US 20160251874A1

(19) **United States**

(12) **Patent Application Publication**

Schopf et al.

(10) **Pub. No.: US 2016/0251874 A1**

(43) **Pub. Date: Sep. 1, 2016**

(54) **PANEL CLAMPS FOR FENCES AND BARRIERS**

(71) Applicants: **John Schopf**, Thornbury (AU); **Manfred Schopf**, Thornbury (AU)

(72) Inventors: **John Schopf**, Thornbury (AU); **Manfred Schopf**, Thornbury (AU)

(21) Appl. No.: **15/053,727**

(22) Filed: **Feb. 25, 2016**

Related U.S. Application Data

(62) Division of application No. 12/997,988, filed on Jun. 7, 2011, now abandoned, filed as application No. PCT/IB2009/005919 on Jun. 14, 2009.

(30) **Foreign Application Priority Data**

Jun. 14, 2008 (AU) 2008903013

Publication Classification

(51) **Int. Cl.**

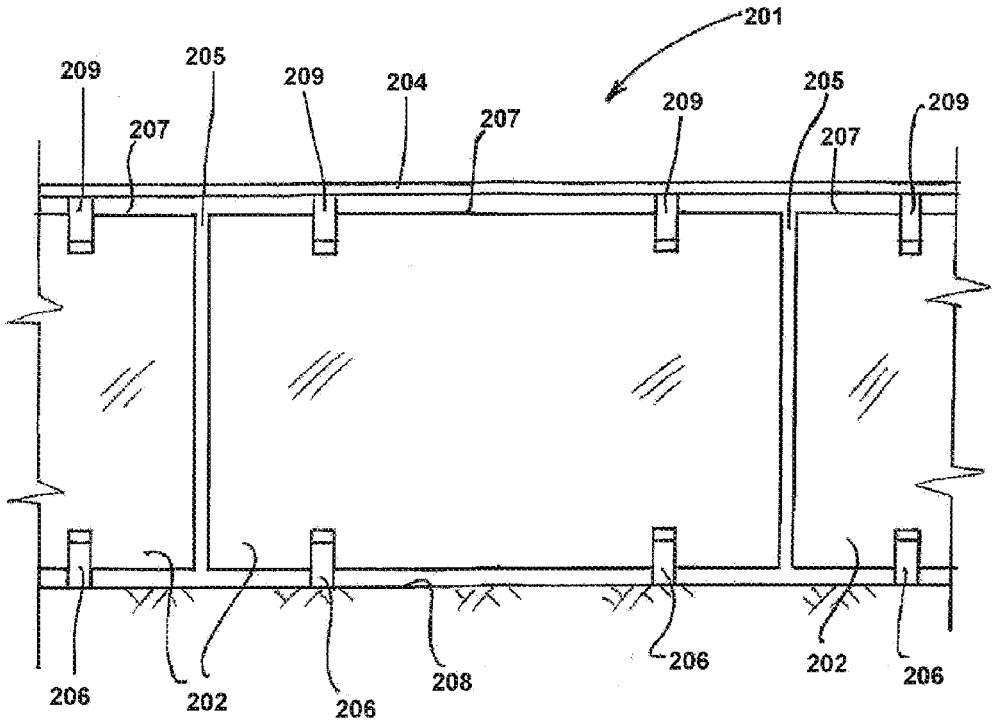
E04H 17/16	(2006.01)
F16B 2/06	(2006.01)
F16M 13/02	(2006.01)

(52) **U.S. Cl.**

CPC ***E04H 17/168*** (2013.01); ***E04H 17/166*** (2013.01); ***F16M 13/02*** (2013.01); ***F16B 2/06*** (2013.01)

(57) **ABSTRACT**

Clamps are provided for supporting panels, such as glass panels. One aspect of the clamps disclosed is that the clamps have two parts that can be slid into clamping engagement with each other. Another aspect is that the clamps comprise a fastener for securing the clamp to a structure is received in an internal cavity in the clamp. This cavity is concealed from external view when the clamp is in use, but can be exposed for access to the fastener by sliding the two clamp halves out of engagement.



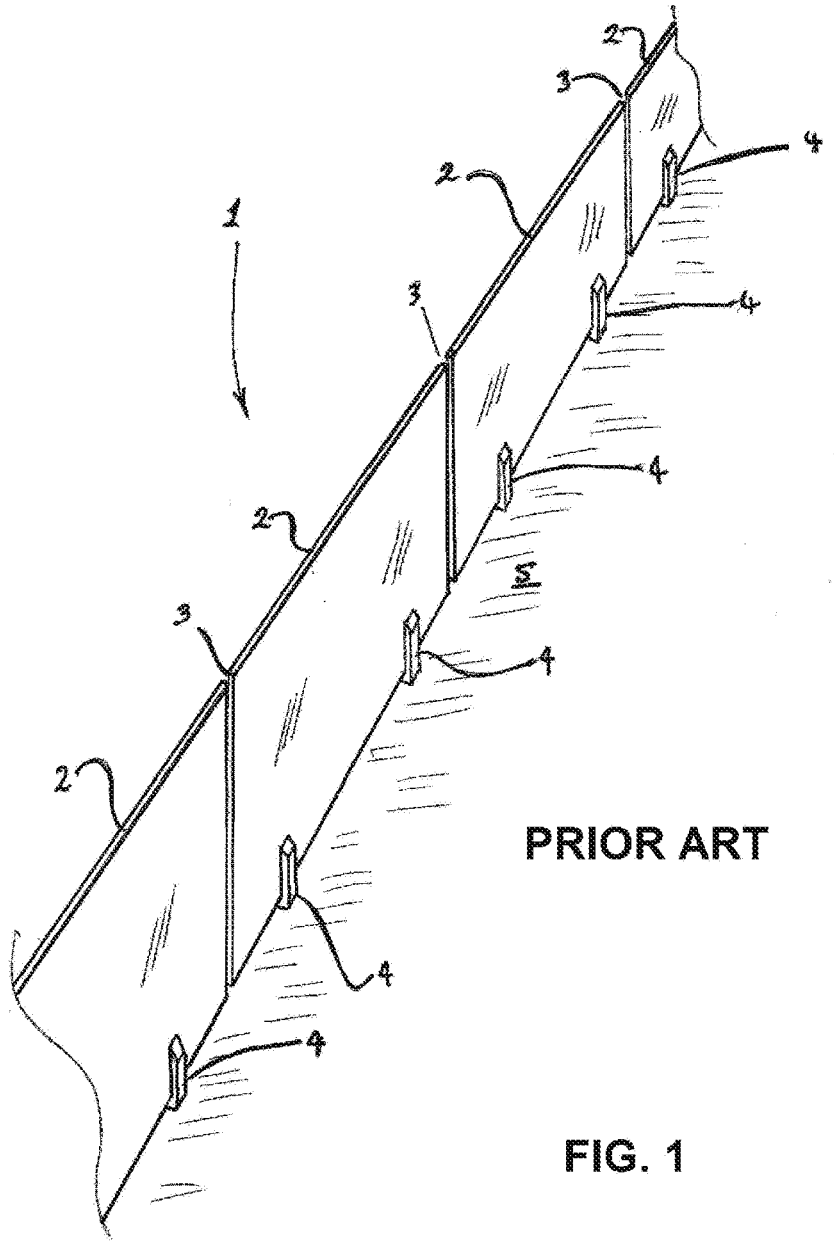


FIG. 1

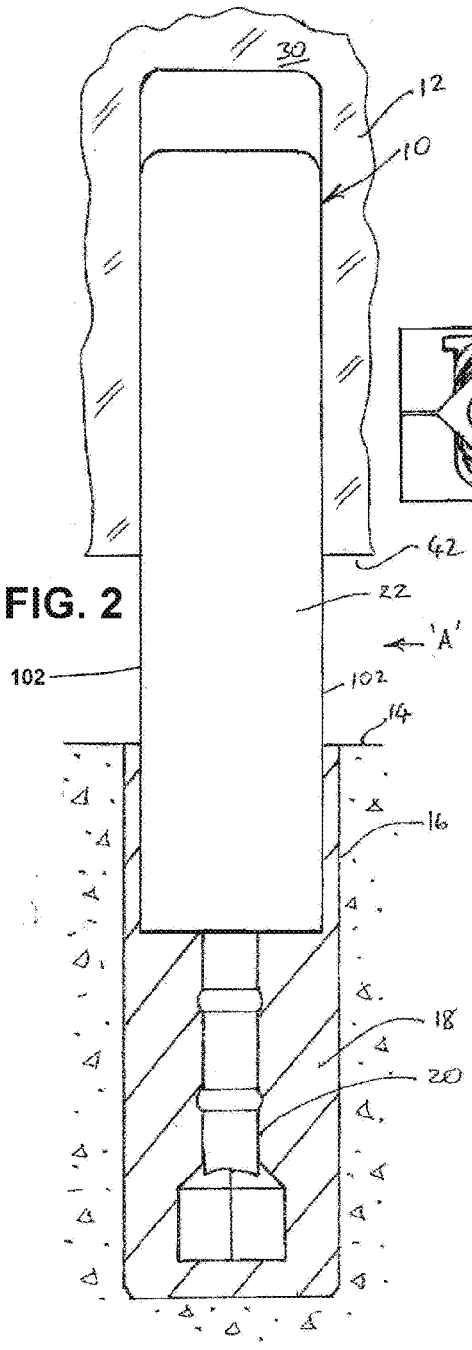


FIG. 2

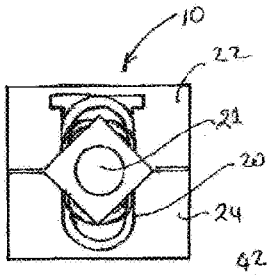


FIG. 4

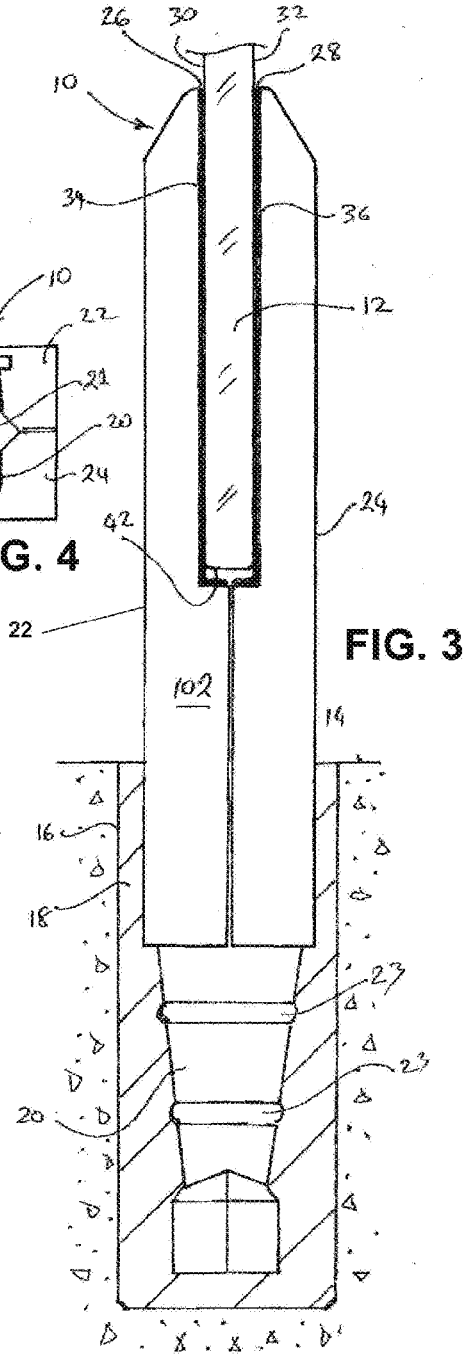


FIG. 3

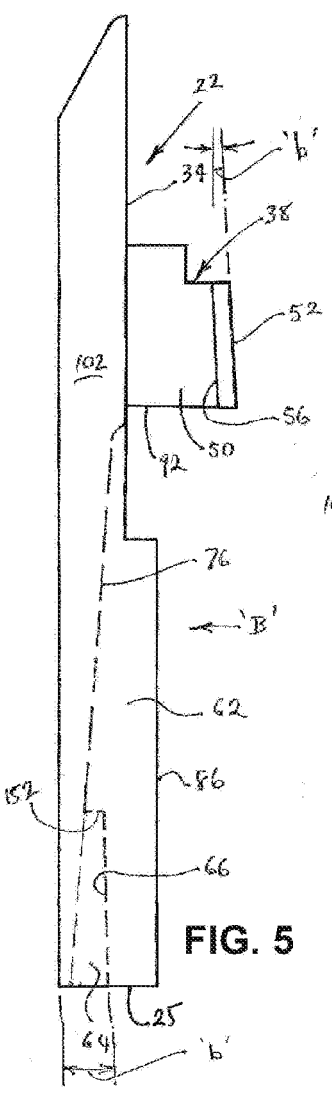

22
'b'
34
38
52
102
56
50
92
76
'B'
62
86
152
66
25
64
'b'

