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(54) **Slide rail assembly**

Schiienenanordnung

Ensemble de rail de glissement

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US-A- 5 417 490 US-A1- 2007 164 644

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Description

Field of the Invention

[0001] The present invention relates to a slide rail assembly and more particularly to a slide rail assembly having two slide rails which are simultaneously displaceable.

Background of the Invention

[0002] US Patent Nos. 6,997,529 B and 7,413,269 B2, both granted to Chen et al., disclose a slide rail assembly featuring simultaneous displacement of two slide rails and are referenced when the present invention was made. US 2007/0164644A discloses a further example of a slide rail assembly. As two simultaneously displaceable slide rails provide better support, a slide rail assembly having such slide rails can withstand a higher load and is therefore well received on the market. The present invention aims to provide an improved version of such a slide rail assembly.

Summary of the Invention

[0003] The present invention relates to a slide rail assembly having two slide rails which can be displaced simultaneously.

[0004] According to one aspect of the present invention, a slide rail assembly includes a first rail; a second rail slidably connected to the first rail, the second rail having an opening; a third rail slidably connected to the second rail; a guiding base provided on the first rail, the guiding base having a pair of guiding portions and a stop portion, the guiding portions defining a guiding path and a guiding entrance in communication with the guiding path; a first contact member provided on the second rail, the first contact member including a pair of first contact portions and a pair of second contact portions connected to the first contact portions, wherein the second contact portions extend through the opening of the second rail and correspond to the guiding entrance of the guiding base; and a second contact member provided on the third rail, the second contact member having at least one lateral portion corresponding to one of the first contact portions of the first contact member. The guiding path of the guiding base has a first width, the guiding entrance of the guiding base has a second width, and the second contact portions of the first contact member define a third width therebetween, wherein the third width is greater than the first width but less than the second width. When the third rail is pulled out from a retracted position relative to the second rail, the lateral portion of the second contact member is pressed against the corresponding one of the first contact portions of the first contact member such that the second rail is displaced simultaneously with the third rail by means of the first contact member. Once the second rail is displaced to a predetermined position relative to the first rail, the first contact member abuts against the

guiding base, and the second contact portions of the first contact member are guided by the guiding path of the guiding base. Consequently, with the first contact portions of the first contact member displaced toward each other, the lateral portion of the second contact member separates from the corresponding one of the first contact portions of the first contact member, allowing the third rail to be pulled out and displaced relative to the second rail.

[0005] Preferably, the slide rail assembly further includes a fixing base fixed to the first rail. The fixing base has a pair of arms which define a clamping space therebetween, and the second contact member has a projection corresponding to the clamping space. When in the retracted position, the projection of the second contact member extends into the clamping space and is clamped by the arms of the fixing base.

[0006] Preferably, the second contact member has a pair of the aforesaid lateral portions which correspond respectively to the first contact portions of the first contact member.

[0007] Preferably, the lateral portions of the second contact member have inner surfaces facing each other and defining a fourth width therebetween, and the first contact portions of the first contact member have outer surfaces facing away from each other and defining a fifth width therebetween, wherein the fifth width is slightly greater than the fourth width.

[0008] Preferably, the first contact portions of the first contact member form a V shape.

Brief Description of the Drawings

[0009] The invention as well as a preferred mode of use and the advantages thereof will be best understood by referring to the following detailed description of some illustrative embodiments in conjunction with the accompanying drawings, wherein:

FIG. 1 is an exploded perspective view of the slide rail assembly in one embodiment of the present invention;

FIG. 2 is a perspective view showing the arrangement of certain components in one embodiment of the present invention;

FIG. 3 is a perspective view showing how the first contact member in one embodiment of the present invention is disposed;

FIG. 4 is a perspective view of the second contact member in one embodiment of the present invention;

FIG. 5 is a schematic plan view showing how the first contact member in one embodiment of the present invention is installed on the second rail;

FIG. 6 is a schematic drawing in which the slide rail assembly in one embodiment of the present invention is in a retracted position, showing in particular the relationships between certain components in this position;

FIG. 7 is a schematic drawing showing how the second rail in one embodiment of the present invention is displaced simultaneously with the third rail;

FIG. 8a is a schematic sectional view in which the second rail in one embodiment of the present invention has been displaced simultaneously with the third rail for a certain distance;

FIG. 8b is a schematic sectional view in which the second rail in one embodiment of the present invention has been displaced simultaneously with the third rail such that the second contact portions of the first contact member partially enter the guiding base;

FIG. 9a is a schematic drawing in which the second contact portions of the first contact member in one embodiment of the present invention have entered the guiding base such that the first contact member is compressed by the guiding base;

FIG. 9b schematically shows how the second contact member in one embodiment of the present invention moves past the first contact member;

FIG. 9c is a schematic drawing in which the second contact member in one embodiment of the present invention has separated from the first contact member in a pulling direction;

Fig. 9d is a schematic drawing in which the second contact portions of the first contact member in one embodiment of the present invention are pressed against the stop portion of the guiding base, thus bringing the second rail to its farthest extended position relative to the first rail;

FIG. 10 schematically shows how the slide rail assembly in one embodiment of the present invention is extended; and

FIG. 11 is a schematic drawing in which the second contact member in one embodiment of the present invention has moved past the first contact member in a retracting direction.

Detailed Description of the Invention

[0010] FIG. 1 shows the slide rail assembly in one embodiment of the present invention. The slide rail assembly includes a first rail 10, a second rail 12, a third rail 14, a fixing base 16, a guiding base 18, a first contact member

20, and a second contact member 22.

[0011] The first rail 10 includes an upper wall 24a, a lower wall 24b, and a sidewall 26 extending between the upper wall 24a and the lower wall 24b. The upper wall 24a, the lower wall 24b, and the sidewall 26 of the first rail 10 jointly define a first channel 28. The sidewall 26 has a front end 30a and a rear end 30b.

[0012] The second rail 12 is slidably connected to the first rail 10. The second rail 12 also includes an upper wall 32a, a lower wall 32b, and a sidewall 34 extending between the upper wall 32a and the lower wall 32b. The upper wall 32a, the lower wall 32b, and the sidewall 34 of the second rail 12 jointly define a second channel 36. The sidewall 34 has an opening 38.

[0013] The third rail 14 is slidably connected to the second rail 12.

[0014] The fixing base 16 is fixedly mounted on the first rail 10 and is adjacent to the rear end 30b of the first rail 10. The fixing base 16 is located in the first channel 28 of the first rail 10. The fixing base 16 includes a pair of arms 40. The arms 40 define a clamping space 42 therebetween.

[0015] The guiding base 18 is provided on the sidewall 26 of the first rail 10 and is located in the first channel 28 of the first rail 10. As shown in FIG. 2, the guiding base 18 has a pair of longitudinal guiding portions 44 and a stop portion 46. The longitudinal guiding portions 44 define a guiding path 48 and a guiding entrance 50 in communication with the guiding path 48. Each of the longitudinal guiding portions 44 has a surface 52 which is located in the guiding path 48 and the guiding entrance 50. More specifically, the surfaces 52 of the longitudinal guiding portions 44 that are located in the guiding path 48 define a first width W1 therebetween, and the surfaces 52 of the longitudinal guiding portions 44 that are located at the guiding entrance 50 define a second width W2 therebetween.

