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(54) Self raking bow top fence panel

(57) A self raking bow top fence panel comprises two horizontal rails (2, 3) supporting a plurality of composite pales (10), each pale comprising two separate vertical legs (12, 13, 13'), each leg being independently pivotably mounted to at least one of the rails. The bows or curved elements (11) forming the top of the fence are preferably provided by the top section of one (12) of the tubular legs of each pale which is bent over to form a downwardly facing socket (15) which receives the upper end (14, 14') of the second leg (13, 13'). The legs may be retained in apertures (32) in the rails by means of fixed transverse pins (20) which enable each leg to pivot independently in the rail, the relative movement between the two legs of each pale being accommodated by movement of the reduced diameter upper end of the second leg in the socket. The bent leg (12) is preferably pinned to both rails while the straight leg (13, 13') may be pinned to both rails or to the lower rail (3) only.

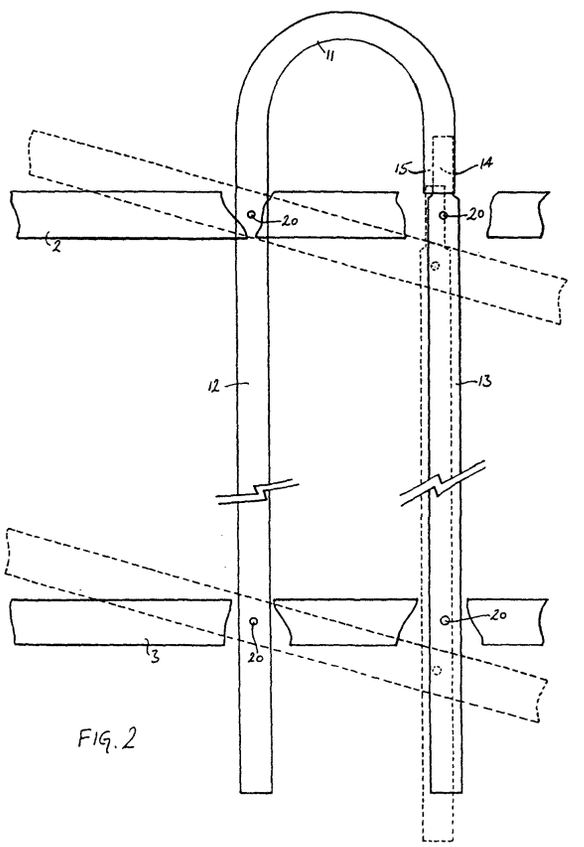

FIG. 2

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Description

[0001] This invention relates to self raking pale-and-rail fence panels for bow top fences.

[0002] Self raking pale-and-rail fence panels, otherwise known as self adjusting pale-and-rail fence panels, are panels comprising a plurality of substantially vertical elongate elements, known as pales, which are fixed between two or more substantially horizontal rails in such a way that the angle between the pales and rails may be adjusted. This permits the rails of each panel to be "raked", which is to say angled with respect to the horizontal, while the pales remain substantially vertical, enabling each panel of the fence to follow the general contour of a sloping ground surface while being attached between substantially vertical posts. The pales are generally attached to the rails at a sufficiently close spacing to prevent access through the panel, and typically project beyond the rails at the top and bottom of the panel. In this specification the term "horizontal" is accordingly intended to embrace the required range of angular adjustment of the rails, while the term "vertical" is intended to include the orientation of pales which are arranged for aesthetic or other reasons in slanting or curved configurations.

[0003] Bow top fences are those where the top of the fence comprises a number of curved elements or "bows" extending above the top rail, usually provided by forming each pale as an inverted "U" shaped rod or tube comprising two substantially parallel legs which are connected by a curved section. The legs are attached to the rails so that the curved section projects above the top rail to form the curved element or bow. The rounded bows form a decorative upper edge which may be used, particularly on fence panels of relatively low height, in order to reduce the risk of injury to people who attempt to climb over the fence. It is often desirable for reasons of cost and lightness to form the pales from hollow tubes rather than from solid rod.

[0004] GB 2 380 745 to Garfex Ltd. discloses a bow top fence formed from tubular "U" shaped pales, wherein each leg of the pale passes through apertures in each of the rails and is pivotably attached to one or other of the rails by spring clips housed within the pales, or alternatively by pivots. A vertical slot is formed in one of the legs to accommodate the pivot, enabling the slotted leg to move up and down relative to its pivot as the panel is raked.

[0005] However, particularly where hollow pales are used, the vertical slot weakens the pale and detracts from the appearance of the installed fence. Both the slot and the holes in the pales through which the spring clips or pivots project can also allow water to penetrate into the interior of the hollow pale, encouraging corrosion and shortening the life of the fence.

[0006] It is desirable that self raking fence panels should be easily assembled on site without the use of heavy riveting or welding equipment or the like, so that spring clips may be preferred over rivets; however, where a spring clip is used within the slotted leg of the pale, it may become displaced along the length of the slot, making it difficult to retain the clip precisely in position to locate in the corresponding recess in the rail.

[0007] It is accordingly the object of the present invention to provide a self raking bow top fence panel which is more attractive in appearance and resistant to corrosion and which is convenient to assemble and effective in use.

[0008] According to the present invention there is provided a self raking bow top fence panel including at least an upper rail, a lower rail and a plurality of pales supported by the rails, each pale including a first leg, a second leg and a curved element extending between the two legs above the upper rail, the panel further including attachment means for attaching each leg to at least one rail such that the angle between the pales and rails is adjustable;

characterised in that the first and second legs are formed as separate parts such that they are displaceable relative to one other when the angle between the pales and rails is adjusted.

[0009] The present panel does not require unsightly slots in the pales, and is attractive and neat in appearance as well as being more robust and resistant to the ingress of water which may lead to internal corrosion, and hence more durable and effective in use. It is also quickly and conveniently assembled on site without the use of heavy tools, and is capable of being proportioned to accept a wide range of angular adjustment without stressing its component parts, making it more adaptable to the requirements of the site.

[0010] This contrasts with the prior art panel described above wherein, as the angle or rake of the prior art panel is increased, sideways pressure is applied to the two legs of each pale by the pivots, tending to force the legs of the pale together against the resistance of the bow. This severely limits the angle through which the panel may be raked, and forcing the panel beyond this point may lead to unsightly deformation of the bows. The problem may be partially overcome by widening the slot so that the pivot is free to move both horizontally and vertically; however, this leads to further weakening and looseness of the pale.

[0011] The present panel in contrast enjoys a strong and rigid construction wherein both legs of each pale may be pivotably attached to at least one rail, and in certain embodiments, to both rails, without any translational movement being permitted between the pales and the pivots or the pivots and the rails, ensuring maximum strength and rigidity. This contrasts with the prior art described above where, since in one leg of each pale the pivot is free to translate within the slot, the slotted leg is effectively unrestrained by either rail in at least one vertical direction. This reduces the overall rigidity of the prior art panel and, depending on the stiffness of the bow which supports it, may make it easier for vandals to dam-

age the pales or the rails.

