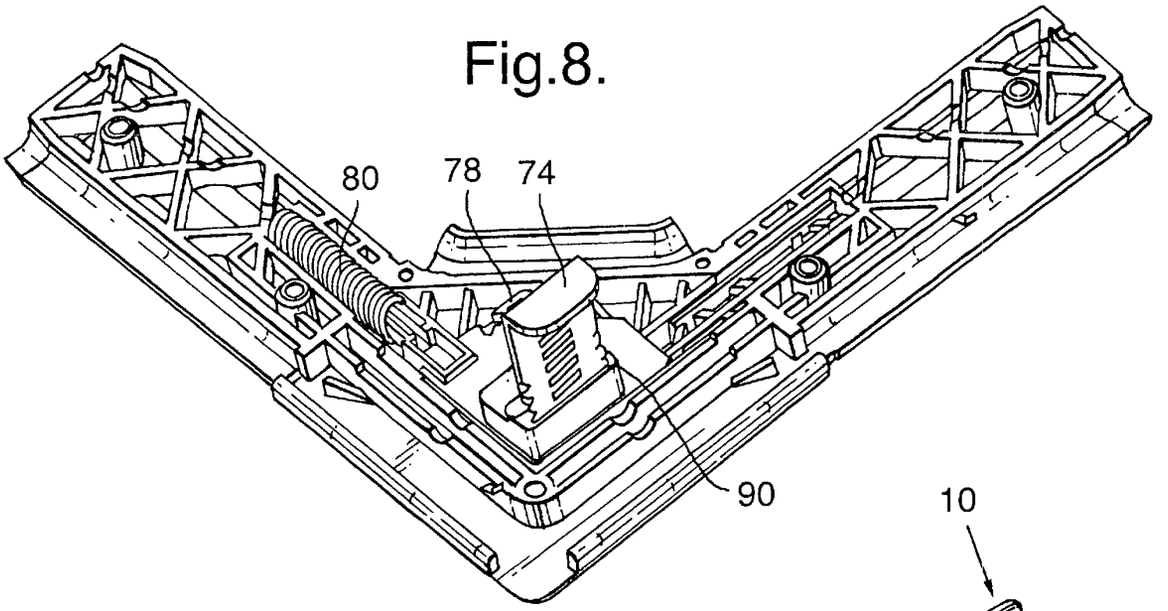


Fig.9.

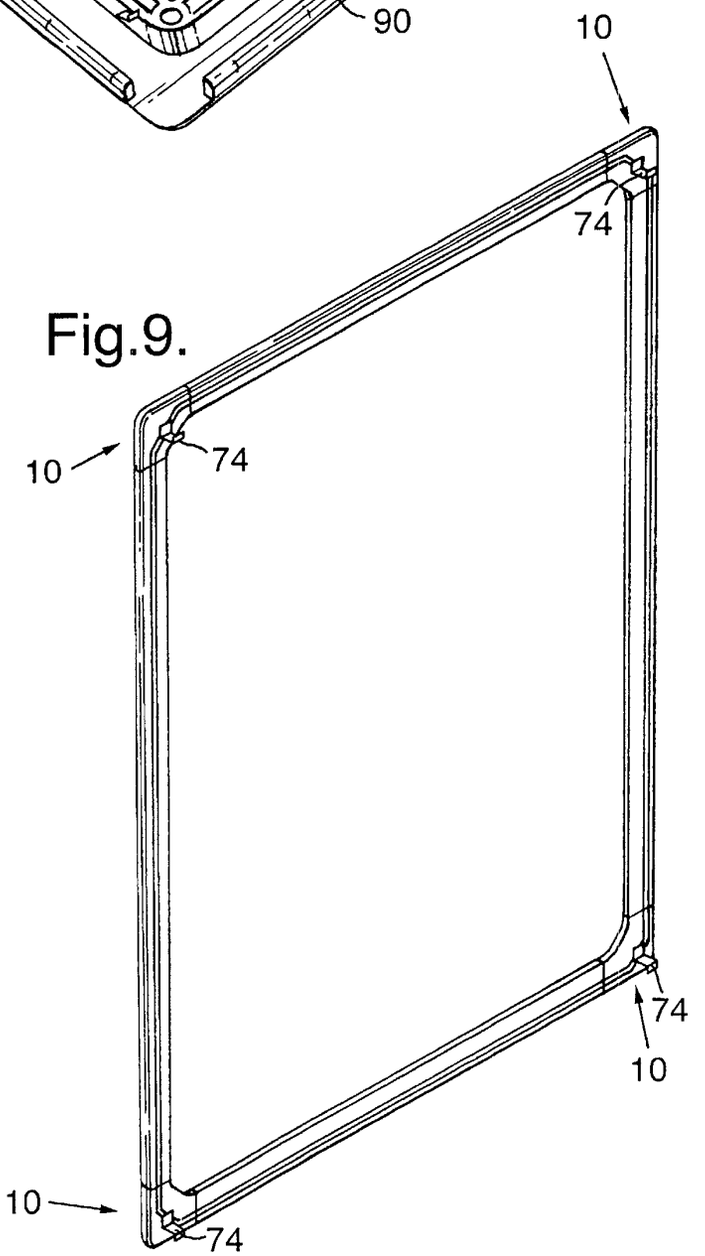
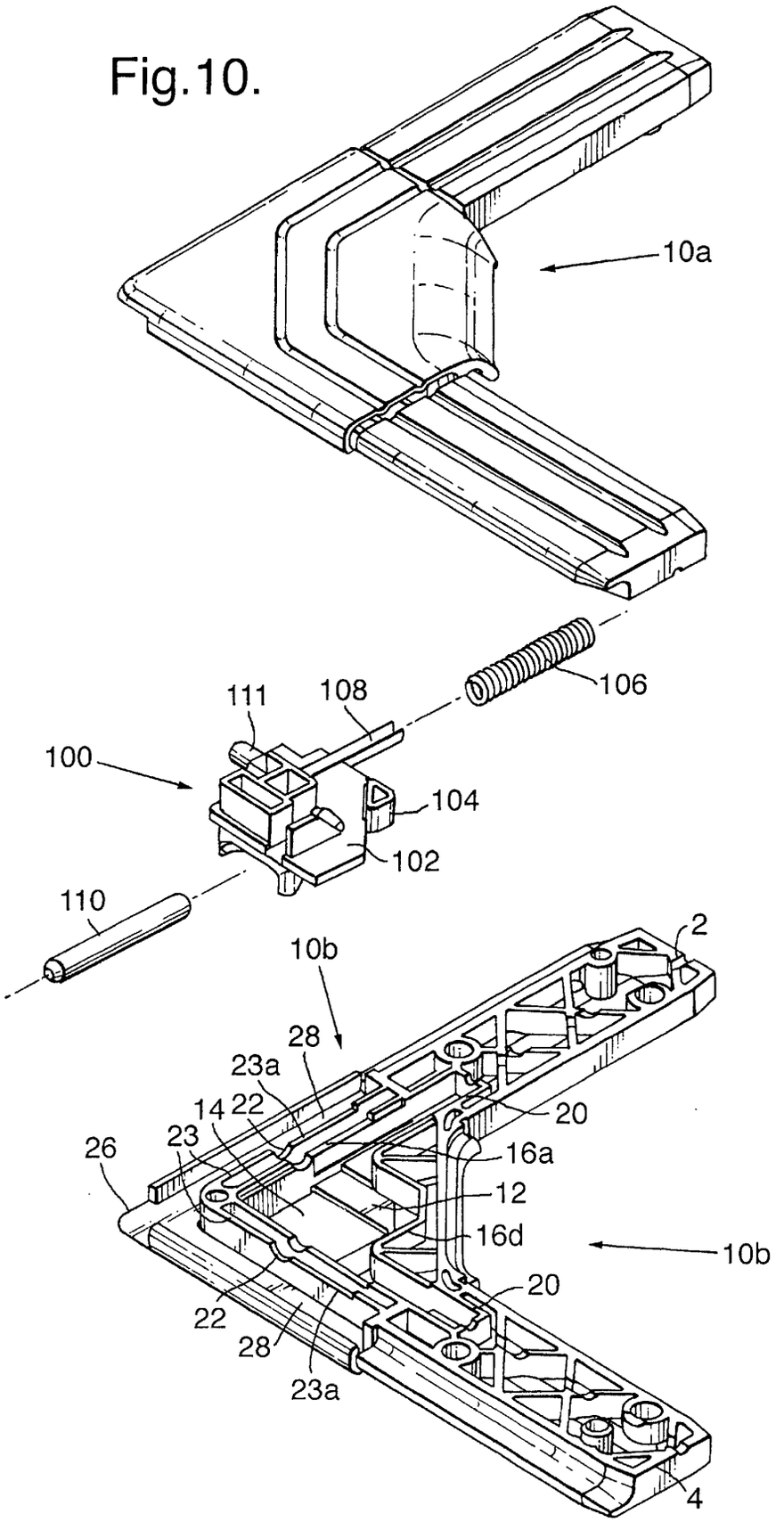


Fig.10.