[0016] As shown in FIG. 3, the first contact member 20 is provided on the sidewall 34 of the second rail 12. The first contact member 20 includes a pair of first contact portions 54 and a pair of second contact portions 56 which are connected to the first contact portions 54. The second contact portions 56 extend through the opening 38 of the second rail 12. Referring back to FIG. 2, the second contact portions 56 correspond to the guiding entrance 50 of the guiding base 18. In one preferred embodiment, the first contact portions 54 form a V shape, the second contact portions 56 have surfaces 58 which face away from each other, and the surfaces 58 define a third width W3 therebetween, wherein the third width W3 is greater than the first width W1 of the guiding path 48 of the guiding base 18 but less than the second width W2 at the guiding entrance 50 of the guiding base 18. Preferably, each of the second contact portions 56 has an inclined surface 57 corresponding to the guiding entrance 50 of the guiding base 18 so that the guiding base 18 can guide the second contact portions 56 with ease.

[0017] As shown in FIG. 1, the second contact member

22 is provided on the third rail 14. The second contact member 22 includes a pair of lateral portions 60 and a projection 62. The lateral portions 60 correspond to the first contact portions 54 of the first contact member 20 respectively while the projection 62 corresponds to the clamping space 42 of the fixing base 16. Preferably, as shown in FIG. 4, the lateral portions 60 have inner surfaces 61 which face each other, and the inner surfaces 61 define a fourth width W4 therebetween. Also preferably, as shown in FIG. 5, the first contact portions 54 of the first contact member 20 have outer surfaces 55 which face away from each other, and the outer surfaces 55 define a fifth width W5 therebetween, wherein the fifth width W5 is slightly greater than the fourth width W4.

[0018] In FIG. 6, the slide rail assembly in one embodiment of the present invention is in a retracted state, in which the second contact member 22 is located between the first contact member 20 and the fixing base 16, and the projection 62 of the second contact member 22 is inserted in the clamping space 42 of the fixing base 16. With the arms 40 of the fixing base 16 clamping the projection 62 of the second contact member 22, the slide rail assembly is kept in the retracted state, and the third rail 14 is prevented from sliding outward even when tilted.

[0019] In FIG. 7 and FIG. 8a, the third rail 14 has been pulled out relative to the first rail 10. More specifically, a portion of the third rail 14 has been pulled out beyond the front end 30a of the first rail 10. In consequence, the second contact member 22 is released from the clamping space 42 of the fixing base 16. At the same time, the lateral portions 60 of the second contact member 22 are pressed against the first contact member 20 due to the fact that the fifth width W5 is slightly greater than the fourth width W4. Therefore, as the third rail 14 is pulled out, the second rail 12 is simultaneously displaced with the third rail 14.

[0020] In FIG. 8b, the first contact member 20, against which the second contact member 22 is pressed, has been displaced to the guiding base 18, with the second contact portions 56 of the first contact member 20 partially entering the guiding entrance 50 of the guiding base 18. As the third width W3 between the second contact portions 56 is greater than the first width W1 of the guiding path 48 of the guiding base 18 but less than the second width W2 at the guiding entrance 50 of the guiding base 18 (see FIG. 2 and FIG. 3), the first contact member 20, once pushed and displaced by the second contact member 22 to a predetermined position, enters the guiding path 48 of the guiding base 18 through the guiding entrance 50 of the guiding base 18, as shown in FIG. 9a. Meanwhile, the second contact portions 56 of the first contact member 20 are guided by the guiding path 48 of the guiding base 18 and compressed toward each other, and in consequence, the first contact portions 54 of the first contact member 20 are also compressed toward each other. In this compressed state as shown in FIG. 9b, the outer surfaces 55 of the first contact portions 54 of the first contact member 20 define a sixth width W6

therebetween, and the sixth width W6 is less than or at least equal to the fourth width W4.

[0021] The third rail 14 is continuously pulled out as shown in FIG. 9c, Fig. 9d and FIG. 10. Since the sixth width W6 is less than or at least equal to the fourth width W4, the second contact member 22 is able to move past the first contact member 20 and thus the lateral portions 60 of the second contact member 22 are no longer in contact with the first contact portions 54 of the first contact member 20. As a result, the second rail 12 ceases to be pulled along with the third rail 14 and stays at the guiding base 18, thanks to the first contact member 20. The second rail 12 stops as soon as it is extended to this position. The third rail 14 in this state, however, can be continuously pulled out relative to the second rail 12. Preferably, with continuously pulled out relative to the second rail 12, the third rail 14 is eventually brought into driving engagement with the second rail 12 in the same way as the conventional slide rails, driving the second rail 12 to move again. In this way, the second rail 12 reaches its farthest extended position relative to the first rail 10 when the second contact portions 56 of the first contact member 20 are pressed against the stop portion 46 of the guiding base 18.

[0022] The third rail 14 when retracted from an extended position relative to the first rail 10 is displaced relative to the second rail 12. The displacement of the third rail 14 relative to the second rail 12 will eventually cause the second contact member 22 to move past the first contact member 20, as shown in FIG. 11. Afterward, the third rail 14 will be brought into driving engagement with the second rail 12 in the same way as the conventional slide rails, allowing the second rail 12 to be pushed relative to the first rail 10, and the first contact member 20 will separate from the guiding base 18 in due course. Once the third rail 14 and the second rail 12 are fully retracted relative to the first rail 10, the slide rail assembly resumes the retracted state shown in FIG. 6.

[0023] While the present invention has been disclosed by way of the foregoing preferred embodiments, the embodiments are not intended to restrict the scope of the present invention. The scope of the present invention is defined only by the appended claims.

Claims

1. A slide rail assembly comprising:

- a first rail (10);
- a second rail (12) slidably connected to the first rail (10), the second rail (12) having an opening (38);
- a third rail (14) slidably connected to the second rail (12);
- a guiding base (18) provided on the first rail (10), the guiding base (18) having a pair of guiding portions (44) and a stop portion (46), the guiding

portions (44) defining a guiding path (48) and a guiding entrance (50) in communication with the guiding path (48);

a first contact member (20) provided on the second rail (12), the first contact member (20) comprising a pair of first contact portions (54) and a pair of second contact portions (56) connected to the first contact portions (54), wherein the second contact portions (56) extend through the opening (38) of the second rail (12) and correspond to the guiding entrance (50) of the guiding base (18); and

a second contact member (22) provided on the third rail (14), the second contact member (22) having at least one lateral portion (60) corresponding to one of the first contact portions (54) of the first contact member (20);

wherein the guiding path (48) of the guiding base (18) has a first width (W1), the guiding entrance (50) of the guiding base (18) has a second width (W2), and the second contact portions (56) of the first contact member (20) define a third width (W3) therebetween; **characterised by**: the third width (W3) being greater than the first width (W1) but less than the second width (W2);

wherein when the third rail (14) is pulled out from a retracted position relative to the second rail (12), the lateral portion (60) of the second contact member (22) is pressed against the corresponding one of the first contact portions (54) of the first contact member (20) such that the second rail (12) is displaced simultaneously with the third rail (14) due to the first contact member (20); and

wherein when the second rail (12) is displaced to a predetermined position relative to the first rail (10), the first contact member (20) abuts against the guiding base (18), and the second contact portions (56) of the first contact member (20) are guided by the guiding path (48) of the guiding base (18) such that the first contact portions (54) of the first contact member (20) are displaced toward each other, causing the lateral portion (60) of the second contact member (22) to separate from the corresponding one of the first contact portions (54) of the first contact member (20), thus allowing the third rail (14) to be pulled out and displaced relative to the second rail (12).