[0012] Various illustrative embodiments, which are not intended to limit the scope of the invention, will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 shows part of a self raking bow top fence comprising two panels in accordance with a first embodiment;

Fig. 2 shows one pale and part of the rails of one of the panels of Fig. 1, in a horizontal position (solid lines) and a raked position (dotted lines);

Figs. 3A and 3B are respectively top and bottom perspective views of one end of one of the rails of Fig. 1 with the end caps removed;

Fig. 4 is a longitudinal section along line A - A of Fig. 3A, seen in the direction of the arrows;

Fig. 5 shows a locking bar for insertion into the rail of Figs. 3 and 4;

Figs. 6A - 6I show the sequence of steps for assembly of the pale to the upper rail of Fig. 2, with the rail shown in longitudinal section;

Fig. 7 shows the completed pale and rail of Figs. 6A - 6I after assembly;

Fig. 8 is a cross section along line B - B of Fig. 7 seen in the direction of the arrows; and

Fig. 9 shows a view corresponding to that of Fig. 2 but according to a second embodiment.

[0013] Referring to Fig. 1, a bow top fence is erected on irregularly sloping ground between vertical posts 1. Each panel comprises an upper rail 2, a lower rail 3, and a plurality of pales 10, each pale having two legs 12, 13 and a curved element or bow 11 which extends as shown between the two legs so that it projects above the upper rail. The two legs 12, 13 of each pale are formed as separate parts so that they are displaceable relative to one another; in the embodiment shown, the curved elements or bows 11 are formed by the curved upper ends of the longer legs 12, although in alternative embodiments they may be separate from the legs. The open end of each bow 11 forms a downwardly facing socket 15 which receives the upper end 14 of the shorter leg of the pale to form a telescopic connection.

[0014] The rails are provided at each end with end caps 4; the end caps are fixed in known manner to lugs 5 on the posts so that the angle of the rails can be adjusted in a vertical plane, and, if required, also in a horizontal plane so that the fence can change direction at each post as required to follow the boundary of the site. Each leg is attached to at least one of the rails by attachment means which form a pivot so that it can be angled with respect to the rail; in the first embodiment shown, both legs are pivoted to both rails, which ensures that each leg of each pale is securely retained against vertical movement and also enhances the strength and rigidity of the rails and the panel. In the illustration the right hand panel R has been raked to a greater angle than the left hand panel L, so that there is a correspondingly greater degree of relative vertical and horizontal displacement between the two legs 12, 13 of each of its pales. This displacement is accommodated by the movement of the upper end 14 of each of the shorter legs 13 within the corresponding socket 15. In the left hand panel, the rails of which are nearly horizontal, the open ends of the bows are almost flush with the top face of the rail 2, whereas in the right hand panel the reduced diameter upper end section 14 of each shorter leg 13 is exposed for most of its length.

[0015] Referring to Fig. 2, the construction of the composite pale 10 is shown in greater detail. Each leg is formed from hollow steel tube, which gives the pales a good ratio of strength, weight and cost. Alternatively, tube of aluminium, plastics or other material or even solid bar might be used. The longer leg 12 is bent over at the top to form the bow 11, and its open upper end forms the downwardly facing socket 15. The shorter leg 13 is formed from a straight length of tube with a reduced diameter section 14 at the top. The section 14 is a loose fit in the socket 15, which allows it to move from a position as shown where it abuts the right hand wall of the socket when the panel is in the horizontal position (represented in the drawing by solid lines) to a position abutting the opposite side of the socket when the panel is raked to its maximum permitted angle (shown by dotted lines). Each pale is pivotably attached to each rail by attachment means 20, so that the pales remain parallel as the panel is raked, whilst the socket 15 provides room for the upper end 14 of the shorter leg to move telescopically between the upper (panel horizontal) and lower (panel raked) positions shown. This avoids stressing the pale and preserves the neat appearance of the panel.

[0016] In an alternative embodiment the socket 15 may be formed into a shape with an elongated or ovoidal cross section whose shorter axis is slightly longer than the diameter of the reduced diameter section 14 and whose longer axis lies along the rail. This holds the reduced diameter section 14 snugly in a direction transverse to the rail whilst maximising the freedom of movement along the axis of the rail, and hence maximises the angle to which the panel may be raked before it is restrained by contact between the section 14 and the side wall of the socket 15. Alternatively or additionally, the upper end 14 of the shorter leg might be formed with an ovoidal cross section. A deformable rubber or plastics seal or the like might also be arranged in the socket around the upper end 14 of the shorter leg to eliminate any tendency to rattle.

[0017] Referring to Fig. 9, in a second embodiment, the rails and the longer leg 12 are formed as in the first embodiment, whereas the upper end 14' of the shorter leg 13' is formed with a larger outer diameter, which is only slightly smaller than the inner diameter of the socket 15. This provides for an effectively continuous visual profile. It is found in practice that a difference of less than a millimetre between the outer diameter of the upper end 14' and the inner diameter of the socket 15 may be sufficient to allow the panel to be raked to a moderate extent, where the rake is assisted by controlled flexing of the pale and by the slight degree of movement of the pivots 20 of the pale along the axis of the rails which may be permitted by the pivotable attachment means as further described below with reference to the first embodiment.

[0018] In addition, whilst the longer leg 12 is pivotably attached to both rails, the shorter leg 13' may be pivotably attached as shown to the lower rail only, so that as the panel is raked the shorter leg assumes a slightly slanted position as shown (dotted lines) in respect of the longer leg 12. At moderate angles of rake the degree of slant of the shorter leg 13' is found in practice to be too small to be visually discernible. As the panel is progressively raked the controlled leverage exerted on the socket 15 tightens the lugs 20 in the recesses against the locking bar as further described below and wedges the upper end 14' of the shorter leg slantwise into the socket, so that the resulting forces and slight flexing of the shorter leg 13' rigidify the panel and hold the upper end 14' snugly in its socket.

[0019] In a development the open end of the socket may be arranged within the upper rail so that at relatively small angles of rake the junction between the two legs is entirely concealed. In a less preferred embodiment, the longer leg may be pivotably attached to the lower rail only whilst the shorter leg is pivotably attached to both rails.

[0020] The details of the first embodiment described hereinafter are applicable mutatis mutandis also to the second embodiment.

[0021] By forming the socket as shown in the downwardly facing upper end of the leg 12, the open upper end of the tubular leg 13, 13' is shielded from the ingress of rain and the interiors of both legs remain dry, prolonging their lives. The use of solid lugs to form the attachment means 20 as described below further assists in preventing the passage of water into the interior of the pale.

[0022] In less preferred embodiments the telescopic connection might be formed instead by providing a socket on the shorter leg, or even dispensed with altogether and the two legs joined by means of a separate sleeve. In a still further alternative embodiment the curved element or bow may be formed by a separate section; each leg of the pale might then be formed as a plain, straight tube, and the bow attached by means of clips or the like after assembly of the pales and rails. The bow might also be formed from resilient material so as to bend to the required diameter in order to accommodate the variable spacing between the two legs of the pale. Other forms of rail may also be used, which might be for example hollow rectangular section, or alternatively solid bars which need not necessarily be provided with apertures; for example, the pivots 20 might be provided by plain rivets, bolts or the like passing through the rail. Intermediate rails may also be used if desired in addition to the upper and lower rails shown.

