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(54) Handrail assemblies

(57) A handrail assembly 1 for a staircase or the like comprises a base rail R and a handrail 2 each preferably having at least one substantially flat surface (2a, Figure 18), at least one upright post 3 and a bracket 4 to connect one rail 2 to the upright post 3, the post-to-rail bracket 4 having a base 40 for engagement with the substantially flat surface (2a, Figure 18) of the rail 2 and a deformable portion 45 to accommodate different inclinations of the rail 2 relative to the post 3. An assembly 1 may further comprise a connector 5 to interconnect the handrail 2 with a rail 6, the connector 5 preferably having a first hollow portion with an internal cross-sectional shape to match the cross-section of the handrail 2, the handrail 2 extending at least partially into the first hollow portion.

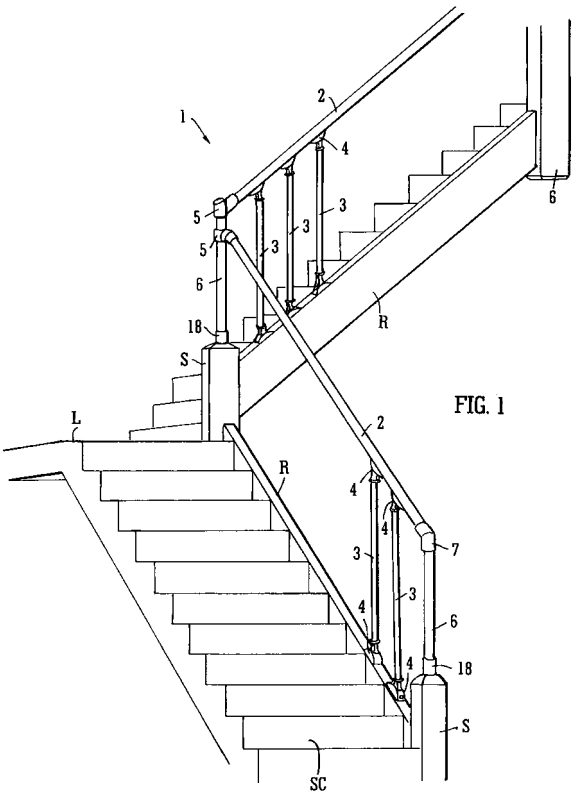

FIG. 1

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Description

[0001] This invention relates to a handrail assembly suitable for use as a safety rail or on a staircase and the like.

[0002] Handrail assemblies for a staircase usually comprise a base rail or support, a hand rail and a set of posts called balusters or banisters which extend in between and support the handrail. Each end of the handrail may be further supported by a newel post. The handrail is supported such that it is parallel to the stairs, and the banisters are generally vertical.

[0003] There are wide variations in the inclination of staircases, in the distance that they have to span and in the total number of bends or changes of direction required. Regulations normally confine modern, new-built staircases to within a certain range of inclinations. Older houses, which were built before the introduction of modern regulations, often have staircases whose inclination falls outside of the proscribed range. Accordingly, replacing a staircase in an older building can often require a builder to install a bespoke staircase, rather than using standard available components. Because of these factors there is a requirement to provide a handrail assembly which can accommodate wide variations of inclination and which can be assembled and installed both by the professional and by the do-it-yourself enthusiast.

[0004] Several variable pitch stair railing assemblies have been proposed. For example, those disclosed in US-A-5056283, US-A-4533121 and US-A-4352485. Further, adjustable connecting members for connecting rigid handrails or safety rails have also been disclosed in GB-A-2299370.

[0005] It is an object of the present invention to provide a handrail assembly which allows for changes of direction and which can be used on stairways which have varying degrees of inclination and varying spans. It is a more specific aspect of the invention to provide a handrail assembly which can be readily assembled by the unskilled or at least partially skilled labour.

[0006] Accordingly, one aspect of the invention provides a kit of parts for the assembly of a handrail installable to adopt a plurality of inclinations, the kit comprising:

- A length of rail for use as a handrail;
- Two parts of a two-part pivotable mount or connector for the rail, one part having a hollow portion into which an end of the rail is insertable, the other part being mountable on a supporting surface, the two parts being interconnectable and being mutually pivotable when interconnected.

[0007] A second aspect of the invention provides a kit of parts for the assembly of a handrail installable to adopt a plurality of inclinations, the kit comprising:

- A length of rail for use as a handrail;
- A plurality of posts; and
- A plurality of brackets to interconnect the posts and handrail, each bracket having a surface shaped for flush engagement with a surface of the rail and a deformable portion to accommodate a plurality of inclinations of the installed handrail.

[0008] The rail may have, in cross section, a rounded portion and a flat surface, the hollow portion of the mount preferably having an internal cross-sectional which is complimentary to that of the rail.

[0009] The kit will preferably include a plurality of posts and a plurality of brackets attachable to the handrail, the posts and brackets may have have respective mating portions for engagement therebetween, each bracket will usually have a deformable portion to accommodate a plurality of inclinations of installed handrail. The deformable portion preferably being able to deform to accommodate a variation in inclination of, say, 10°, preferably 7°.

[0010] The kit may further include at least one two-part pivotable mount for supporting the handrail, a first part of the mount having a hollow portion into which an end of the rail is insertable, the second part being mountable on a support surface, the two parts being interconnectable to provide pivotable motion with respect to one another.

[0011] Also included in the kit may be one or more connectors having hollow portions into which an end of a length of rail is insertable to interconnect two lengths of rail, one or both hollow portions preferably having an internal cross section having a rounded portion and a flat portion.

[0012] There is also provided, in a third aspect of the invention, a two-part pivotable mount or connector for a handrail, the first part of the mount having a hollow portion into which an end of a handrail is insertable, the second part of the mount being attachable to a support surface, the two parts being pivotable with respect to one another when interconnected, and wherein the internal surface of the hollow portion is shaped to prevent, in use, rotation of the hollow portion about a complimentarily shaped handrail end inserted therein.

[0013] A yet further aspect of the invention provides a connector to connect non-parallel lengths of rail, the connector having two hollow parts into which lengths of rail are insertable, the hollow parts having openings which are non-parallel, at least one of the hollow parts has an internal surface shaped to prevent, in use, rotation of that part about the end of the length of rail when inserted therein.

[0014] The internal surface of the hollow portion may be shaped to have a rounded part and a flat surface

[0015] Preferably, the openings of two hollow parts are orthogonal to one another.

[0016] In a fifth aspect of the invention there is provided a bracket to connect a post to a rail, the bracket compris-

ing a terminal portion for engagement with an end of the post and a surface for flush engagement with a surface of the rail, and an intermediate deformable portion between the terminal portion and the surface which is deformable to accommodate different angles between the rail and post.

[0017] A further aspect of the invention provides a method of installing a handrail assembly comprising a two-part pivotable mount or connector, a length of handrail, the assembly being capable of accommodating different inclinations of handrail, the method comprising the steps of:

- Connecting one part of the mount to a supporting surface;
- Inserting an end of the handrail into a hollow part of the second part of the mount;
- Interconnecting the two parts of the mount;
- Mounting a second end of the handrail at an intended location;

wherein, the two parts of the mount are pivotable with respect to one another to allow the handrail to adopt the inclination between the support and the intended location.

[0018] A yet further aspect of the invention provides a handrail assembly comprising a length of rail having one end inserted into a body portion of a connector, the connector being mounted on and secured to a support surface and being pivotable about a pivot point to accommodate a desired angle of inclination of the handrail, a plurality of posts and a plurality of brackets which connect the posts to the handrail, the brackets having a portion which is deformable to accommodate a desired angle of inclination.

[0019] The bracket may be formed from a plastics material, the material may be acrylonitrile butadiene styrene (ABS), nylon, polyeythylene, polypropylene or other hard wearing and deformable materials.

[0020] The hand rail preferably has a substantially flat lower surface and an upper generally rounded shape. Most preferably the cross-section of the handrail will be in the form of a segment of a circle, most preferably a major segment of a circle. Alternatively, the rounded portion of the cross-section may be elliptical or square in shape, or may be non-uniform.

[0021] It is most preferred that the cross-sectional shapes of at least one hollow portion of the connector, the handrail, the hollow portion of the mount are major segments of a circle.

[0022] The hand rail and rail member are advantageously formed from wood, although they may also be formed from a core material provided with a sheath, veneer or other protective coating.

[0023] A plurality of brackets and upright posts may be connected to the handrail. Further, brackets and upright posts may be connected to the rail member.