10a
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108
100
104
102
110
2
10b
28
23a
14
22
20
26
23
16a
12
16d
10b
20
22
28
23a
4

Fig.11.

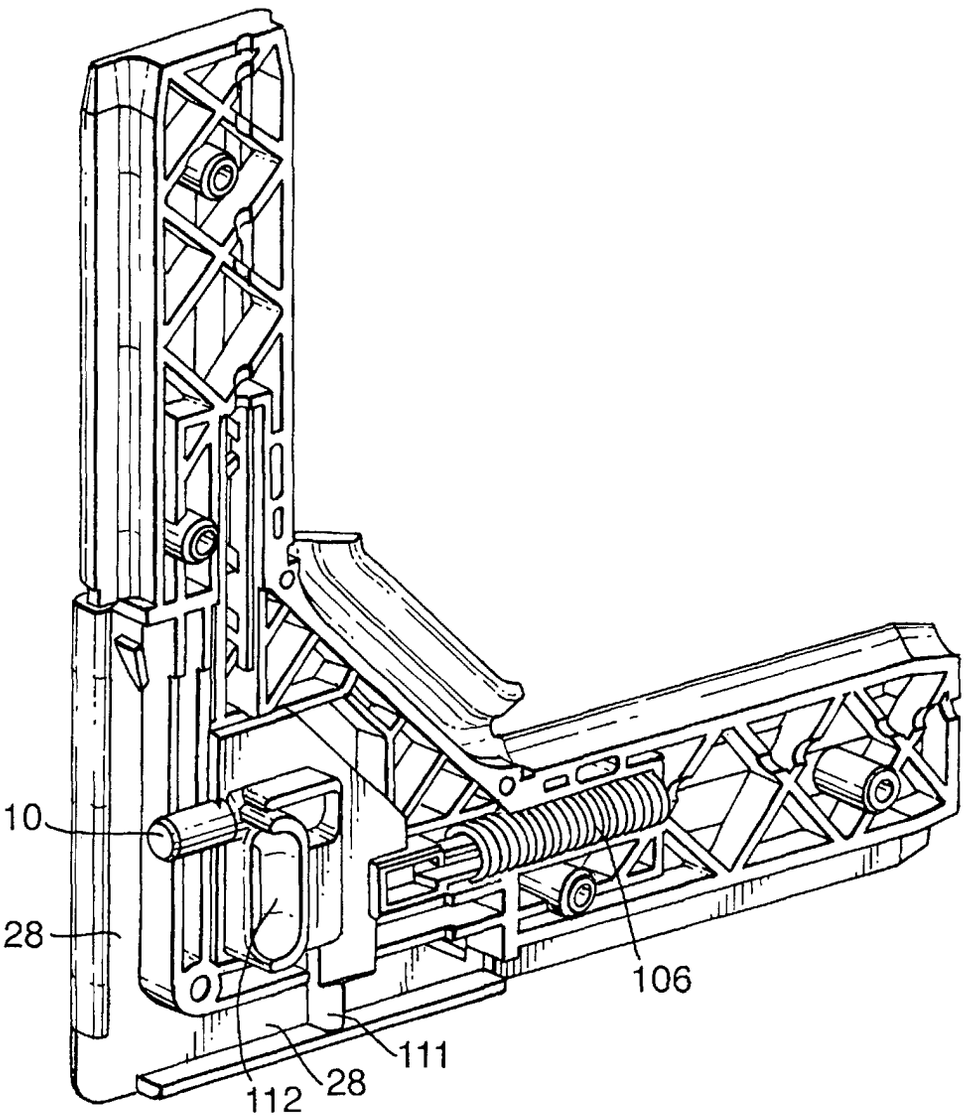


Fig.12(a).

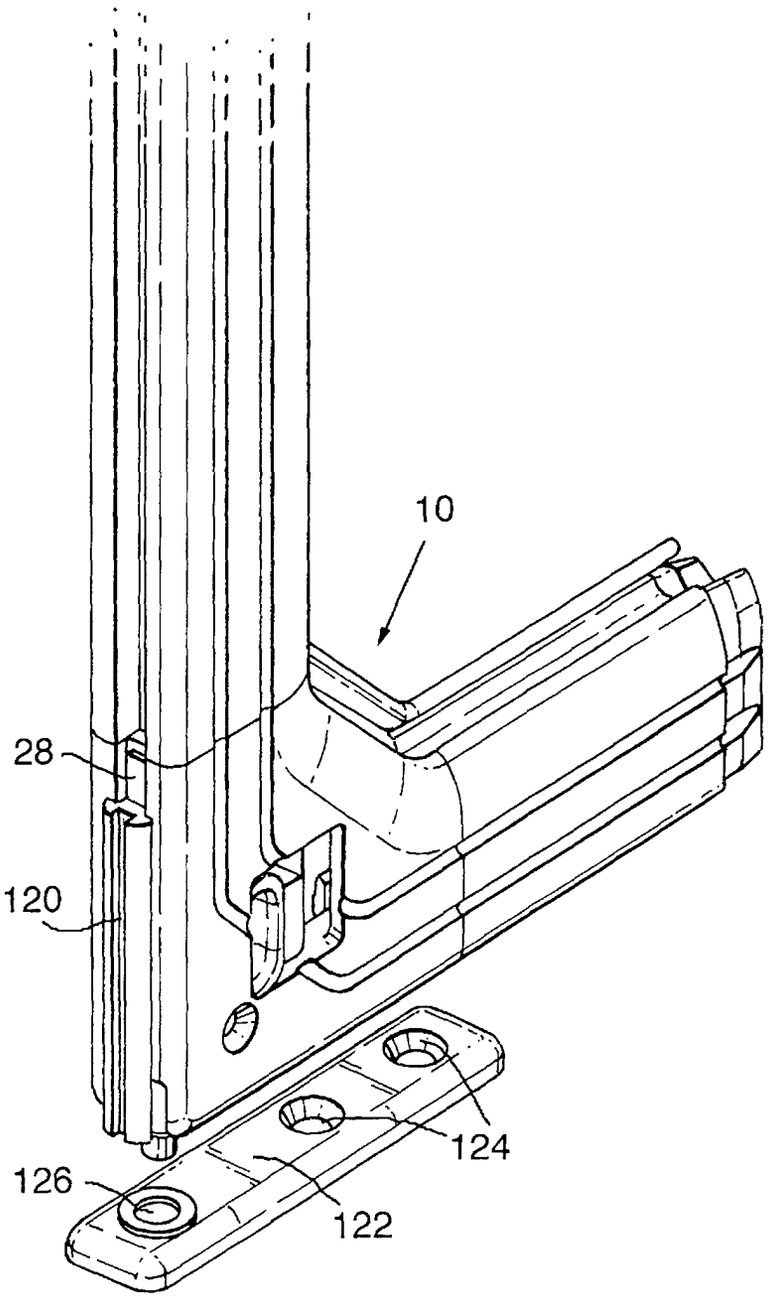


Fig.12(b).