2. The slide rail assembly of claim 1, further comprising a fixing base (16) fixed to the first rail (10), the fixing base (16) having a pair of arms (40), the arms (40) defining a clamping space (42) therebetween, the second contact member (22) having a projection (62) corresponding to the clamping space (42), wherein when in the retracted position, the projection (62) of the second contact member (22) extends into the

clamping space (42) and is clamped by the arms (40) of the fixing base (16).

3. The slide rail assembly of claim 1, wherein the second contact member (22) has two lateral portions (60) which correspond respectively to the first contact portions (54) of the first contact member (20).
4. The slide rail assembly of claim 3, wherein the lateral portions (60) of the second contact member (22) each have an inner surface (61), the two inner surfaces (61) facing each other and defining a fourth width (W4) therebetween, and the first contact portions (54) of the first contact member (20) each have an outer surface (55), the two outer surfaces (55) facing away from each other and defining a fifth width (W5) therebetween, the fifth width (W5) being slightly greater than the fourth width (W4).
5. The slide rail assembly of claim 1, wherein the first contact portions (54) of the first contact member (20) form a V shape.

Patentansprüche

1. Ein Gleitschienenaufbau, umfassend:

eine erste Schiene (10);

eine zweite Schiene (12), die gleitbar an der ersten Schiene (10) befestigt ist und eine Öffnung (38) aufweist;

eine dritte Schiene (14), die gleitbar an der zweiten Schiene (12) befestigt ist;

einen Führungskörper (18) an der ersten Schiene (10), wobei der Führungskörper (18) ein Paar Führungsteile (44) und einen Anschlagteil (46) aufweist; mit den Führungsteilen (44) einen Führungsweg (48) und einen Führungseingang (50) gebildet werden, wobei letzterer mit dem Führungsweg (48) verbunden ist;

ein erstes Kontaktglied (20) an der zweiten Schiene (12), wobei das erste Kontaktglied (20) ein Paar erster Kontaktteile (54) und ein paar zweiter Kontaktteile (56), die an den ersten Kontaktteilen (54) befestigt sind, umfaßt; die zweite Kontaktteile (56) durch die Öffnung (38) der zweiten Schiene (12) ragt und mit dem Führungseingang (50) des Führungskörpers (18) übereinstimmt; und

ein zweites Kontaktglied (22) an der dritten Schiene (14), wobei das zweite Kontaktglied (22) mindestens einen Seitenteil (60) in Übereinstimmung mit einem der ersten Kontaktteile (54) des ersten Kontaktgliedes (20) aufweist; wobei der Führungsweg (48) des Führungskörpers (18) eine erste Breite (W1), der Führungseingang (50) des Führungskörpers (18) eine

- zweite Breite (W2) und die zweiten Kontaktteile (56) des ersten Kontaktgliedes (20) eine dritte Breite (W3) dazwischen aufweisen; **dadurch gekennzeichnet, dass** die dritte Breite (W3) größer als die erste Breite (W1), jedoch geringer als die zweite Breite (W2) ist; wobei beim Herausziehen der dritten Schiene (14) aus einer eingezogenen Position in der zweiten Schiene (12) der Seitenteil (60) des zweiten Kontaktgliedes (22) gegen den entsprechenden der ersten (54) des ersten Kontaktgliedes (20) so angedrückt wird, dass die zweite Schiene (12) wegen dem ersten Kontaktglied (20) gleichzeitig mit der dritten Schiene (14) verschoben wird; und wobei beim Verschieben der zweiten Schiene (12) in eine vorbestimmte Position in der ersten Schiene (10) das erste Kontaktglied (20) an den Führungskörper (18) anstößt und die zweiten Kontaktteile (56) des ersten Kontaktgliedes (20) im Führungsweg (48) des Führungskörper (18) so geführt werden, dass die ersten Kontaktteile (54) des ersten Kontaktgliedes (20) aufeinander zu verschoben werden, wodurch der Seitenteil (60) des zweiten Kontaktgliedes (22) vom entsprechenden der ersten Kontaktteile (54) des ersten Kontaktgliedes (20) entfernt wird, so dass die dritte Schiene (14) aus der zweiten Schiene (12) herausgezogen und zu dieser verschoben werden kann.
2. Der Gleitschienenaufbau nach Anspruch 1, weiter umfassend einen fixierenden Unterteil (16), der an der ersten Schiene (10) befestigt ist; der fixierende Unterteil (16) mit einem Paar Armen (40) und zwischen diesen Armen (40) ein Klemmraum (42) gebildet ist; das zweite Kontaktglied (22) in Übereinstimmung mit dem Klemmraum (42) einen Vorsprung (62) aufweist, wobei in der eingezogenen Position der Vorsprung (62) des zweiten Kontaktgliedes (22) in den Klemmraum (42) ragt und mit den Armen (40) des fixierenden Unterteils (16) eingeklemmt wird.
3. Der Gleitschienenaufbau nach Anspruch 1, wobei das zweite Kontaktglied (22) in Übereinstimmung mit je einem der ersten Kontaktteile (54) des ersten Kontaktgliedes (20) zwei Seitenteile (60) aufweist.
4. Der Gleitschienenaufbau nach Anspruch 3, wobei die Seitenteile (60) des zweiten Kontaktgliedes (22) je eine Innenfläche (61) aufweisen; die beiden Innenflächen (61) einander gegenüber gebildet sind und dazwischen eine vierte Breite (W4) bilden, während die ersten Kontaktteile (54) des ersten Kontaktgliedes (20) je eine Außenfläche (55) aufweisen, diese beiden Außenflächen (55) voneinander weg gerichtet sind und dazwischen eine fünfte Breite (W5)

bilden; die fünfte Breite (W5) dabei leicht größer als die vierte Breite (W4) ist.

5. Der Gleitschienenaufbau nach Anspruch 1, wobei die ersten Kontaktteile (54) des ersten Kontaktgliedes (20) eine V-Form bilden.

Revendications

1. Ensemble de rails coulissants, **caractérisé par le fait qu'il comprend:**

un premier rail (10) ;
 un deuxième rail (12) raccordé de façon coulissante au premier rail (10), le deuxième rail (12) présentant une ouverture (38) ;
 un troisième rail (14) raccordé de façon coulissante au deuxième rail (12) ;
 une base de guidage (18) prévue sur le premier rail (10), la base de guidage (18) présentant une paire de parties de guidage (44) et une partie d'arrêt (46), les parties de guidage (44) définissant une trajectoire de guidage (48) et une entrée de guidage (50) en communication avec la trajectoire de guidage (48) ;
 un premier élément de contact (20) prévu sur le deuxième rail (12), le premier élément de contact (20) comprenant une paire de premières parties de contact (54) et une paire de secondes parties de contact (56) raccordées aux premières parties de contact (54), dans lequel les secondes parties de contact (56) se prolongent à travers l'ouverture (38) du deuxième rail (12) et correspondent à l'entrée de guidage (50) de la base de guidage (18) ; et
 un second élément de contact (22) prévu sur le troisième rail (14), le second élément de contact (22) présentant au moins une partie latérale (60) correspondant à l'une des premières parties de contact (54) du premier élément de contact (20) ;

caractérisée par le fait que la trajectoire de guidage (48) de la base de guidage (18) présente une première largeur (W1), l'entrée de guidage (50) de la base de guidage (18) présente une deuxième largeur (W2), et les secondes parties de contact (56) du premier élément de contact (20) définissent une troisième largeur (W3) entre elles ; **caractérisé par** : la troisième largeur (W3) est plus importante que la première largeur (W1) mais moins importante que la deuxième largeur (W2) ;

caractérisée par le fait que lorsque le troisième rail (14) est extrait d'une position rétractée par rapport au deuxième rail (12), la partie latérale (60) du second élément de contact (22) est comprimée contre l'une des premières parties de

contact (54) correspondantes du premier élément de contact (20) de sorte que le deuxième rail (12) est simultanément déplacé avec le troisième rail (14) du fait du premier élément de contact (20) ; et

caractérisée par le fait que lorsque le deuxième rail (12) est déplacé vers une position prédéterminée par rapport au premier rail (10), le premier élément de contact (20) est en butée contre la base de guidage (18), et les secondes parties de contact (56) du premier élément de contact (20) sont guidées par la trajectoire de guidage (48) de la base de guidage (18) de sorte que les premières parties de contact (54) du premier élément de contact (20) sont déplacées l'une vers l'autre, amenant la partie latérale (60) du second élément de contact (22) à se séparer de l'une des premières parties de contact (54) correspondantes du premier élément de contact (20), permettant ainsi au troisième rail (14) d'être extrait et déplacé par rapport au deuxième rail (12).

de contact (54) du premier élément de contact (20) constituent une forme en V.