[0024] In order that the invention may be more fully understood, it will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a staircase provided with a handrail assembly according to the invention;
Figure 2A is a perspective view of a bracket according to the invention;
Figure 2B is an elevation of the bracket of Figure 2A;
Figure 3A is a perspective view of a second bracket according to the invention;
Figure 3B an elevation of the bracket of Figure 3A;
Figure 4A is a perspective view of a connector part according to the invention;
Figure 4B is an elevation of the connector of Figure 4A;
Figure 4C is an end elevation of the connector of Figure 4A;
Figure 5A is a perspective view of a connector part according to the invention;
Figure 5B is an elevation of the connector of Figure 5A;
Figure 6A is a perspective view of a connector part according to the invention;
Figure 6B is an elevation of the connector of Figure 6A;
Figure 6C is an end elevation of the connector of Figure 6A;
Figure 7A is a perspective view of a connector part according to the invention;
Figure 7B is an elevation of the connector of Figure 7A;
Figure 7C is an end elevation of the connector of Figure 7A;
Figure 8A is a perspective view of a connector part according to the invention;
Figure 8B is an elevation of the connector of Figure 8A;
Figure 8C is an end elevation of the connector of Figure 8A;
Figure 9A is a perspective view of a connector according to the invention;
Figure 9B is an elevation of the connector of Figure 9A;
Figure 9C is an end elevation of the connector of Figure 9A;
Figure 10A is a perspective view of a connector according to the invention;
Figure 10B is an elevation of the connector of Figure 10A;
Figure 10C is an end elevation of the connector of Figure 10A;
Figure 11A is a perspective view of a connector according to the invention;
Figure 11B is an elevation of the connector of Figure

11 A;
Figure 11C is an end elevation of the connector of Figure 11A;
Figure 12A is a perspective view of a connector according to the invention;
Figure 12B is an elevation of the connector of Figure 12A;
Figure 12C is an end elevation of the connector of Figure 12A;
Figure 13A is a perspective view of a cap according to the invention;
Figure 13B is an elevation of the cap of Figure 13A;
Figure 13C is an end elevation of the cap of Figure 13A;
Figure 14A is a perspective view of a connector according to the invention;
Figure 14B is an elevation of the connector of Figure 14A;
Figure 14C is an end elevation of the connector of Figure 14A;
Figure 15A is a perspective view of a connector according to the invention;
Figure 15B is an elevation of the connector of Figure 16A;
Figure 15C is an end elevation of the connector of Figure 15A;
Figure 16A is a perspective view of a connector according to the invention;
Figure 16B is an elevation of the connector of Figure 16A;
Figure 16C is an end elevation of the connector of Figure 16A;
Figure 17A is a perspective view of a connector according to the invention;
Figure 17B is an elevation of the connector of Figure 17A;
Figure 18 is part of a handrail assembly according to the invention;
Figure 19 is part of a handrail assembly according to the invention;
Figure 20A is a perspective view of a third bracket according to the invention;
Figure 20B is a side elevation of the bracket of Figure 20A
Figure 21A is a perspective view of a fourth bracket according to the invention; and
Figure 21 B is a side elevation of the bracket of Figure 21A.

[0025] Referring to Figure 1, there is shown a handrail assembly 1, on a staircase SC which has a landing L. The flights of stairs which lead from and to the landing L extend at right angles to one another, within a corner of a building (not shown).

[0026] The handrail assembly 1 has handrails 2 and upright posts or banisters 3, which are connected to the handrails 2 by brackets 4. The upright banisters 3 are connected, at their lower end, to a base rail R by further brackets 4. The handrails 2 are connected to newel posts 6 by connectors 5. The newel posts 6 are mounted on supports S by further connectors 18.

[0027] The individual components of the handrail assembly 1 will now be described.

[0028] Figures 2A and B show an individual bracket 4 formed from a material such as ABS comprising a body 40 having a flat or planar base 41 and a curved surface 42. The body has three apertures 43A, 43B and 43C. Two of the apertures 43A and 43B have wider, or countersunk, portions which extend from the curved surface 42 of the body 40. The third aperture 43C extends from the planar base 41 into an extension 44 which extends upwards at an angle from the curved surface 42 of the body 40. The aperture 43C has a countersunk portion which extends from planar base 41.

[0029] The extension 44 has a narrow waist 45 which widens to form an annular abutment member 46. A cylindrical spigot 47 extends from the distal end of the extension 44. The spigot 47 is split twice, diametrically, to form four portions 48, each having a quadrant-like cross section and each having a chamfered edge 49.

[0030] Figures 3A and 3B show another bracket 4' (like features being indicated by the same numeral as in Figures 2A and 2B with the addition of a prime (')) having a body 40' with a planar lower surface 41' and curved upper surface 42'. Three apertures 43A', 43B', 43C' extend through the body 40', two of which 43A' and 43B' having a relatively large diameter portion communicating with the curved upper surface 42' of the body 40' and the third 43C' having a large diameter portion communicating with the lower planar surface 41' and extending into an extension 44' having a narrow waist 45'.

[0031] The extension portion 44' terminates, at its' distal end, in an annular abutment member 46' which is provided with a substantially cylindrical engagement spigot 47'. The spigot 47' is split to form four quadrant-like portions 48' each extending substantially the entire length of the spigot 47'.

[0032] The brackets 4 and 4' differ in the positions of the apertures, respectively 43A, 43B, 43C and 43A', 43B', 43C', with respect to the bodies 40 and 40' and in the angle at which the respective extensions 44, 44' make with the respective planar surfaces 41 and 41'. The reasons for these differences will be explained below.

[0033] Figures 4A, 4B and 4C show a one half of a rail/post connector 50 having an annular portion 51 with a circular internal surface. A body portion 52 is connected to the annular portion 51. The body portion 52 has a recess 53 extending into one half thereof, the recess 53 having a curved surface 54. Extending from the recess 53, and communicating with the internal surface of the annular portion 51, are a pair of countersunk apertures 55A and 55B. An aperture 55C extends through the body portion 52 to communicate with the recess 53.

[0034] Figure 5A and 5B show a second embodiment of one half of a rail connector 50', which is identical to that shown in Figures 4A to 4C (like parts being denoted

by identical numerals with a prime (')) except that the body 52' extends from a circular plate 56 instead of from an annular portion. The countersunk apertures 55A' and 55B' extend through the body 52' and plate 56.

[0035] Figures 6A, 6B and 6C show a third embodiment of one half of a rail connector 50" which has a body 52" similar to that shown in Figures 4A to 5B, (like features being denoted by identical numerals with a double prime (")) except that the body 52" is mounted upon, and connected to, a tubular portion 57. The aperture 55C" is countersunk on the side distant from the recess 53" (as may be those shown in Figures 4A to 5B).

[0036] The tubular portion 57 has an external surface which is circular in cross-section and an internal surface which has a cross section of a major segment of a circle. The planar surface 58 is shown in dotted lines in Figure 6C. A pair of apertures 59A and 59B extend through the tubular portion 57 which emerge on the planar surface 58. The apertures 59A and 59B may be countersunk (not shown) on the outer surface of the tubular portion 57.

[0037] It will be appreciated that the parts 50, 50' and 50" may be configured as left-hand or right-hand parts, which is to say that the recess 53, 53', 53" may extend into either half of the body 52, 52', 52". As shown, parts 50, and 50' may be described as left-hand parts, the recess 53, 53' respectively, extending into the left-hand portion of the body 50, 50'. In contrast, the recess 53" of part 50" extends (as shown) into the right-hand portion of the body 52". As described below, whether left-hand or right-hand parts are used will depend on the particular staircase to which the rails are installed.

[0038] Figures 7A to 7C show a second part of a rail connector 60 having a tubular body 61 which tapers from an open end 62 to a closed end 63. The internal surface of the tubular body has a cross-section (at the open end 62) of a major segment of a circle with a planar surface 64 extending the length of the body 61. A pair of apertures (not shown) extend through the tubular body 61 to emerge on the planar surface 64.

[0039] Extending from the body 61 is a male member 65 which extends substantially orthogonally to the plane of the planar surface 64 and from one side of the midpoint of the plane of the planar surface 64. The distal portion of the male member 65 has an aperture 66 formed therethrough which is countersunk on one side. It will be appreciated that the part 60 may be configured as a left-hand or right-hand part by altering the side of the part 60 from which the male member 65 extends.

[0040] In use, the male member 65 can extend into the recess 53, 53', 53" of any of the parts 50, 50', 50" to form a connector 5, the aperture 66 being aligned with the aperture 55C, 55C', 55C" extending through the body 52, 52', 52". A nut and bolt (not shown) may be use to secure the two parts 50, 50', 50" and 60 together to form a connector 5 which is pivotable about the nut and bolt (not shown) to adopt a multiplicity of configurations for use on any desired inclination of hand rail.