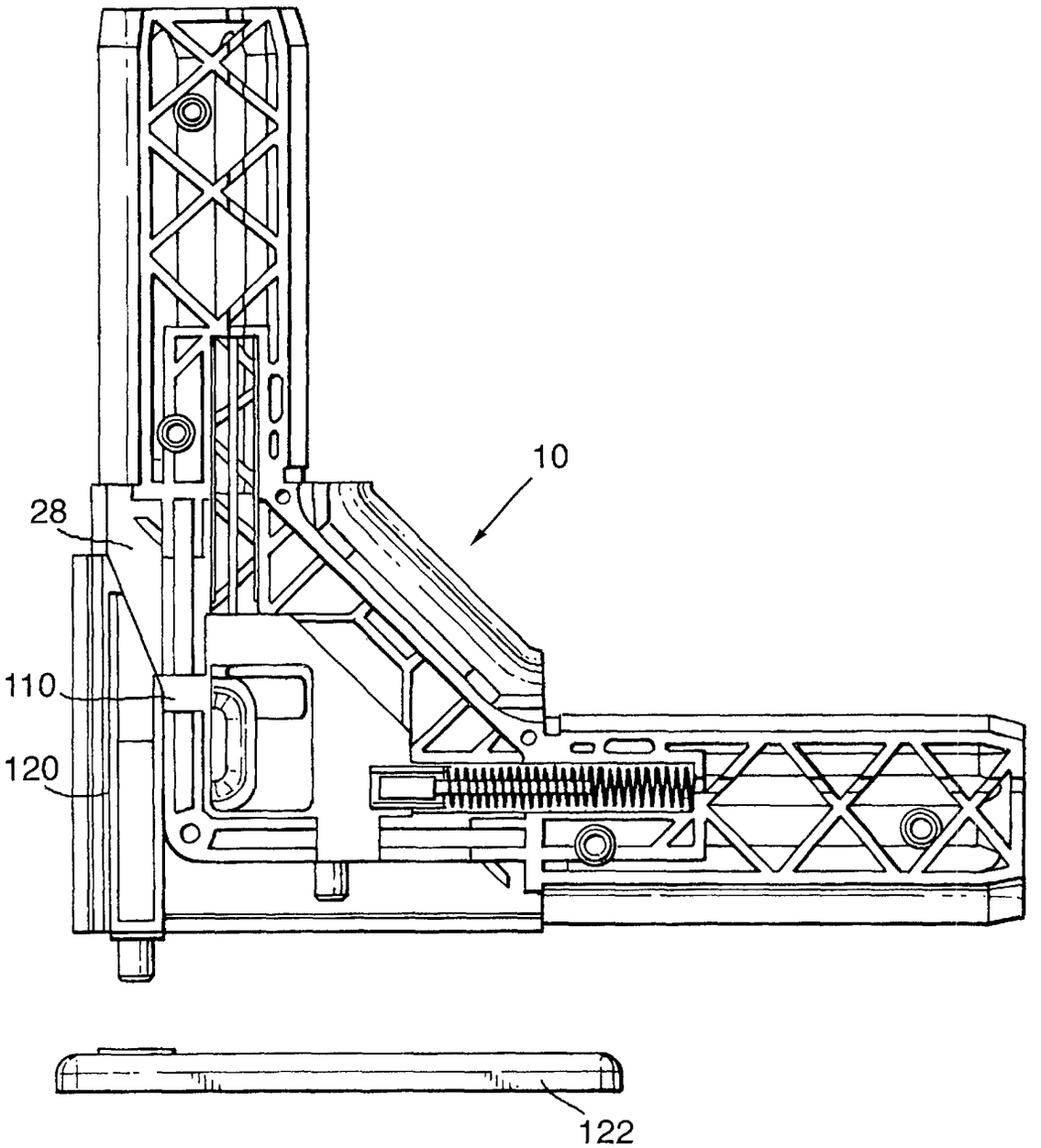


Fig.12(c).

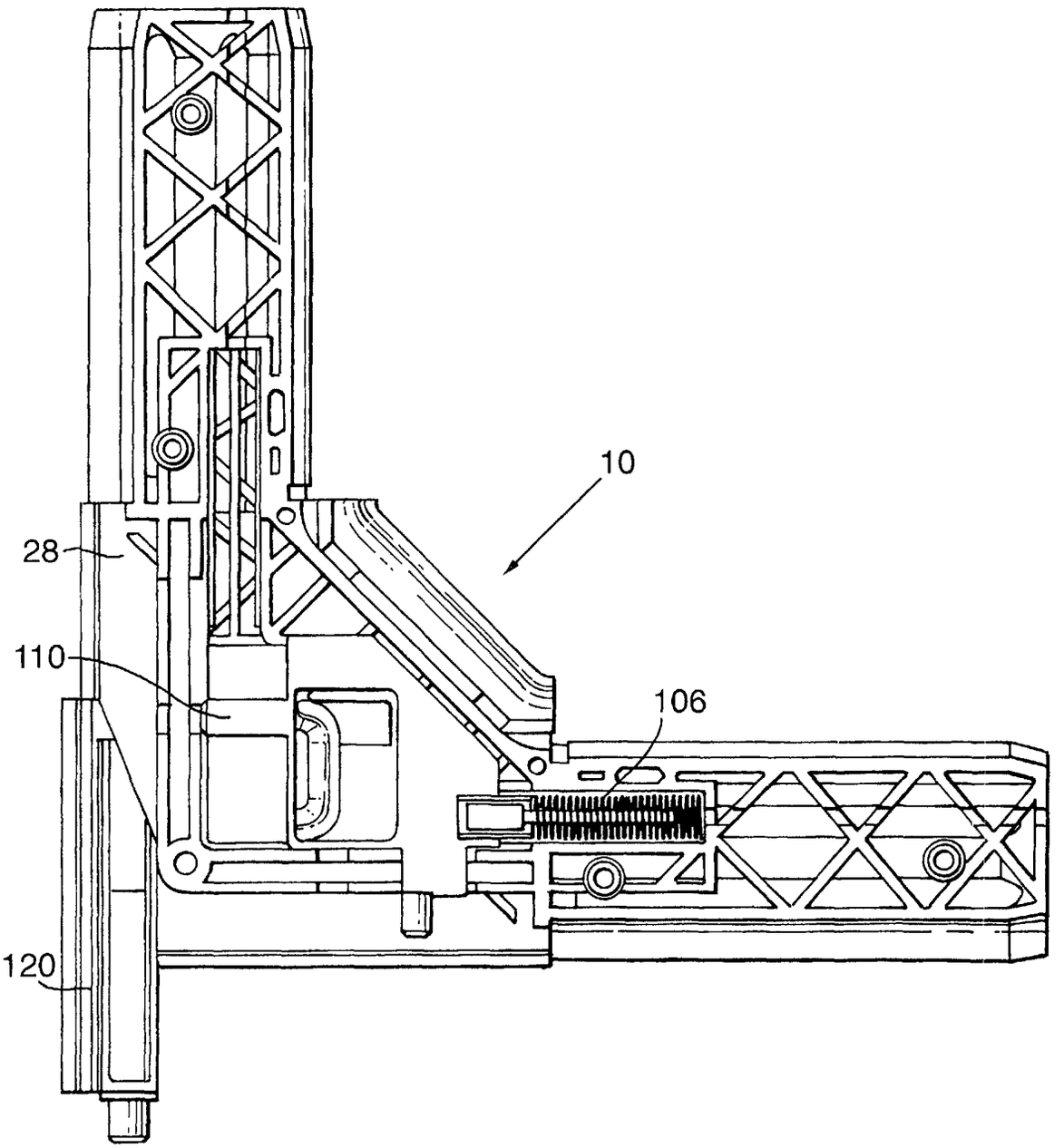


Fig.12(d).