2. Ensemble de rails coulissants selon la revendication 1, **caractérisé par le fait qu'il** comprend en outre une embase de fixation (16) attachée au premier rail (10), l'embase de fixation (16) présentant une paire de bras (40), les bras (40) définissant un espace de serrage (42) entre eux, le second élément de contact (22) présentant une saillie (62) correspondant à l'espace de serrage (42), dans lequel lorsqu'en position rétractée, la saillie (62) du second élément de contact (22) se prolonge dans l'espace de serrage (42) et est serrée par les bras (40) de l'embase de fixation (16).
3. Ensemble de rails coulissants selon la revendication 1, **caractérisée par le fait que** le second élément de contact (22) présente deux parties latérales (60) qui correspondent respectivement aux premières parties de contact (54) du premier élément de contact (20).
4. Ensemble de rails coulissants selon la revendication 3, **caractérisée par le fait que** les parties latérales (60) du second élément de contact (22) ont chacune une surface interne (61), les deux surfaces internes (61) se faisant face et définissant une quatrième largeur (W4) entre elles, et les premières parties de contact (54) du premier élément de contact (20) ont chacune une surface externe (55), les deux surfaces externes (55) étant disposées dos à dos et définissant une cinquième largeur (W5) entre elles, la cinquième largeur (W5) étant légèrement plus importante que la quatrième largeur (W4).
5. Ensemble de rails coulissants selon la revendication 1, **caractérisée par le fait que** les premières parties

