(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 898 016 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.03.2008 Bulletin 2008/11

(51) Int Cl.:
E04B 9/00 *(2006.01)* ***E04B 9/22*** *(2006.01)*

(21) Application number: **07016866.1**

(22) Date of filing: **28.08.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **28.08.2006 US 840653 P**

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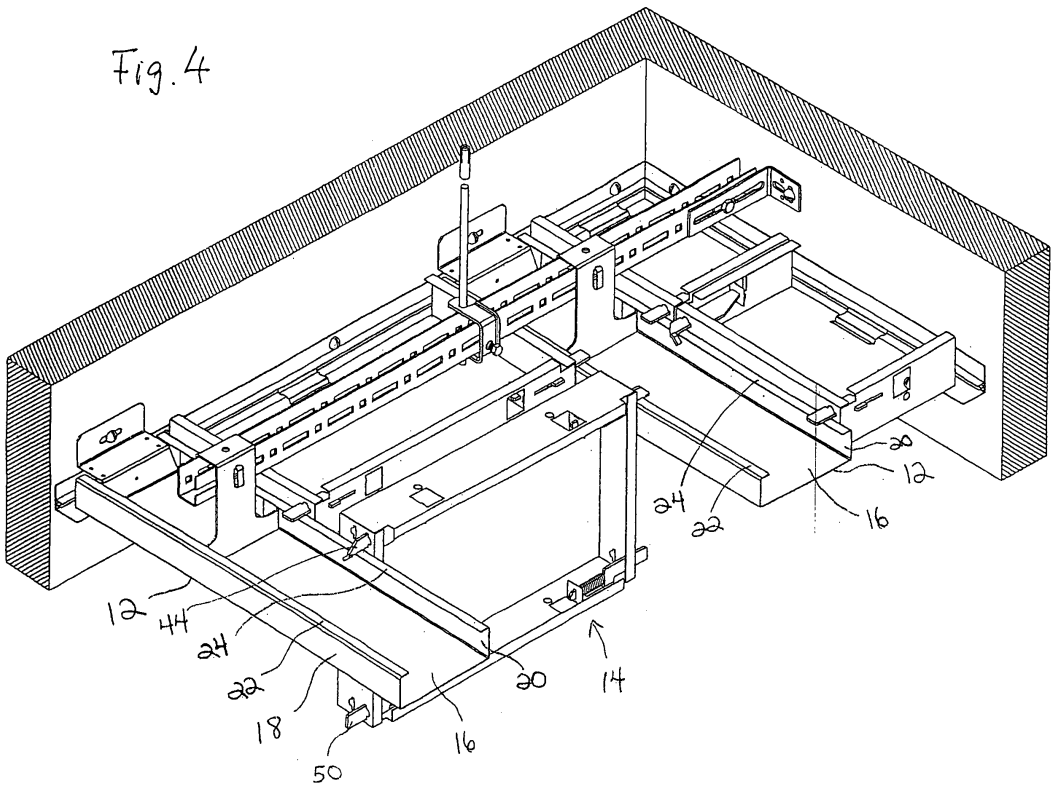
(54) **Suspended ceiling with downwardly pivotable panels**

(57) The hinge-down ceiling panel assembly 14 has an improved panel 32 which has a horizontal lower surface 36 and a plurality of sidewalls 40 to 43 extending substantially vertically. The panel 32 includes hardware for pivotally mounting and locking and releasing the panel 32 in the ceiling which are in engagement with the vertical sidewalls 40 to 43 of the panel 32. The panel hardware includes pivot members 44 and spring biased slide members 50 for moving the hardware out of the way of the support members 12 when the panel 32 is either installed or uninstalled. The pivot members 44 and the slide members 50 are made of flat stamped sheet metal and are mounted by being inserted and positioned in slots 62, 64, 66, 72, 72' of the sidewalls 40 to 43 and in notched out bend tabs 70, 70', respectively.

Fig. 4



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Description

[0001] The present invention relates to a hinge-down ceiling panel assembly and a suspended ceiling system provided with hinge-down ceiling panel assemblies.

[0002] In the following description, the terms "upper," "lower," "vertical" and "horizontal" are used to refer to the normal position of the panels in use, forming part of the horizontal planar suspended ceiling.

[0003] Conventional suspended ceiling systems include a network of support members and ceiling panels, which rest on, and are supported by, the support members. These panels are often capable of being pivoted, i.e. hinged, downwardly in order to access the space between the grid and the overhead ceiling.

[0004] A conventional suspended ceiling system is disclosed in the leaflet B-H 300 [PowerSwing (Dec. 2004)] of the applicant and will be discussed in the following referring to a drawing, in which

FIG. 1 is a perspective view of a portion of a suspended ceiling system containing a hinge-down panel assembly according to the prior art,

FIG. 2 is a perspective view of a slide member arrangement according to the prior art, and

FIG. 3 is a perspective view of a pivot member according to the prior art.

[0005] Referring to Figure 1, the ceiling system 10 includes support members 12 and a hinge-down panel assembly 14. The support members 12 extend in one direction, and are in spaced, parallel relation to one another. The support members 12 can be suspended in any suitable way. The key is that the support members 12 provide a horizontally extending support for the hinge-down panel assembly 14. Though there are numerous profiles that could be utilized as support members 12, Figure 1 illustrates support members having U-shaped profiles. Accordingly, the support member 12 has a lower horizontal surface 16 and first and second vertical surfaces 18, 20 extending from opposing edges of the lower horizontal surface 16. Extending from an edge of each vertical surface is an end return flange 22, 24. The end return flanges 22, 24 extend inwardly and are in substantial parallel relation to the lower horizontal surface 16.