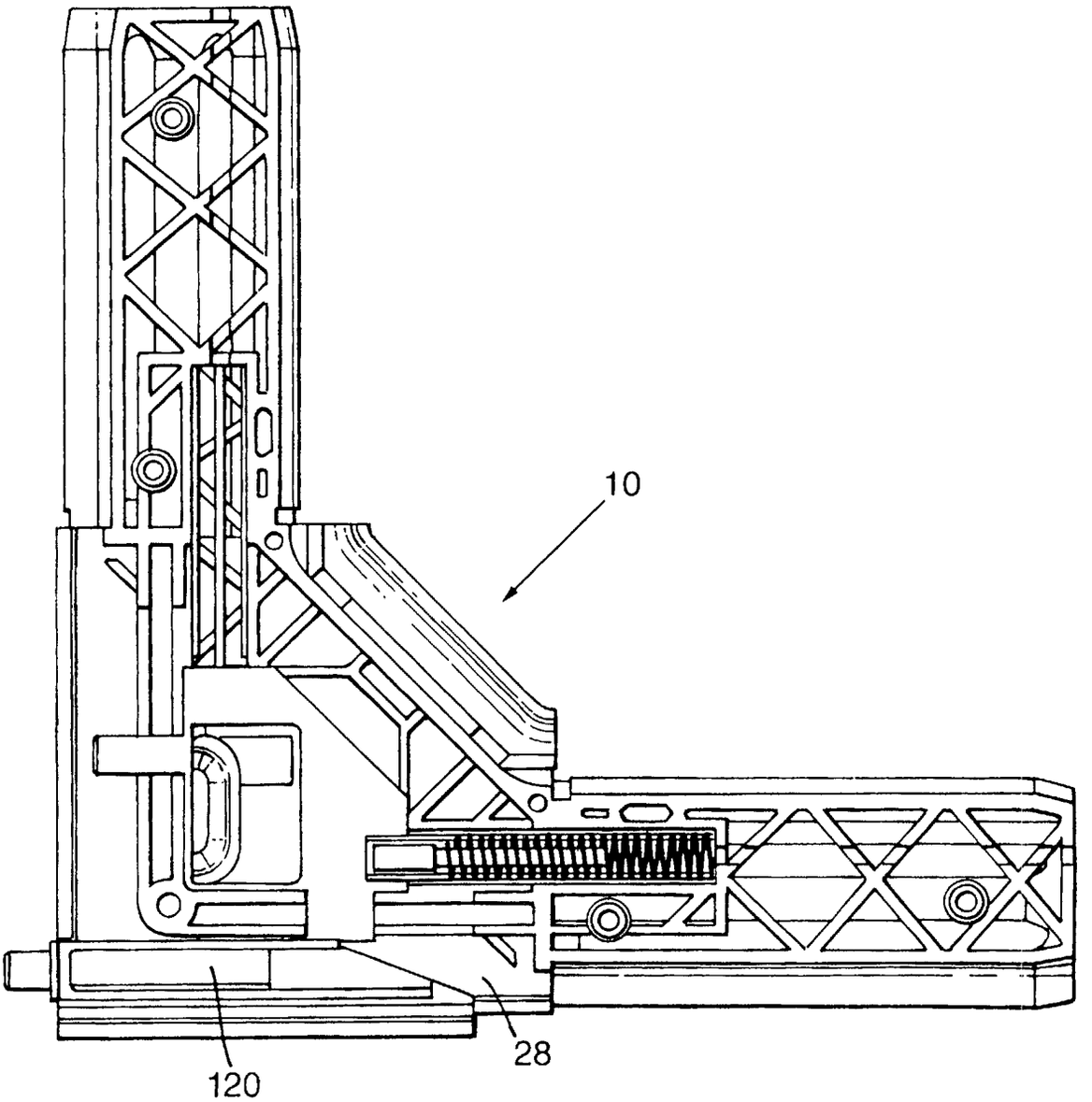


Fig.12(e).

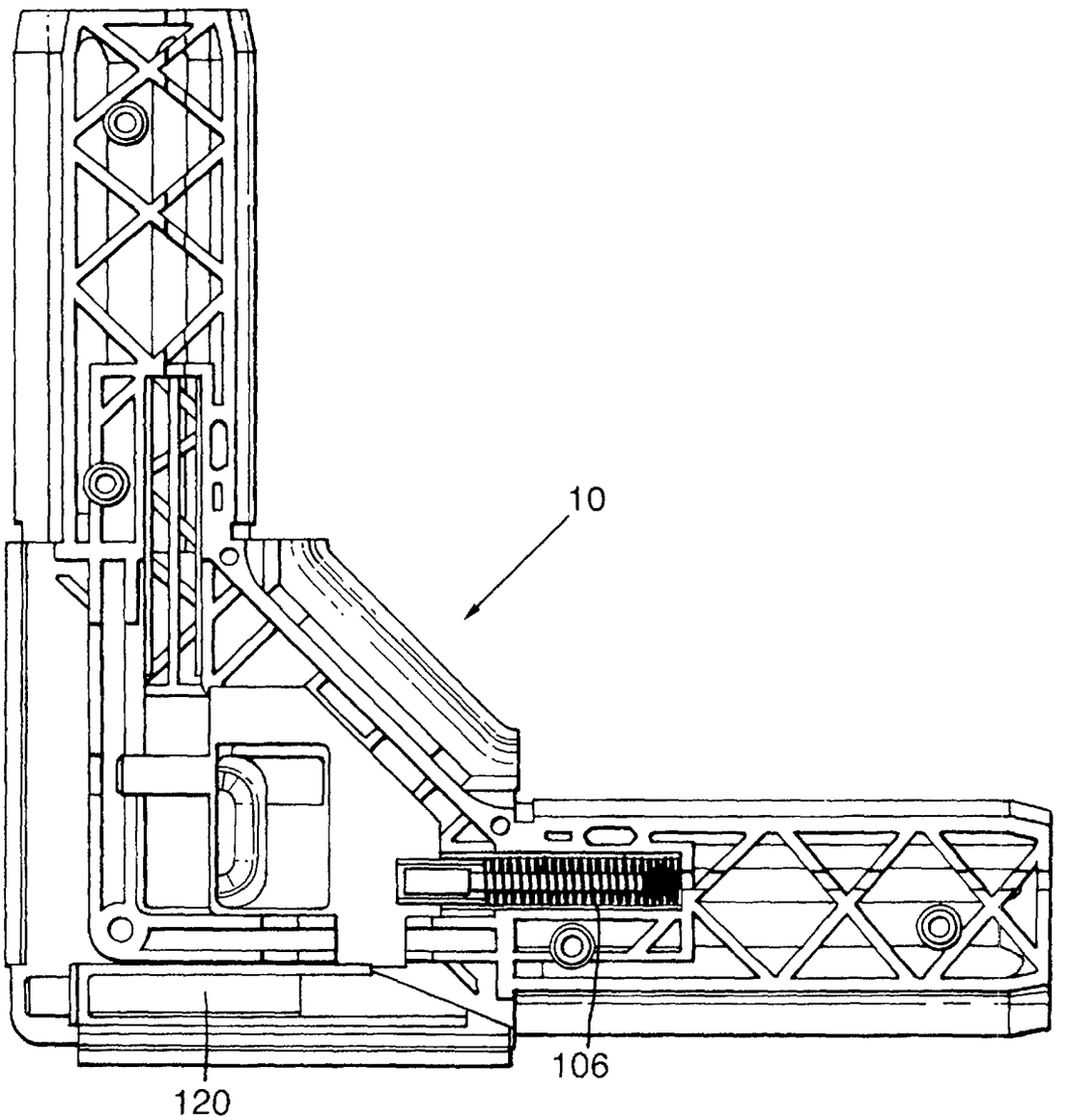


Fig.13.

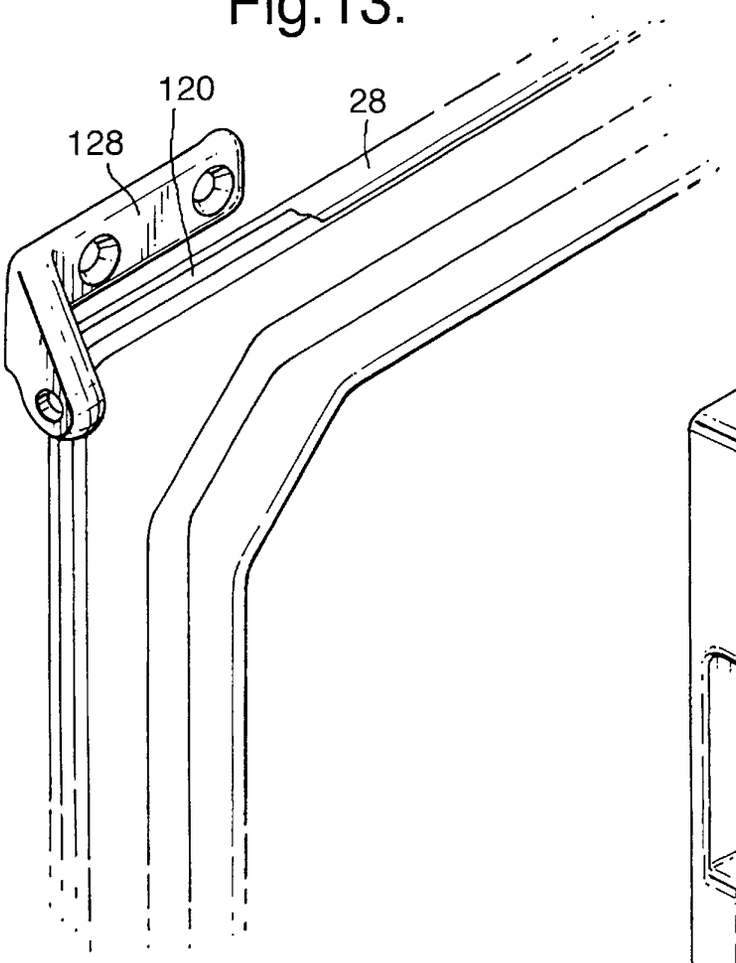


Fig.15.