[0041] Figures 8A, 8B and 8C show a further half of a connector 70 for use with part 50" having a tubular body portion 71 with a substantially circular external cross section and an internal cross section in the form of a major segment of a circle with a planar surface 74. Two pairs of apertures 73, one pair at either end, extend through the body portion 71 in the region of the planar surface 74.

[0042] A male member 75 extends from the body portion 71, the distal end of which having an aperture 76 extending therethrough, the aperture 76 being countersunk on one side.

[0043] In use, the male member 75 of part 70 is located or locatable in the recess 53" of part 50" the respective apertures 76 and 55C" being aligned. A nut and bolt may be passed through the apertures 76 and 55C" to hold the parts 50", 70 together, the parts 50", 70 being pivotable about the bolt to allow the so-formed connector 5' to accommodate a large number of desired inclinations of hand rail.

[0044] Figures 9A and 9B show a further rail/post one-piece connector 8 having two substantially orthogonal tubular portions 81, 85, each having a closed end 82, 86 and an open end 83, 87. The first portion 81 has an internal surface with a cross section which is in the form of a major surface of a circle, with a planar surface 84. Apertures 88, 89 extend through each of the tubular portions 81, 85, which, in the first portion 81, is in the region of the planar surface 84.

[0045] The rail/post one-piece connector 9 of Figures 10A, 10B and 10C, has a first portion 81 identical to that described in relation to Figures 9A to 9C and a second portion 91 comprising a substantially annular body 92 having an internal surface with a with a substantially circular cross-section. Apertures 94 extend through the body 92.

[0046] Figures 11 A, 11B and 11C show a further rail/post one piece connector 10 having two substantially orthogonal tubular portions 101, 105, each having a closed end 102, 106 and an open end 103, 107. The first portion 101 has an internal surface with a cross section which is in the form of a major surface of a circle, with a planar surface 104. The second portion has a circular internal cross section. Apertures 108, 109 extend through each of the tubular portions 101, 105, which, in the first portion 101, is in the region of the planar surface 104.

[0047] A further post/rail connector 11 is shown in Figures 12A, 12B and 12C which is similar to that shown in Figures 10A to 10C with a first portion 81 identical to that described in relation to Figures 9A to 9C and a second portion 111 comprising a substantially annular body 112 having an internal surface with a with a substantially circular cross-section. Apertures 114 extend through the body 112.

[0048] The annular body 112 is connected to the first portion 81 about a line defining a diameter of the internal surface of first portion 81. The upper and lower surfaces 113, 115 of the annular portion 111 taper respectively upwardly and downwardly (as shown) to meet the (respective) upper and lower surfaces of the first portion 81.

[0049] The cap 12 of Figures 13A - 13C is for use with the connector 11 of Figures 12A to 12C. It has a substantially circular internal surface. The bottom wall 120 tapers in such a fashion that it matches the taper of the wall 113 of connector 11.

[0050] Figures 14A - 14C show a rail connector 14 having two open, tubular parts 141, 142, each having an internal cross-section in the shape of a major segment of a circle, with a planar surface 143, 144 respectively running the length thereof. The parts 141, 142 have their principal axes orthogonal to one another. Two apertures extend through each part, in part 141 the apertures 145 extend through the wall of the part in the region of the planar surface, in part 142 the apertures 146 extend through a wall.

[0051] Figures 15A to 15C show an identical connector 14' configured for a right-hand turn (identical components being denoted by identical numerals with a prime (')).

[0052] Figure 16A - C show a handrail support 16 having a tubular part 161 having an internal cross section in the form of a major segment of a circle, with a planar surface 164. The part 161 terminates in an integrally formed plate 162 which has a pair of countersunk apertures 163 extending therethrough. A pair of apertures 165 extends through the tubular part in the region of the planar surface 164.

[0053] A newel post support 18 is shown in Figures 17A and 17B which has a tubular portiont 181 with an internal cross section the shape of a major segment of a circle, with a planar surface 184. The portion 181 terminates in an integrally formed plate 182 which has apertures (not shown) extending therethrough. Apertures 185 extend through the tubular portion 181 in the region of the planar surface 184.

[0054] Figure 18 shows a part of a handrail assembly 1 at the top of a staircase SC. The hand rail 2 and newel post 6 are typically formed of wood, although other material may be utilised and they both have a cross section which is in the form of a major segment of a circle, with a planar surface 2a and 6a respectively.

[0055] The inclined handrail 2 is supported by a connector 5 formed from a part 50 and a part 60, the male member 65 of part 60 being located within the recess 53 of part 50. The two parts are secured together by a nut and bolt which extends through the aligned apertures 55C and 66. The male member 65 has a curved surface which faces the curved surface 54 of the recess to reduce friction therebetween during relative pivotal motion between the two parts 50, 60 about the bolt.

[0056] The part 50 is located on the newel post 6 and secured thereto by screws which extend through apertures 55A and 55B and into the post 6. The rail 2 is retained within the part 60 by screwing through apertures present in the underside of the part and into the planar surface 2a of the rail 2.

[0057] A bracket 4 is attached to the planar surface 2a of the handrail 2. The spigot 47 of the bracket 4 is located within a hollow end of a baluster 3 so that the end of the baluster 3 abuts the annular abutment portion 46. A screw is screwed through aperture 43C to force the four portions 48 outwards, away from one another to forcefully engage the inner surface of the hollow end of the baluster 3 to prevent separation. The bracket 4 is connected to the planar surface of the handrail by screwing screws through the apertures 43A and 43B into the rail 2.

[0058] A connector 10 is located at the top of the newel post 6 by screwing screws through apertures 109 and into the planar surface 6a of the post 6. A horizontal hand rail 2' is supported at one end by the connector 10. The planar surface 2a of the handrail 2 lies adjacent the planar surface 104 of the connector 10. As will be appreciated, the provision of complimentarily-shaped internal surfaces of the connectors (10, 60 etc) and outer surfaces of the handrails 2, 2' ensures the accurate location of the two parts. The other end of the handrail 2' may be supported against a wall by a connector 16 or by a further connector 10 to a newel post 6, or by connectors 9, 11, 14, 14' as the case may be.

[0059] A bracket 4' is connected to the handrail 2' such that the planar surface 41' of the bracket 4' lies against the planar surface 2a' of the handrail 2'. The bracket 4' is secured to the rail 2' and banister 3 as described above. The banisters 3 are secured, at their lower ends, to base rails R by brackets 4, 4' in an identical fashion.

[0060] Figure 19 shows a part of a staircase SC at the bottom of the stairs. A newel post 6 is located within a connector 18 which is screwed to a support S. The planar surface 6a of the post lies against the planar surface 184 of the connector 18, the two being secured together by screws (not shown) extending through apertures 185 in the connector 18.

[0061] Brackets 4 are secured to the base rail R and the spigots thereof are located in the hollow end of balusters 3, as described above.

[0062] The provision of the 'waist' 44 in the extension portion 43 of the baluster 4 allows for the deformation of the brackets 4 so that variable inclinations of staircase can be catered for, rather than that equivalent to the angle between the post 3 and the planar surface 41 of the undeformed brackets 4. The pivotal connection between the various connector parts allows for various inclinations to be accommodated. The deformable waist 43' of brackets 4' ensures that a landing handrail 2' which is not perfectly true *(i.e.* horizontal) can be catered for. Indeed, the waist portion 43 of a bracket 4 formed from ABS allows for a variation in incline in a staircase of about 7°, say from 38° to 45°. A similar variation in incline (*i.e.* 7° or 3.5° either side of the equilibrium position shown) can be accommodated by the horizontal brackets 4'. Other materials may allow variations in inclination of up to 10°. Variations outside this limit are possible and are within the scope of the present invention.

[0063] By using connectors 8 and 9, a turn in a handrail 2' can be accommodated. Parts 85 and 91 are secured to a newel post 6 by screws extending through respective apertures 89 and 94 into the post 6. The parts 81 sup-

porting the hand rail 2'. As the internal cross section of parts 85 and 91 are not in the form of a major section of a circle, they are free to rotate about the newel post 6, allowing for any angle between the two handrail 2' parts.

[0064] If a run up the stairs is considered too long for safe support by the balusters 3 on their own, a newel post 6 can be placed mid-run with a connector 50" mounted thereon. A connector 70 can then be used to interconnect two handrail portions 2 to increase stability.

[0065] The connector part 50' will be used if a handrail 2 requires support at a terminal end against a wall.