[0023] Returning to the first embodiment and referring now to Figs. 3A, 3B, 4 and 5, each rail is conveniently formed as a pressed or roll formed steel section having an open base 30 and outer side walls 34, each of which is inturned to form respectively an inner wall 35 defining an interior channel 31 therebetween. Apertures 32 are formed in the upper wall 33 of the rail to receive respectively the legs 12, 13 of the pales; each aperture is elongate along the axis of the rail, so that each leg is snugly received within the minor axis of the aperture but is free to move about its transverse pivot along its major axis. A recess 36 is formed on either side of the rail in each inner wall 35 adjacent each aperture to receive a fixed lug 20 which projects transversely to the rail on either side of each leg 12, 13 of the pale as further described below. A cutout 37 is formed adjacent the recess to give room for the lugs 20 to enter the recesses as the leg 12, 13 is rotated. The lugs are then locked into the recesses 36 by inserting a locking bar 40 into each channel 31. This enables each leg to pivot about its transverse lugs 20 which are held within the recesses 36 to the extent permitted by the length of the aperture 32 through which it passes. Once the panel is assembled, end caps 4 are inserted into the open ends of the rails to retain the locking bars 40 in position and provide attachment points for mounting to the fence posts 1. The recesses and locking bar may if required be dimensioned so as to allow a small degree of movement of the lugs 20 along the axis of the rail as the panel is raked, which in the second embodiment increases the maximum rake and reduces the need for the pales to flex.

[0024] In the embodiment shown, the recesses 36 are arranged adjacent the centre point of each aperture 36, which allows each leg of the pale to be pivoted in either direction along the major axis of the rail. It will be noted however from Figs. 1, 2 and 9 that the embodiments illustrated are intended to be pivoted in one direction only. This maximises the angle of rake which can be achieved whilst the projecting upper end 14 of the shorter leg 13 remains within the socket, while at the same time minimising the length of the socket 15. In order to rake the panel in the opposite direction from that shown it would therefore be attached to the posts in mirror image, i.e. with the front face as shown towards the rear.

[0025] It will therefore be appreciated that the apertures 32 may if desired be shortened at one end only so that they abut the leg 12 or 13 (13') of the pale at the shortened end when the rail is horizontal. This permits

the panel to be raked in one direction only, and minimises the amount of clearance around the pale, which is desirable insofar as it prevents access through the apertures 32 and helps to prevent trapped fingers during installation or unauthorised tampering once installed.

[0026] Referring to Figs. 6A to 6I, the upper ends of the component legs of one composite pale are shown during assembly of the pale to the upper rail 2 of the panel; it will be understood that the legs may be assembled simultaneously to the lower rail, which may be identical to the upper rail as shown or alternatively may take any other convenient form. The direction of movement at each step is indicated by the arrow. (It will be understood that in the second embodiment as illustrated in Fig. 9, the lugs on the shorter leg are provided in the lower rail only, but its assembly is in other respects as shown.)

[0027] The shorter leg 13 (13') is first inserted loosely into an aperture 32 so that its upper end 14 lies below the top of the rail (Fig. 6A). The longer leg 12 is then inserted into an adjacent aperture (Fig. 6B). Each leg is provided with a solid steel pin which is fixed transversely through the pale so that each end forms a projecting lug 20; only one end of each pin can be seen in the Figures. In the illustrated embodiment, the lower rail is similar to the upper rail and each leg is provided with a second identical pin (shown in Fig. 2) in a position corresponding to the respective recess 36 in the lower rail. In each case the lugs 20 are oriented along the longitudinal axis of the rails so that they pass through the elongated aperture 32.

[0028] The longer leg 12 is positioned with the lugs 20 within the rail and adjacent the recesses 36 and then rotated (Figs. 6C, 6D) so that the lugs enter the cutouts 37 to lie transversely across the rail and above the recesses 36. The leg 12 is then lowered (Fig. 6E) so that the lugs enter the recesses 36 and the socket 15 lies above the adjacent aperture 32.

[0029] The shorter leg 13 is then raised (Fig. 6F) until its upper section 14 enters the socket 15 and its lugs 20 lie adjacent the recesses 36 and cutouts 37, and then rotated (Fig. 6G) until the lugs 20 enter the cutouts 37 and lie transversely above the recesses 36. It is then lowered (Fig. 6H) so that the lugs 20 enter the recesses 36.

[0030] The sequence of operations described requires only that each leg is inserted into the rails and rotated in the correct order, and with minimal practice may be quickly and easily performed to assemble each pale to the rails. Once all the pales are assembled as described above a locking bar 40 is inserted (Fig. 6I) from one end of the rail into one or both of the channels 31 to lock the lugs into the recesses 36, allowing the pales to pivot about the lugs as required as the panel is installed in position.

[0031] Referring to Figs. 7 and 8 the pale is shown after assembly to the top rail with both locking bars 40 in position. After assembly it is difficult or impossible to remove the pales from the fence without removing the whole panel from the posts, and the pivots 20 hold the rails and pales firmly in position, making the panel rigid and resistant to damage.

[0032] By forming each U shaped pale in at least two separate sections, the panel thus enjoys the additional advantage that one or both legs of the pale may be passed through apertures in the rail and then rotated in order to assemble them to the rail; this is impossible to achieve with a traditional U shaped pale made in a single piece. In alternative embodiments however, spring clips or the like, located in the rail or inside the hollow pale, might be used instead of fixed pins or lugs to fasten the pales to the rails, and one or both legs need not necessarily be rotated after insertion into apertures in the rail. The two legs of each pale may also be fastened to the rail in dissimilar ways.

[0033] In a development, means may be provided for limiting the maximum angle of rake of the panel. For example, the end pales may be provided with suitable abutments which contact the rails to prevent the panel from being raked beyond its designed limit.

[0034] In summary, one preferred embodiment provides a self raking bow top fence panel comprising two horizontal rails supporting a plurality of composite pales, each pale comprising two separate vertical legs, each leg being independently pivotably mounted to at least one of the rails. The bows or curved elements forming the top of the fence are preferably provided by the top section of one of the tubular legs of each pale which is bent over to form a downwardly facing socket which receives the upper end of the second leg. The legs may be retained in apertures in the rails by means of fixed transverse pins which enable each leg to pivot independently in the rail, the relative movement between the two legs of each pale being accommodated by movement of the reduced diameter upper end of the second leg in the socket. The bent leg is preferably pinned to both rails while the straight leg may be pinned to both rails or to the lower rail only.

[0035] Many further modifications may be made to the invention within the scope of the claims, and it is to be understood therefore that the foregoing embodiments are provided solely by way of illustration and are not intended to limit the invention in any way.