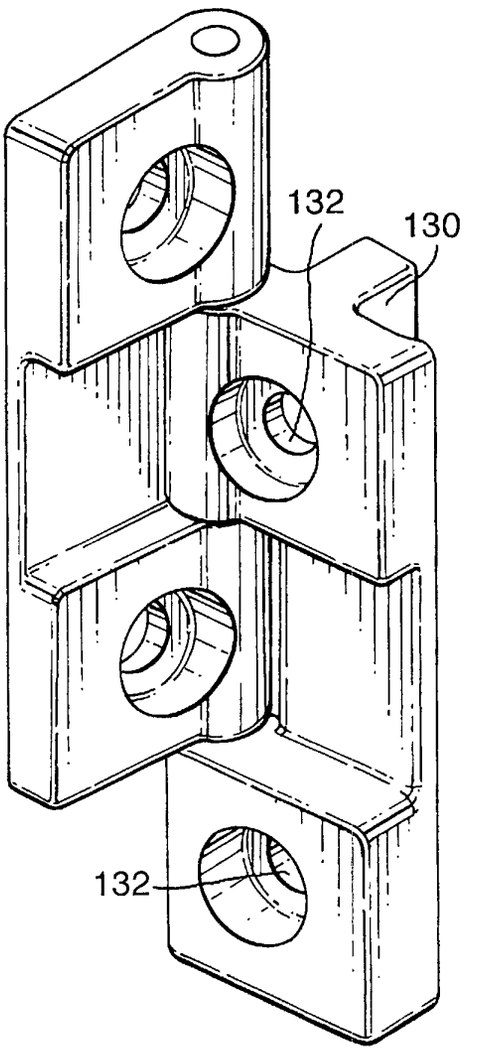


Fig.14(a).

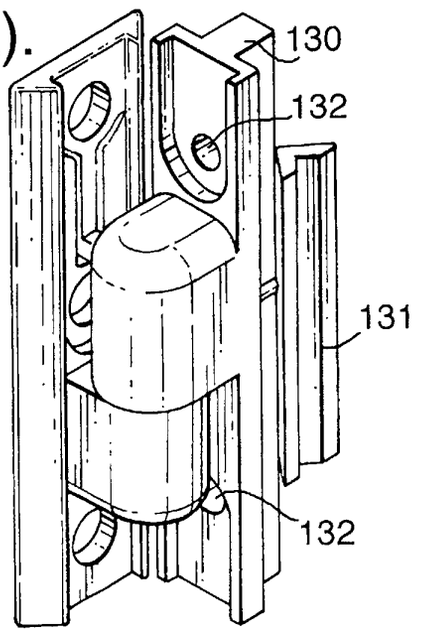


Fig.14(b).

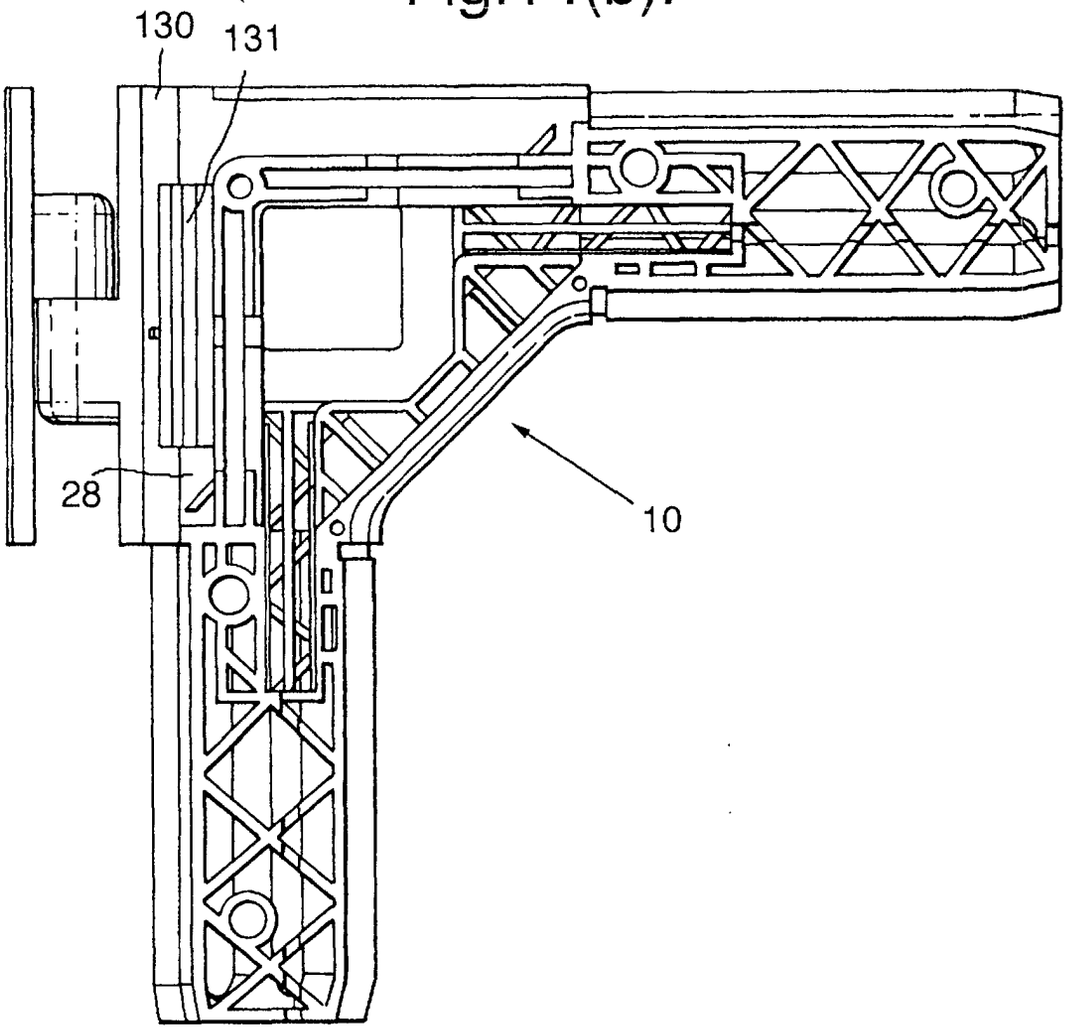


Fig.14(c).

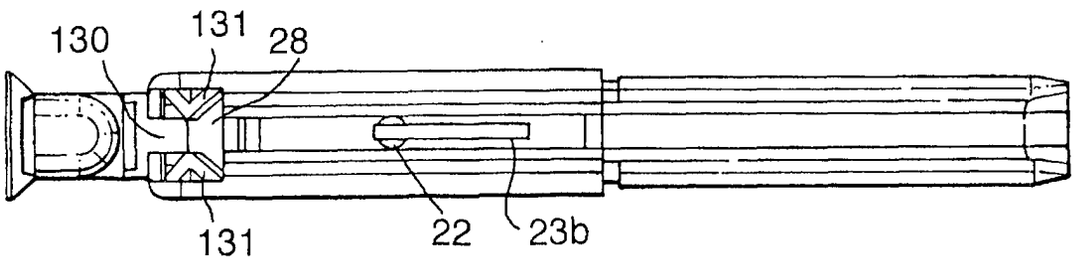


Fig.14(d).