[0006] As further shown in Figure 1, a hinge-down panel assembly 14 spans the distance between two adjacent support members 12. The hinge-down panel assembly 14 includes a panel 32 of rectangular shape having a bottom surface 36 and two pairs of opposing sidewalls, namely a first sidewall 43, opposite thereto a second sidewall 41 and a third sidewall 40 and opposite thereto a fourth sidewall 42. The sidewalls 40, 42 and 41, 43 extend substantially vertically from the horizontal bottom surface 36. Each one of the third and fourth sidewalls 40 and 42 includes a pair of keyed apertures 64 into which can be inserted attachment hardware for attaching the hinge-down panel assembly 14 to the support members 12. The attachment hardware of the hinge-down panel assembly 14 includes pivot members 44 and slide members 50.

[0007] The hinge-down panel assembly 14 as shown in Fig. 1 comprises two pivot members 44 each being engaged with an end of the first sidewall 43 and held on the support member 12, and two slide members 50, each being engaged with an end of the second sidewall 41 and releasably held on a support member 12.

[0008] As shown in Fig. 2, the slide member 50 comprises a rod that can be divided into a first portion 54, a second portion 56 aligned to the first portion 54 and a third portion 62 extending outwardly from and between the first portion 54 and the second portion 56. The slide member 50 further comprises a U-shaped profile having a web 103, two legs 102 and two outwardly bent extensions 104. The legs 102 are provided with respectively opposite apertures 101, through which the rod extends such that its first portion 54 extends between the third portion and the one leg 102. This first portion 54 is surrounded by a coil spring 58 abutting against the third portion 62 and the one leg 102. The second portion 56 extends through the aperture 101 in the other leg 102. The rod extends parallel to the web 103 through the apertures 101 and beyond the legs 102. The extensions 104 are parallel to the web 103 and provided with holes 105 for being fixed to the second sidewall 41 by means of screws, rivets or the like. As can be seen in Fig. 1, the second portion 56 extends through the third sidewall 40 and can be supported by the end return flange 22. The third portion 63 extends through a slot 66 in the second sidewall 41. By gripping and axially displacing the third portion 62 in the slot 66, the engagement of the second portion 56 with the end return flange 22 can be released and the panel assembly 14 can be pivoted by means of the pivot members 44 into the position shown in Fig. 1 between the two support members 12.

[0009] Each pivot member 44 consists of a first portion 46 provided with an angle 49 and a second portion 48 perpendicularly bent with respect to the first portion 46 and being longer than the width of the first portion 46. The angle 49 is substantially parallel in its extension to the second portion 48 of the pivot member 44. As shown in Fig. 1, the long second portion 48 of the pivot member 44 extends in the space between the bottom surface 36 and inwardly folded upper edges of the sidewalls 40, 42, while the first portion 46 of each pivot member 44 rests on the surface of the end return flanges 22, 24, and is securely held by means of the angle 49 extending below the respective end return flange 22, 24.

[0010] The hinge-down ceiling panel assembly according to the above-discussed prior art needs great effort for manufacturing and installing the slide members as riveting, screwing, welding and the like is requested in order to attach the premanufactured slide members to the panel.

[0011] It is the object of the invention to provide a hinge-down ceiling panel assembly as defined in the preamble of claim 1, the design of which is simplified, uses a few components only and allows installment and uninstallment in a suspended ceiling without the need for special tools which can be used by trained or professional installers only, and without special preassembly of parts in the manufacturing process.

[0012] This aim is obtained by a hinge-down ceiling panel assembly as defined in claim 1, embodiments of which are subjects of dependent claims 2 to 7, and by a suspended ceiling system according to claim 8.

[0013] In the production of the hinge-down ceiling panel assembly the parts can be manufactured by simple punching or stamping and bending steps and can be easily assembled by manual plugging. Because of the simplified structure of the slide members and the pivot members, no special tool is required to slide the third portion from the first position to the second position. By way of example, when uninstalling the panel assembly from the horizontal ceiling plane, any handy implement, such as a screwdriver, can be inserted into the clearance between the vertical walls of the panel and the adjacent support member. With the third portion in the second position, the first portion of the slide member no longer engages the profile and is clear of the edge of the profile. In turn, the panel is free to swing downwardly by pivoting about the pivot members and hang freely from the pivot members to permit access to the functional elements contained in the space above the horizontal suspended ceiling plane. As with similar hinge-down ceiling assemblies, it is unnecessary to remove the panel from the ceiling in the process of getting at the space above the ceiling plane. Further, there is no screwing, riveting or welding operation for fixing the parts.

[0014] The invention is further explained by way of example referring to further drawings.

[0015] FIG. 4 is a perspective view of a portion of a suspended ceiling system containing the hinge-down panel assembly in accordance with an example embodiment of the present invention.

[0016] FIG. 5 is a perspective view of the hinge-down panel assembly of the invention.

[0017] FIG. 6 is a perspective view of the slide member of the invention with coil spring.

[0018] FIG. 7 is a perspective view of the pivot member of the invention.

[0019] FIGS. 8 and 9 are perspective detailed views of corners of the panel assembly showing the slide member of the invention with the slide member attached to the panel and resting in the first position.

[0020] FIGS. 10 and 11 are perspective detailed views of corners of the panel assembly showing the pivot member attached to the panel.

[0021] FIGS. 12 and 13 are perspective detailed views of corners of the panel assembly showing the slide member with coil spring of the invention attached to the panel and retracted in the second position.

[0022] As far as parts of the conventional hinge-down ceiling panel assembly of Figs. 1 to 3 and those of the invention according to Figs. 4 to 13 are identical, they are provided with the same reference numbers. As far as their functions are the same, reference is made to the introductory part of the specification. The basic structure of the hinge-down ceiling panel assembly of Fig. 1 corresponds to that of Fig. 4. Thus, only the different structured elements are described in the following.