[0066] Typically (when using a newel post 6), a handrail for a staircase SC will be installed by cutting a newel post 6 from a length of rail 2 and mounting it in a connector 8. A first part of a connector 5 will be attached to the newel post 6. The handrail 2 will be cut to length and an end thereof will be inserted into the second part of the connector 5. The support for the other end of the rail 2 will be installed (either on a second newel post 6 or against a wall or other supporting surface) and the rail located between the support and the newel post connector 5. The pivotable nature of the connector 5 will allow the handrail 2 to adopt manifold inclinations. Brackets 4 will then be fitted into the ends of posts 3 and secured therein, as previously explained. The bases of the brackets 4 will then be screwed to the base rail R and handrail 2 at a set distance apart. When the brackets 4 are screwed into the handrail 2, the deformable waist portion 45 will deform, if necessary, to accommodate the angle of inclination between the newel post connector and other end support.

[0067] Referring now to Figures 20A and 208, a third embodiment of bracket 400 is shown formed from ABS comprising a body 440 having a flat or planar base 441 and a hump shaped top part. The body has three apertures 442A, 442B and 442C. Two of the apertures 442A and 442B have wider portions which communicate with the curved top surface of the body 440. The third aperture 442C extends from the planar base 441 at an angle and into an extension 443 which extends upwards at an angle from the curved top surface of the body 440.

[0068] The extension 443 has a narrow waist 444 which widens, at its' upper end to join a hollow "cup" portion 445

[0069] Figures 21A and 21 B show another bracket 400' (like features being indicated by the same numeral as in Figures 20A and 20B with the addition of a prime (')) having a body 440' with a planar lower surface 441'. Three apertures 442A', 442B', 442C' extend through the body 440', two of which 442A' and 442B' having a large diameter portion communicating with the curved upper surface of the body 440' and the third 442C' having a large diameter portion communicating with the lower planar surface 441' and extending into an extension 443' having a narrow waist 444'.

[0070] The extension portion 43' terminates, at its' distal end, to join with a hollow portion 445'.

[0071] The brackets 400 and 400' differ in the positions of the apertures, respectively 442A, 4428, 442C and 442A', 442B', 442C', with respect to the bodies 440 and 440' and in the angle at which the respective extensions 443, 443' make with the respective planar surfaces 441 and 441'.

[0072] The hollow portions are sized and dimensioned to accept the end of an upright post 3, preferably fabricated from wood. A screw can be screwed through the apertures 442C, 442C' to secure the banister 3 to the bracket 400, 400'. Screws can be used to secure the bracket 400, 400' to the rail R, the deformable waist portions 444, 444' accommodating any variation in the incline of the post 3 relative to the rail 2, 9.

[0073] It will be appreciated that using a set of banisters 3, some brackets 4, 4', 400, 400' lengths of handrail 2 (to also form the newel posts 6) and some or all of a set of connector parts and connectors 50, 50', 50", 60, 70, 8, 9, 10, 11, 12, 14, 14', 16, 18, a handrail assembly 1 can be constructed for any set of stairs SC. The use of various connectors enables different bends and turns in the staircase SC to be accommodated. Moreover, the use of deformable brackets 4, 4', 400, 400' together with pivotable connectors 5 enables different inclines of staircases SC to be accommodated.

[0074] Because the ends of the handrails 2, 2' and newel posts 6 are always hidden within connectors or connector parts, there is no need to accurately and/or precisely cut the rails 2, 2', 6. Indeed, the assembly 1 of the current invention is substantially 'deskilled' compared with other handrail assemblies. It has been found that on a typical staircase for a straight flight of timber balustrading about 125 saw cuts is required. In contrast, the assembly 1 of the current invention requires just 7.

[0075] The connectors and connector parts may be formed from a tough plastics material and may be moulded. They may also be formed from metal. The handrail 2 may be formed from wood or plastics. They may be provided with a sheath, such as veneer.

[0076] The brackets 4, 4' need not have quadrant-like portions. The brackets 4, 4' may have two or three portions or may be of unitary form and may be formed to form a friction fit within the post. The spigot 46, 46' need not be cylindrical, it may be square or otherwise shaped in cross-section. The balusters 3 need not be round.

[0077] The handrail 2 may have a cross-sectional shape substantially in the form of an ellipse with a minor segment removed, the internal surfaces of the connector parts and connectors having identical cross-sectional form. Other substantially curvilinear forms may be used, the only proviso being that the intended bottom surface is substantially flat and is matched by the surface 41, 41' of the brackets 4, 4', 400, 400' and/or by the internal surfaces of the connectors.

[0078] It will be further appreciated that the provision of a flat or planar surface is the easiest to manufacture. Further by providing the matched, preferably flat, surfaces on the components it will ease installation for the do-

it-yourself enthusiast and for the professional handrail fitter alike. The provision of matched surfaces ensures that the components are in the correct configuration when inserted and that no rotation of the, say, connector about the end of the rail is possible.

[0079] The components of the assembly 1 may be sold as a kit bought off-the-shelf or may be ordered to complete a specific job. Clearly, the provision of the parts of the invention, together with the simple mode of construction will allow both the skilled person and the do-it-yourself enthusiast to simply and effectively install a staircase SC which is functional and attractive.

Claims

1. A handrail assembly (1) comprising a length of rail (2) having one end inserted into a body portion of a connector (5), the connector being mounted on and secured to a support surface and being pivotable about a pivot point to accommodate a desired angle of inclination of the handrail (2), a plurality of posts (3) and a plurality of brackets (4; 4'; 400; 400') which connect the posts to the handrail (2), the brackets (4; 4'; 400; 400') having a portion which is deformable (45; 45'; 444; 444') to accommodate a desired angle of inclination.

2. A kit of parts for the assembly of a handrail installable to adopt a plurality of inclinations, the kit comprising:

   • A length of rail (2) for use as a handrail;
   • Two parts (50; 50'; 50"; 60; 70) of a two-part pivotable connector (5) for the rail (2), one part having (60; 70) a hollow portion (61; 71) into which an end of the rail (2) is insertable, the other part (50; 50'; 50") being mountable on a supporting surface, the two parts (50; 50'; 50"; 60; 70) being interconnectable and being mutually pivotable when interconnected.

3. A kit according to Claim 2, wherein the rail (2) has, in cross section, a rounded portion and a flat part, the hollow portion (60; 70) of the connector (5) having an internal cross-sectional which is complementary to that of the rail (2).

4. A kit according to Claim 2 or 3 further comprising a plurality of posts (3) and a plurality of brackets (4; 4'; 400; 400') attachable to the handrail (2), the posts (3) and brackets (4; 4'; 400; 400') having mating portions for engagement therebetween, each bracket (4; 4'; 400; 400') having a deformable portion (45; 45'; 444; 444') to accommodate a plurality of inclinations of installed handrail.

5. A kit according to Claim 4 when dependent on Claim 3, wherein each bracket (4; 4'; 400; 400') has a flat surface (41; 41'; 441; 441') for flush engagement with the flat surface of the rail (2).

6. A kit of parts for the assembly of a handrail installable to adopt a plurality of inclinations, the kit comprising:

   • A length of rail for use as a handrail (2):
   • A plurality of posts (3); and
   • A plurality of brackets (4; 4'; 400; 400') to interconnect the posts (3) and handrail (2), each bracket (4; 4'; 400; 400') having a surface (41; 41'; 441; 441') shaped for flush engagement with a surface of the rail (2) and a deformable portion (45; 45'; 444; 444') to accommodate a plurality of inclinations of the installed handrail.

7. A kit according to Claim 6, wherein the rail (2) has, in cross section, a rounded part and a flat part, each bracket (4; 4'; 400; 400') having a planar surface (41; 41'; 441; 441') for flush engagement with the flat surface of the rail (2).

8. A kit according to Claim 6 or 7, wherein the deformable portion (45; 45'; 444; 444') can deform to accommodate a variation in inclination of about 10°, preferably 7°.

9. A kit according to Claim 6, 7 or 8 further comprising at least one two-part pivotable connector (5) for supporting the handrail (2), a first part (60; 70) of the connector (5) having a hollow portion (61; 71) into which an end of the rail (2) is insertable, the second part (50; 50'; 50") being mountable on a support surface, the two parts (50; 50'; 50"; 60; 60) being interconnectable to provide pivotable motion with respect to one another.

10. A kit according to any preceding Claim, further comprising one or more connectors (8; 9; 10; 11; 14; 14') having hollow portions (81, 85; 81, 91; 101, 105; 81, 111; 141, 142; 141', 142') into which an end of a length of rail (2) is insertable to interconnect two lengths of rail, one or both hollow portions (81, 85; 81, 91; 101, 105; 81, 111; 141, 142; 141', 142') having an internal cross section having a rounded part and a flat part (84; 104; 143, 144; 143', 144').

11. A kit according to any of Claims 2 to 10 further comprising a hollow mount (16) to support an end of a handrail (2) inserted into the hollow mount (16), the mount (16) having an internal surface which has a curved part and a flat part (164).