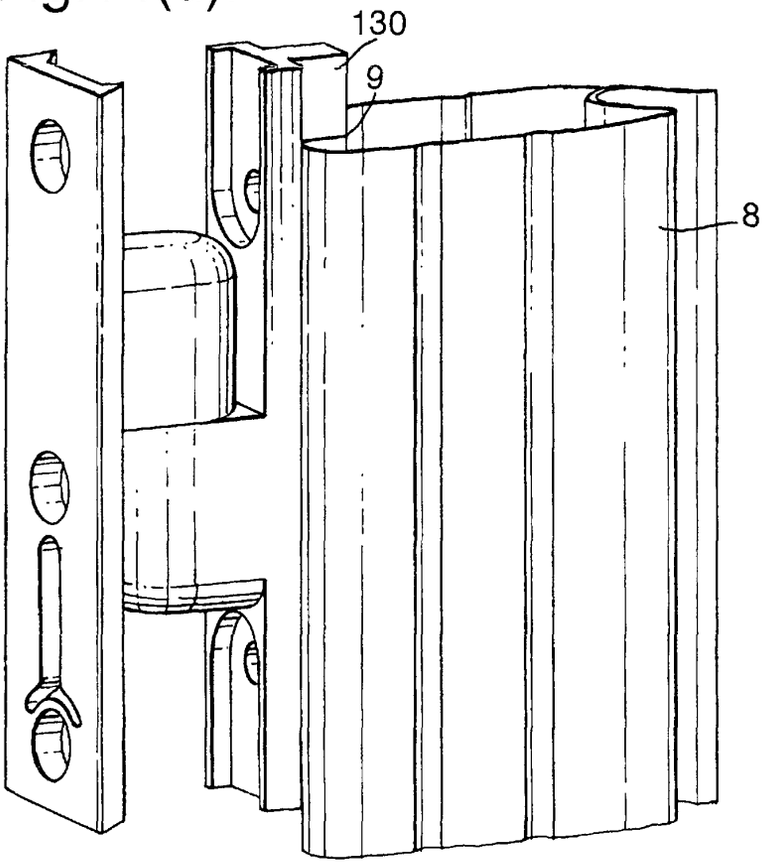
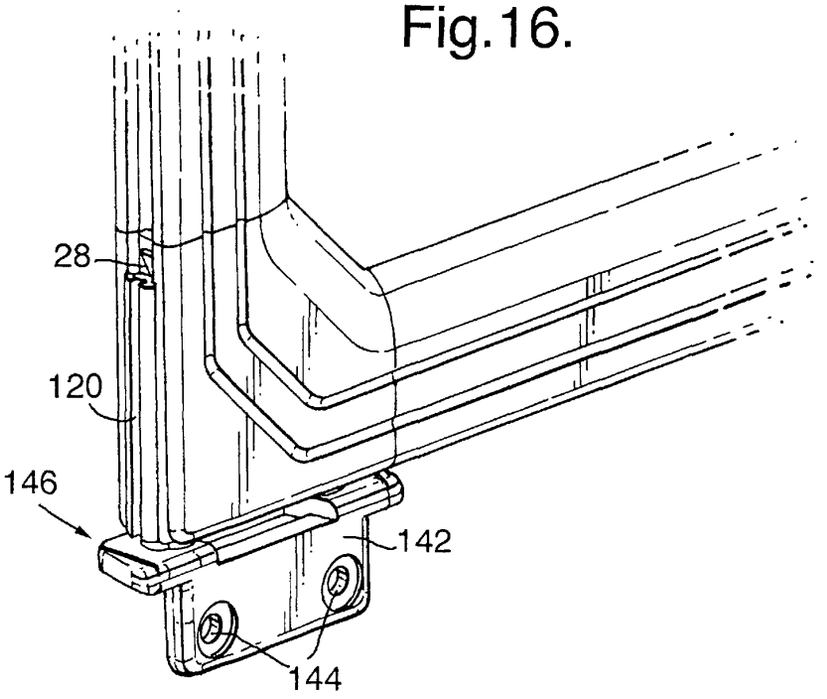


Fig.16.



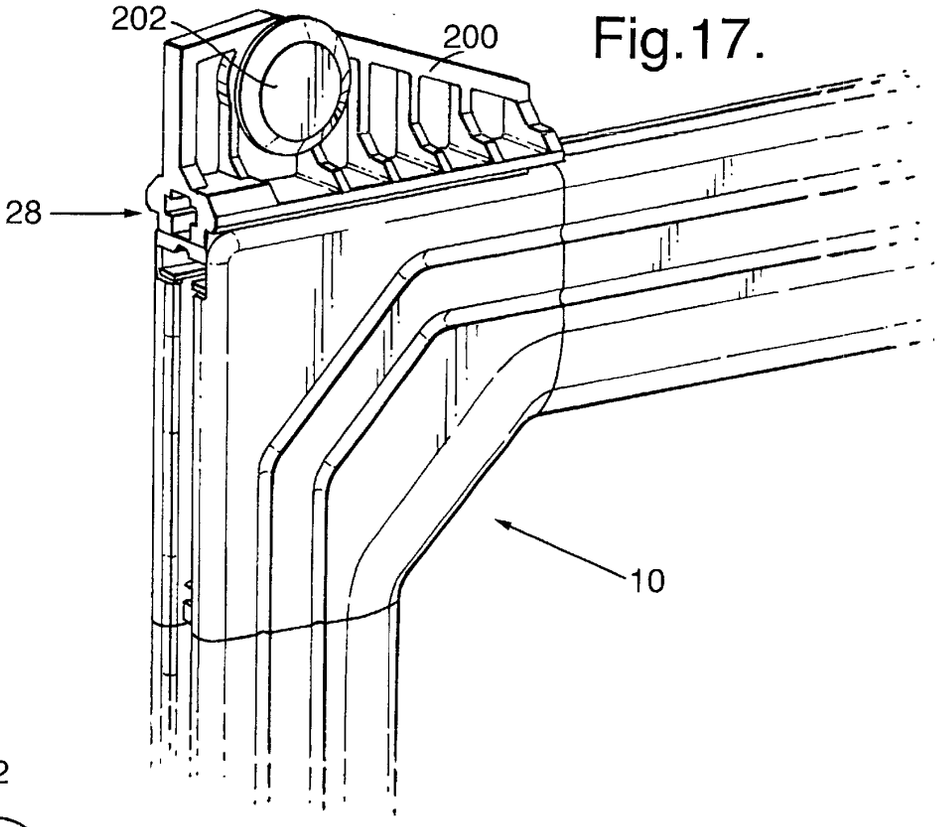


Fig.17.

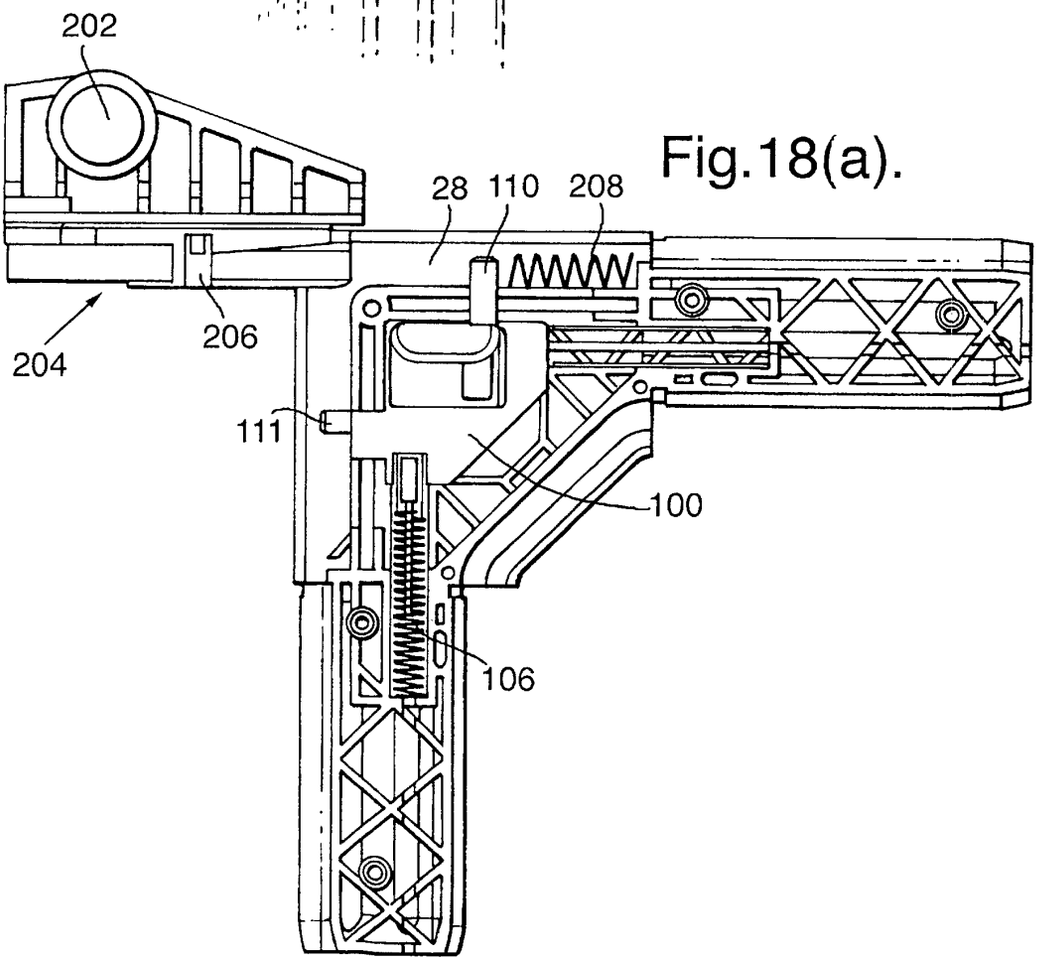


Fig.18(a).

Fig.18(b).