[0023] As best seen in Figure 7, the pivot member 44 has a body 45 which includes a first portion 46 and a second portion 48. The first portion 48 of the pivot member includes an angle 49 which extends integrally therefrom and is bent in a direction generally perpendicular to the body 45. When installed on a support member 12, as illustrated in Figure 4 the angle 49 assists in horizontally locking the panel assembly 14 to the support members 12 of the grid. The angle 49 is critical in keeping the panel on the support members when the panel is in the hinged-down position. The second portion 48 of the pivot member has a tapered edge 47. As shown in Figures 5, 10, 11, the first portion 46 of the pivot members 44 is inserted through a slot 52 in the fourth sidewall 42 of the panel 32. The slot 52 is positioned proximate a corner of the panel 32.

[0024] As best seen in Figures 10 and 11, the first sidewall 43 includes a bend tab 70', or latch, which is notched out of sidewall 41. The bend tab 70' is bent inwardly to a position substantially perpendicular to vertical wall 43 and, therefore, parallel to vertical wall 42. The point of bending can include a relief slot 71 for ease in bending. The bend tab 70 includes a slot 72' into which the tapered edge 47 of the second portion 48 of the pivot member body 45 is inserted. The slot 72' is positioned on the bend tab 70' such that it is in vertical alignment with slot 52. The bend tab 70' serves as an abutment for the pivot member body 45.

[0025] The slide members 50 enable the panel 32 to connect and disconnect easily from the support members 12 to allow access to the plenum. As best seen in Figures 5 and 6, each slide member 50 has a body 51 which includes a first portion 54 and a second portion 56. A helical compression spring or coil spring 58 encircles the first portion 54 and is attached to the first portion via notching 60 at the base of the first portion 54. The second portion 56 of the slide member 50 extends integrally form the first portion 54 and has a width greater than the first portion 54. The second portion 56 functions as an abutment piece for the coil spring 58. The second portion 56 includes a third portion or an ear 62 which extends outwardly from the base of the second portion 56 in a direction transverse to the first portion 54 of the slide member 50.

[0026] To attach the slide member 50 to the panel 32, the first portion 54 is inserted into and through a slot 64 in the third sidewall 40 of the panel 32, the slot 64 being positioned proximate a corner of the panel 32. Figures 5 and 9 illustrate the slot 64 with the second portion 56 of

the slide member 50 seated therein. The ear 62 of the second portion 56 is then inserted through a slot 66 in the second sidewall 41 located adjacent the third sidewall 40 containing the slot 64 into which the second portion 56 of the slide member 50 is inserted. These two slots, 64 and 66, are in vertical alignment with one another. As shown throughout the drawings, adjacent vertical sidewalls are essentially perpendicular to one another, and, thus, the two slots, 64 and 66, are also in perpendicular relation.

[0027] As best seen in Figures 8 and 9, the second sidewall 41 includes a bend tab 70 formed in the second sidewall 41. The bend tab 70 is positioned on the side of the ear slot 66, distal to the slot 64. The bend tab 70 is bent inwardly to a position substantially perpendicular to the second sidewall 41 and, therefore, parallel to the third sidewall 40. The point of bending can include a relief slot 71 for ease in bending. The bend tab 70 includes a slot 72 into which the first portion 54 of the slide member 50 is inserted. The slot 72 is positioned on the bend tab 70 such that it is in vertical alignment with slots 64 and 66. The bend tab 70 serves as a second abutment for the helical compression or coil spring 58, and thus, the spring 58 interposes the second portion 56 and bend tab 70.

[0028] When the slide member 50 is attached to the panel, the spring 58 is somewhat recoiled, and, thus, exerts a force on the ear 62 of the slide member 50 and pushes the ear 62 against the edge of slot 66 which is proximate the third sidewall 40. This position is hereafter referred to as the first position and is best illustrated in Figure 8. In the first position, the second portion 56 of the slide member 50 extends from the interior of the panel 32, through the slot 64 and beyond the outer surface of the third sidewall 40. In order to move the panel 32 from its hinged-down position as shown in Figure 4, into the horizontal planar position, the ear 62 of the slide member 50 must be moved from the first position in slot 66 to a second position. In the second position, the spring 58 is further recoiled and the second portion 56 of the slide member 50 is retracted substantially into the interior of the panel 32, such that the second portion 56 does not extend outwardly from the third sidewall 40.

[0029] When the slide member 50 is retracted in the second position, the panel 32 is then pivoted upwardly about the pivot members 44 until the slide members 50 are at a higher position than the end return flanges 22, 24 of the support members 12. Once the slide members 50 of the panel clear the support members 12, the ear 62 of the slide members 50 are released which will permit the spring 58 to press the slide member 50 back into the first position. Once the ear 62 returns to the first position, the first portion 56 of the slide member 50 will project over and above the end return flanges 22, 24 of the U-profile support members 12 and will rest on the end return flanges 22, 24, effectively locking the panel assembly 14 in the horizontal ceiling plane.

[0030] Both the pivot members 44 and the slide members 50 are made of flat stamped metal, preferably sheet metal and are mounted by being inserted or plugged and positioned in associated slots 52, 64, 66; 72, 72' pinched in the sidewalls 40 to 43 and in notched out bend tabs 70, 70', respectively.

Claims

1. A hinge-down ceiling panel assembly (14) comprising

- a rectangular panel (32) having a bottom surface (36) and four sidewalls (40 to 43) extending vertically from the bottom surface (36) and including a first sidewall (43) and opposite thereto a second sidewall (41) as well as perpendicularly to this first and second sidewalls (43, 41) a third sidewall (40) and a fourth sidewall (42),
- two pivot members (44) each being engaged with an end of the first sidewall (43),
- two slide members (50) each being engaged with an end of the second sidewall (41), wherein each slide member (50) consists of a first portion (54), a second portion (56) aligned to the first portion (54) and a third portion (62) extending outwardly from and between the first portion (54) and the second portion (56),
- a first slot (64) in each of the third and fourth sidewalls (40, 42) near the second sidewall (41), which first slot (64) slidably receives the second portion (56) of the slide member (50),
- a second slot (66) near each end of the second sidewall (41), which second slot (66) slidably receives the third portion (62) of the slide member (50),
- a holding means provided at each end part of the second sidewall (41) and including a slot (72) for slidably receiving the first portion (54) of the slide member (50), and
- a biasing coil spring (58) around the first portion (54) of the slide member (50) abutting with one end the holding means (70) and with the other end the third portion (62) of the slide member (50),

characterized

- **in that** each holding means consists of a tab (70) notched out of the second sidewall (41) and bent substantially perpendicularly to the second sidewall (41), such that the free end of the tab (70) faces the first sidewall (43), and
- **in that** each slide member (50) consists of a single piece of stamped metal sheet.