Claims

1. A self raking bow top fence panel including at least an upper rail (2), a lower rail (3) and a plurality of pales (10) supported by the rails,
   each pale including a first leg (12), a second leg (13, 13') and a curved element (11) extending between the two legs above the upper rail,
   the panel further including attachment means (20) for attaching each leg to at least one rail such that the angle between the pales and rails is adjustable;

characterised in that the first and second legs are formed as separate parts such that they are displaceable relative to one other when the angle between the pales and rails is adjusted.

2. A bow top fence panel according to claim 1, **characterised in that** the curved element (11) comprises an upper curved end of the first leg (12).

3. A bow top fence panel according to claim 2, **characterised in that** the first and second legs of each pale are telescopically connected.

4. A bow top fence panel according to claim 3, **characterised in that** the curved element includes a downwardly facing socket (15)
and an upper end (14, 14') of the second leg extends upwardly inside the socket.

5. A bow top fence panel according to any of claims 1 - 4, **characterised in that** each leg is attached to both the upper and lower rails.

6. A bow top fence panel according to any of claims 1- 4, **characterised in that** the first leg (12) is attached to both the upper and lower rails and the second leg (13, 13') is attached to the lower rail only.

7. A bow top fence panel according to any of claims 1 - 6, **characterised in that** at least one rail includes a plurality of apertures (32) for receiving the legs of the pales.

8. A bow top fence panel according to claim 7, **characterised in that** the pales are assembled to the at least one rail by inserting each leg of each pale through a respective aperture (32) and then rotating at least one leg of each pale.

9. A bow top fence panel according to claim 8, **characterised in that** the at least one leg of each pale includes at least one fixed lug (20),
and **in that** the at least one rail includes recess means (36) for receiving the lug (20) when the leg is rotated,
together with locking means (40) for retaining the lug in the recess means.