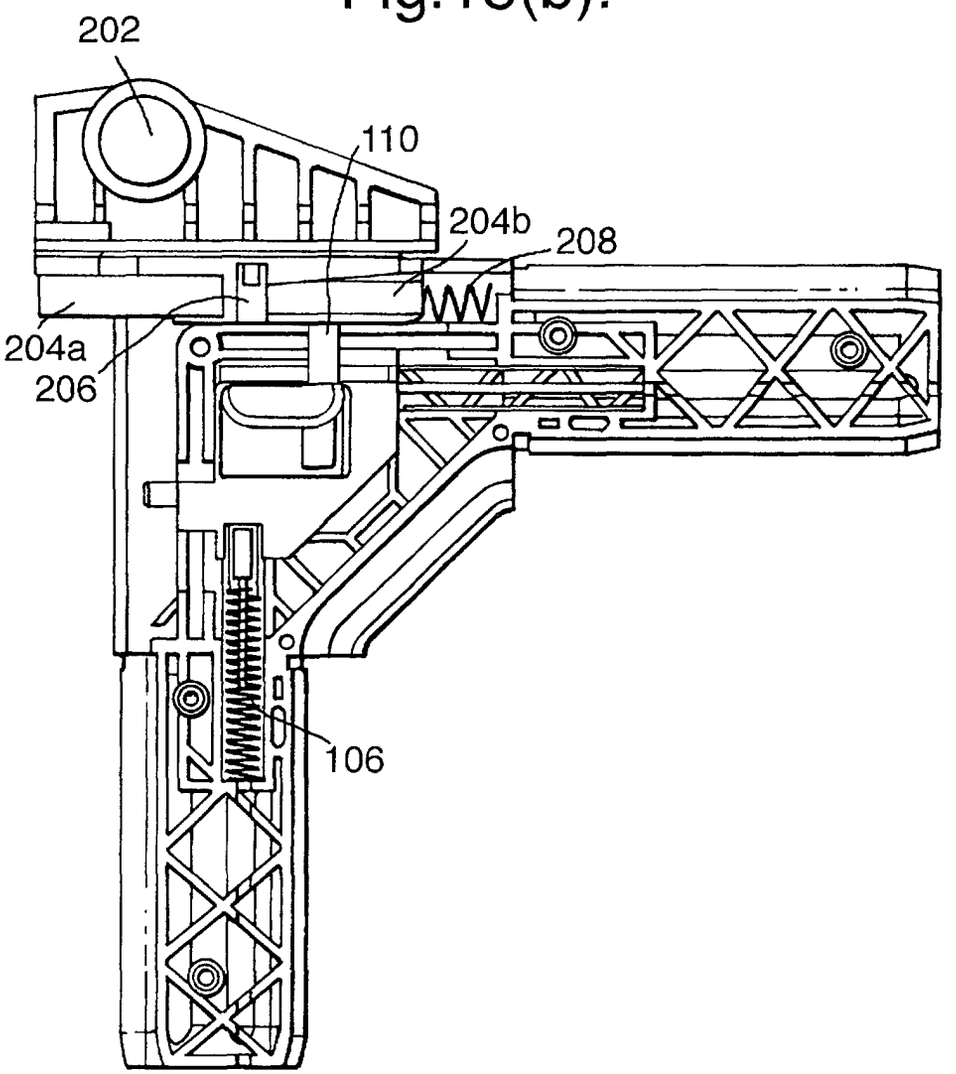


Fig.18(c).

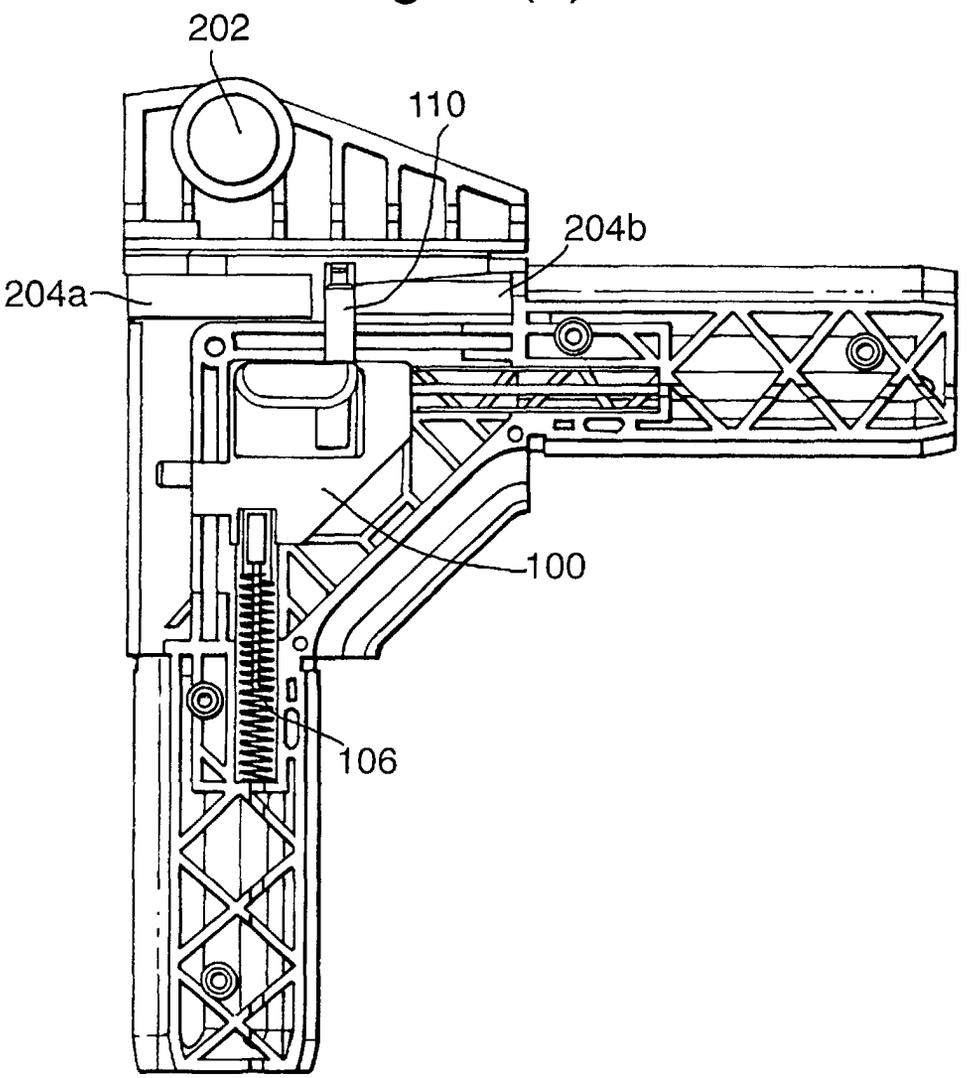


Fig.18d.