2. The hinge-down ceiling panel assembly according to claim 1 **characterized in that** the width of the first portion (54) of the slide member (50) is smaller than

that of the second portion (56).

3. The hinge-down ceiling panel assembly according to claim 1 or 2, **characterized in that** the first portion (54) of the slide member (50) has a tip with at least one inclined flank.

4. The hinge-down ceiling panel assembly according to one of the preceding claims, **characterized in that** the extension of the first portion (54) of the slide member (50) is offset to the extension of the second portion (56) of the slide member in the direction of the third portion (62).

5. The hinge-down ceiling panel assembly according to one of the preceding claims, **characterized in that** the first portion (54) of the slide member (50) has a notching (60) at its transition into the third portion (62) and second portion (56), respectively.

6. The hinge-down ceiling panel assembly according to one of the preceding claims, wherein each pivot member (44) consists of a first portion (46) having an angle (49) on one end and a second portion (48) integral with the first portion (46),
characterized

- **in that** the pivot member (44) consists of a single piece of stamped metal sheet,
- **in that** a fourth slot (52) is provided in the third and fourth sidewalls (40, 42) near the first sidewall (43) for slidably receiving the first portion (46) of the pivot member (44), and
- **in that** a further tab (70') is notched out of the first sidewall (43) near each end part, and is bent substantially perpendicularly to the first sidewall (43), such that the free end of the further tab (70') faces the second sidewall (41), which further tab (70') includes a fifth slot (72') for slidably receiving the second portion (48) of the pivot member (44).

7. The hinge-down ceiling panel assembly according to claim 6, **characterized in that** the second portion (48) of the pivot member (44) is broader than the fifth slot (72') of the further bend tab (70') and has a tapered edge (47) for fixing the pivot member (44) in the fifth slot (72') of the bend tab (70') in a predetermined position.

8. Suspended ceiling system (10) comprising a plurality of support members (12) spaced in parallel relation to one another and at least one hinge-down ceiling panel assembly (14) according to one of the preceding claims, the assembly (14) spanning the distance between two adjacent support members (12).