FIG. 5

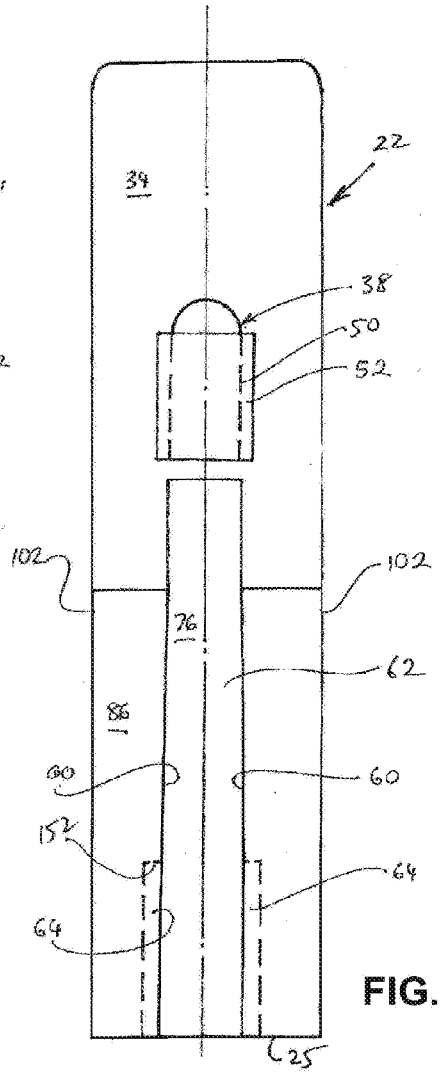

34
22
38
50
52
102
102
76
62
86
60
60
152
64
64
25

FIG. 6

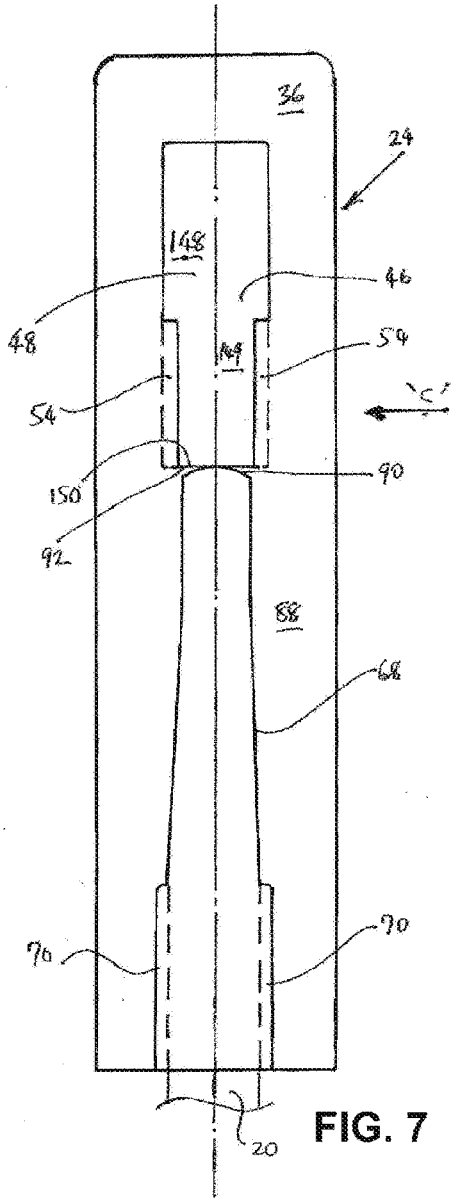

36
24
148
46
48
149
54
54
150
90
92
88
68
70
70
20

FIG. 7

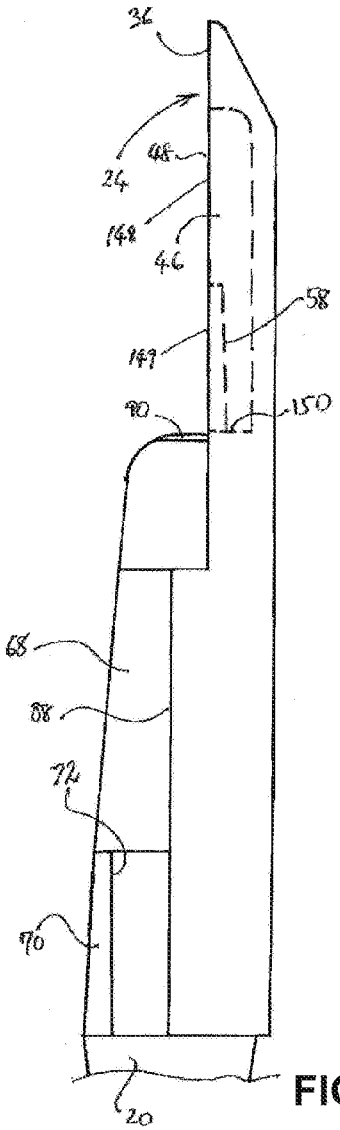

36
24
48
148
46
58
149
90
150
68
88
72
70
20

FIG. 8

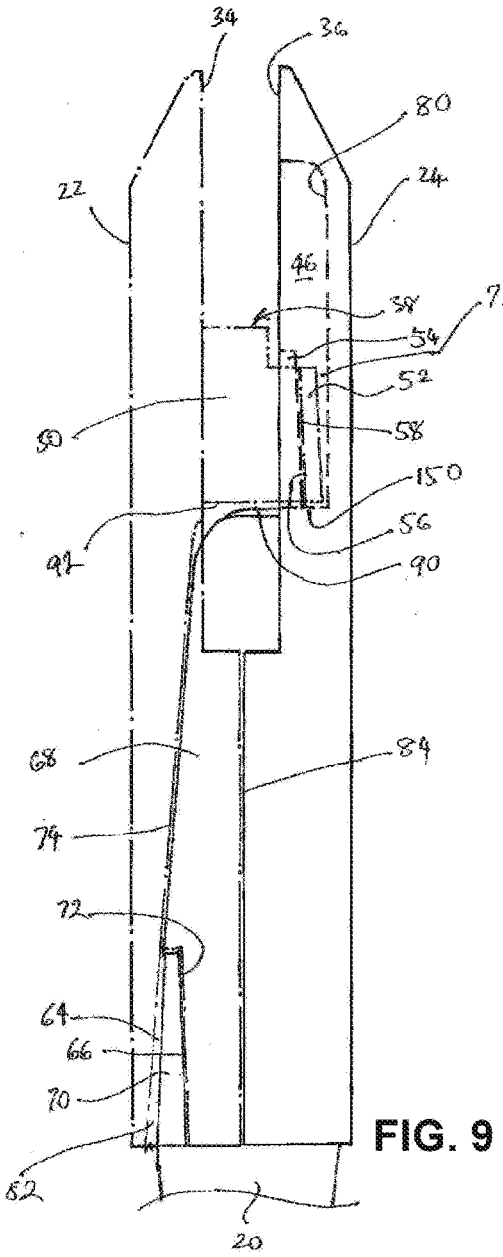

34
36
80
22
24
46
38
78
54
52
50
58
150
56
92
90
68
84
74
72
64
66
70
62
20

FIG. 9

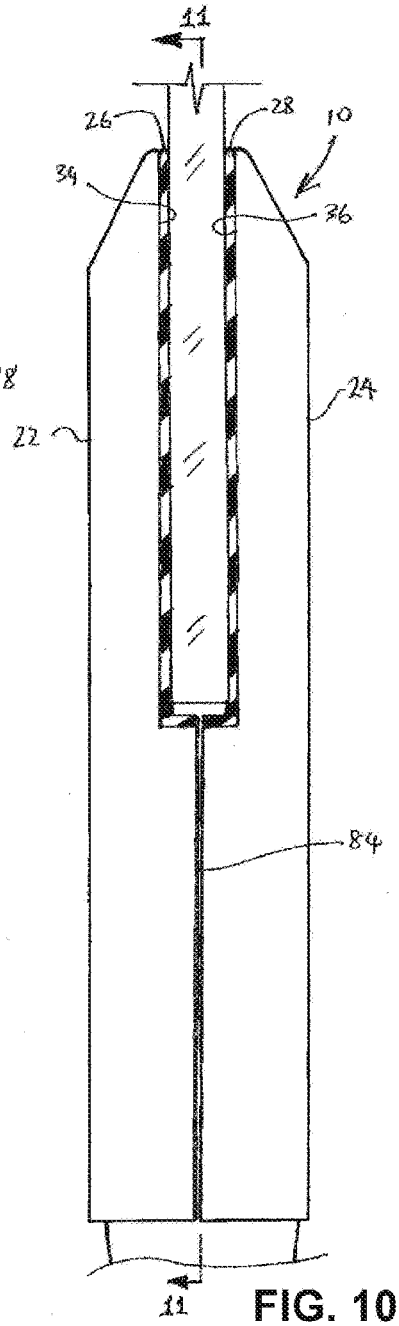

11
26
28
10
34
36
24
22
84
11

FIG. 10

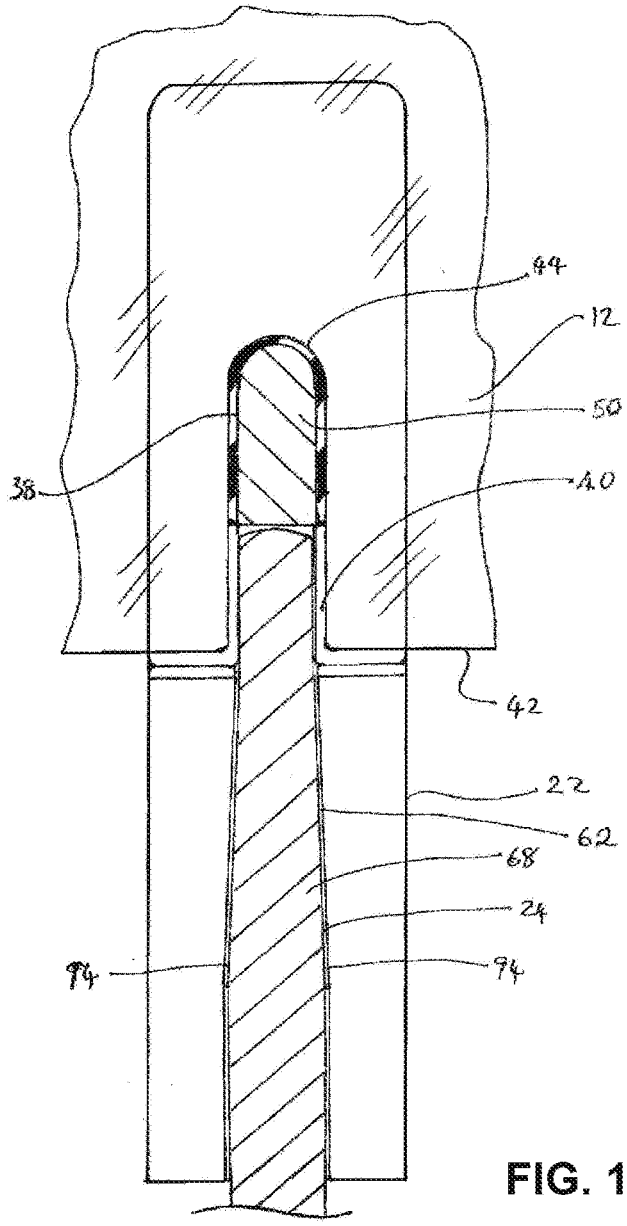


FIG. 11

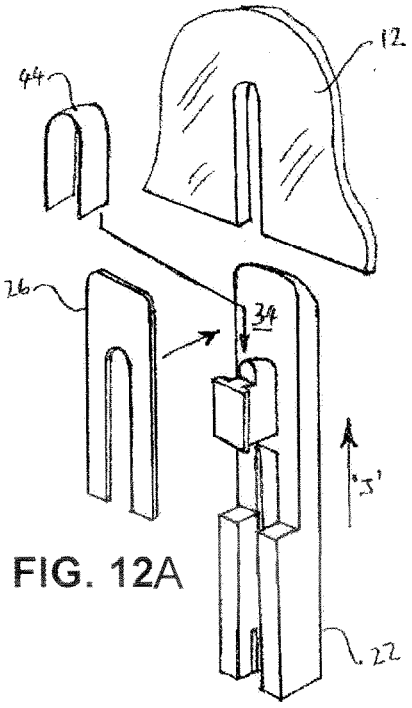


FIG. 12A

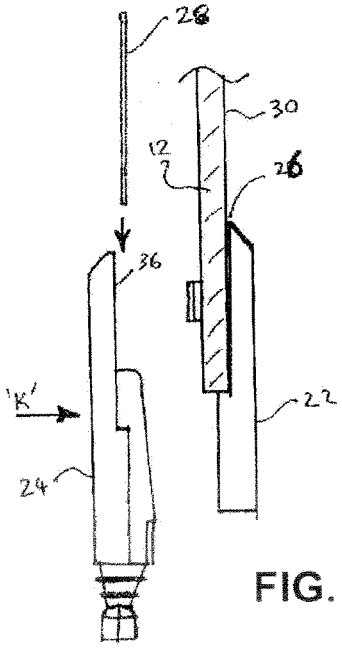


FIG. 12B

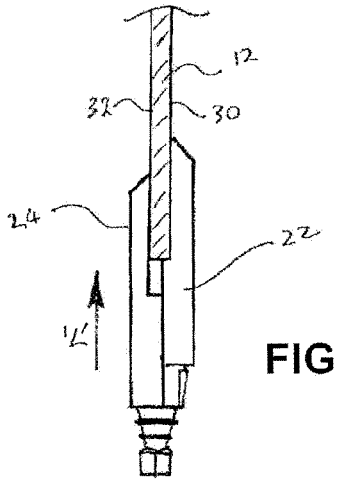


FIG. 12C

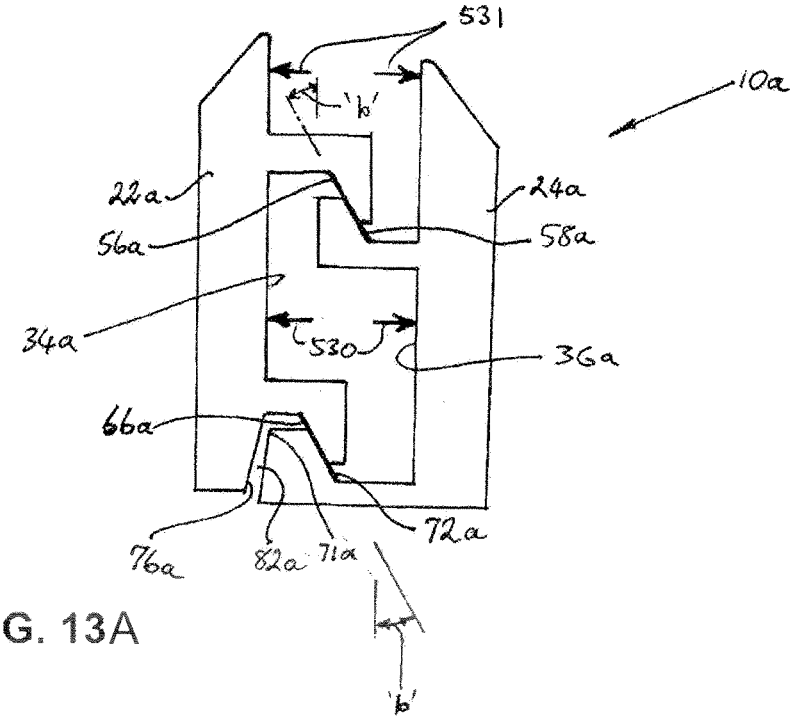


FIG. 13A

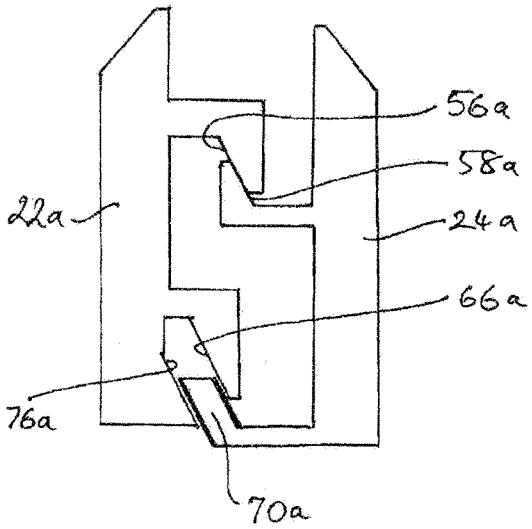


FIG. 13B

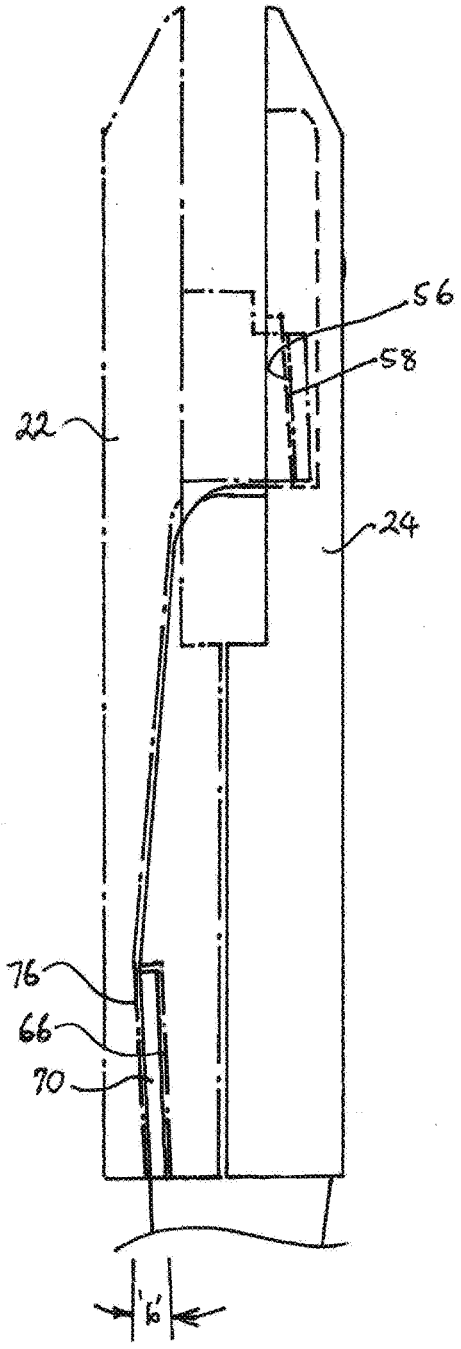
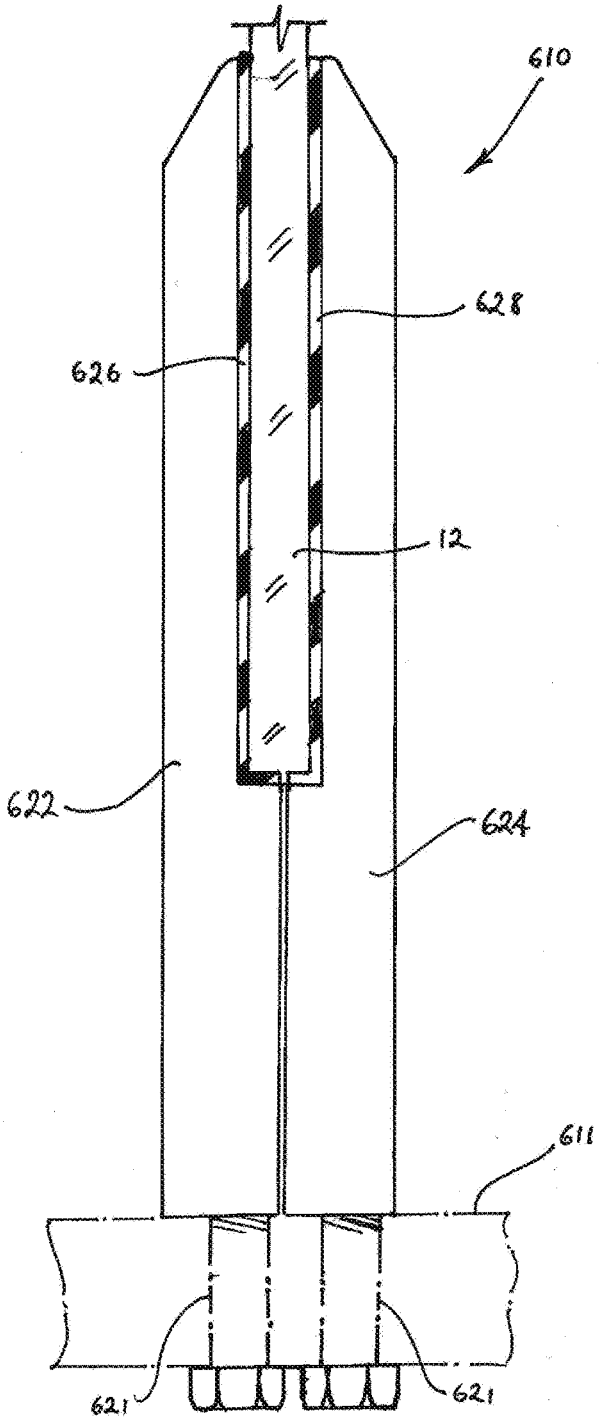