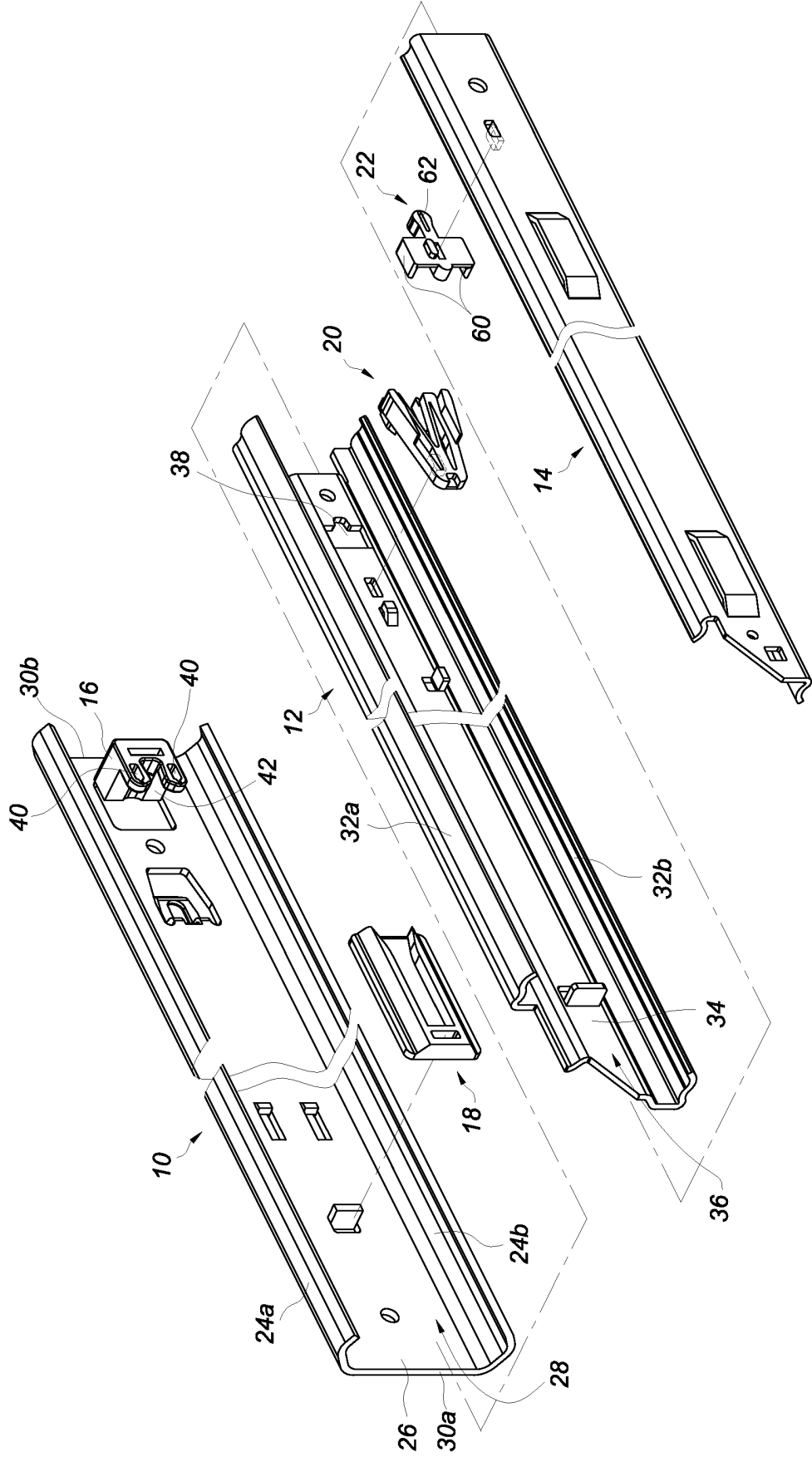


FIG. 1

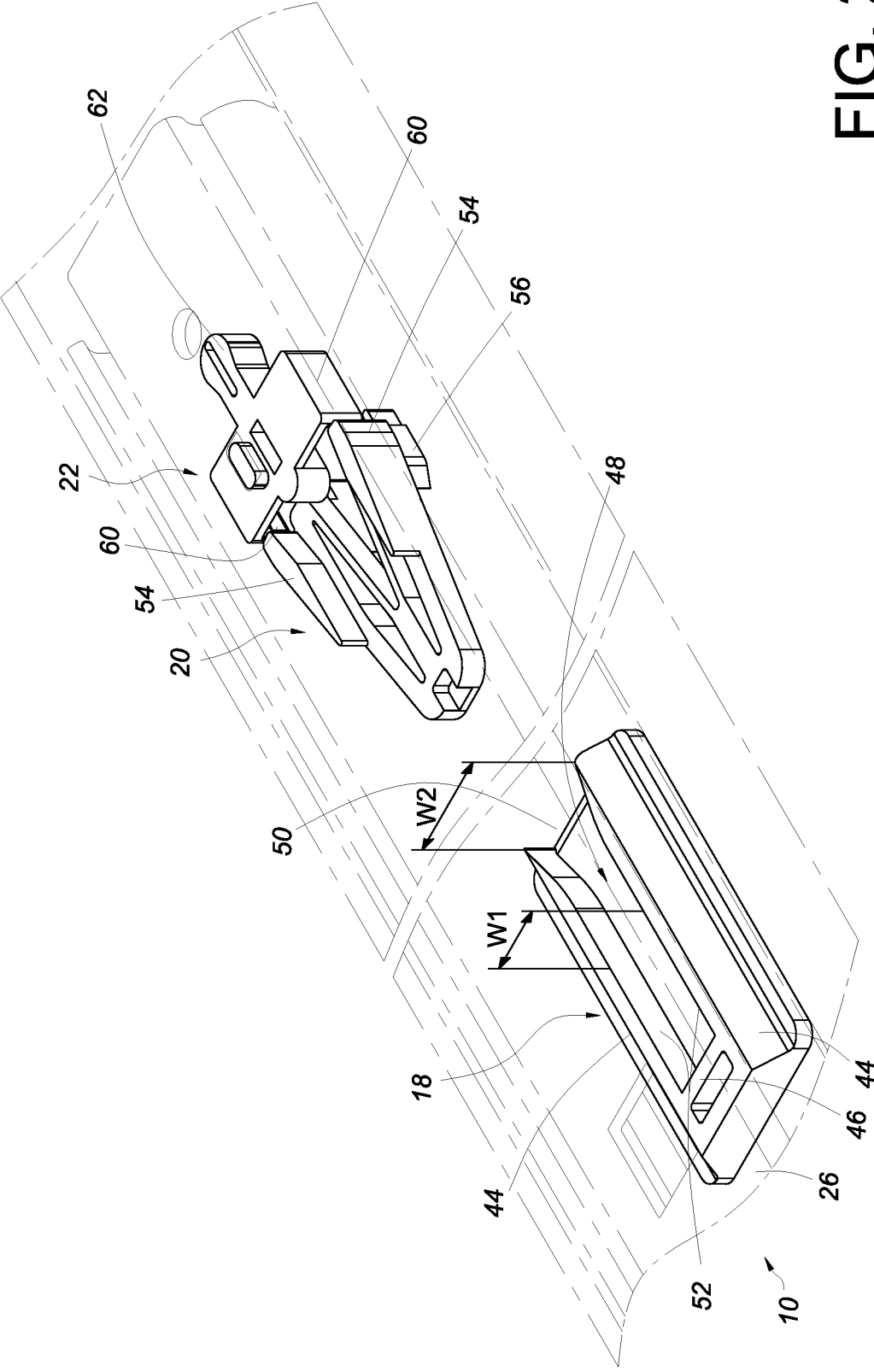


FIG. 2

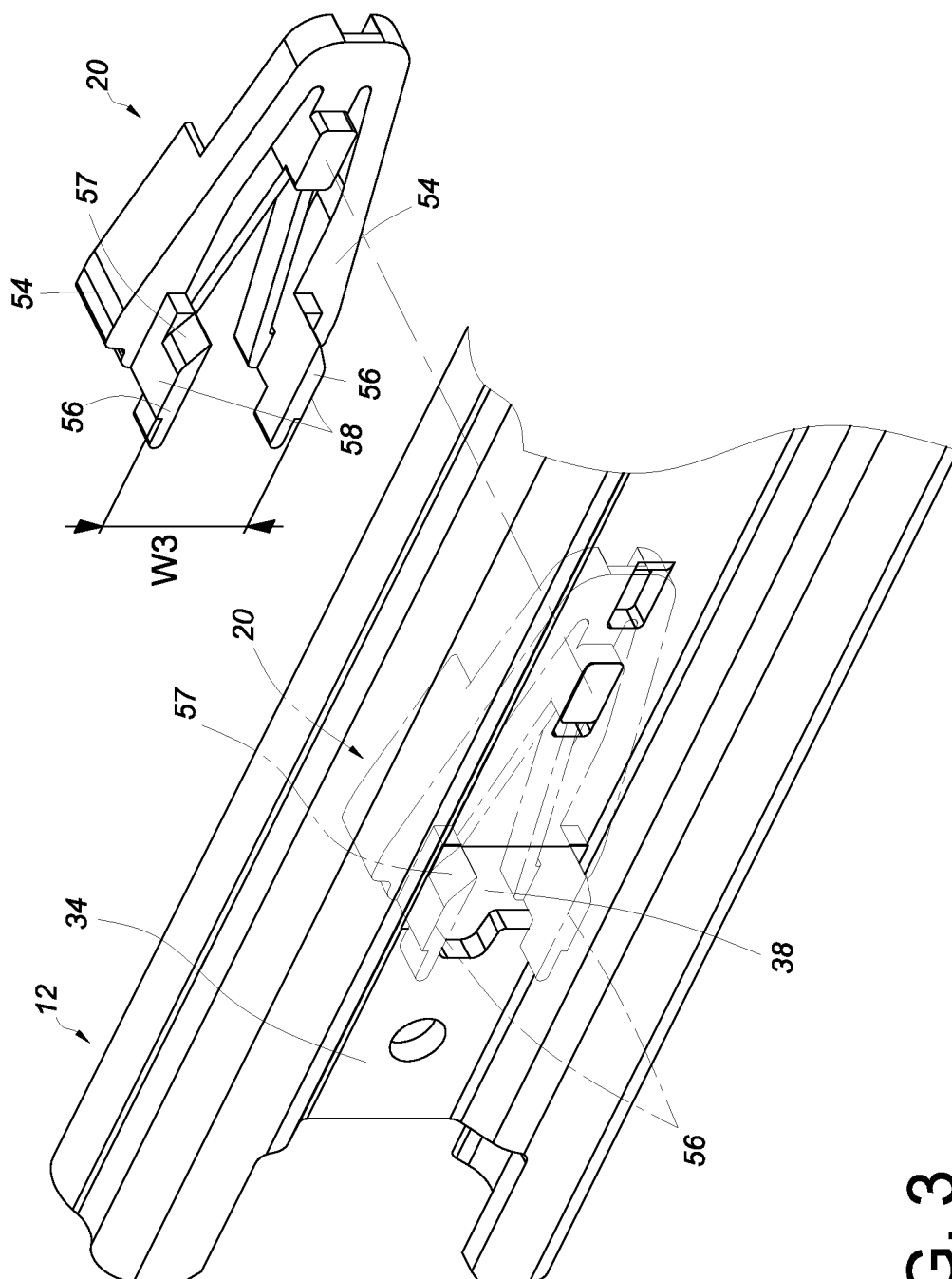