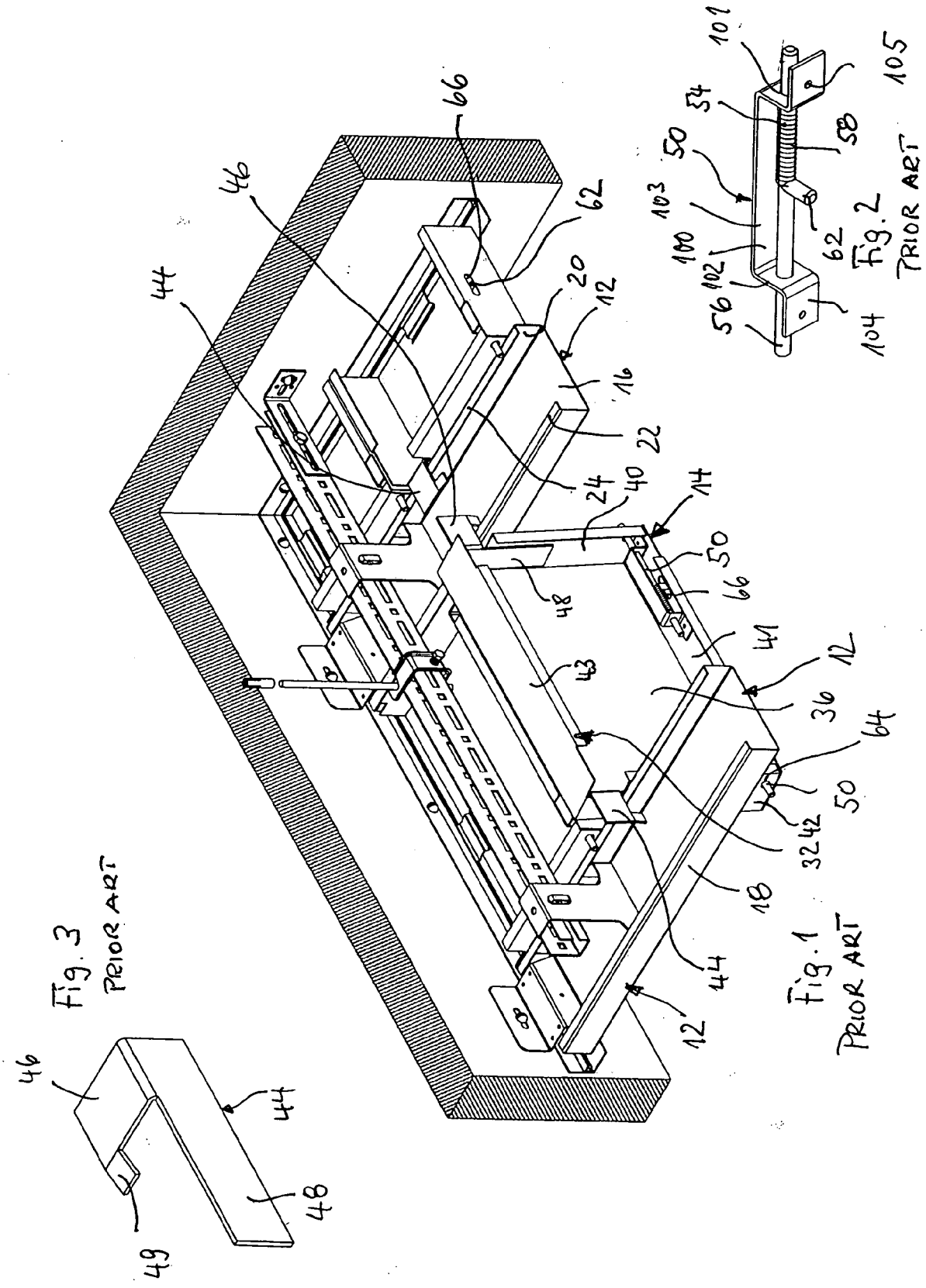

Fig. 1
PRIOR ART

Fig. 2
PRIOR ART

Fig. 3
PRIOR ART

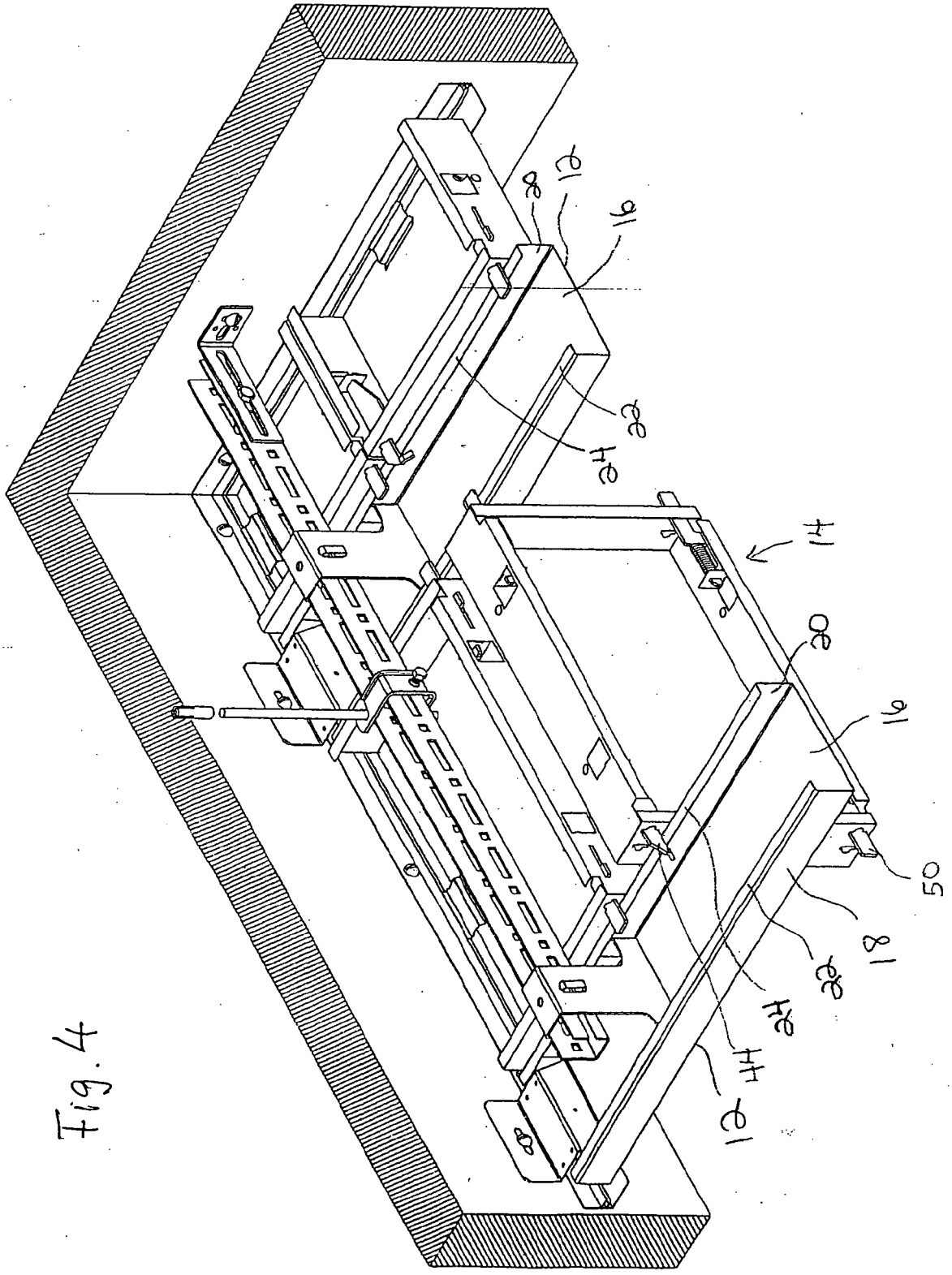