12. A kit according to any of Claims 2 to 11 further comprising a mount (18) to support a post (6) formed from the length of rail (2), the mount (18) having a hollow portion (181) in which an end of the post (6) is insertable, the internal surface of the mount (18)

having a rounded portion and a flat portion (184).

13. A two-part pivotable connector (5) for a handrail (2), the first part (60; 70) of the mount having a hollow portion (61; 71) into which an end of a handrail (2) is insertable, the second part (50; 50'; 50") of the mount (5) being attachable to a support surface, the two parts (50; 50'; 50"; 60; 70) being pivotable with respect to one another when interconnected, and wherein the internal surface of the hollow portion (60; 70) is shaped to prevent, in use, rotation of the hollow portion (60; 70) about a complementarily shaped handrail end inserted therein.

14. A connecotr (5) according to Claim 13, wherein the internal surface of the hollow portion (60; 70) is shaped to have a rounded part and a flat surface (64; 74).

15. A connector (8; 9; 10; 11; 14; 14') to connect non-parallel lengths of rail (2), the connector (8; 9; 10; 11; 14; 14') having two hollow parts (81, 85; 81, 91; 101, 105; 81, 111; 141, 142; 141', 142') into which lengths of rail (2) are insertable, the hollow parts (81, 85; 81, 91; 101, 105; 81, 111; 141, 142; 141', 142') having openings which are non-parallel, at least one of the hollow parts (81, 85; 81, 91; 101, 105; 81, 111; 141, 142; 141', 142') has an internal surface shaped to prevent, in use, rotation of that part about the end of the length of rail (2) when inserted therein.

16. A connector (8; 9; 10; 11; 14; 14') according to Claim 15, wherein the internal surface of said at least one hollow part (81, 85; 81, 91; 101, 105; 81, 111; 141, 142; 141', 142') has a curved part and a flat part (84; 104; 143, 144; 143', 144').

17. A connector (8; 9; 10; 11; 14; 14') according to Claim 14, 15 or 16, wherein the openings of two hollow parts (81, 85; 81, 91; 101, 105; 81, 111; 141, 142; 141', 142') are orthogonal to one another.

18. A bracket (4; 4'; 400; 400') to connect a post (3) to a rail (2), the bracket (4; 4'; 400; 400') comprising a terminal portion (47; 47'; 445; 445') for engagement with an end of the post (3) and a surface (41; 41'; 441; 441') for flush engagement with a surface of the rail (2); and an intermediate deformable portion (45; 45'; 444; 444') between the terminal portion (47; 47'; 445; 445') and the surface (41; 41'; 441; 441') which is deformable to accommodate different angles between the rail (2) and post (3).

19. A bracket (4; 4', 400; 400') according to Claim 18, wherein the deformable portion (45; 45'; 444; 444') is deformable to accommodate variations of up to 5° either side of its equilibrium position, preferably up to 3.5°.

20. A method of installing a handrail assembly comprising a two-part pivotable mount or connector and a length of handrail, the assembly being capable of accommodating different inclinations of handrail, the method comprising the steps of:

- Connecting one part of the mount to a supporting surface;
- Inserting an end of the handrail into a hollow part of the second part of the mount;
- Interconnecting the two parts of the mount;
- Mounting a second end of the handrail at an intended location;

wherein, the two parts of the mount are pivotable with respect to one another to allow the handrail to adopt the inclination between the support and the intended location.

21. A method according to Claim 20 further comprising the step of connecting posts to the handrail with brackets, the brackets having a deformable portion to accommodate different angles of inclination.