FIG. 3

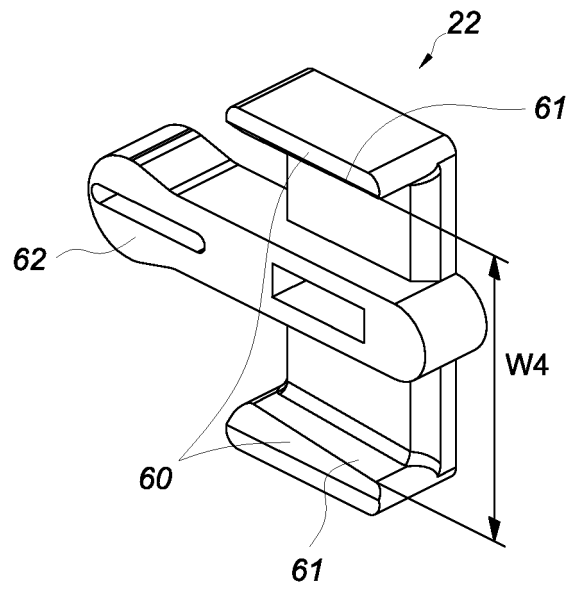


FIG. 4

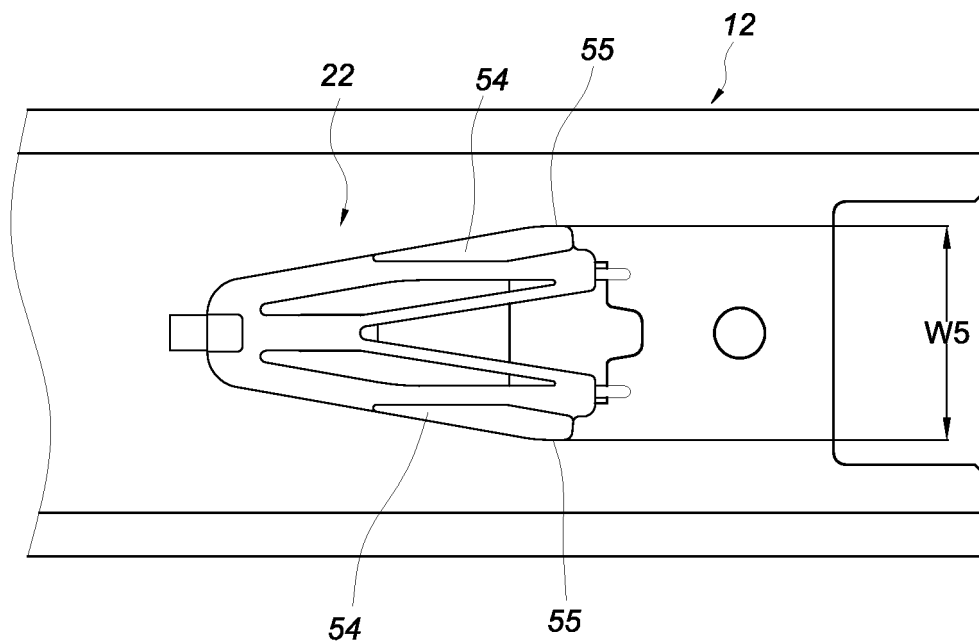


FIG. 5

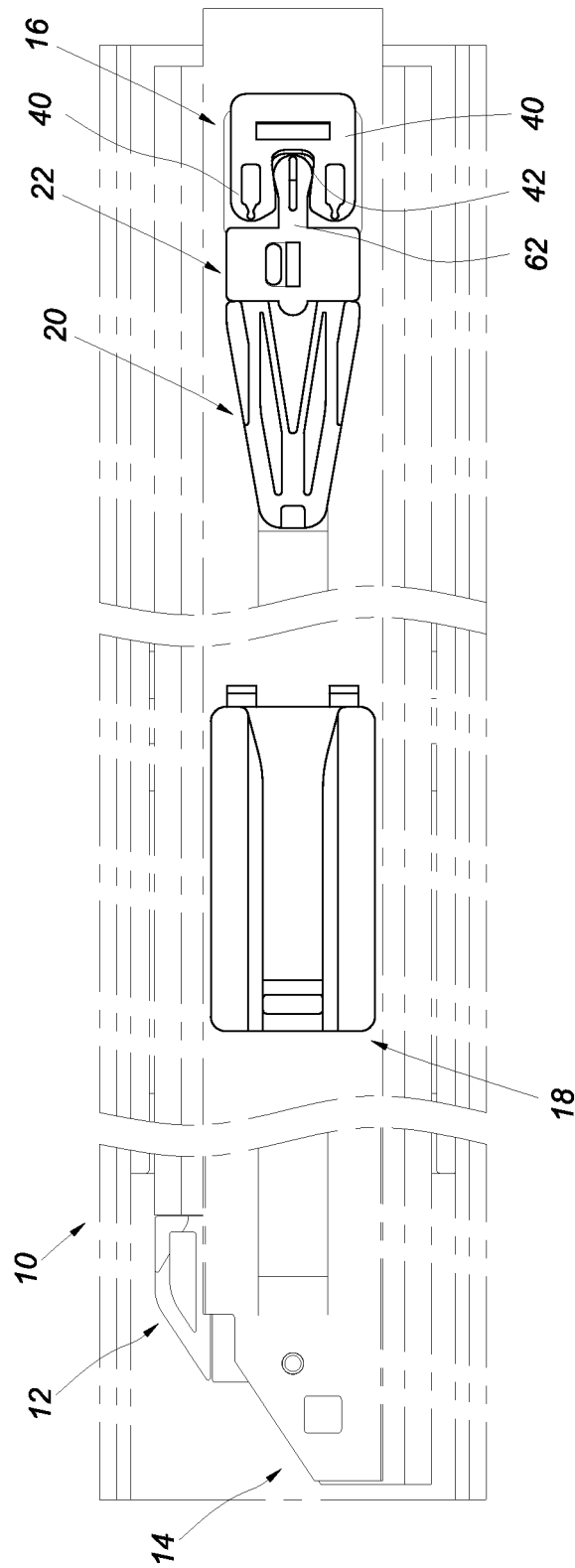