FIG. 14

FIG. 15



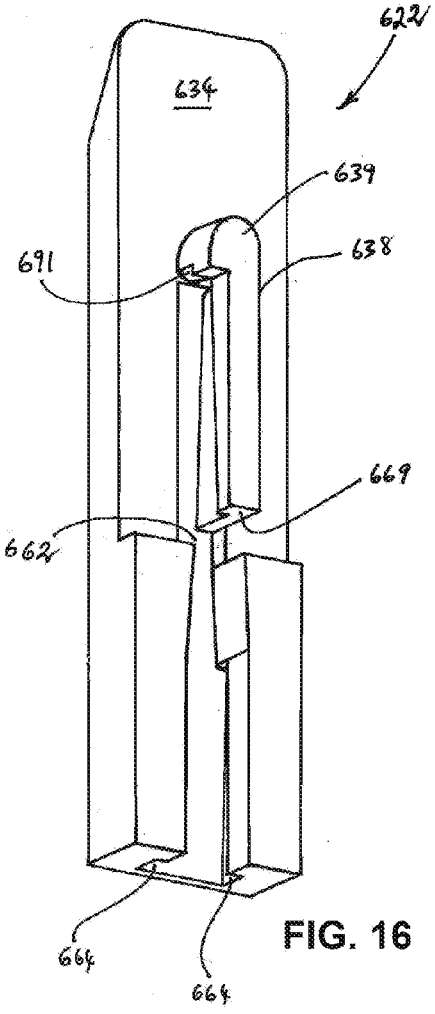

622
634
639
638
691
669
662
664
664

FIG. 16

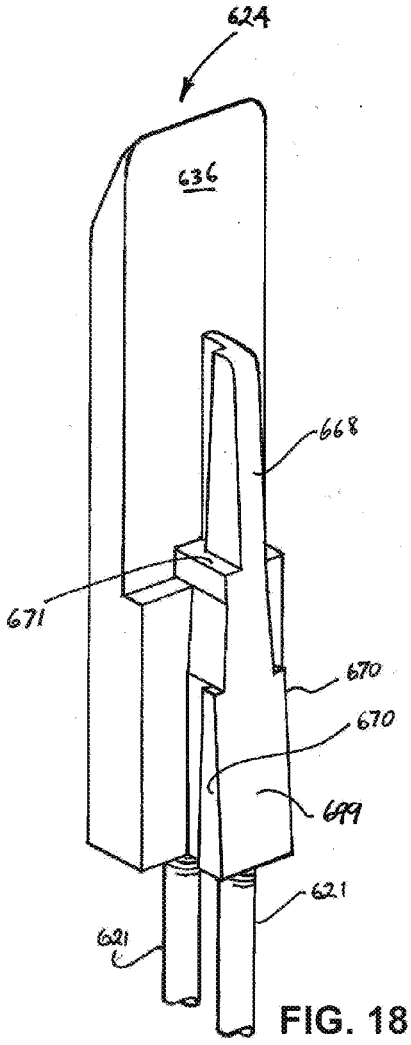

624
636
668
671
670
670
699
621
621

FIG. 18

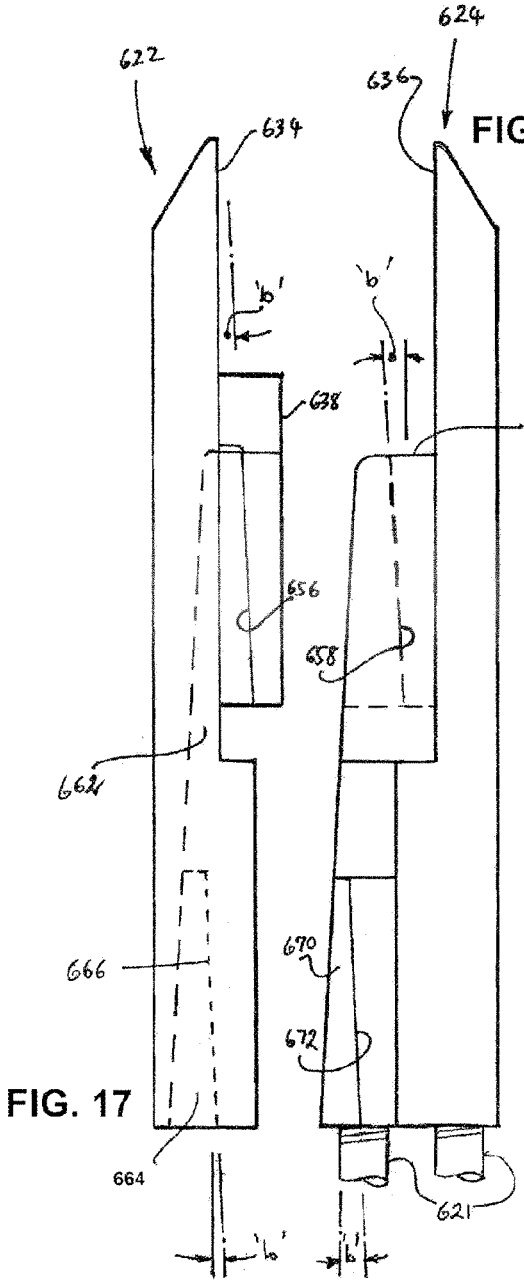


FIG. 17

FIG. 19

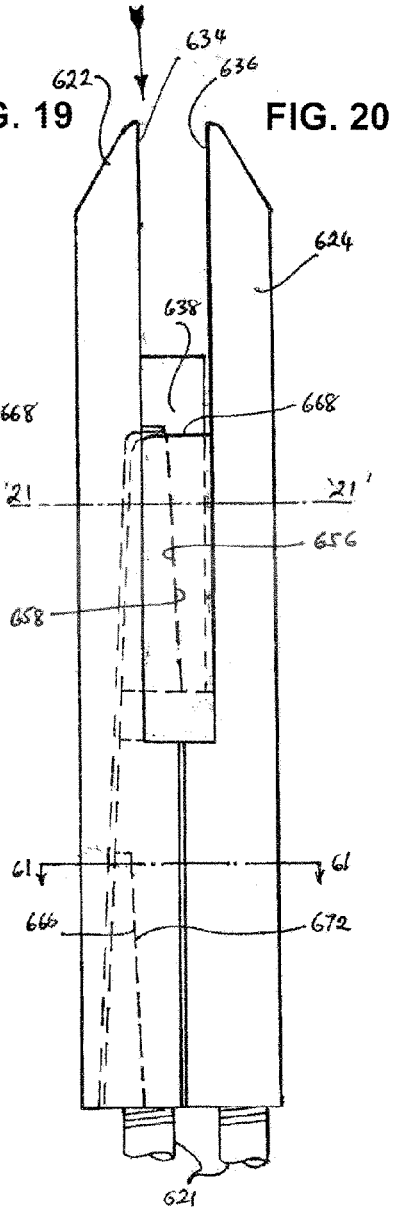


FIG. 20

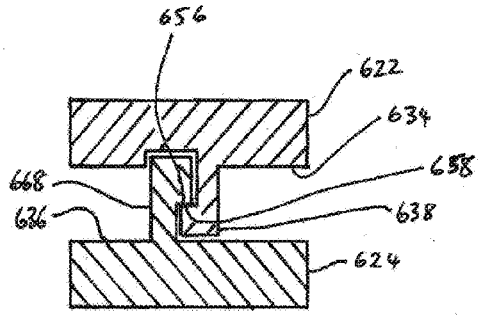


FIG. 21

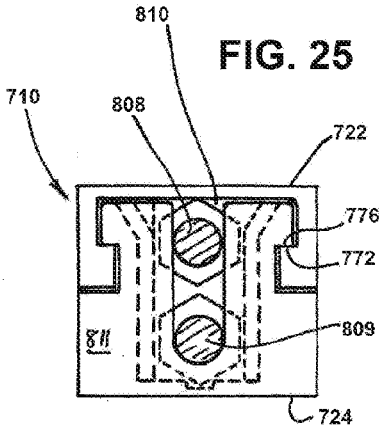


FIG. 25

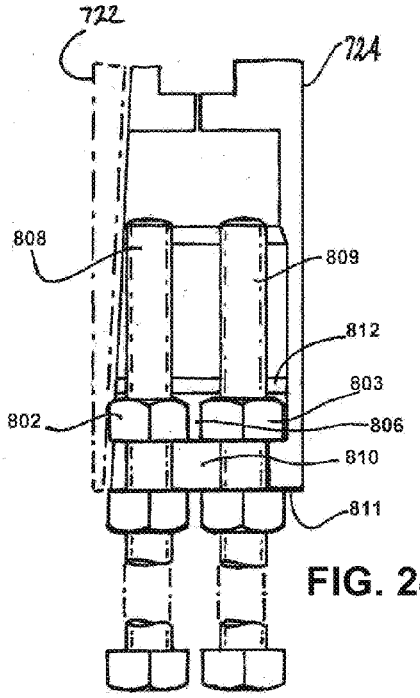


FIG. 24

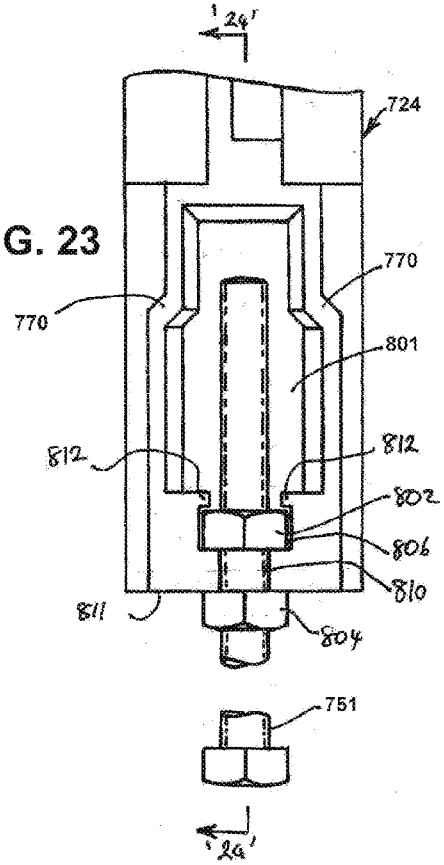


FIG. 23

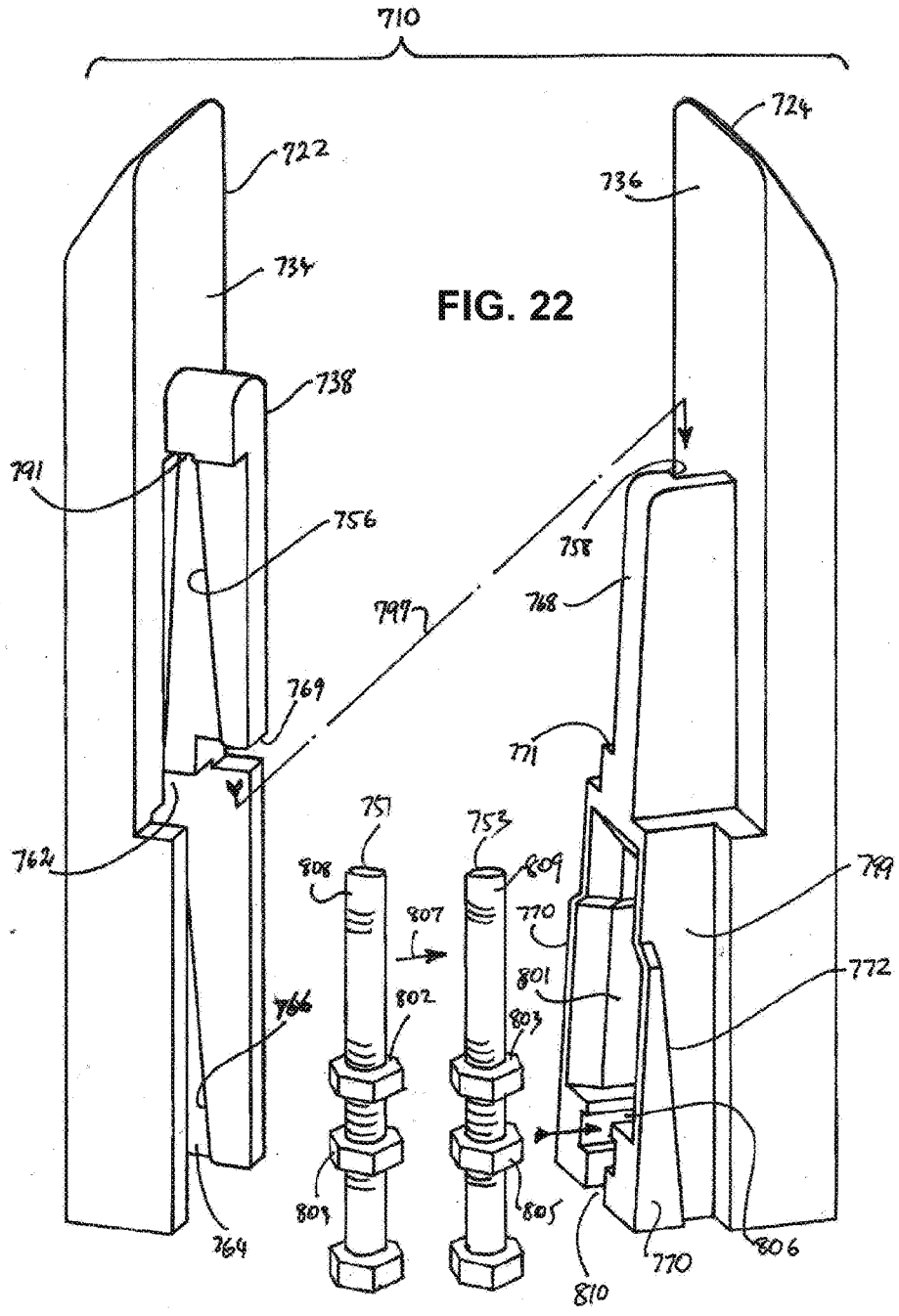

710
722
724
736
734
738
791
756
758
799
768
769
771
762
751
753
808
809
807
770
799
801
772
766
802
803
804