Fig. 4

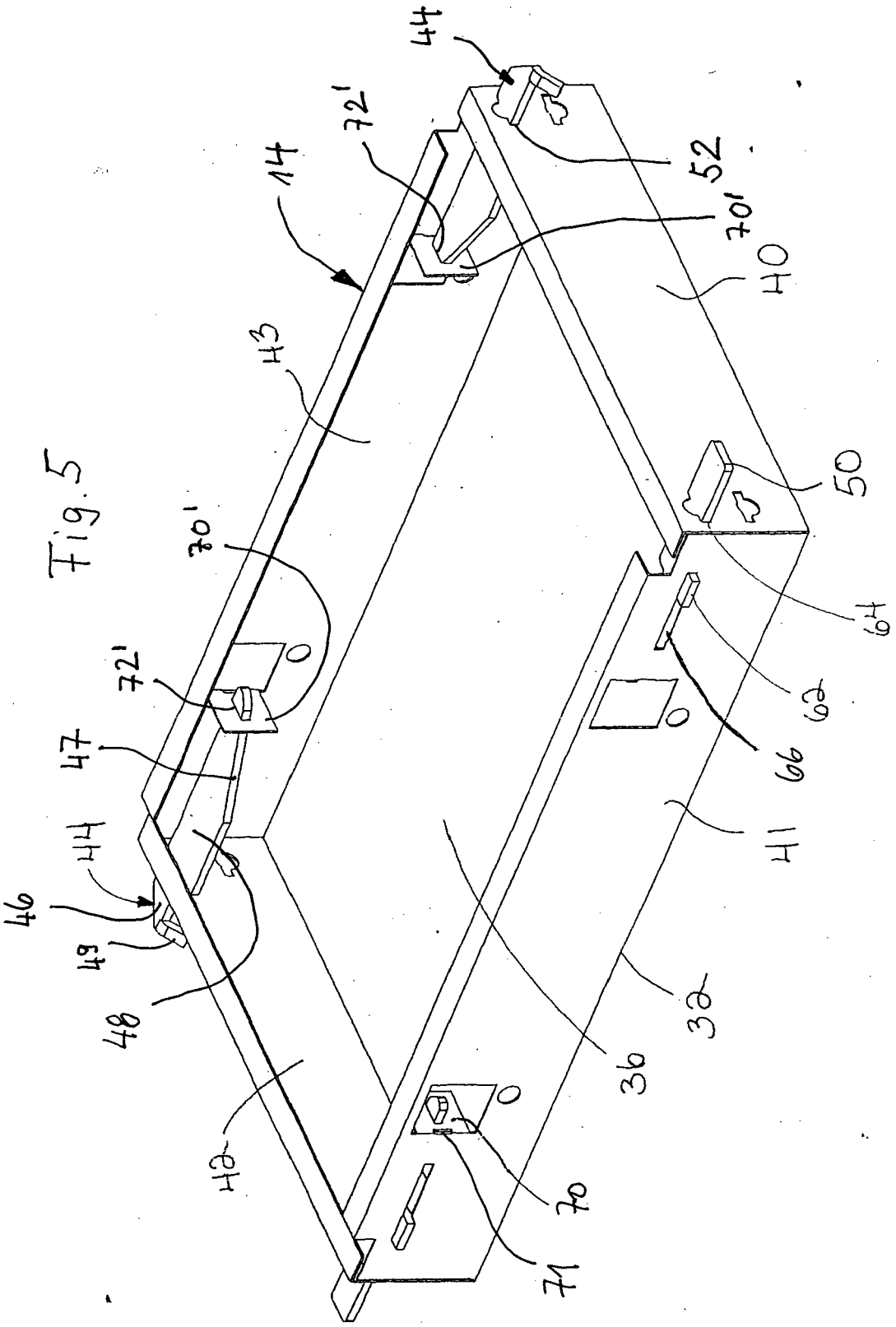

Fig. 5

Fig. 6

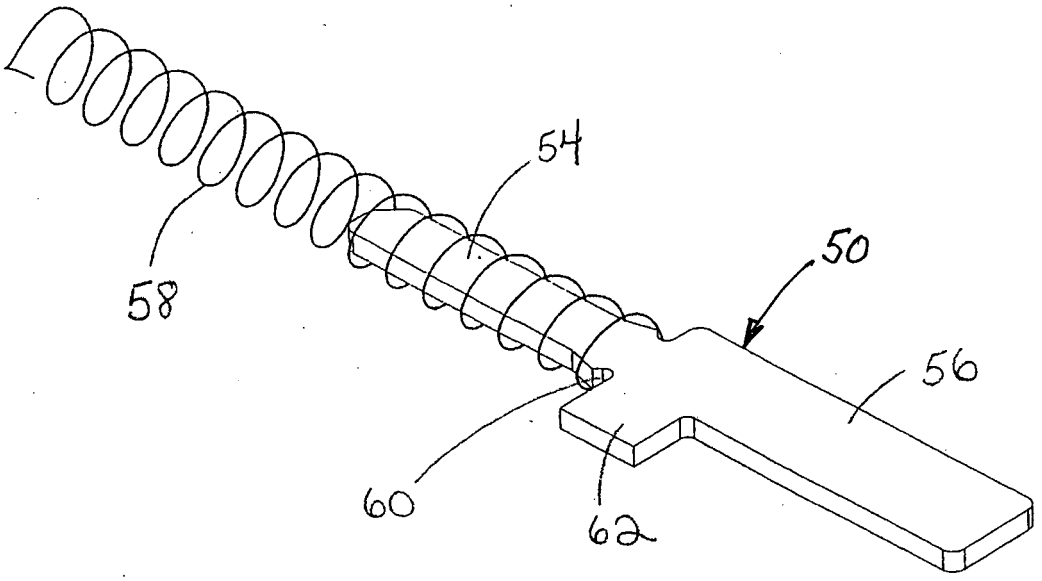

Fig. 7

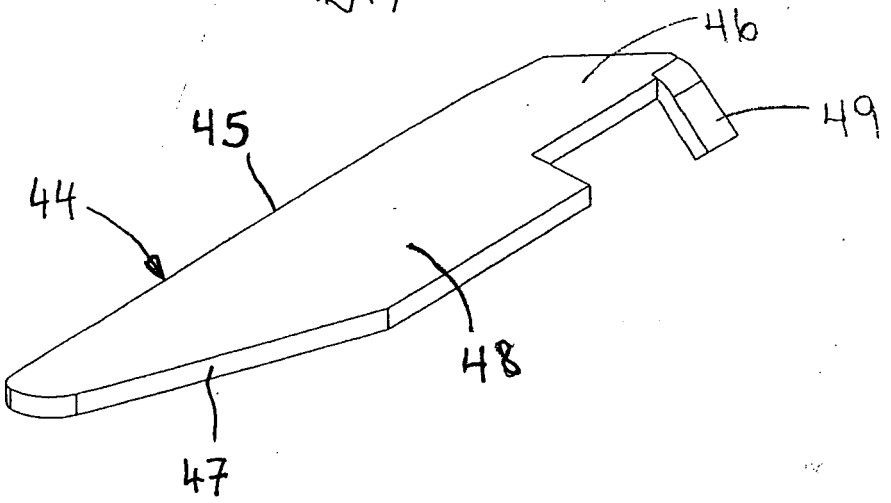