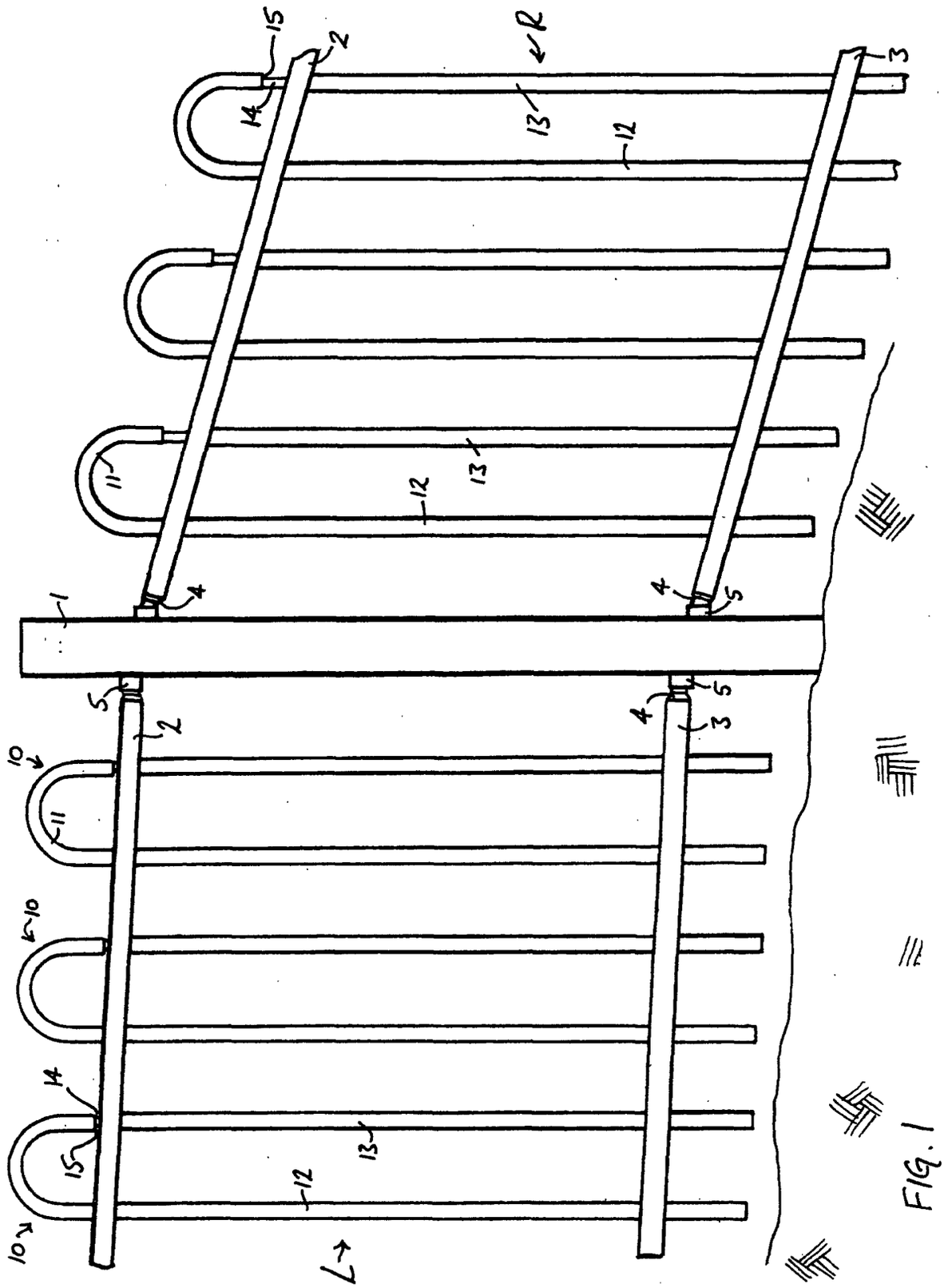


FIG. 1

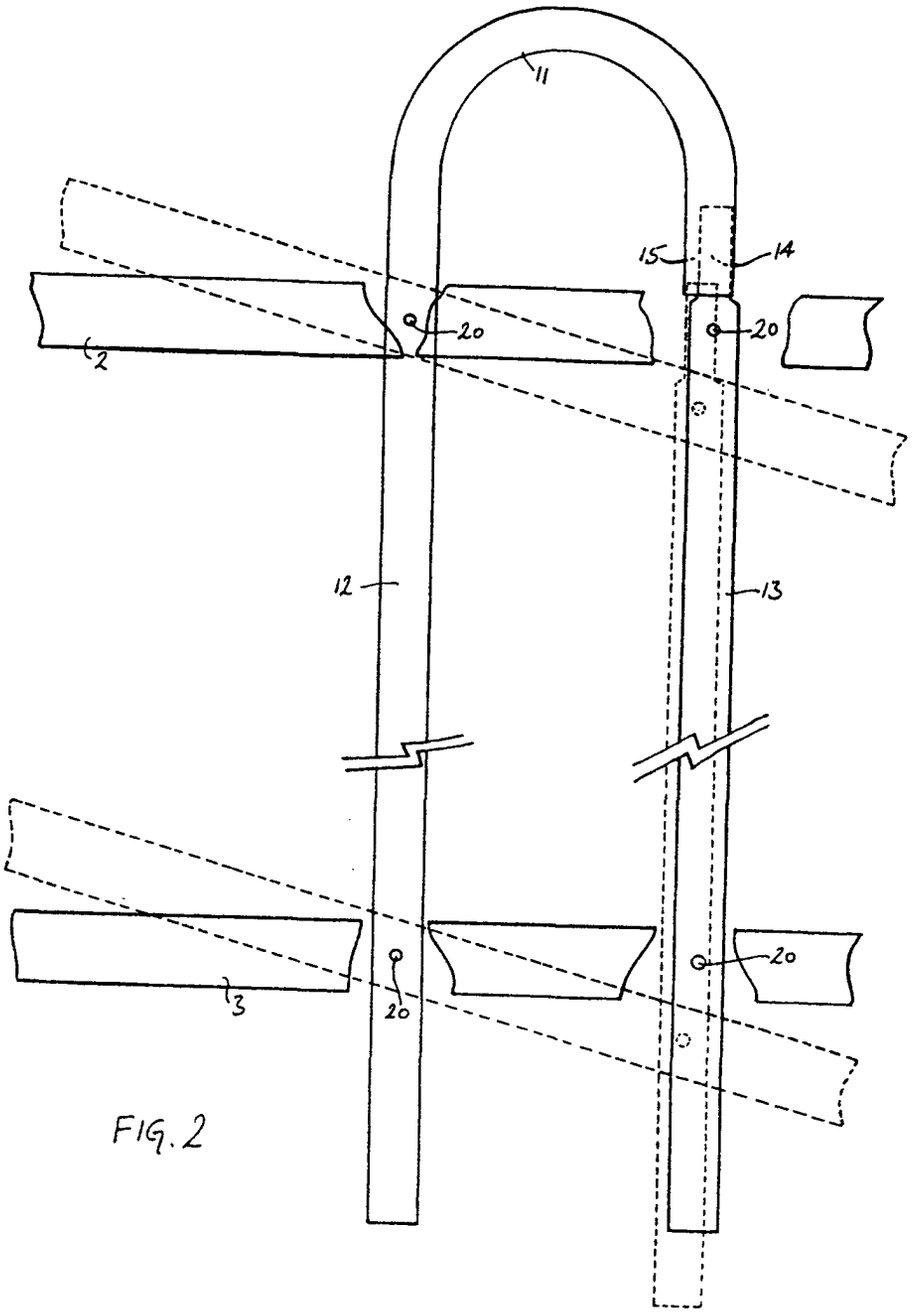


FIG. 2

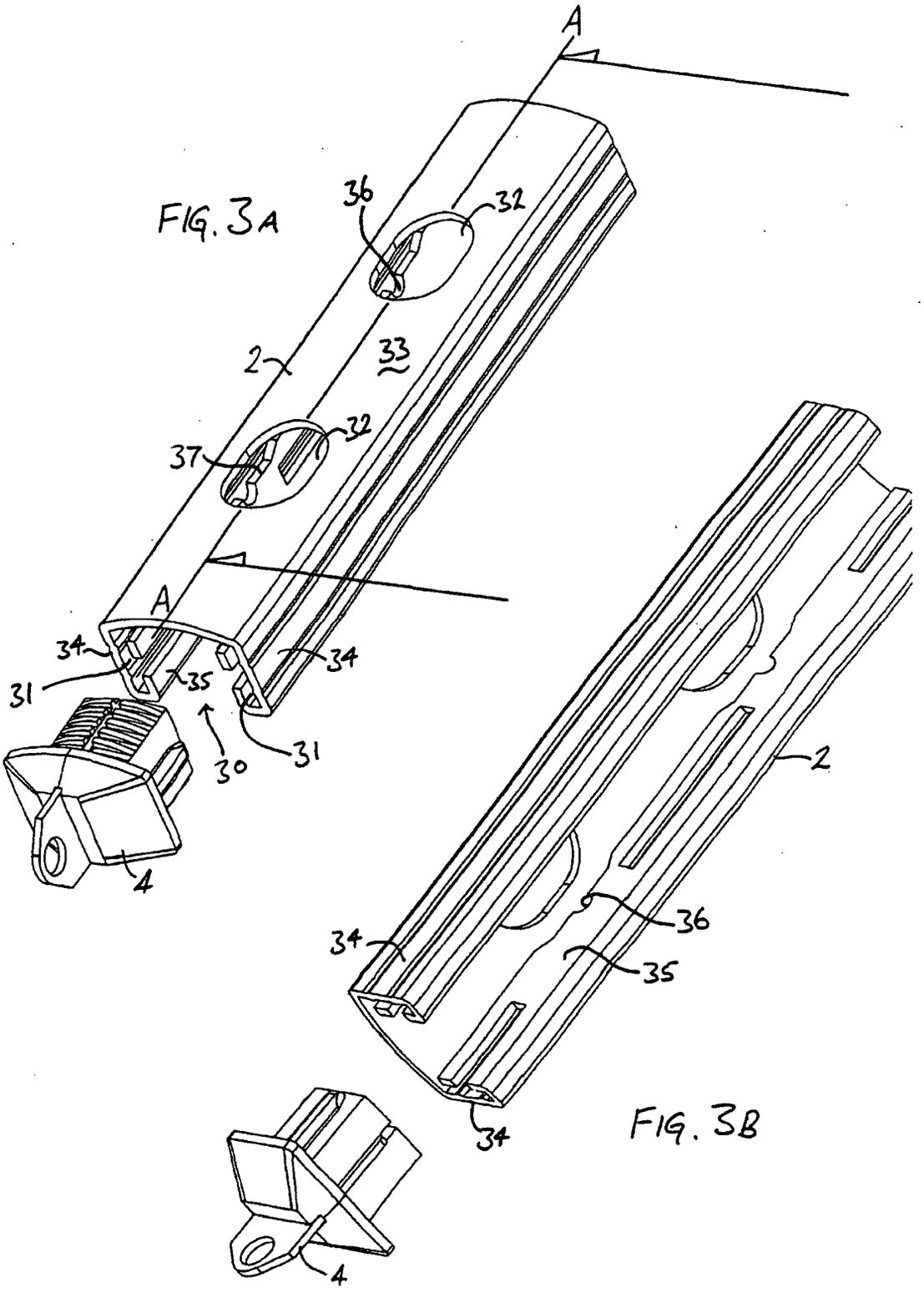


FIG. 3A

FIG. 3B

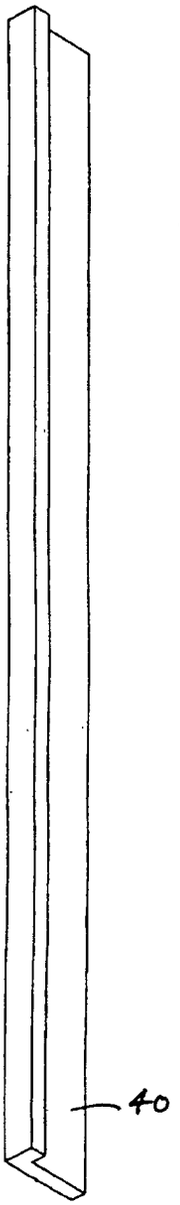


FIG. 5

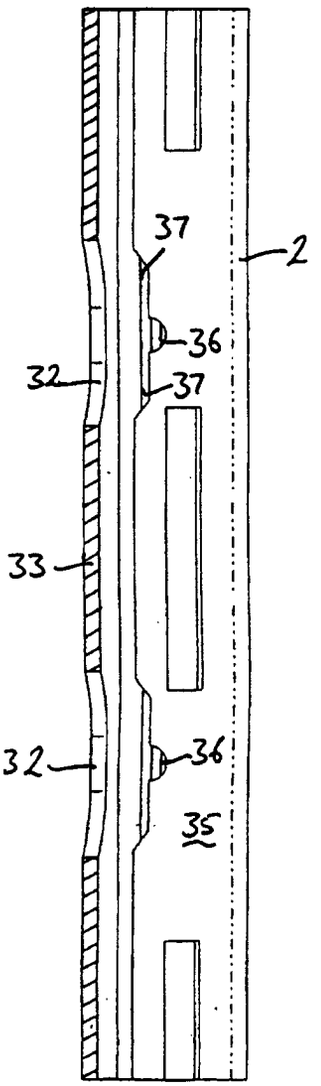