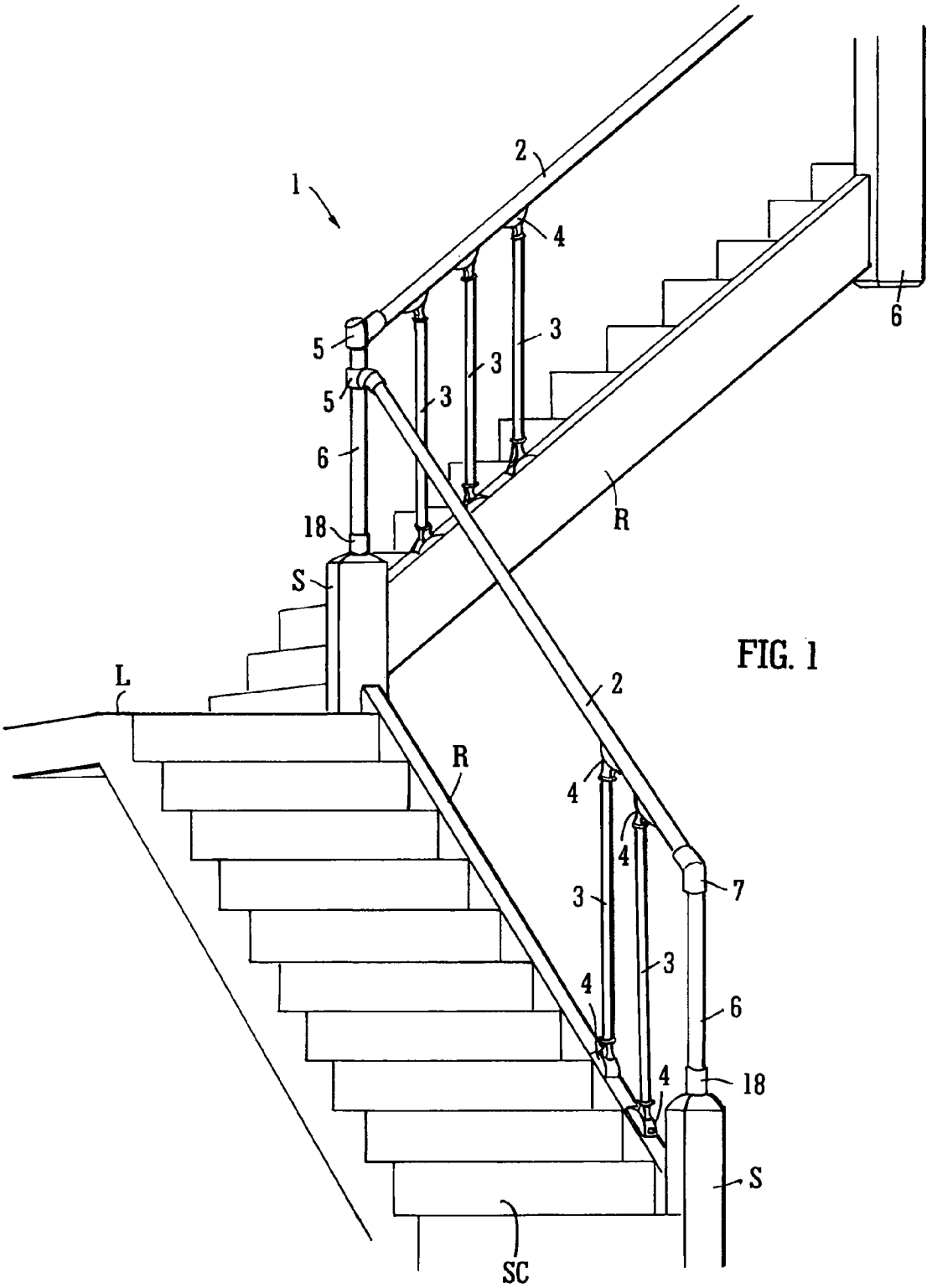

FIG. 1

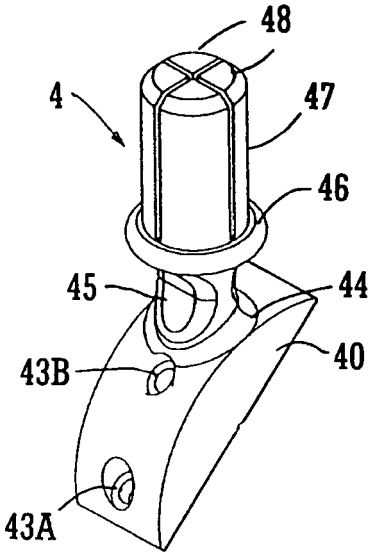

FIG. 2A

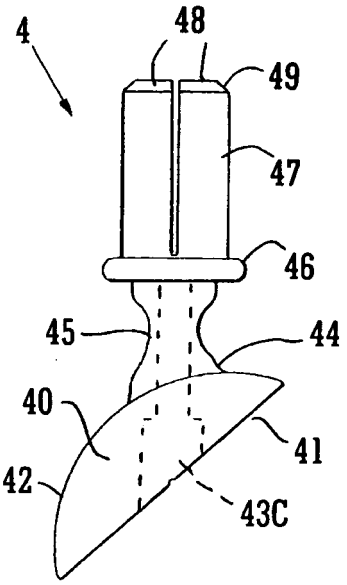

FIG. 2B

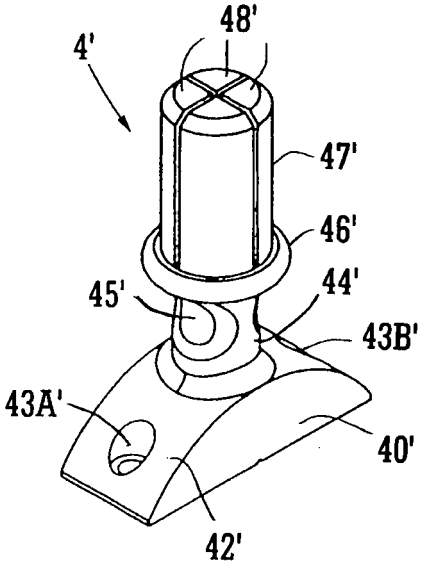

FIG. 3A

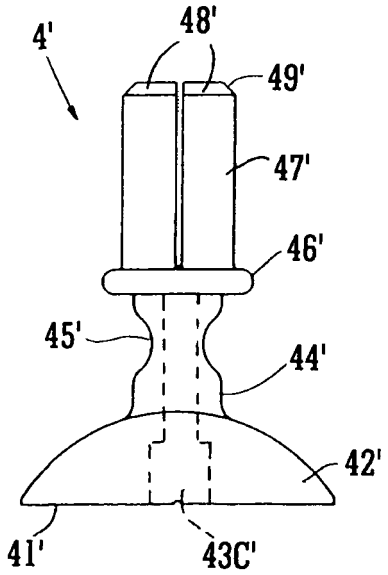

FIG. 3B

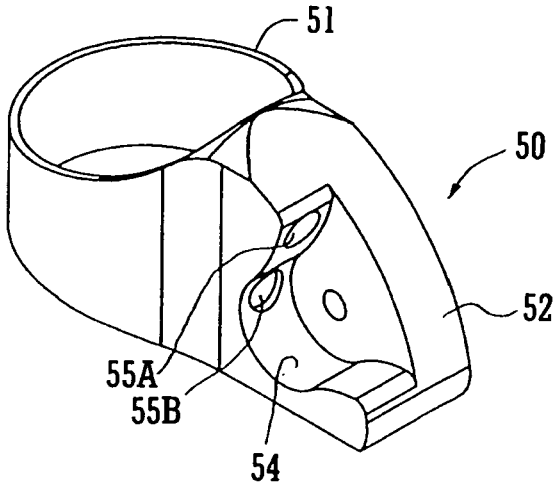

FIG. 4A

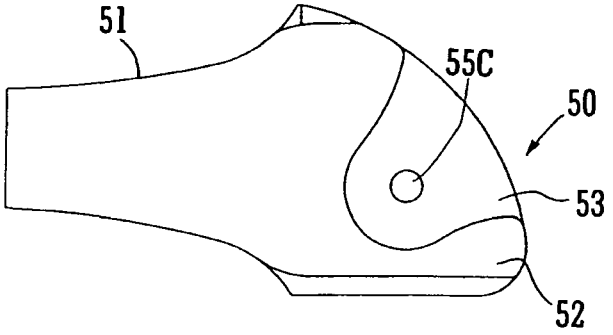

FIG. 4B

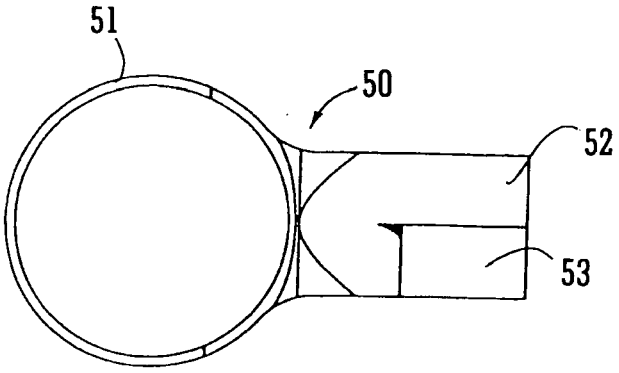

FIG. 4C

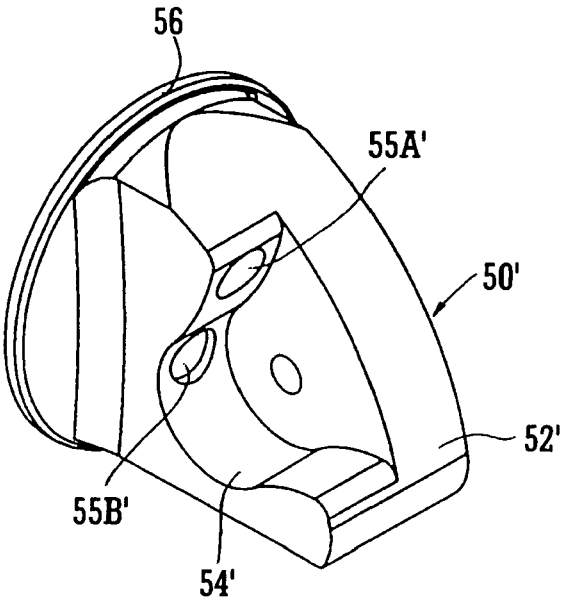

FIG. 5A

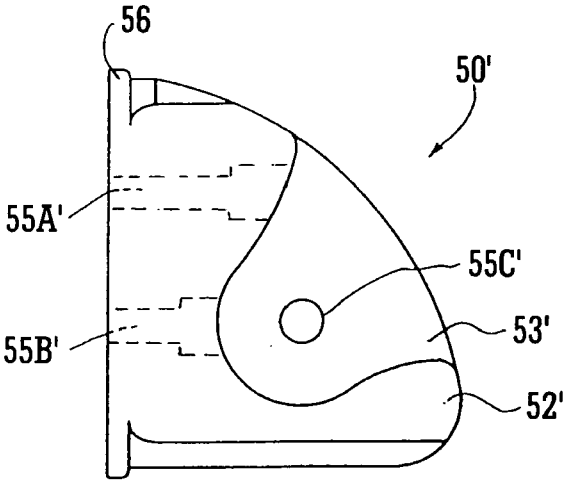

FIG. 5B

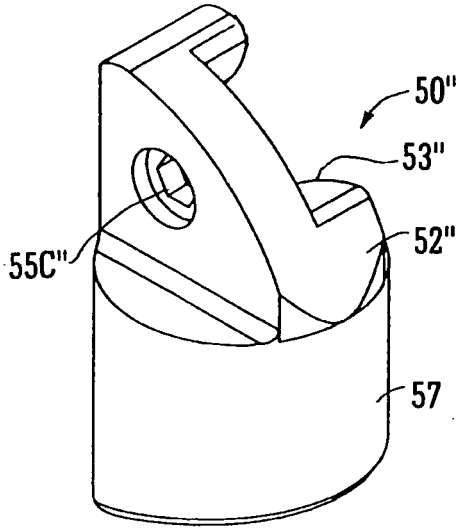

FIG. 6A

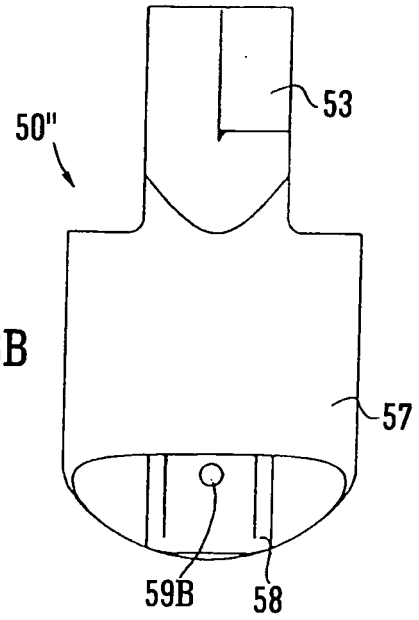