FIG. 6

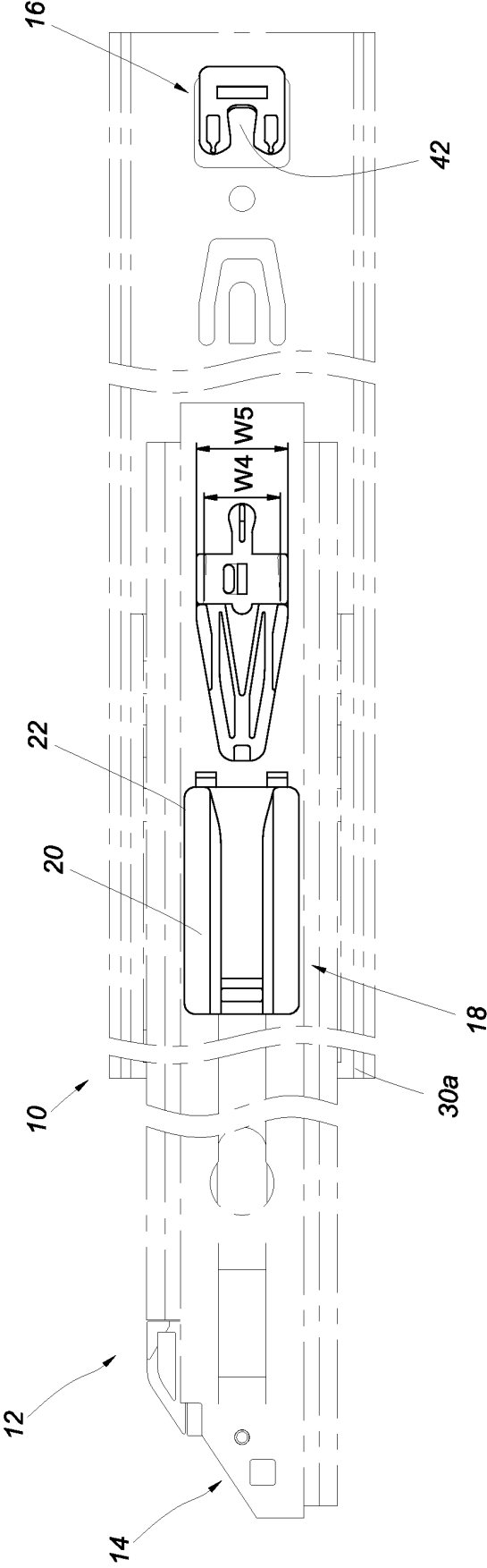
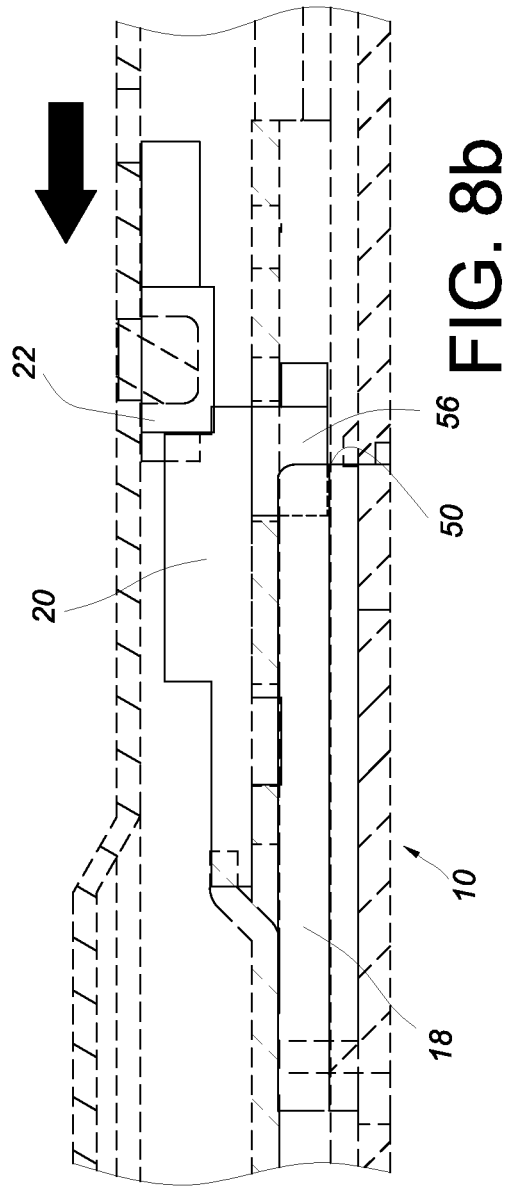
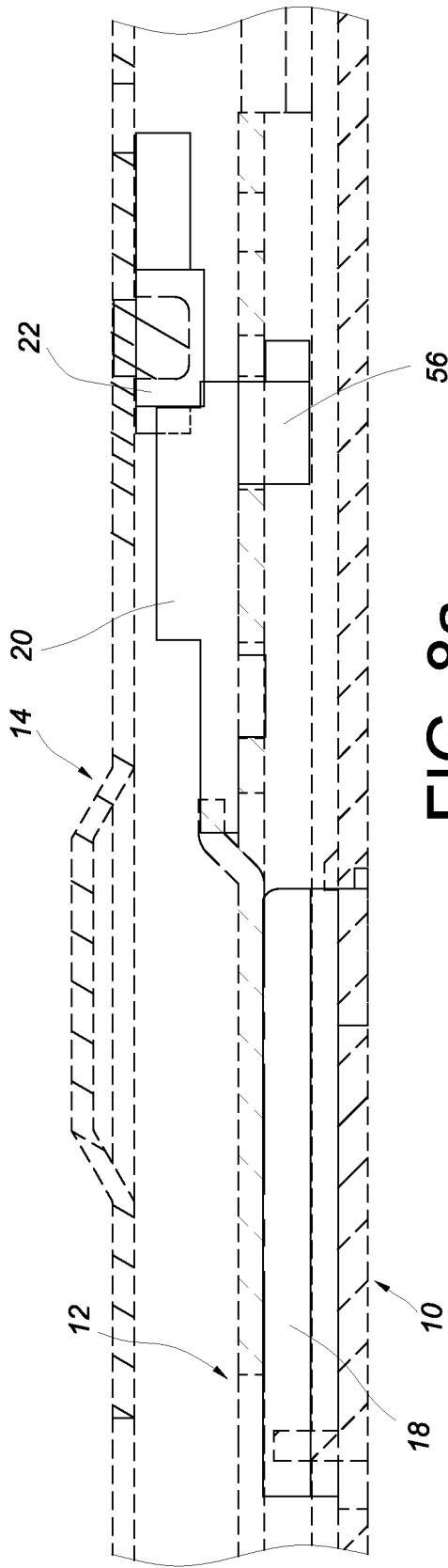