FIG. 4

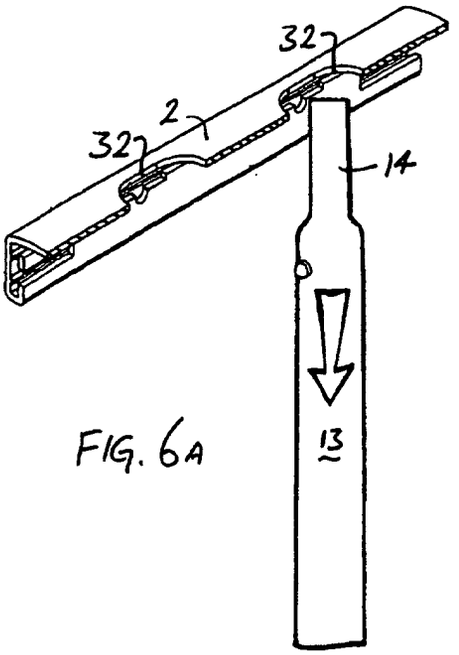


FIG. 6A

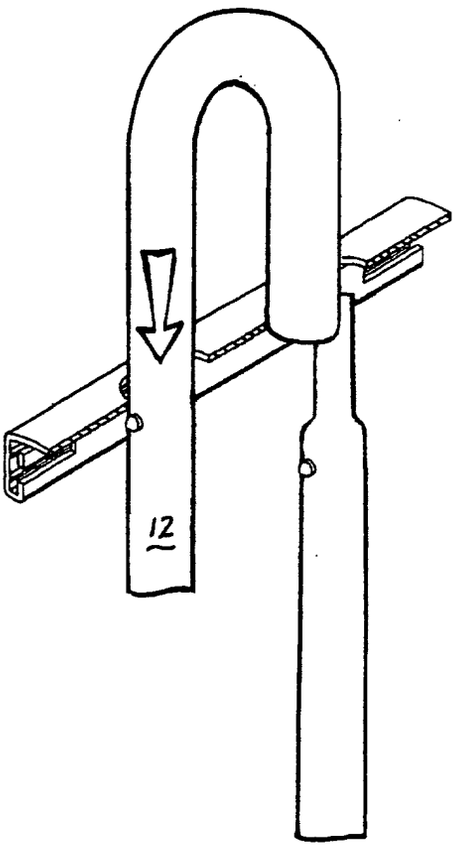


FIG. 6B

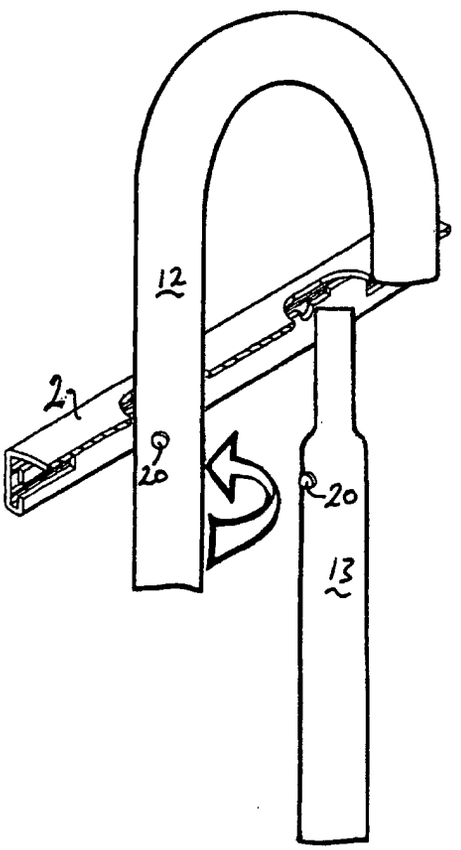


FIG. 6C

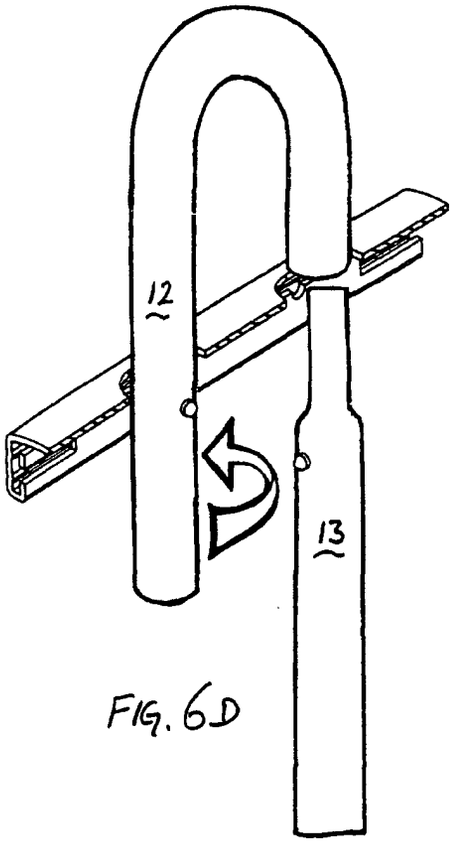


FIG. 6D

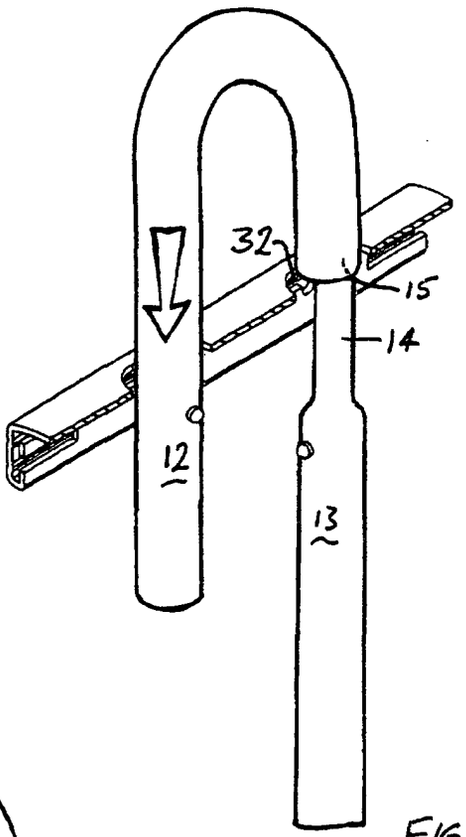