805
770
806
810
764

FIG. 22

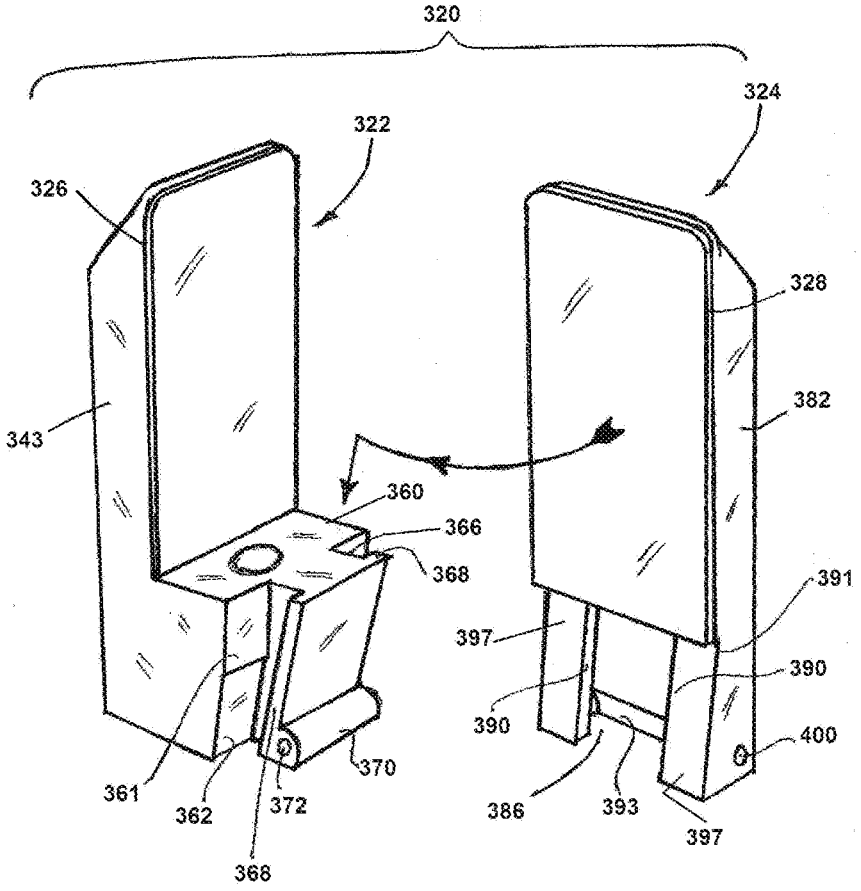

320
324
322
326
328
382
343
360
366
368
391
397
390
390
400
370
361
362
372
368
386
393
397

FIG. 26

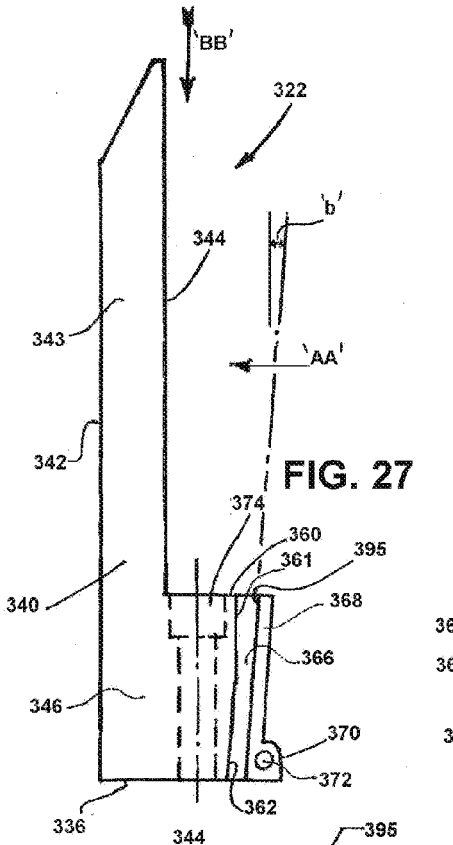


FIG. 27

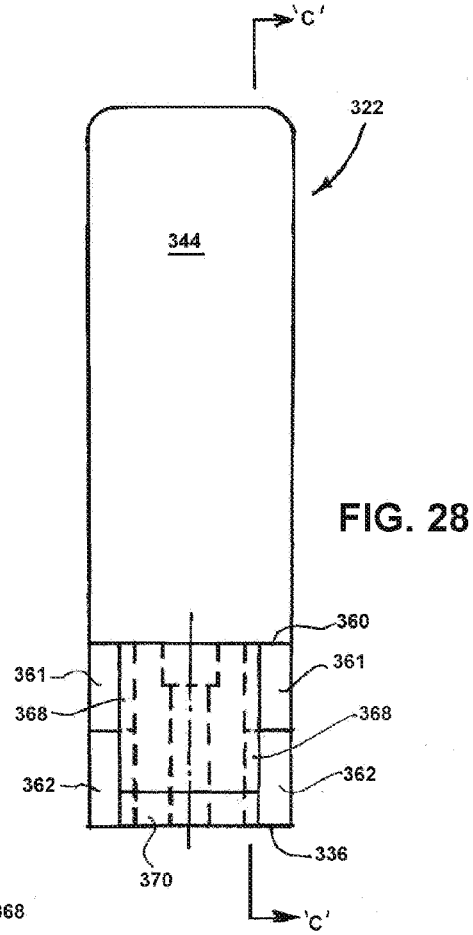


FIG. 28

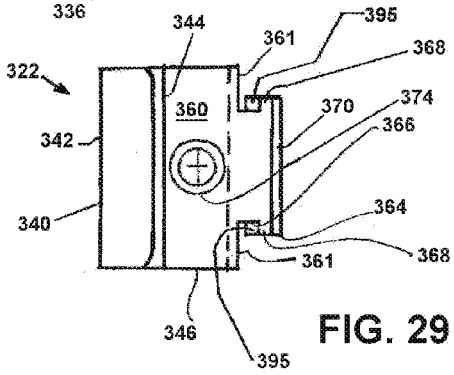


FIG. 29

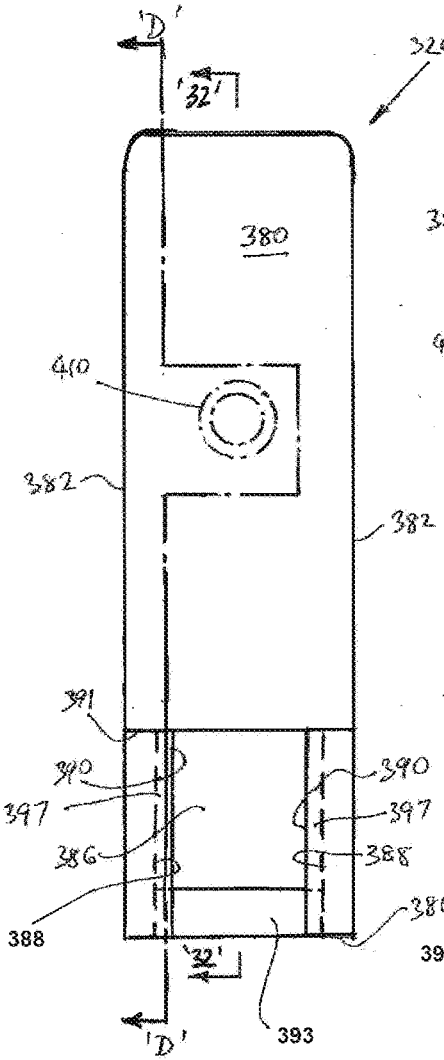


FIG. 30

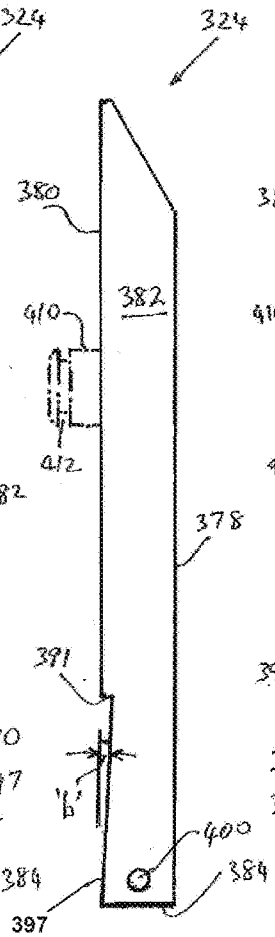


FIG. 31

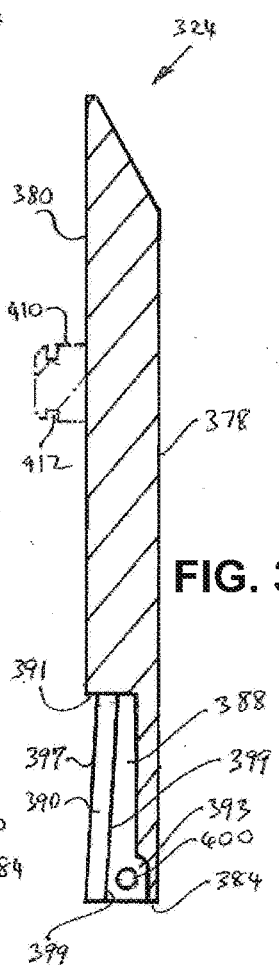


FIG. 32

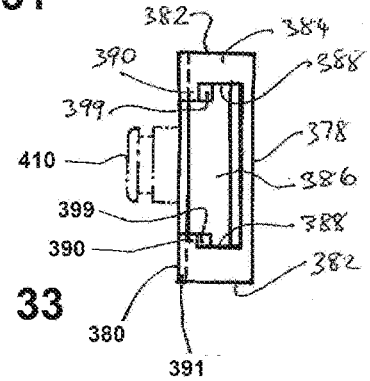


FIG. 33

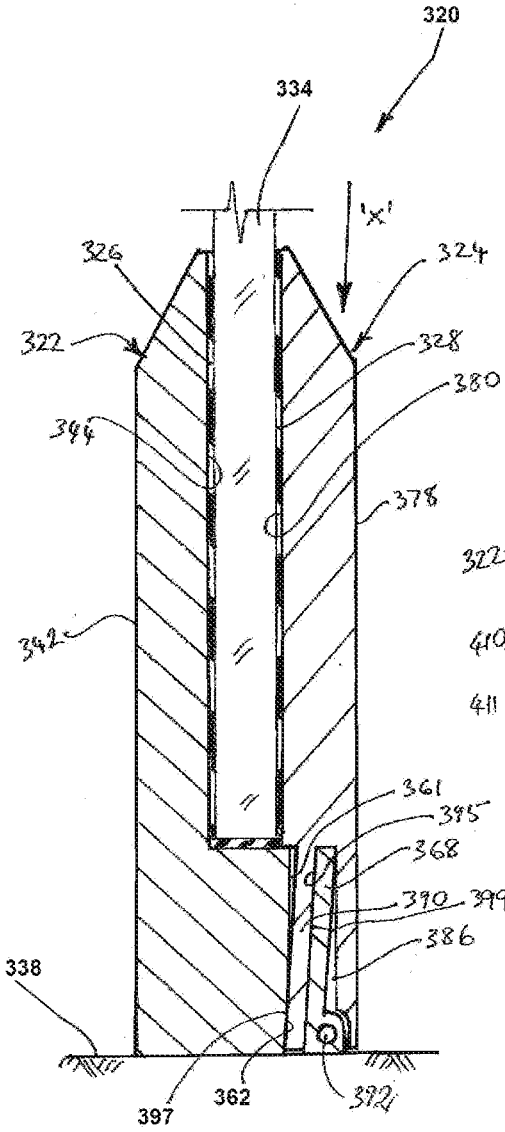

320
334
'x'
326
324
322
328
380
346
378
342
361
395
368
390
399
386
338
397
362
392