Fig.8

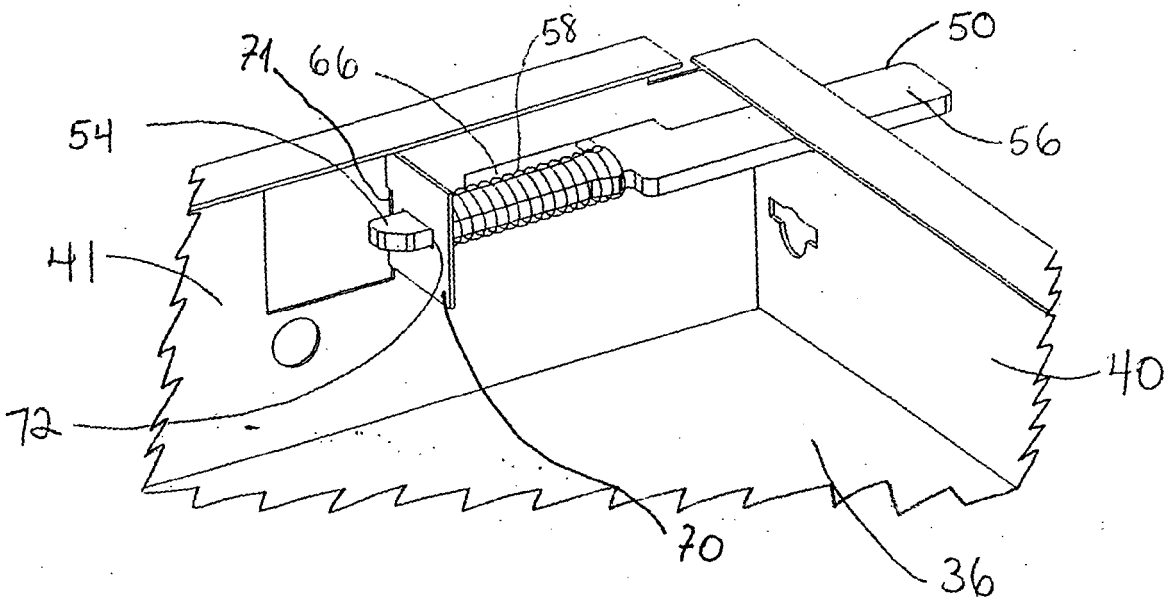

Fig.9

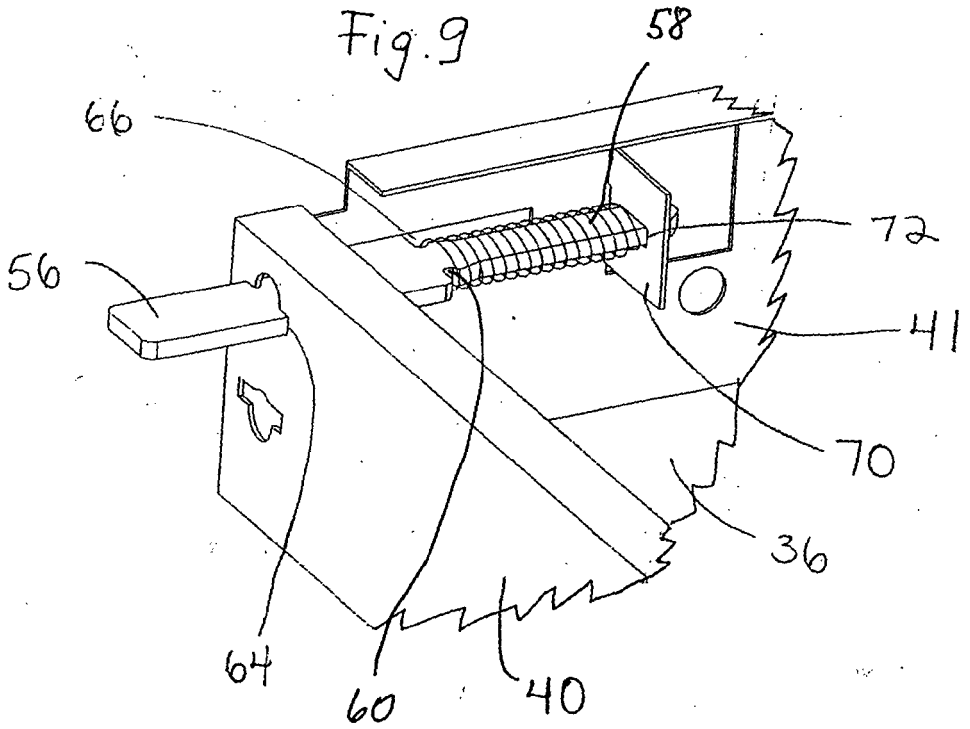

Fig. 10