FIG. 6B

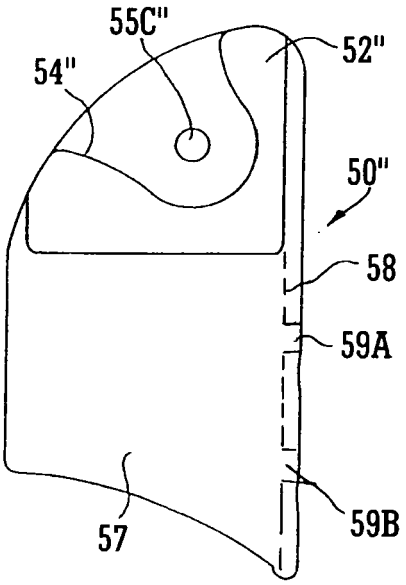

FIG. 6C

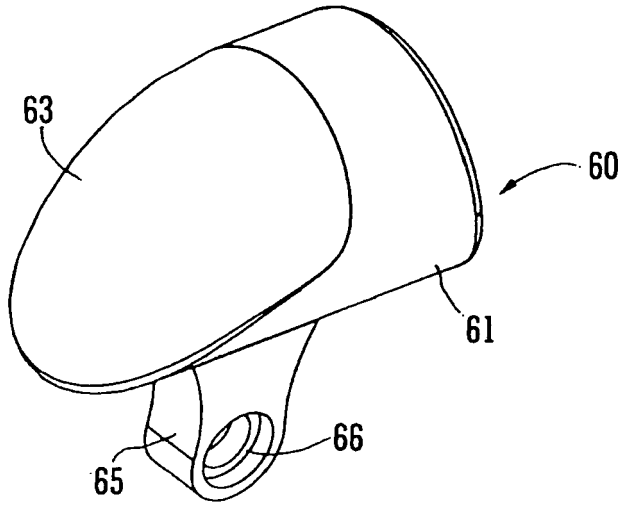

FIG. 7A

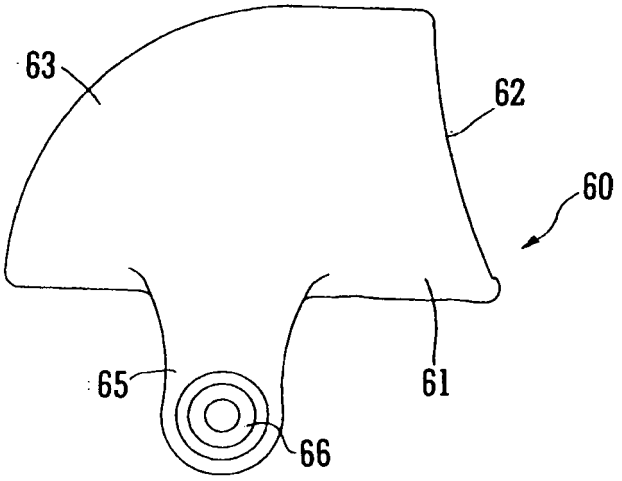

FIG. 7B

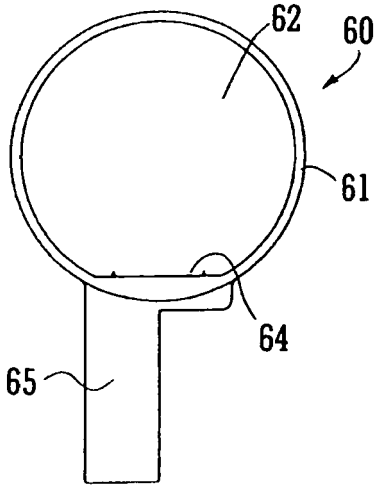

FIG. 7C

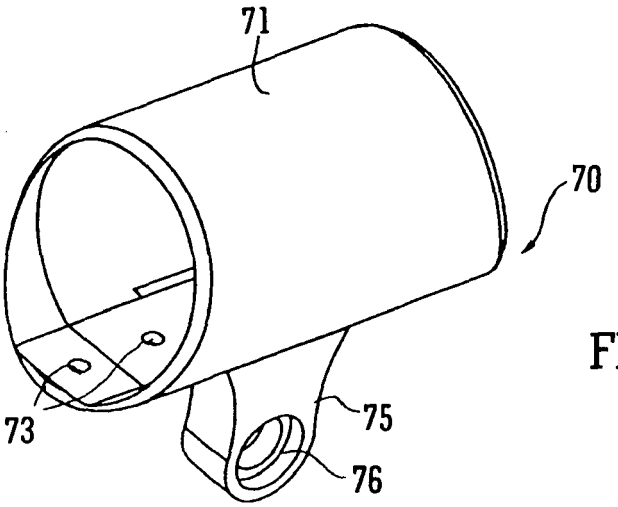

FIG. 8A

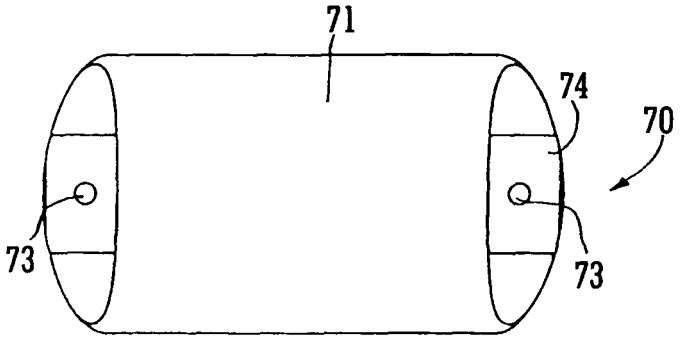

FIG. 8B

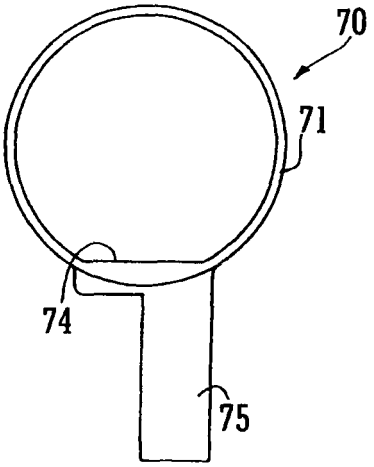

FIG. 8C

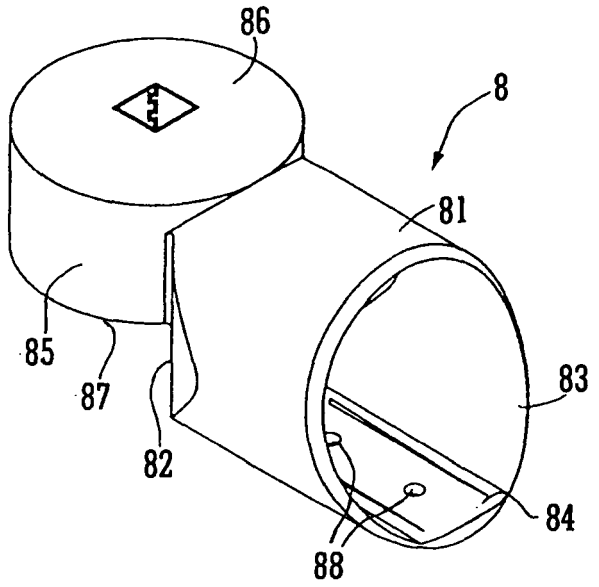

FIG. 9A

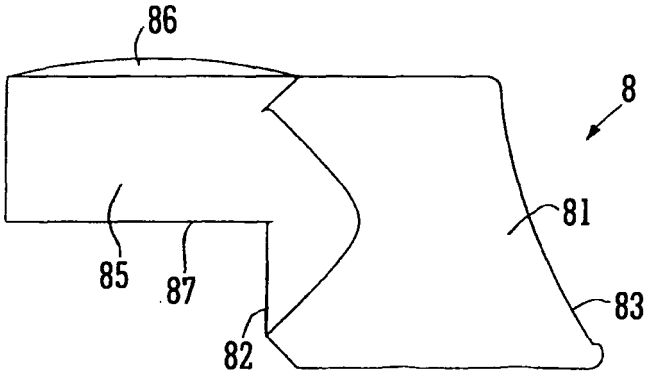

FIG. 9B

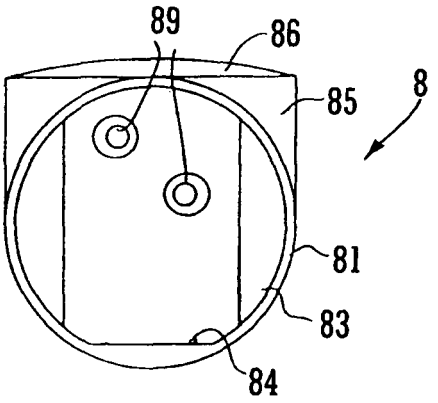

FIG. 9C

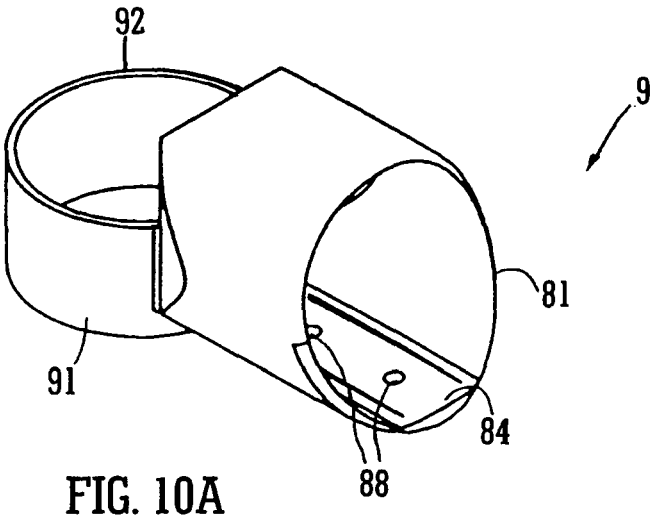