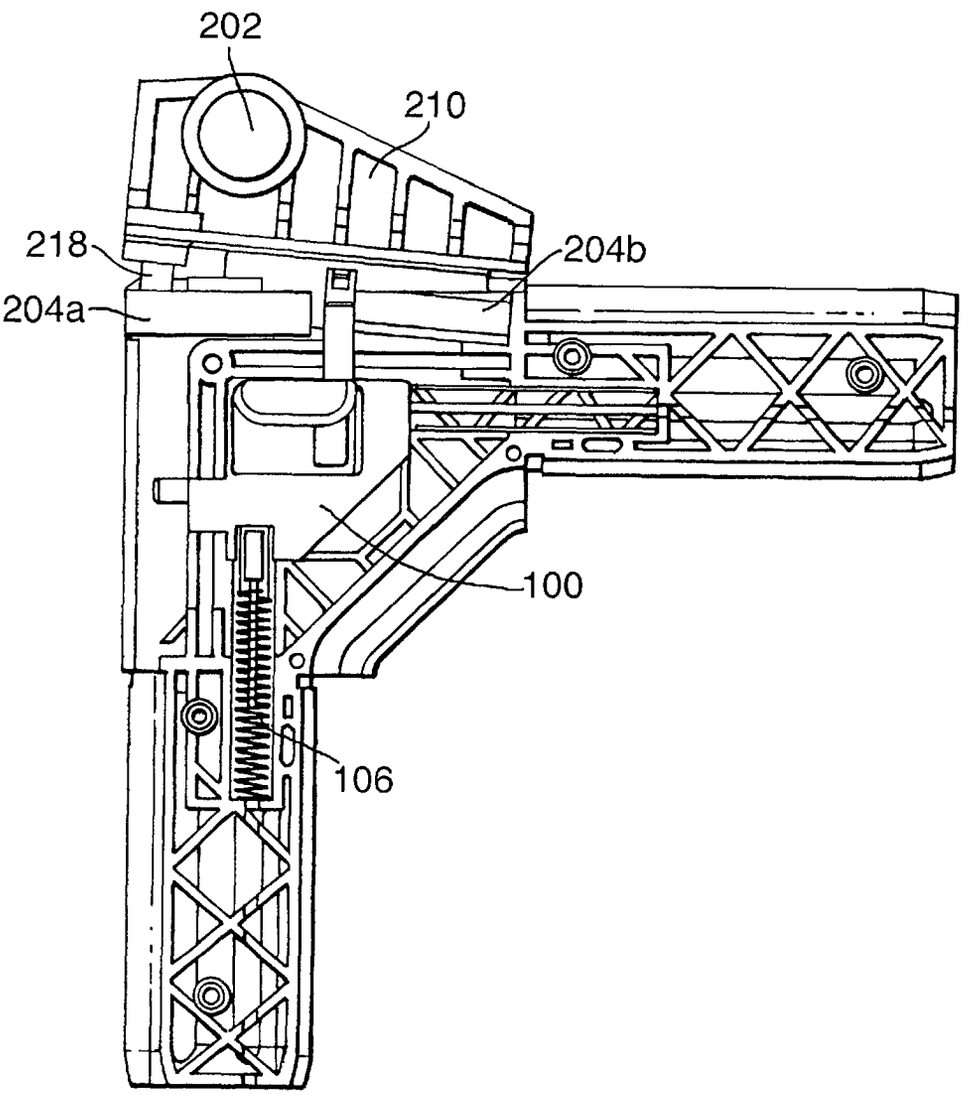


Fig.18(e).

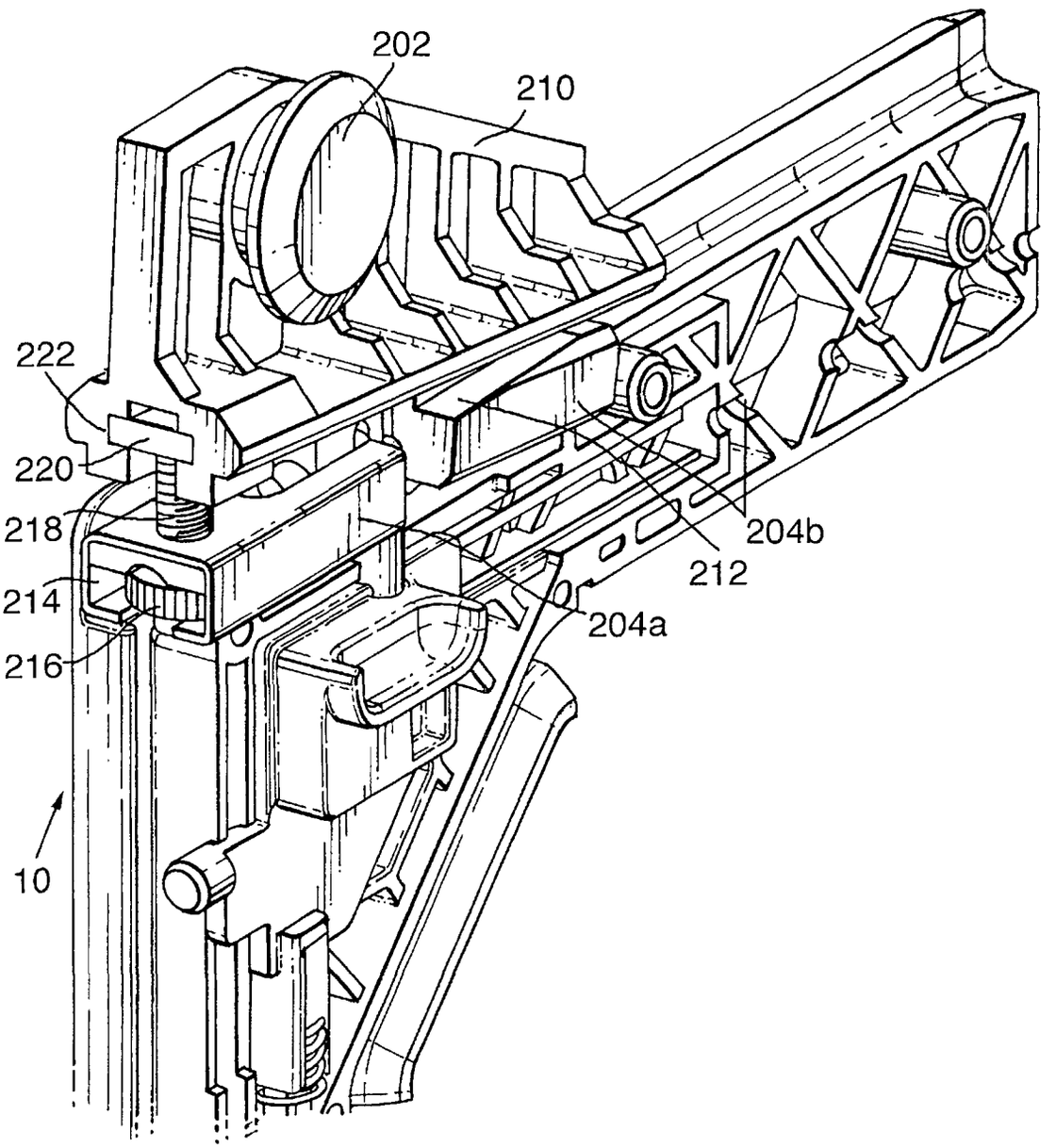


Fig.19.

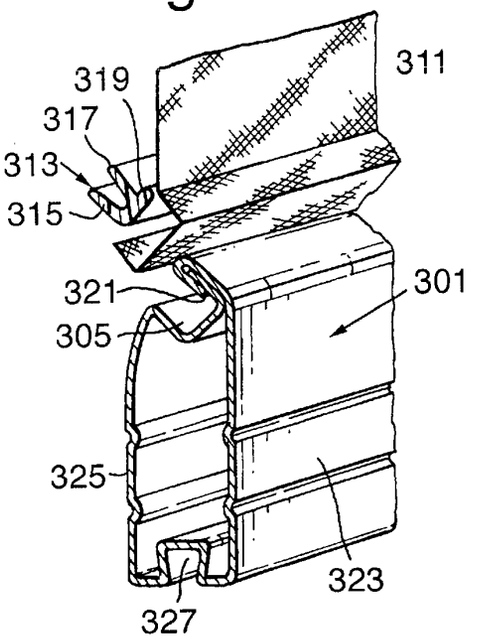


Fig.20.

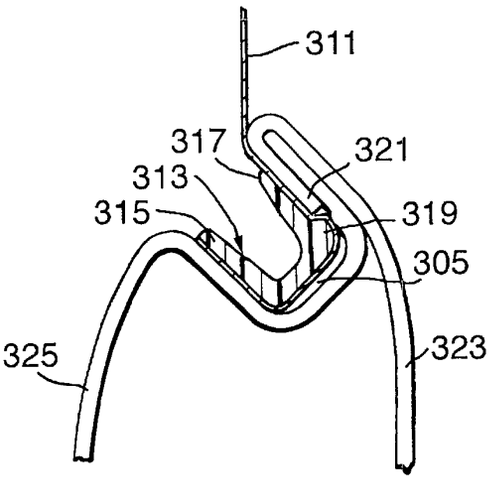


Fig.21.

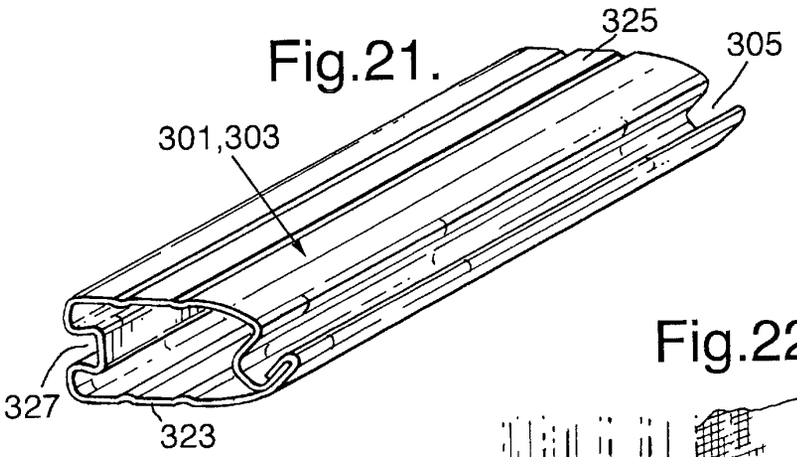


Fig.22.