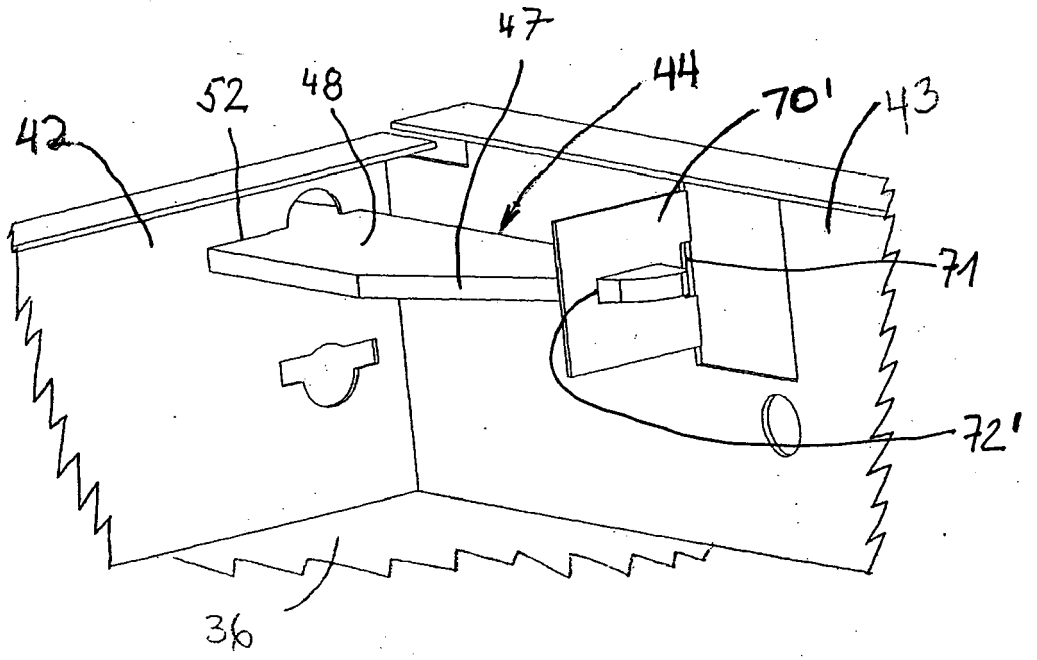

Fig. 11

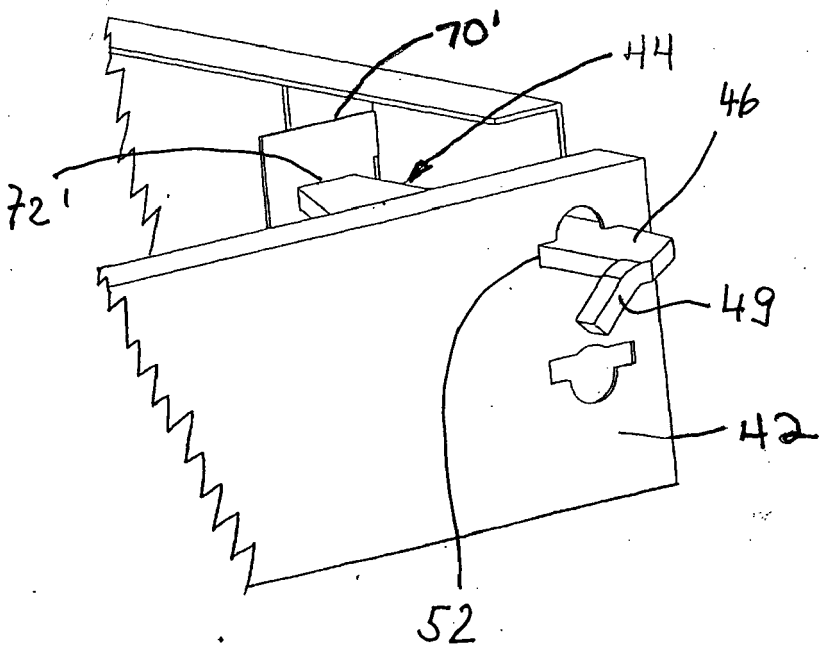

Fig. 12

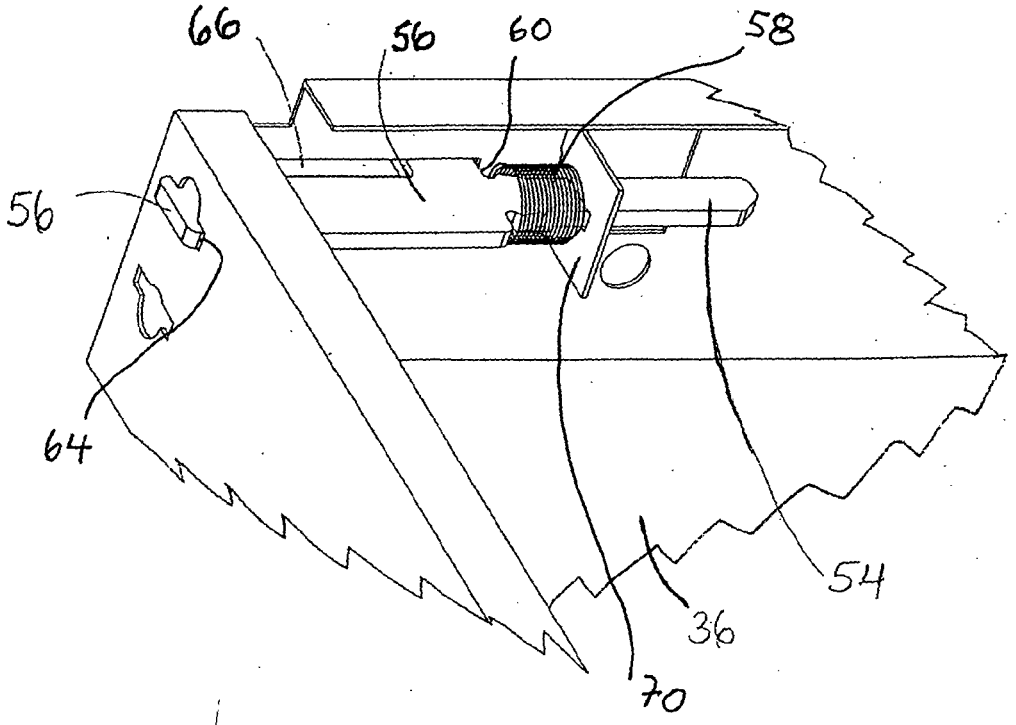

Fig. 13