FIG. 7



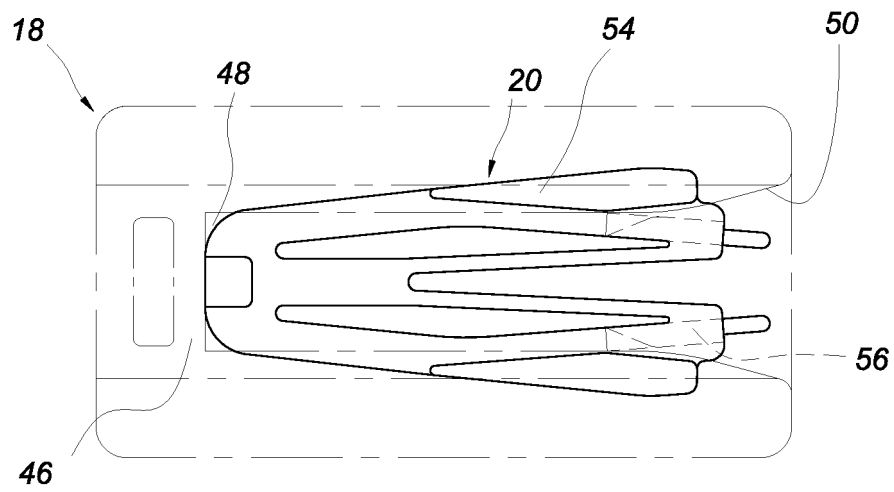


FIG. 9a

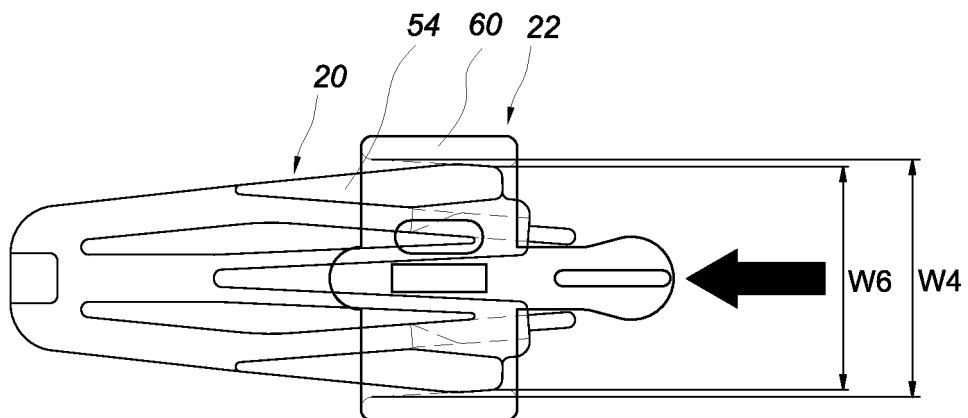


FIG. 9b

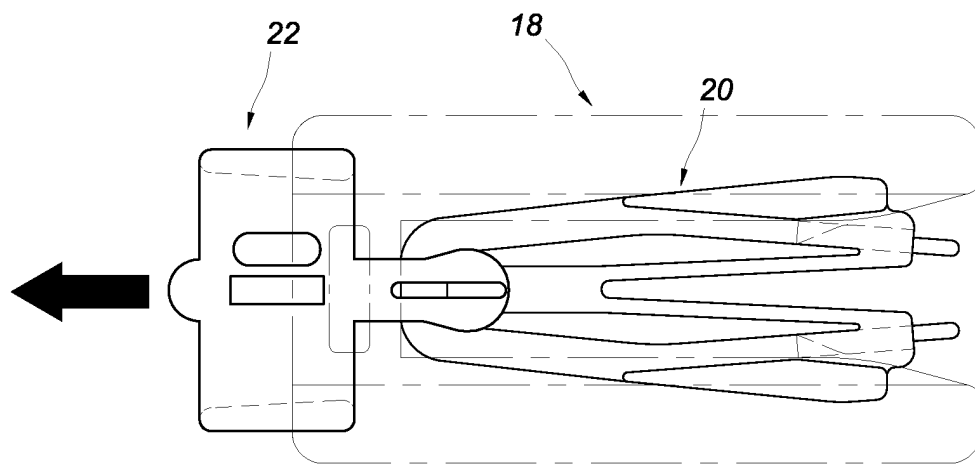


FIG. 9c

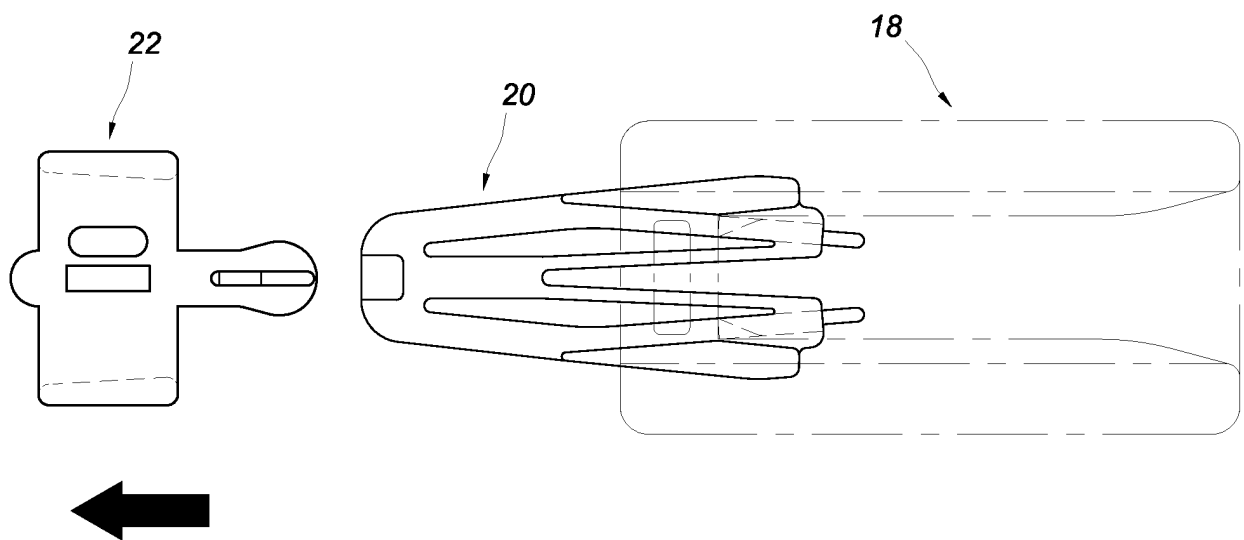


FIG. 9d

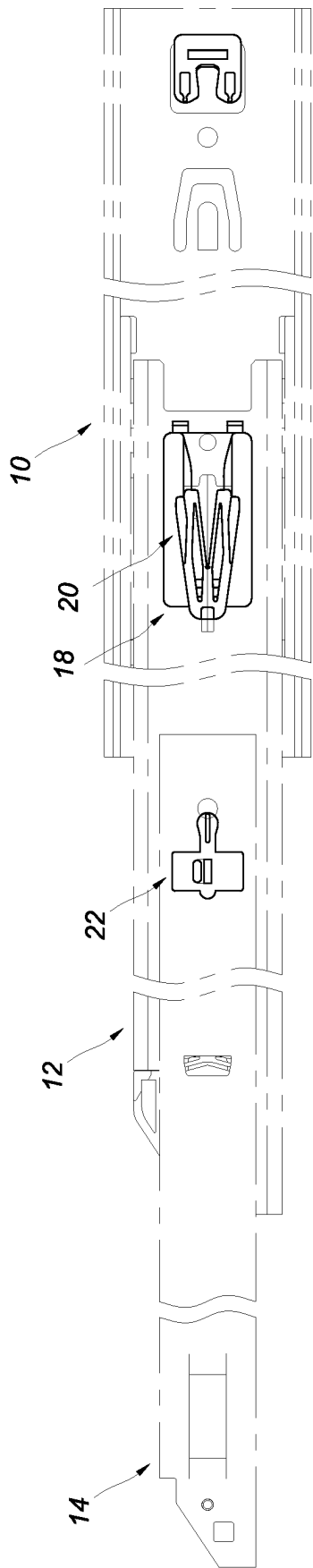


FIG. 10

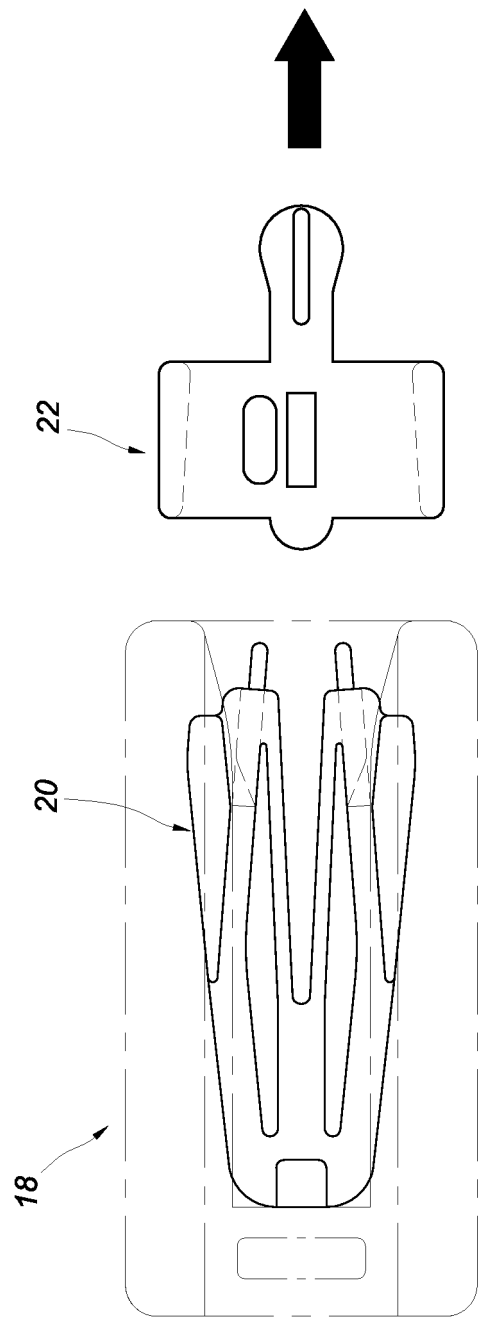


FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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