FIG. 6E

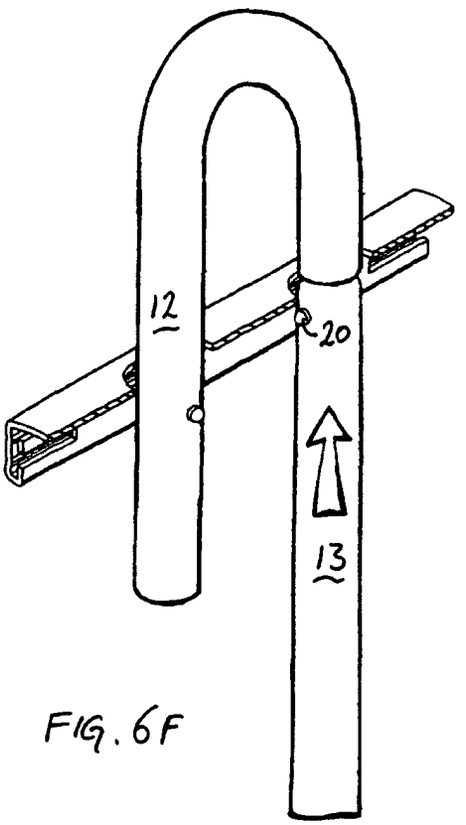


FIG. 6F

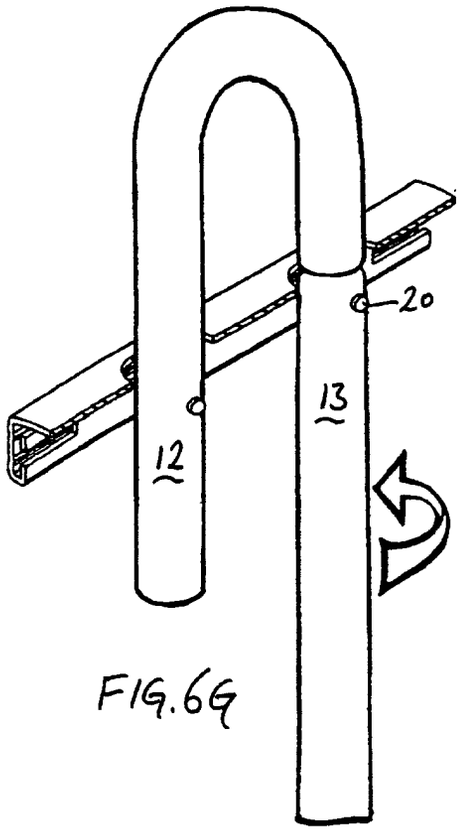


FIG. 6G

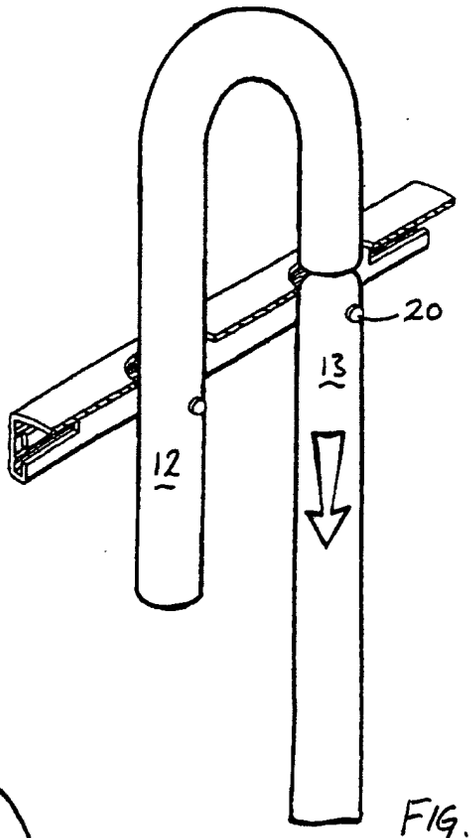


FIG. 6H

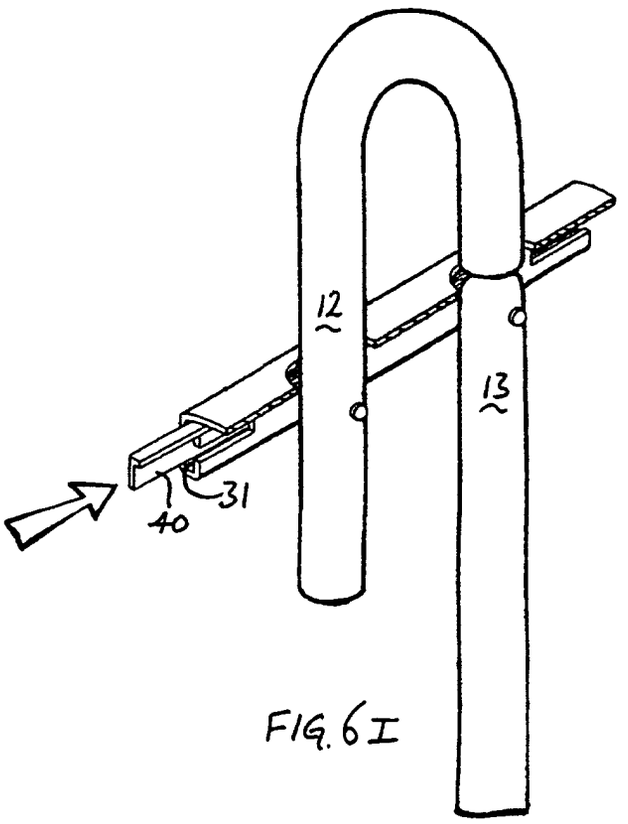
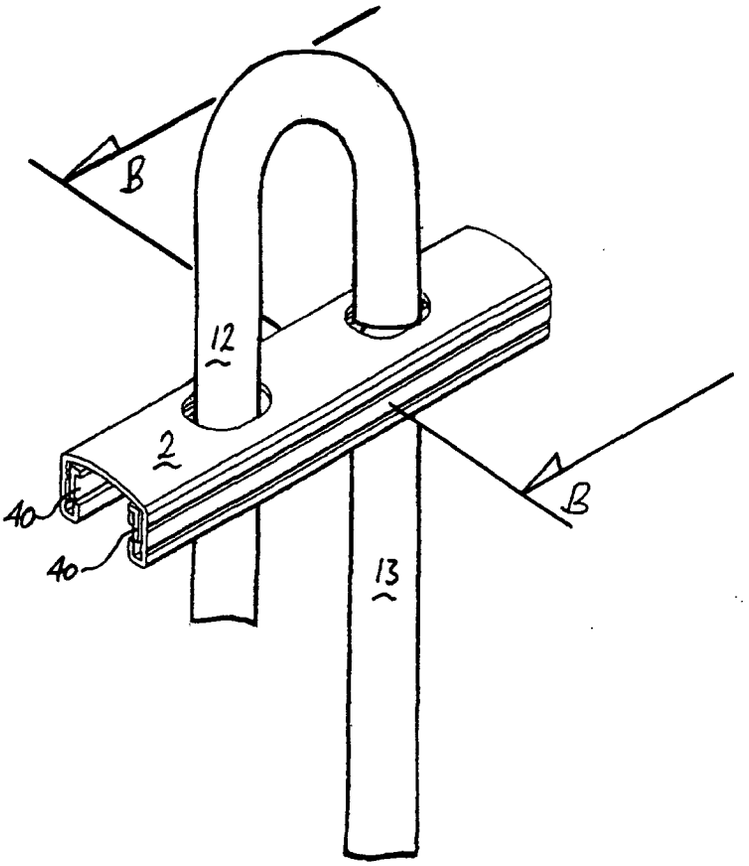