FIG. 34

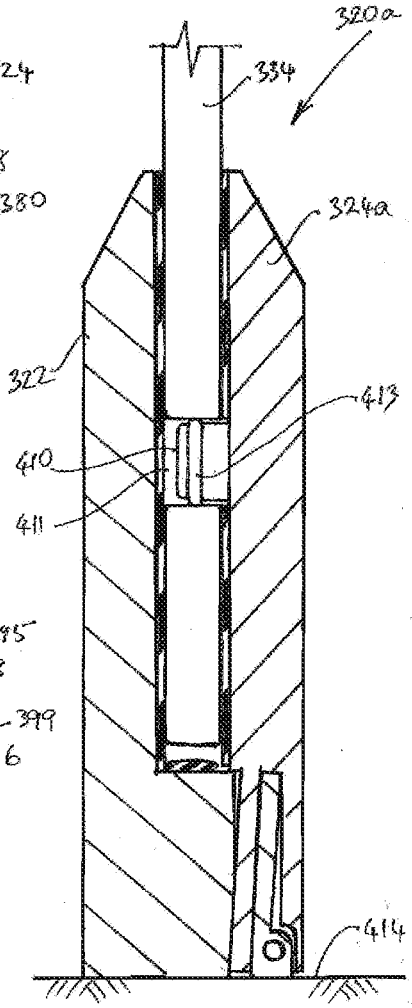

320a
334
324a
322
413
410
411
414

FIG. 35

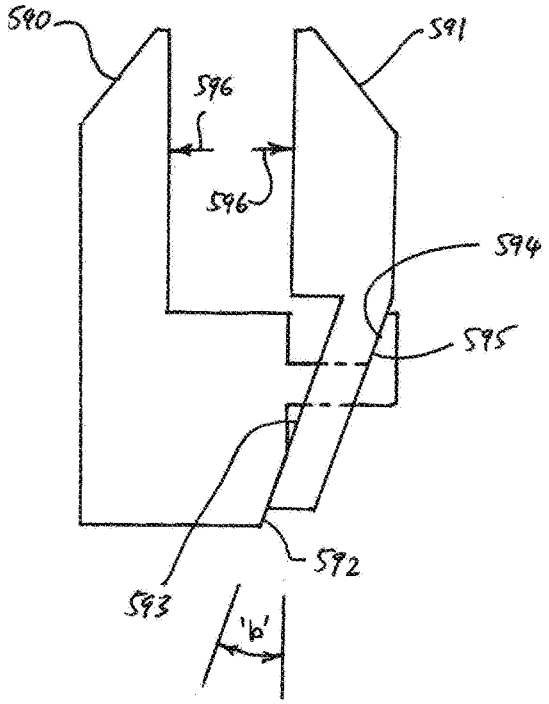


FIG. 36

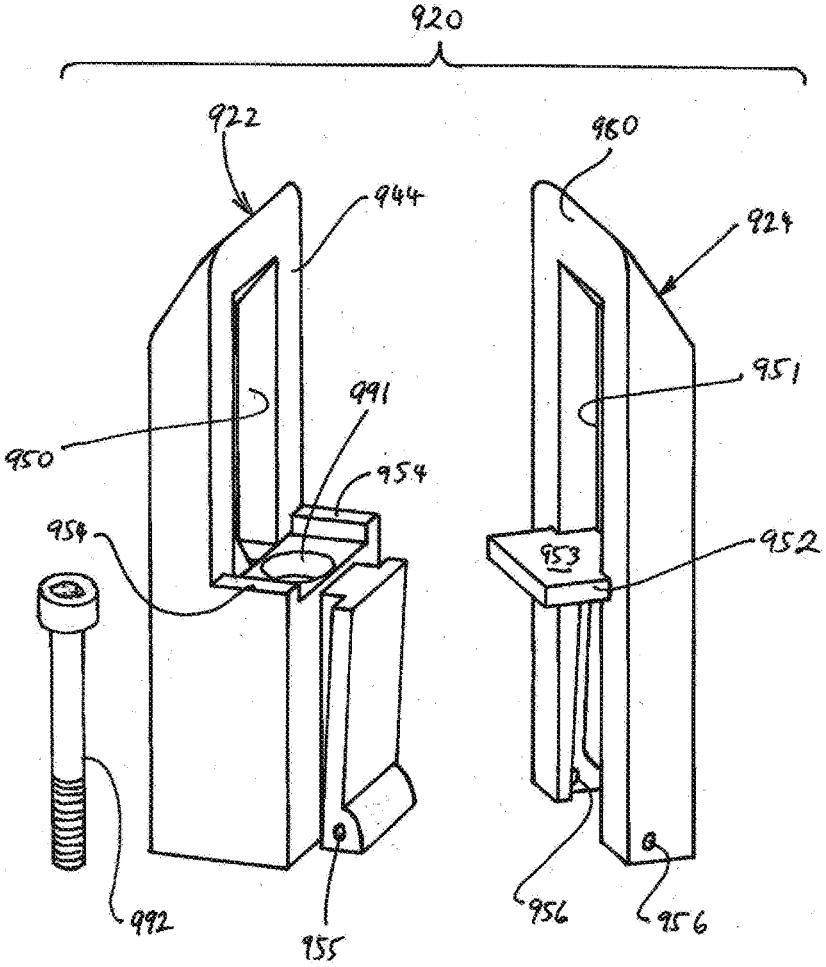


FIG. 37

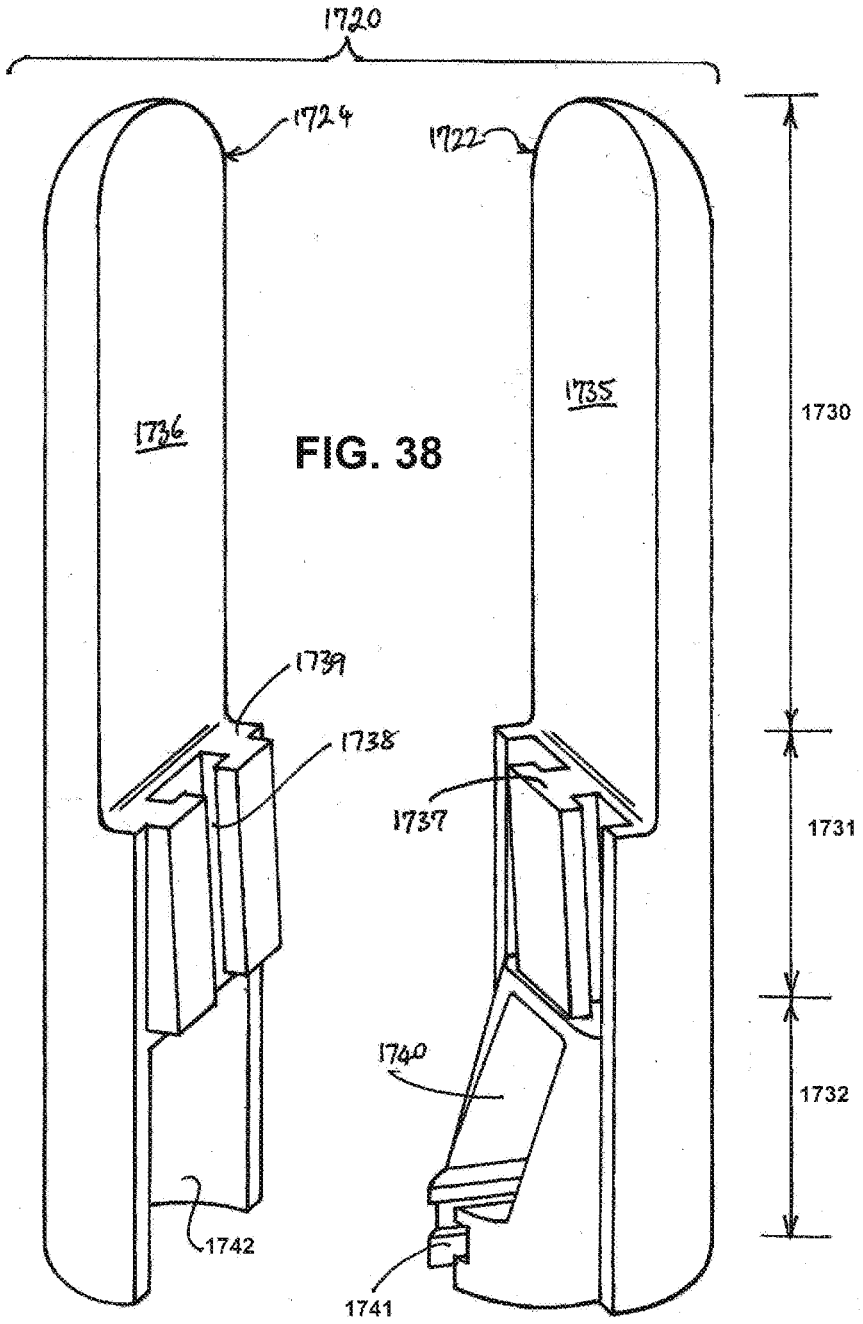

1720
1724
1722
1736
1735
1730
1739
1738
1737
1731
1740
1732
1742
1741

FIG. 38

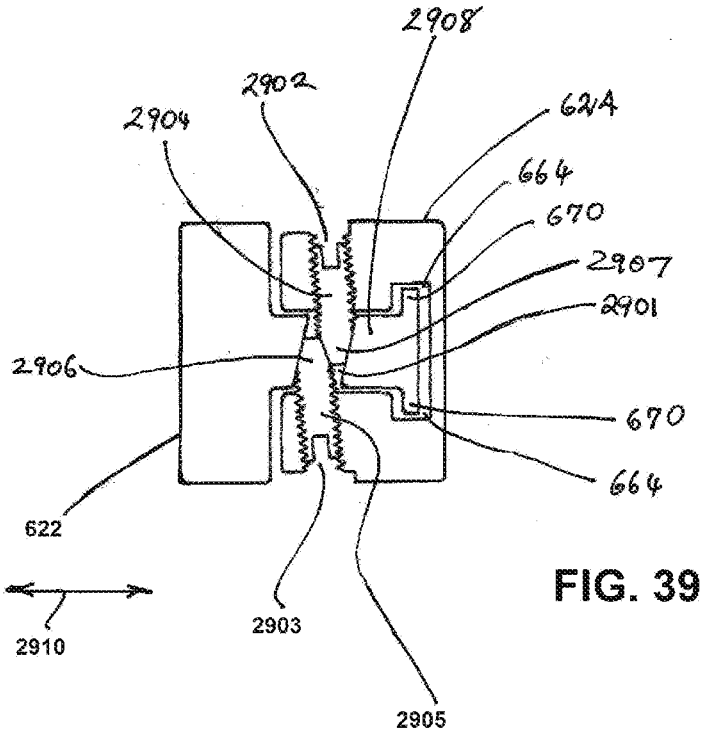

2908
2902
2904
624
664
670
2907
2901
2906
670
664
622
2910
2903
2905

FIG. 39

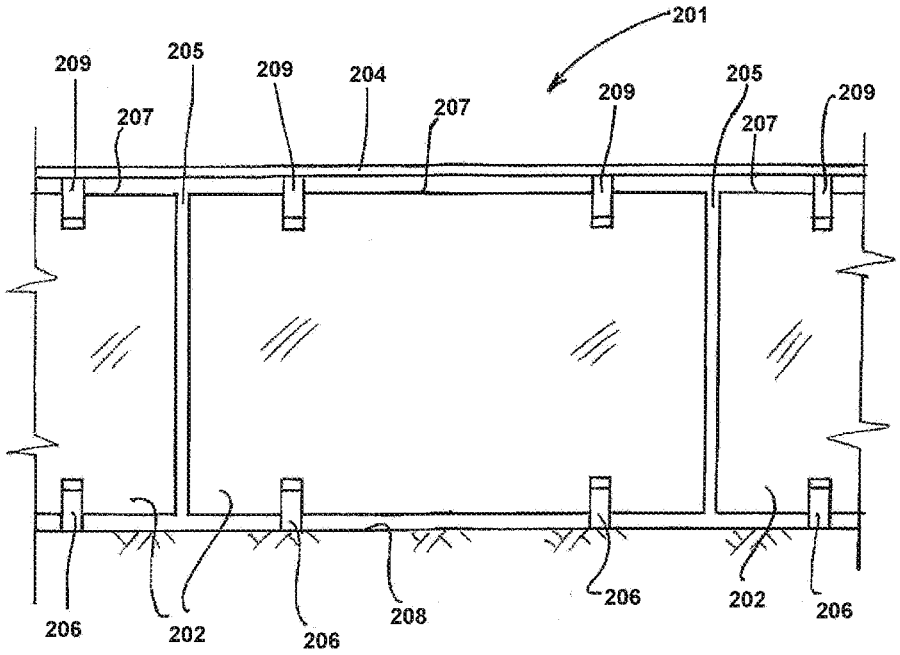

201
209
205
209
204
207
207
209
205
207
209
206
202
206
208
206
202
206

FIG. 40

PANEL CLAMPS FOR FENCES AND BARRIERS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a divisional of U.S. patent application Ser. No. 12/997,988, filed on Jun. 7, 2011, which is a U.S. national stage patent application of PCT/IB2009/005919, filed on Jun. 14, 2009, which claims priority to Australian patent application no. 2008903013, filed on Jun. 14, 2008. Each aforementioned application is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention described here relates to improved clamps for panels, with particular reference to clamps for use in fences and barriers.

BACKGROUND

[0003] FIG. **1** is a perspective view of a portion of a fence **1** that comprises a plurality of panels **2** arranged end-to-end with small gaps **3** therebetween, each panel being held in a vertical plane by two clamps **4**, with clamps **4** being set into a supporting surface **5**. Fences of this type, typically with panels **2** being made of glass or a transparent plastic (for example those sold under the trade marks Lexan and Perspex), are widely used as security fences for swimming pools, to mark boundaries of eating areas of restaurants and in like applications. They have sometimes been used as balustrades on buildings.

[0004] The appearance and the speed and ease of erection of fence **1** are dependent in part on the design of the panel-supporting clamps **4**, as of course is the structural integrity and safety of fence **1**. Several clamps applicable to such fences, and to certain other fences also, are described below. These are believed to be useful additions to the choices available to designers, when judged by the combination of appearance, erection ease, and speed, and by the safety and integrity they offer.

[0005] Particular advantages of the clamps disclosed herein is that they can avoid or minimize the obtrusive sight of fasteners on the clamps' exteriors, and are convenient and adapted for comparatively rapid installation compared to some more conventional types

SUMMARY OF THE INVENTION

[0006] The invention offers a useful alternative to conventional clamps such as those in which two clamp parts are held together by through bolts or screws for example.

[0007] According to the invention there is provided in one aspect a clamp securable to a panel said clamp comprising separable first and second clamping means, wherein:

[0008] said first and second clamping means are adapted to in use press against opposing faces of the panel; and

[0009] said first and second clamping means are movable into engagement with each other for use and adapted to thereafter resist separation from each other by friction between a surface of the first clamping means and a surface of the second clamping means.

[0010] Preferably, said first and second clamping means are movable slidingly into interlocking engagement.

[0011] Said clamping means may comprise a rigid part and an elastic part that in use lies between the rigid part and a said face of the panel and in use of the clamp is compressed whereby said panel is clamped and a force is developed that urges together said surface of the first clamping means and said surface of the second clamping means.

[0012] Preferably, it is arranged that movement of said first and second clamping means into engagement with each other requires relative movement at an acute angle to a surface of a panel clamped between said first and second d clamping means whereby movement of said first and second clamping means into engagement with each other compresses said elastic part. Some driving together of the two clamping means is generally required to complete secure attachment of a clamp to a panel, and the direction of driving can be substantially parallel to the panel surface which is convenient and reasonably safe.

[0013] Said acute angle is preferably between 2 degrees and about 10 degrees, preferably between 2 degrees and about 7 degrees.

[0014] In one embodiment, one of the first and second clamping means is wedgingly receivable in the other. However, wedging action is not essential.

[0015] In preferred embodiments, the said surface of the first clamping means and the said surface of the second clamping means comprise one of a plurality of pairs of surfaces that in use of the clamp lie in contact with each other.

[0016] A clamp according to the invention may have a formation comprised in a said clamping means that is adapted to be in contact with a downwardly facing surface of the panel in use of the clamp to support the panel above a substrate or structure to which the clamp is secured.

[0017] Said formation may be adapted to be received in an opening in said panel or in a recess in an edge of the panel.

[0018] Said formation may comprise one of a pair of surfaces that in use of the clamp lie in contact with each other.

[0019] One class of clamps according to the invention is adapted to be grouted into a hole in a substrate and that permits disassembly and removal from said hole of at least one of said first and second clamping means when the panel is removed from the clamp.

[0020] In another aspect the invention provides a clamp having first and second clamping means adapted to engage each other so as to clamp a panel therebetween wherein one the first and second clamping means has a cavity therein partially bounded by a recess or opening within which at least one fastener assembly is receivable, the fastener assembly being adapted to secure said one of the first and second clamping means to a structure or substrate. This arrangement can make for convenience is securing clamps to structures or substrates.

[0021] A portion of the said at least one fastener assembly may be receivable in the cavity.

[0022] Preferably, upon assembly of the first and second parts together so as to clamp a panel therebetween the cavity is covered by the other of the first and second parts.

[0023] The invention further provides a barrier comprising a panel supported from below by at least one clamp and a railing secured to an upper edge of said panel by at least one clamp wherein a said clamp accords with any one of the embodiments disclosed herein. The barrier may be for example a swimming pool safety fence, or a balustrade for use on a deck or balcony.

[0024] The invention further provides a method for securing a panel to a structure or substrate comprising the steps of:

[0025] providing a clamp according to any one of the embodiments disclosed herein;

[0026] securing said clamp to a panel; and

[0027] securing said clamp to a structure or substrate.

[0028] It may be provided that said clamp is secured to said panel before said clamp is secured to said structure or substrate. This has been found to be convenient for installers of fences, balustrades and the like.

[0029] Other inventive aspects features and refinements of the invention are set out below in the following detailed description and in the claims and diagrams. These relate at least to the means whereby the clamp may be secured to a supporting surface or substrate, means whereby the clamp may be removed from a panel and from a supporting substrate, further aspects of design of the clamping means, methods of assembly of the clamp, and fences and other structures incorporating the clamp.

[0030] In this specification, including in the appended claims, the words "comprising" and "comprises" when used in relation to a set of elements integers features or steps are to be taken to indicate that the elements integers features or steps are present, but are not to be taken to preclude the possibility of other elements integers features or steps being present also.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0031] Preferred embodiments of the inventions will be further described in the following detailed description, by reference to the attached Figures, of which:

[0032] FIG. **1** is a perspective view of a portion of a fence having clamps of a type disclosed herein;

[0033] FIG. **2** is an elevation of a clamp according to the invention, as installed in a fence;

[0034] FIG. **3** is a side elevation of the clamp shown in FIG. **2**, seen looking in the direction of arrow "A";

[0035] FIG. **4** is a view from below of the clamp shown in FIG. **2**;

[0036] FIG. **5** is a side elevation of a first part of the clamp shown in FIG. **2**;

[0037] FIG. **6** is a front elevation of the clamp first part shown in FIG. **5**, seen looking in the direction of arrow "B";

[0038] FIG. **7** is a front elevation of a portion of a second clamp part of the clamp shown in FIG. **2**;

[0039] FIG. **8** is a side elevation of the second clamp part as shown in FIG. **7**, seen looking in the direction of arrow "C";

[0040] FIG. **9** is a side elevation of the first and second clamp parts shown in FIGS. **5** and **8** respectively, when assembled together, the first clamp part being shown in chain dotted lines and the second clamp part portion being shown in full lines;

[0041] FIG. **10** is a side elevation of a portion of the clamp shown in FIG. **2**, assembled and clamped to a panel;

[0042] FIG. **11** is a sectional view taken at station **11-11** in FIG. **10**, the sectioned glass being treated as transparent;

[0043] FIGS. **12**A, **12**B, and **12**C are a set of three views showing successive steps in the assembly to a panel of the clamp shown in FIG. **2**;

[0044] FIGS. **13**A and **13**B comprise two schematic views illustrating the interlocking principle of the clamp shown in FIGS. **2-11** (FIG. **13**A), and a possible variation of that interlocking principle (FIG. **13**B);

[0045] FIG. **14** is a side elevation of two interlocking parts of a further clamp according to the invention incorporating the interlocking principle shown in FIG. **13**B;

[0046] FIG. **15** is a side elevation of a further clamp according to the invention;

[0047] FIG. **16** is a perspective view of a first part of the clamp shown in FIG. **15**;

[0048] FIG. **17** is a side elevation of the clamp first part shown in FIG. **16**;

[0049] FIG. **18** is a perspective view of a second part of the clamp shown in FIG. **15**;

[0050] FIG. **19** is a side elevation of the clamp second part shown in FIG. **18**;

[0051] FIG. **20** is a side elevation of the first and second clamp parts shown in FIGS. **16** and **18** respectively, when assembled together;

[0052] FIG. **21** is a cross-sectional view of the assembly shown in FIG. **20**, the section being taken at station "**21-21**";

[0053] FIG. **22** is a perspective exploded view showing first (at left) and second (at right) parts of a yet further clamp according to the invention; and two mounting bolt/nut assemblies;

[0054] FIG. **23** is a front view of a portion of the second clamp part shown in FIG. **22**;

[0055] FIG. **24** is a cross-sectional view of the second clamp part portion shown in FIG. **23**, the section being taken at station "**24-24**";

[0056] FIG. **25** is a view from below of the second clamp part shown in FIG. **23**;

[0057] FIG. **26** is a perspective view of two clamping means of a further clamp according to the invention, disassembled;

[0058] FIG. **27** is a side elevation of a first part of the clamp shown in FIG. **26**;

[0059] FIG. **28** is a front elevation of the clamp first part shown in FIG. **27**, seen looking in the direction of arrow "AA";

[0060] FIG. **29** is a plan view of the clamp first part shown in FIG. **27**, seen looking in the direction of arrow "BB"

[0061] FIG. **30** is a front elevation of a second part of the clamp shown in FIG. **26**;

[0062] FIG. **31** is a side elevation of the clamp second part shown in FIG. **30**;

[0063] FIG. **32** is a cross-sectional view of the clamp second part shown in FIG. **30**, the section being taken at station '**32-32**';

[0064] FIG. **33** is a view from below of the clamp second part shown in FIG. **32**;

[0065] FIG. **34** is a cross-sectional view of the clamp shown in FIG. **26**, now assembled and holding a glass panel, the sectioning being at station "CC" for the first clamp part shown in FIG. **28** and at station "DD" for the second clamp part shown in FIG. **30**;

[0066] FIG. **35** is a cross-sectional view of a further clamp according to the invention and incorporating the first clamp part shown in FIG. **28** and a modified form of the second clamp part shown in FIG. **30**, the clamp being shown assembled and holding a glass panel, the sectioning being at station "CC" for the first clamp part shown in FIG. **28** and at station "DD" for the second clamp part shown in FIG. **30**;

[0067] FIG. **36** is a schematic view illustrating the interlocking principle of the clamp shown in FIG. **26**;

[0068] FIG. **37** is an exploded perspective view of a modified version of the clamp shown in FIG. **26**;

[0069] FIG. **38** is an exploded perspective view of a further clamp according to the invention;

[0070] FIG. **39** is a cross section through a modified version of the clamp shown in FIG. **20**, the section being on a plane marked '**61-61**' on FIG. **20**;

[0071] FIG. **40** is an elevation of a portion of a further fence comprising clamps according to the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0072] Several clamps according to the invention will be described below that are suitable for use as the clamps **4** in fence **1**, using glass, transparent plastics or other sheet-type materials for the panels **2**. Their applicability to other fence types and similar applications will also be discussed. Purely for convenience, glass panels only will be discussed, but this is not intended to imply any limitation on the panel materials to which any of the clamps may be applied.

[0073] An important class of extra but related application for at least some of the clamps to be described is to the securing of hand- and other rails to panels of glass and other materials of balustrades and the like.

[0074] FIGS. **2** and **3** show a clamp **10** as it would be installed (in the role of a clamp **4**) in a fence of the type of fence **1**. Clamp **10** is shown supporting a glass panel **12** above a supporting surface **14**. Clamp **10** is supported within a hole **16** in supporting surface **14** by settable grout **18**, which could be for example cementitious or a resin-type such as an epoxy resin. Clamp **10** has a formation **20** at its lower end that is shaped so as to provide a positive engagement in the set grout **18**.

[0075] Clamp **10** comprises a first clamp part **22** and a second clamp part **24**, and formation **20** is comprised in second part **24** as an integrally formed portion thereof. First clamp part **22** is shown in FIGS. **5** and **6** and second clamp part **24** is shown (excluding a portion of formation **20**) in FIGS. **7** and **8**. Clamp parts **22** and **24** in use interlock with each other in a way shown in FIG. **9** and explained below. Only parts **22** and **24** are shown in FIG. **9**, to simplify the explanation. FIGS. **3** and **10** show the completed clamp **10**, wherein panel **12** is held between first and second parts **22** and **24**, with pad **26** between face **34** of part **22** and face **30** of panel **12**, and pad **28** between face **32** of panel **12** and face **36** of part **24**.

[0076] The elastic resilient pads **26** and **28** play an important part in the clamping action of clamp **10**, and also prevent damage to glass panel **12** by preventing contact between panel **12** and faces **34** and **36** of clamp parts **22** and **24**. Suitable grades of vulcanized natural rubber, synthetic rubber, or rubber-like polymer materials may be used for elastic resilient pads **26** and **28**. Pads **26** and **28** may be secured to clamp parts **22** and **24** respectively using suitable adhesives before assembly of clamp **10**. Pads **26** and **28** may be of the same or different materials as required. The combination of first clamp part **22** and pad **26** is referred to elsewhere in this specification as a "clamping means", as is the combination of second clamp part **24** and pad **28**. The remarks in this paragraph in relation to resilient elastic pads **26** and **28** are equally applicable to the corresponding pads of other clamps disclosed below.

[0077] Clamp parts **22** and **24** and pads **26** and **28** are so shaped and proportioned that when they are placed into interlocking engagement as shown in FIG. **9**, panel **12** and pads **26** and **28** can only be accommodated between faces **34** and **36** when pads **26** and **28** are in compression. In this way, panel **12** is gripped by clamp **10**.

[0078] FIG. **11** shows how panel **12** is located longitudinally (i.e. in an along-fence direction) by clamp **10**. A formation **38** extends from face **34** and is shaped to be received in a slot **40** extending inward from an edge **42** of panel **12**. To avoid direct contact between formation **38** and panel **12**, a resilient pad **44** of inverted "U" shape is placed over a portion of formation **38** before formation **38** is positioned in slot **40**. Pad **44** is formed from a suitable material chosen from the options mentioned above for pads **26** and **28**.

[0079] FIG. **12**A-C shows steps in the assembly of clamp **10** onto a panel **12**. FIG. **12**A shows pad **26** is positioned against face **34** of part **22**, pad **44** is positioned over formation **38**, and then part **22** is slid in the direction of arrow "J" so that pad **44** and formation **38** are received in slot **40** of panel **12**. Next, FIG. **12**B shows pad **28** is positioned against face **36** of clamp part **24**, and part **24** is moved in the direction of arrow "K" so that formation **38** of part **22** enters a cavity **46** in part **24** through an upper portion **148** of an opening **48** thereof. Finally, FIG. **12**C shows part **24** is moved in the direction of arrow "L", to complete the interlocking engagement of parts **22** and **24** in a way described further below, and therefore the clamping of panel **12**. FIG. **12**C requires compression of pads **26** and **28**, and so involves the use of some force or impacts from a mallet or the like.

[0080] Reference is now made to FIGS. **5-8** and particularly FIG. **9**. FIG. **9** shows how parts **22** and **24** are positioned relative to each other when clamp **10** is assembled, but with all other components omitted. Formation **38** comprises a web portion **50** protruding from face **34** and a flange **52** that extends on either side of web portion **50**. Upper portion **148** of opening **48** is wide enough at its upper end for the flange **52** to pass through into cavity **46**, but a lower portion **149** of opening **48** is less wide due to flanges **54** extending partially over cavity **46** and towards each other. Web **50** can pass between flanges **54** but flange **52** cannot do so. When the movement in FIG. **12**C is made, each face **56** of flange **52** (there being one face **56** on each side of web **50**) slides into contact with a face **58** of one of the flanges **54**, and is held in such contact due to the compressing of resilient pads **26** and **28**. Faces **56** are inclined at an angle "b" to face **34** (as seen in the side view of FIG. **5**) and faces **58** are inclined at substantially the same angle to face **36** so that as formation **38** is moved downward in cavity **46**, i.e. from portion **148** of opening **48** to portion **149**, faces **34** and **36** of parts **22** and **24** are held substantially parallel to each other and move towards each other and pads **26** and **28** are progressively placed under increasing compression.

[0081] Below formation **38**, part **22** has a tapered elongate cutaway **62** that becomes deeper and wider with increasing distance below formation **38**, and extends through to a bottom surface **25** of part **22**. Walls **60** define opposing sides of cutaway **62** and themselves have cutaway channels **64** at their lower ends which also extend to bottom surface **25**. Faces **66** in cutaway channels **64** are parallel to faces **56** of flange **52**, i.e. at the angle "b" to face **34** when seen in the side view of FIG. **5**. An elongate rib **68** on part **24** is received in cutaway **62** when the clamp **10** is assembled as shown in FIG. **9**. Rib **68** has laterally protruding flanges **70** at its lower end which, during the movement shown at FIG. **12**C, enter cutaway channels **64**. Faces **72** of flanges **70** are inclined at angle "b" to face **36** of part **24**. Thus faces **72** and faces **66** can be in sliding contact as flanges **70** enter cutaway channels **64**. So long as there is contact between faces **72** and **66** near the base

of clamp **10** and faces **56** and **58** nearer the top of clamp **10**, faces **34** and **36** are parallel to each other.

[0082] Parts **22** and **24** and pads **26** and **28** are so proportioned, and the materials of pads **26** and **28** are so chosen, that at the conclusion of the movement shown at FIG. **12**C where the two parts **22** and **24** reach the relative positions shown in FIGS. **3**, **9** and **10**, the faces **56** and **58** are held firmly against each other due to the compression of pads **26** and **28** between faces **34** and **36** and faces **30** and **32** of panel **12**, and panel **12** is held firmly between parallel faces **34** and **36** but without damage to panel **12**. The angle "b" is made small enough (for example in the range between about 2 degrees and about ten degrees or preferably between about 2 degrees and about seven degrees) that the forces between faces **56** and **58** generate enough frictional resistance to sliding of parts **22** and **24** relative to each other that the clamp **10** remains assembled as in FIGS. **3** and **10** in normal use. In this way, panel **12** is clamped firmly between parallel clamp faces **34** and **36** without the use of fasteners such as bolts. The movement shown at FIG. **12**C is completed when flange **52** abuts end face **150** of cavity **46**, or when a flange **70** abuts an end face **152** of a channel **64**, or when web **50** of formation **38** abuts an upper end of rib **68**.

[0083] The way in which flanges **70** interact with part **22** during the movement in FIG. **12**C and subsequently is described below with reference to FIG. **13**A-B.

[0084] The above comments regarding angle "b" relates also to the angle "b" mentioned in the disclosures below of alternate clamp designs. Generally the intention is that a value be chosen for "b" that makes the clamps operate correctly (without for example their various parts separating) with the particular materials (including the resilient elastic pads) that are used.