FIG. 6I

FIG. 7



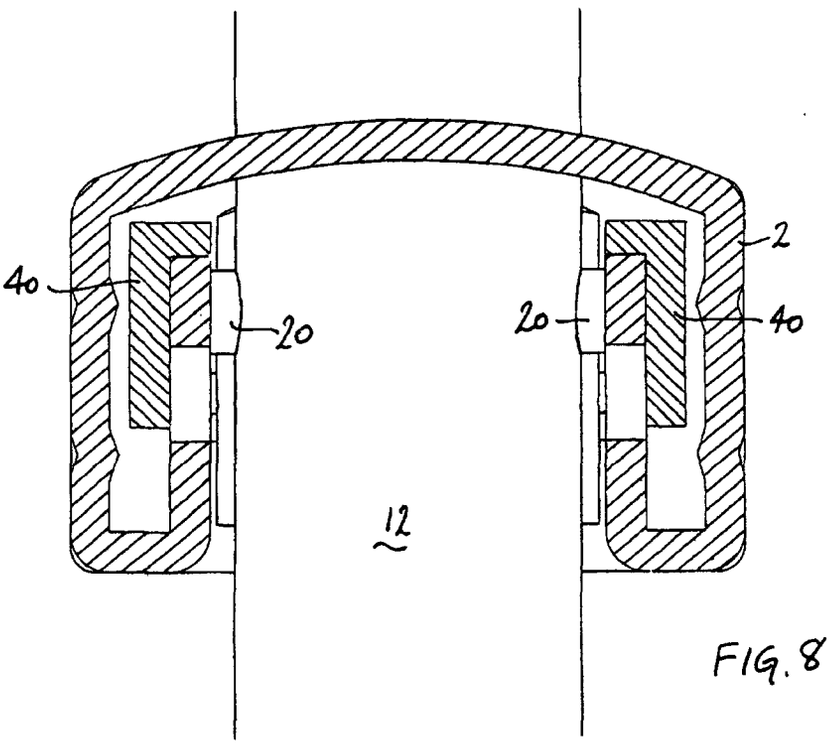


FIG. 8

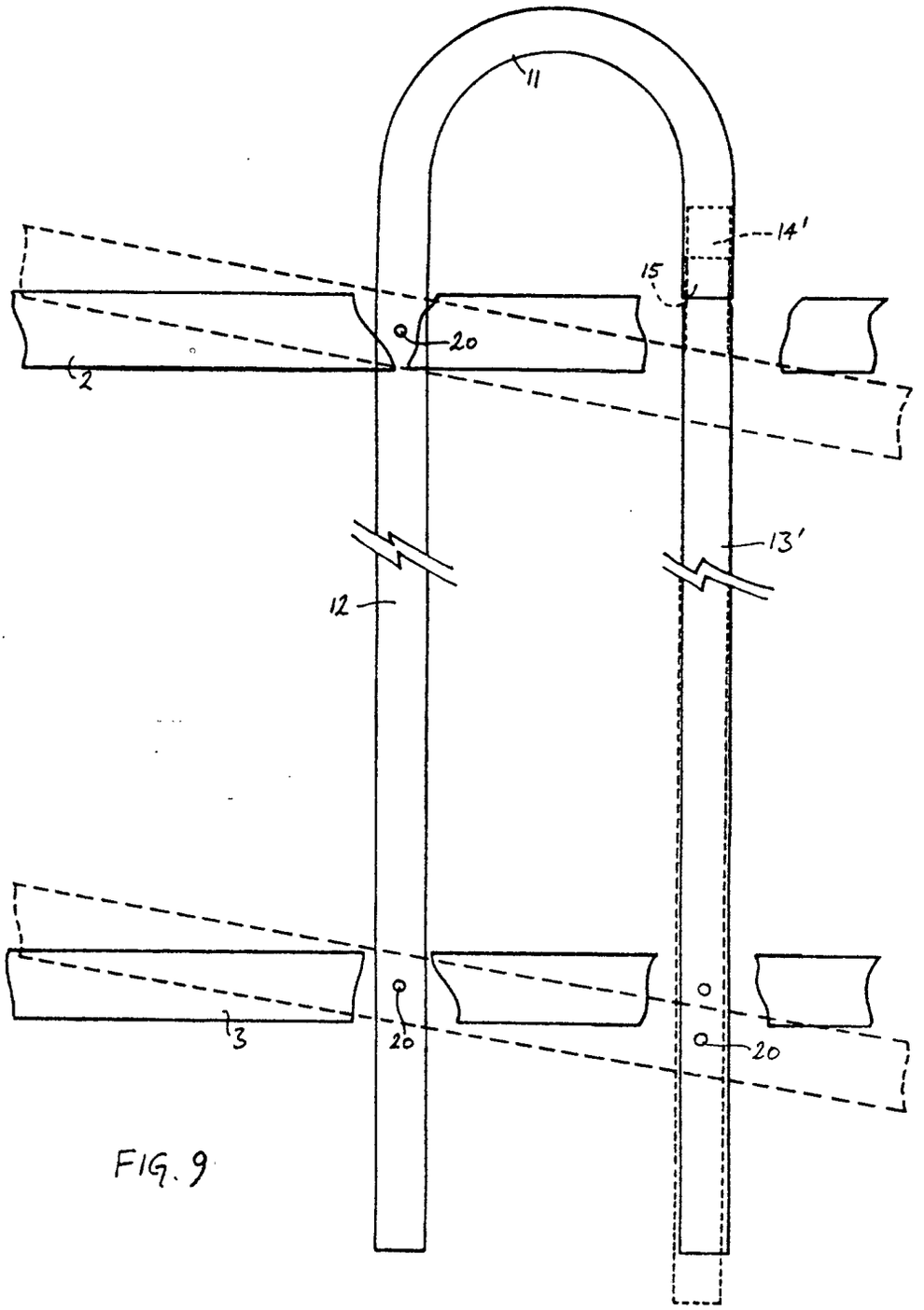


FIG. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 07 8280

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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E04H
E04F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 February 2005	Porwoll, H

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22-02-2005

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