[0085] Parts **22** and **24** are shown fully engaged with each other in FIG. **9**, with a clearance gap **74** between rib **68** and floor **76** of cutaway **62**, a clearance gap **78** between flange **52** and inner wall **80** of cavity **46**, and a clearance gap **82** between flanges **70** and floor **76**. Further there is a clearance gap **84** between parallel faces **86** and **88** of parts **22** and **24**.

[0086] Rib **68** does not wedge between sidewalls **60** of cutaway **62**, but does have clearances **94** therefrom—see FIG. **11**. However, clearances **94** are sufficiently small so that the two clamp parts **22** and **24** align neatly.

[0087] It will be noted that the non-use of fasteners such as bolts to hold parts **22** and **24** and so clamp panel **12** allows greater freedom in the external shape of clamp **10** than is possible in other clamp types.

[0088] It will be further noted that any portion of the weight of panel **12** that bears down on the upper end of formation **38** tends to hold the two clamp parts **22** and **24** in engagement, when the clamp **10** is used in the upright position shown in FIGS. **2**, **3** and **10**. This is desirable from a safety point of view.

[0089] FIG. **13**A is provided to clarify how clamp **10** works. FIG. **13**A shows schematically a "clamp" **10***a* comprising a pair of laminae **22***a* and **24***a* that are movable in the plane of the page to interact with each other in essentially the way that clamp parts **22** and **24**, respectively, of clamp **10** do. "Clamp" **10***a* is a schematic analog of actual clamp **10**. Each item number in FIG. **13**A with the suffix "a" corresponds in function (though not necessarily in exact shape) to the same item number without the suffix "a" in FIGS. **2**-**12**. Thus for example lamina **22***a* corresponds to clamp part **22** and lamina **24***a* corresponds to clamp part **24**.

[0090] Faces **56***a*, **58***a* and **66***a* and **72***a* are all angled at the small angle "b" (shown exaggerated) to clamping faces **34***a* and **36***a*, so that, if faces **56***a* and **58***a* are in contact and faces **66***a* and **72***a* are in contact, faces **34***a* and **36***a* move progressively closer to each other as lamina **22***a* is slid downwardly relative to lamina **24***a* while remaining parallel to each other. Arrows **530** schematically represent resultant forces applied to faces **34***a* and **36***a* to represent resultant forces that in clamp **10** would be developed due to the presence between faces **34** and **36** of panel **12** and resilient pads **26** and **28**, and compression of pads **26** and **28**. Faces **56***a* and **58***a*, and faces **66***a* and **72***a*, do press against each other while forces **530** act in the position shown, and friction between these pairs of faces resists any tendency of the laminae **22***a* and **24***a* to slide out of engagement with each other so that clamping action is maintained.

[0091] If instead the resultant forces due to clamping were to act at the higher positions shown by arrows **531**, instead of the positions shown by arrows **530**, the contact between faces **72***a* and **66***a* would be lost, and there would instead be contact between point **71***a* and face **76***a*. However, if clearance **82***a* is made suitably small, "clamp" **10***a* will still operate as a clamp in the way described above, when clamping forces are located as shown by arrows **531**.

[0092] In practice, when clamp **10** is proportioned approximately as shown in FIGS. **2**-**10**, the true position for the resultant clamping forces in use appears to be typically in the vicinity of formation **38**, so that the clamping forces are mainly balanced by contact forces between faces **56** and **58** (or points thereof), with the contact forces between either faces **66** and **72** (or points thereon), or point **71** and face **76**, as the case may be, being much smaller. Whether there is contact between faces **66** and **72** on the one hand or point **71** and face **76** on the other hand, or even an intermediate position, will depend on the precise position of the resultant forces developed by compression of pads **26** and **28**. The clearance **82** is made small enough that if there is contact between point **71** and face **76**, any deviation from parallelism between faces **34** and **36** will be inconsequential.

[0093] Instead of flanges **70** being of tapering thickness as shown in FIGS. **8** and **9**, they may alternatively be of constant thickness, with the bottom face **76** of cutaway **62** being set at the angle "b" to face **34** over that part of its length in their vicinity. Such an alternative arrangement is shown in FIG. **14**, which is otherwise identical to FIG. **9**. Then, the space between each face **66** and face **76** would be a constant-width slot within which one of the flanges **70** could be received with small sliding clearance. This arrangement is also shown schematically in FIG. **13**B, in which the same item numbering approach is used as in FIG. **13**A. Assuming again a clamp proportioned similarly to clamp **10**, the clamping forces (not shown) would be substantially balanced by contact between faces **56***a* and **58***a* (faces **56** and **58** in this version of clamp **10**) with sliding movement of flanges **70***a* between faces **76***a* and **66***a* serving to maintain faces **34***a* and **36***a* substantially, if not necessarily exactly, parallel during clamp assembly.

[0094] Parts **22** and **24** of clamp **10** have undercuts and cavities and while able to be manufactured by a range of methods known in the art, such as machining from solid or die- or sand-casting with or without finish machining, lend themselves particularly to investment or "lost wax" casting. This can ensure that clearances such as clearance **82** for example can be kept small without the need for machining. Metals such as stainless steels are able to be formed using

these latter methods, and can be suitable for architectural and external applications such as swimming pool fences. Exposed surfaces may be brought to a polished finish by known methods.

[0095] Note that the clamping mechanism described above depends on the compression of resilient elastic pads **26** and **28** and not on actual wedging of one of parts **22** and **24** into the other. Thus, if panel **12** is broken and is removed (e.g., knocked out) from between faces **34** and **36**, the effects of the ceasing of compression of pads **26** and **28** and of clearances **74**, **78**, **82** and **84** are that part **22** can move slightly towards part **24** (e.g., tending to close gap **84**) and pressure between faces **56** and **58** is broken so that friction between them does not greatly resist separation of parts **22** and **24**.

[0096] This may be an advantage when a damaged fence must be repaired. The ability of part **22** to be moved towards part **24** after removal of panel **12** may allow part **22** to be broken away from grout **18** with little damage thereto and to be moved upward relative to supporting surface **14** and then fully out of engagement with part **24**. Such upward movement may be initiated by placing a wedge-shaped tool (e.g., screwdriver end) between the curved upper end **90** of rib **68** and the bottom face **92** of formation **38**. Although sidewalls **102** of clamp part **22** are shown in the Figures as parallel, their lower end portions could alternatively be slightly tapered (converging in a downward direction) to facilitate removal in the above manner after their initial grouting in place. A new panel **12** could then be placed on formation **38** (with a new pad **44** on formation **38**) of part **22** and part **22** then mated again with part **24**, compressing pads **26** and **28**, without part **24** having to be removed from the grout **18**. It is not asserted that this approach will always be possible, as the ability to use it will depend on the conditions at a particular site.

[0097] An alternative clamp **610** according to the invention, similar to clamp **10** in the way it clamps, will now be described. (A further clamp **710** with essentially the same clamping arrangement, but a different mounting arrangement, will then be described.)

[0098] Clamp **610** is shown in FIG. **15** secured to a member **611** and holding panel **12** between resilient pads **626** and **628** similar to pads **26** and **28**. FIGS. **16** and **17** show a first part **622** and FIGS. **18** and **19** show a second part **624** that are comprised in clamp **610**. FIG. **20** shows parts **622** and **624** only, i.e. without pads **626** and **628**, assembled together in the same way and view as FIG. **9** shows parts **22** and **24** of clamp **10** assembled together.

[0099] Clamp **610** differs from clamp **10** in two ways. First, instead of the formation **20** of clamp **10**, clamp **610** has two bolts **621** screwed upwardly into second part **624**. Bolts **621** (or other threaded members (not shown)) can themselves act as anchors grouted into a hole, or they can enable clamp **610** to be easily secured to a deck, beam or the like as represented by member **611** of FIG. **15**.

[0100] The second difference relates to the way the clamping principle is achieved. Although a pair of inclined faces **656** and **658** slide on each other during assembly, functioning as faces **56** and **58** do in clamp **10**, the formations that support faces **656** and **658** differ from those in clamp **10** that support faces **56** and **58**. Part **622** has a formation **638** protruding from clamping face **634** that during clamp assembly slides on a formation **668** that protrudes from clamping face **636** of part **624**. Formation **668** is similar to the rib **68** of clamp **10** and on assembly is partly received in an elongate recess **662** in part **622**. As best seen in FIG. **21**, formations **638** and **668**, where they overlap when clamp **610** is assembled, are L-shaped in cross-section and define faces **656** and **658**. Faces **656** and **658** are at angle "b" to faces **634** and **636**, as shown in the side views of FIGS. **17** and **19**. Formation **638** has a rounded upper section **639** with a width approximately the same as the combined width of formations **638** and **668** when they are in engagement. Clamp **610** is assembled to a slotted edge **40** of a panel **12** in the same way shown in FIGS. **12**A-C for clamp **10**, with formations **638** and **668** being received in the slot **40** as formation **38** is received in the slot **40** in the case of clamp **10**. During assembly of part **622** to part **624**, faces **656** and **658** slide along each other. A U-shaped resilient elastic pad (not shown), like pad **44** of clamp **10**, is placed over the rounded upper section **639** before assembly, is received neatly in the slot **40** in the panel **12**, and carries out the same function as pad **44** does in clamp **10**, namely to prevent direct contact between the panel **12** and upper section **639**. When clamp **610** is used upright to clamp a bottom edge of a panel **12**, the weight of the panel **12** supported on upper section **639** tends to hold clamp halves **622** and **624** together.

[0101] Flanges **670** having faces **672** are provided on part **624** and on assembly of clamp **610** are received in channels **664** of part **622** so that faces **666** of part **622** slide on faces **672** of flanges **670**. Flanges **670** and faces **672** correspond in function to flanges **70** and faces **72** respectively of part **22** and channels **664** and faces **666** correspond in function to channels **64** and faces **66** respectively of part **24**. Clamp **610** could also be varied (not shown) to have non-tapering flanges **670**, in the same way, and for the same reasons, as described above in relation to clamp **10** by reference to FIG. **14** and FIG. **13**B. End face **669** of formation **638** can contact face **671** of part **624** to act as a stop when the two parts **622** and **624** are fitted together as in FIGS. **15** and **20**. Despite the geometrical differences, clamp **610** clamps a panel **12** in essentially the same way as clamp **10**. Faces **656** and **658**, as seen looking lengthwise of the clamp **610** (as in sectional view FIG. **21**) may be parallel to faces **634** and **636**, or may be at a slight angle to them (as shown in FIG. **21**) so as to lock together in a hook-like manner.

[0102] A rounded face **691** on formation **638** is provided (see FIG. **16**) to provide a recess into which a wedge (or screwdriver end) can be entered if panel **12** shatters and is broken away from between clamp parts **622** and **624** together with the rubber components to lift part **622** out of engagement with part **624**.

[0103] A clamp (not shown) could of course be made that is like clamp **610** in having formations **638** and **668** as described above, but that has a different anchoring arrangement, such as for example an integrally formed anchoring formation (not shown) like formation **20** of clamp **10**, instead of bolts **621**.

[0104] A clamp **710** generally similar to clamp **610**, and clamping in the same way, but with still another possible anchoring arrangement will now be described. FIG. **22** is a perspective exploded view of clamp **710** which has two halves **722** and **724** and two mounting bolt assemblies **751** and **753** with which clamp **710** is used. Clamp **710** can clamp a panel such as panel **12** having an edge slot **40** in the same way as clamp **610**. The following item numbers in FIGS. **22-25** indicate elements which are directly equivalent in their functions to elements of clamp **610** with item numbers that are the **100** less: **722**, **724**, **734**, **736**, **738**, **768**, **756**, **758**, **769**, **771**, **772**, **766**, **762**, **770**, and **764**. Thus, for example, item **738** of clamp **710** engages with item **768** in exactly the same way

as item **638** engages with item **668**. Accordingly, part **722** can be moved into engagement with part **724** by movement as shown by arrow **797**

[0105] Corresponding in clamp **710** to solid formation **699**, which is an extension of element **668**, is a wider but hollow formation **799**. Formation **799** has an open-bottomed cavity **801** formed therein for receiving upper ends of bolt assemblies **751** and **753**, by means of which clamp **710** can be conveniently secured to a substrate (not shown) or to a supporting member (not shown). Bolt assemblies **751** and **753** have nuts **802** and **803** respectively threadably received on bolts **808** and **809** together with nuts **804** and **805** as shown. Nuts **802** and **803** can be slidingly received in a channel **806** at the bottom of cavity **801** by being moved in the direction of arrows **807**, with bolts **808** and **809** entering a slot **810**. Flanges **812** prevent excessive upward and downward movement of nuts **802** and **803**. Tightening of nut/washer sets **804** and **805** against a bottom face **811** of part **724** (which is easily possible because the width of channel **806** prevents nuts **802** and **803** turning therein) then secures bolt assemblies **751** and **753** in place partly in cavity **801** and partly extending below part **724**. It is then possible for mating part **722** to be engaged with art **724** just as part **622** engages with part **624** in clamp **610**. This arrangement avoids the need to provide threaded holes in part **724**, and also has been found to be versatile and convenient for mounting part **724** and clamp **710** as required. The cavity **801** can be made long enough to accommodate a significant amount of longitudinal readjustment of the position of bolts **808**, **809**.

[0106] Clamp **710** is shown with flanges **770** that correspond to flanges **670** of clamp **610**. Flanges **770** are shown as tapered, like flanges **670**. However, just as flanges **670** can be made parallel instead of tapered (like the flanges **70** shown in FIG. **14**) so too can flanges **770** be made parallel, with a corresponding modification of part **722**, and for exactly the same reasons as stated above by reference to FIG. **13**B.

[0107] It will be understood readily that the general way of anchoring described by reference to clamp **710** could be adapted to other clamps, for example the clamp **10**. This anchoring arrangement is submitted to be inventive in itself.

[0108] A still further possible variation on clamp **610** will now be described. Installers of fences such as fence **1** desire to be able to adjust the position of glass panels, at least to a small degree, even after clamps such as **610** are secured in place. Specifically, they wish to be able to tilt a clamped panel (such as a panel **2** of fence **1**) so that its upper edge can be moved slightly in a direction normal to the length of the panel. Because in clamp **610** reaction loads from the clamped panel onto the clamping parts **622** and **624** are largely resisted where they arise, by bearing of face **656** on face **658**, lateral movement of flanges **670** within their receiving channels **664** requires (and can be resisted by) comparatively little force. Further, movement of flanges **670** within channels **664** corresponds to slight tilting of clamped panels. Therefore a degree of the desired form of adjustment can be secured by providing some clearance for lateral movement of flanges **670** in channels **664** and a means for causing and controlling such movement.

[0109] FIG. **39** shows a section through clamp **610** now modified in one way at a suitable position to provide the adjustment, the section location and orientation being shown as station '**61-61**' on FIG. **20**; Through fin formation **2908** which bears flanges **670**, there is drilled, on a slant as shown, a hole **2901**. In part **624** there are drilled and threaded two holes **2902** and **2903**. These too may be on a slant as shown. Grubscrews **2904** and **2905** are placed in holes **2902** and **2903**. They have tapered ends **2906** and **2907** that bear on each other within hole **2901**. The effect of this arrangement is that fin formation **2908** can be moved through a small distance range in either of the directions of arrow **2910** by partially withdrawing one of screws **290** and **2905** and advancing the other. The effect of this in turn is to tile a clamped panel (not shown) slightly, as required. Screws **2904** and **2905** are much less obtrusive in appearance than the screws or bolts that pass through conventional clamps.

[0110] Another clamp embodying the invention will now be described. FIG. **26** shows in disassembled form a further clamp **320** according to the invention. Clamp **320** has a first clamp part **322** (see FIGS. **27-29**) and a second clamp part **324** (see FIGS. **30-33**) that in use co-operatingly mates with clamp part **322** and secured to clamp parts **322** and **324** respectively, elastic resilient pads **326** and **328**. FIG. **34** shows clamp **320** in cross section when assembled and holding a glass panel **334** and illustrates the interlocking of the two parts **322** and **324**.

[0111] FIG. **34** also shows the resilient pads **326** and **328** that in use are positioned between surface **344** and panel **334** and between surface **380** and panel **334** respectively. Their purpose is to distribute pressure on clamped glass panel **334** evenly and so to avoid damage due to direct contact between the glass panel **334** and the parts **322** and **324**.

[0112] Clamp part **322** has a bottom face **336** that in use abuts a supporting surface **338** on which clamp **320** is to be secured. A main body **340** extends upward from bottom face **336** and has an outer face **342**, side faces **343**, and a clamping face **344**. In use, resilient pad **326** lies against (and as stated above may be adhered to) face **344**. A lower section **346** has an upper face **360** and faces **361** (coplanar with each other) that are parallel to face **344** and extend downward from face **360**. Intersecting face **361**, and at an acute angle "b" thereto, are locking faces **362**.

[0113] Protruding outward from faces **361** and **362** of lower section **346** is a formation **364** that has a web **366** and flanges **368** that protrude laterally therefrom. At a lower end of formation **364** is a fillet-shaped extension **370** with a hole **372** extending therethrough. Flanges **368** are of constant thickness and are substantially parallel to faces **362** when seen in the side view of FIG. **27**.

[0114] A stepped hole **374** extends between upper face **360** and bottom face **336** and can accommodate a socket-head fastener such as a bolt or screw (not shown).

[0115] Second clamp part **324** has an outer face **378**, an inner, clamping face **380**, and side faces **382**. When parts **322** and **324** are interlocked with each other as described below, clamping face **380** is parallel to clamping face **344**. Elastic resilient pad **328** (see FIG. **34**) in use lies against clamping face **380** and against glass panel **334** and, like pad **326**, has the purpose of evenly distributing clamping pressure onto panel **334** so as to avoid damage to panel **334**.

[0116] Extending upwardly from a bottom face **384** is a cutaway channel **386** with sidewalls **388**. Flanges **390** extend along sidewalls **388** and towards each other from sidewalls **388**. Flanges **390** are of constant thickness as seen in FIG. **32**, and are at an angle "b" to face **380**.

[0117] At the upper end of flanges **390** is a shoulder **391**.

[0118] A formation **410** that is optional is shown in chain-dotted lines in FIGS. **30-33**. Its purpose when used will be described later.

[0119] FIG. **34** shows how clamp parts **322** and **324** (without optional formation **410**) can interlockingly engage with each other and clamp a glass panel **334**. By urging part **324** in the direction of arrow "X" relative to part **322**, that part of formation **364** including flanges **368** can be slidingly received in channel **386**. This is done with pads **326** and **328** in their respective positions against faces **344** and **380** and with panel **334** between pads **326** and **328**. For flanges **390** to be received between flanges **368** and faces **361** and **362** to the point where shoulder **391** of part **324** abuts face **360** of part **322**, it is necessary for pads **326** and **328** to be compressed, so clamping panel **334** between them. The effect of this compression is that faces **397** of flanges **390** press against faces **362** of part **322** (but clear faces **361**) and faces **399** of upper portions of flanges **390** press sufficiently hard against faces **395** of flanges **368**, that there is a frictional resistance to separation of parts **322** and **324**. Holes **400** in part **324** and a hole **372** in part **322** also register with each other. Preferably, the application of some force or impacts (e.g., from a mallet) is required to bring the two parts **322** and **324** into their designed positions as shown in FIG. **34**, with pads **326** and **328** under an appropriate degree of compression to clamp panel **334** without damage thereto. The holes **372** and **400** are optional and allow a pin (not shown) which may be a spring-type dowel or pins or a screw, to be passed through holes **400** in part **324** into hole **372** in part **322** to more positively lock parts **322** and **324** together. Such pin(s) or screw can be small (and for pins, flush with sidewalls **382**) and so much less obtrusive than the comparatively large fasteners used to apply clamping force between jaws of some known clamps.

[0120] If part **324** has the optional formation **410**, such a modified second clamp part being designated **324***a*, a modified form of clamp **320**, designated clamp **320***a* and shown in FIG. **35**, is obtained. (FIG. **35** is exactly equivalent for clamp **320***a* to FIG. **34** for clamp **320**.) Like clamp **10** and unlike clamp **320**, clamp **320***a* provides positive location of panel **334** within the plane of the panel **334**. Formation **410** is adapted to be received in an opening **411** of panel **334** to provide such positive location. A range of shapes is possible for formation **410**, but the particular one shown in FIGS. **35** and **30-33** has a circular cross-section with a peripheral groove **412** for an O-ring **413**. O-ring **413** provides a cushion against direct contact between panel **334** and clamp part **324***a* to prevent damage to panel **334**. Clamp **320***a* interlocks and clamps in the same way as clamp **320** save for the action of formation **410**, so reference may be had to FIG. **34** and its supporting disclosure above. It will be noted that formation **410** of part **324***a* must be placed into opening **411** before parts **324***a* and **322** can clamp panel **334**.

[0121] Other shapes and forms of formations may be used to obtain the functionality of formation **410**. For example, a formation (not shown) like formation **38** of clamp **10** could be provided, and would suit a panel **334** having a slot-type opening (not shown) rather than the circular opening **411**.

[0122] It is to be noted that formation **410** is provided on second clamp part **324***a* of clamp **320***a* rather than first part **322**. When clamp **320***a* is used in the upright position shown, on a supporting surface **414**, the result is that the weight of the panel **334** tends to hold parts **322** and **324***a* in engagement with each other, that weight being applied through formation **410**. This principle is the same as the one discussed above, whereby formation **38** of clamp **10** was placed on second clamp part **24** rather than first clamp part **22**.

[0123] FIG. **37** shows in disassembled form another clamp **920** that embodies this last principle in a different way, but otherwise clamps in the same way as clamp **320**. Clamp **920** has a first clamp part **922** and a second clamp part **924** that in use co-operatingly mates with clamp part **322** in the same way that parts **322** and **324** of clamp **320** mate so as to clamp a glass or other panel (not shown).

[0124] Clamping faces **944** and **980** of parts **922** and **924** respectively are intended to have elastic resilient pads (not shown, but corresponding to the pads **326** and **328** of clamp **320**) against them to prevent direct contact with the surfaces of a clamped panel and to carry out the same part of the clamping function as pads **326** and **328** of clamp **320**. (Specifically, clamp parts **922** and **924** are not proportioned to wedge one into the other, but to be held together frictionally due to the forces generated by compression of the resilient elastic pads during engagement of the parts **822** and **924**.)

[0125] Clamp parts **922** and **924** have hollows **950** and **951** to reduce the amount of material required to make them (for example by investment casting in metal). Provided faces **944** and **980** are left with sufficient area (as is found possible in practice) there need be no excessive pressures on the clamped panel's surfaces.

[0126] Further clamp part **924** has a protruding ledge **952** on which in use of the clamp **910** an edge of the panel being clamped is supported (directly or more preferably by a resilient pad (not shown)) on upper surface **953** of ledge **952**. This has the effect of causing the weight of the panel to hold parts **922** ands **924** in engagement, when the clamp **910** is used in the upright manner shown in FIG. **37** to support a lower panel edge.

[0127] Ledge **952** is received neatly and slidingly between raised formations **954** on part **922** to help keep the two parts **922** and **924** neatly in alignment with each other.

[0128] As an option, the two parts **922** and **924** are provided with holes **955** and **956** respectively through which can be passed a pin, dowel, screw or the like (not shown) to lock the parts **922** and **924** positively together in their fully engaged configuration.

[0129] Clamp part **922** is shown with a stepped hole **991** extending through it and in which can be received a screw **992** whereby part **922** is secured to a floor, deck, grouted-in ground anchor or the like (not shown).

[0130] FIG. **36** is provided to enable comparison and contrasting of the clamping principles underlying clamps **10**, **320** and **320***a*. It may be compared with FIG. **13**A-B which refers to clamps **10** (and **710**).

[0131] FIG. **36** shows two laminae **590** and **591** that are analogous respectively to the parts **322** and **324** of clamp **320** in the same way as in FIG. **13**A parts **22***a* and **24***a* are analogous to parts **22** and **24**. Faces **592** and **593** are analogous to the pair of faces **362** and **397** (lower portion) and faces **594** and **595** are analogous to the pair of faces **395** and **399**. Arrows **596** are analogous to forces developed in the actual clamp **320** due to compression of resilient elastic pads **326** and **328** between parts **322**, **324** and panel **334**. FIG. **36** illustrates the clamping principle of clamp **320**.

[0132] The distinction between clamps **10** and **320** lies in the relative positions of the forces (arrows **530** and **596**) and the pairs of abutting faces at which reaction forces are developed that maintain the clamp parts in engagement with each other and clamp the panels.

[0133] Note that clamp parts **22** and **24**, and clamp parts **322** and **324** are not wedged into each other, in the sense of

being pushed into a gap between two converging surfaces—in the absence of resilient elastic pads **26** and **28** and **326** and **328**, there is no clamping action.

[0134] It is to be noted that the clamping principle of the clamps **320** and **920** can be combined with various methods of mounting clamps to decks or floors or within ground masses. FIG. **38** shows, disassembled, two clamping parts **1722** and **1724** of a clamp **1720** that is an example of this, inasmuch as the mounting arrangement of clamp **710** is combined with the clamping arrangement described by reference to clamp **320**. Clamp **1720** has three distinct portions **1730**, **1731**, and **1732** (shown in the Figure by reference to part **1722**). Parts **1722** and **1724** correspond to parts **322** and **324**, respectively, of clamp **320**. In portion **1730**, they have faces **1735** and **1736** that correspond respectively to clamping faces **344** and **380**, and that have the same function.

[0135] In portion **1731**, clamp part **1722** has a formation **1737** that corresponds in function to formation **364** of clamp **320**. That is, it is slideable into a shaped channel **1738**, as parts **1722** and **1724** are assembled together in the same way as parts **322** and **324**, the sliding occurring at a small angle to the length of the clamp **1720**. To assemble clamp **1720** onto a panel (not shown) the panel's edge is supported on (or preferably slightly above) surface **1739** of part **1724** and formation **1737** is firstly slid and then driven into channel **1738** as elastic pads (not shown, but corresponding to pads **326** and **328**) abutting faces **1735** and **1736** are compressed.

[0136] In portion **1732**, part **1722** has a cavity **1740** and a slot **1741** that correspond respectively to cavity **801** and slot **810** of clamp **710** so that mounting bolts or anchors (not shown but analogous to bolts **808** and **809**) can be positioned and secured therein in the same way as in clamp **710**. As parts **1722** and **1724** are slid and driven into engagement with each other, a lower part-cylindrical wall **1742** covers the cavity **1740** and slot **1741**.

[0137] Clamps such as **320** and **920** and the variations on them described above are suitable for application to fences such as fence **1** but, like clamp **10**, may also be used on other types of fences or barriers. FIG. **40** shows a fence **201** that is similar to fence **1**, having panels **202** (for example only, of glass) arranged end-to-end but with gaps **205** therebetween and each supported on a substrate **208** by several clamps **203** (which could be of the type of clamp **10** or clamps **320** or **920**), but differs in having an elongate rail assembly **204** that is secured to one or several adjoining panels **202** by further clamps **209** positioned on their upper edges **207**. Clamps made on the principles described above, and in particular clamp **10**, could also be used for clamps **206**. Although not shown, rail assembly **204** may optionally be anchored to a structure (for example at its ends) as opposed to being supported entirely through panels **207** and clamps **209**. It has been found that fence **201** can advantageously be applied as a balustrade for decks and balconies of buildings. It is considered that the fence **201** is inventive in itself, whether or not clamps made in accordance with the present invention are used in fence **201**. The clamps described herein lend themselves to being secured to panels before being secured to a structure or substrate, and it has been found that this can be convenient for installers of fences, balustrades and the like.

[0138] Other embodiments and variations, within the scope of the described invention, will in the light of the above description readily suggest themselves to persons skilled in the art.

[0139] The specification of Australian Provisional Patent Application No. 2008903013, filed 14 Jun. 2008, is hereby incorporated in this specification by reference.

1-17. (canceled)

18. A clamp securable to a panel, said clamp extending longitudinally between top and bottom clamp ends and comprising:

a first clamp part that comprises a first clamping surface adjoining the top clamp end;

a second clamp part that comprises a second clamping surface adjoining the top clamp end and facing the first clamping surface across a gap therebetween;

a longitudinally elongate fastener of which an upper section is received in an internal cavity in the clamp and of which a lower section protrudes below the first and second clamp parts

wherein:

the internal cavity has an opening to the clamp exterior at its lower end through which the elongate fastener passes and above the opening is defined by a recess in the first clamp part and by a portion of the first clamp part that faces the recess;

the opening comprises a first slot extending laterally in a direction normal to the clamping surfaces the elongate fastener being slidingly received in the slot; and

upwardly facing lands within the recess extend outwardly from each side of the slot immediately above the first slot,

and further wherein:

one of the first and second clamp parts comprises formations protruding laterally outward on opposite sides of that clamp part and the other clamp part comprises grooves on opposite sides of the said other clamp part within which grooves the formations are slidingly received;

the grooves extend upwardly at an acute angle to the clamping surfaces so that the second clamp part is slideable longitudinally relative to the first clamp part into a non-clamping position where the recess is uncovered and the first and clamping surfaces move apart during such sliding.

19. The clamp of claim **18** wherein:

the fastener comprises a bolt threadably engaged with a nut;

the bolt is received in and slideable normal to its length along the first slot; and

the nut is slideably received within a channel in the recess that extends normal to the clamping surfaces and the nut bears on the lands immediately above and extending outwardly from each side of the first slot, the channel having a wall parallel to and close enough to the first slot to prevent rotation of the nut.

20. The clamp of claim **19** wherein the first clamp part comprises downwardly facing lands in the recess and therebetween a second slot parallel to the first slot along which the bolt is slideable the downwardly facing lands being spaced above the upwardly facing lands sufficiently for the nut to be received between the upwardly facing lands and the downwardly facing lands thereby to limit longitudinal movement of the nut in the clamp.

21. The clamp of claim **19** wherein the channel is open at one end whereby when the recess is uncovered in the non-clamping position the nut is movable laterally into the channel

22. The clamp of claim **19** wherein the first slot is open at one end whereby when the recess is uncovered in the non-clamping position the bolt is movable laterally into the first slot.

23. The clamp of claim **18** wherein the second clamp part comprises a surface within a gap between the first and second clamping surfaces that faces upwardly to provide support for a panel that is to be clamped in the clamp.

24. The clamp of claim **18** wherein each clamping surface has thereon an elastic resilient pad and the gap between the first and second clamping surfaces is so sized that that each pad is compressed when a panel is clamped in the clamp.

* * * * *