FIG. 10A

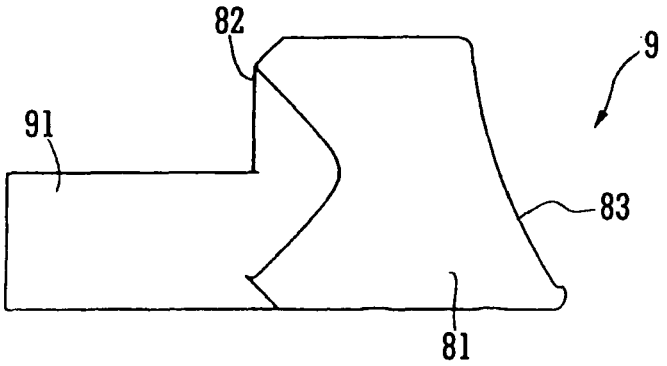

FIG. 10B

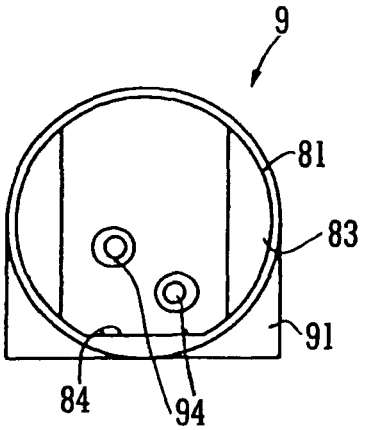

FIG. 10C

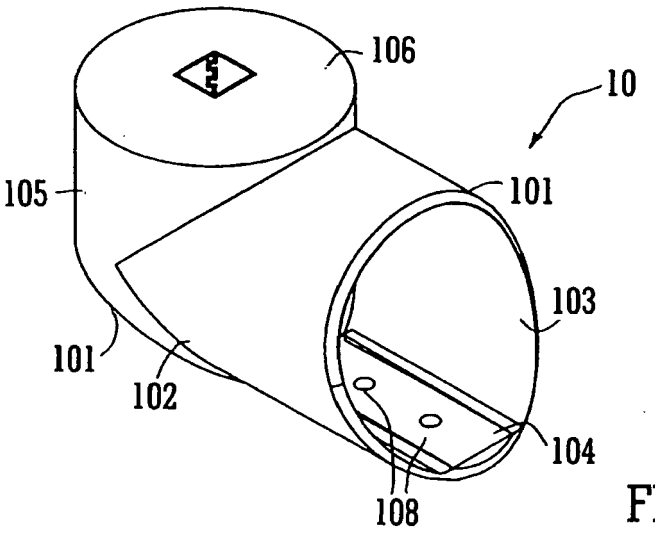

FIG. 11A

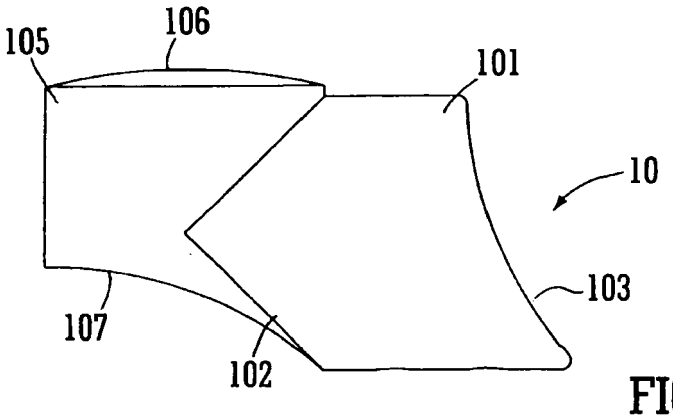

FIG. 11B

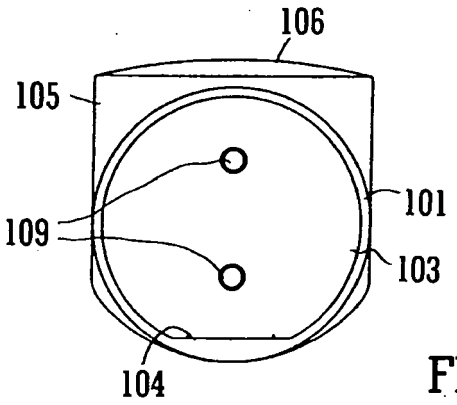

FIG. 11C

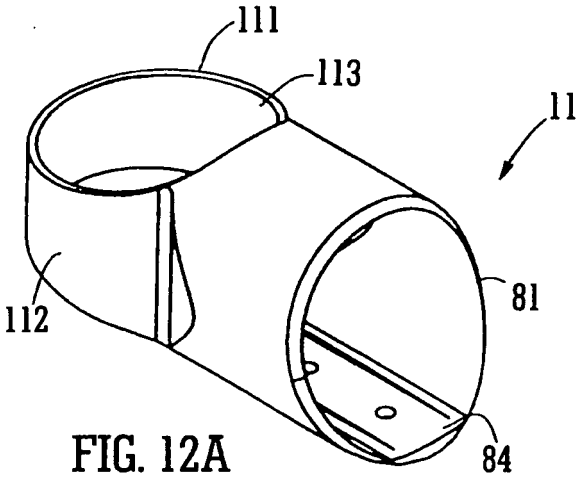

FIG. 12A

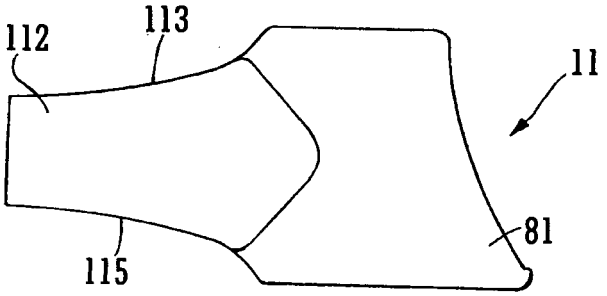

FIG. 12B

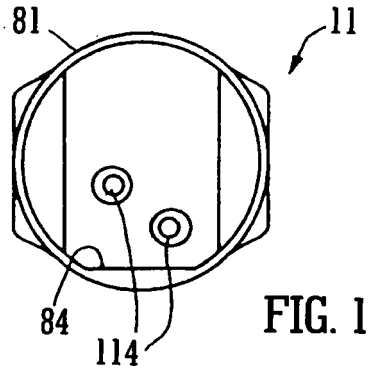

FIG. 12C

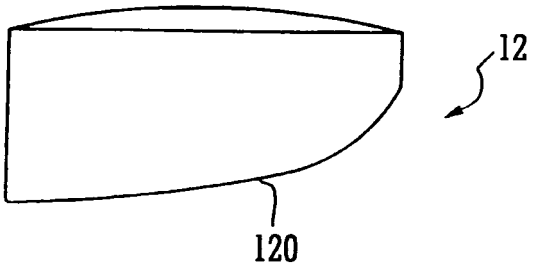

FIG. 13A

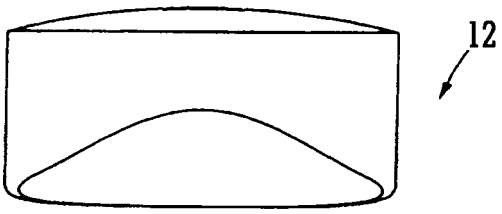

FIG. 13B

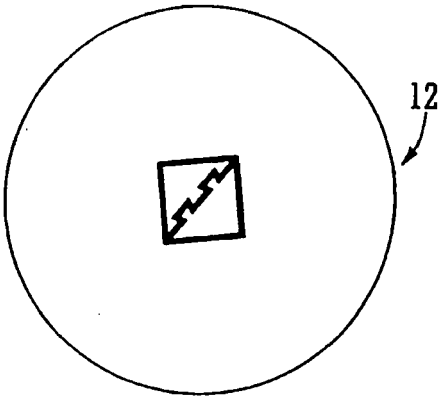

FIG. 13C

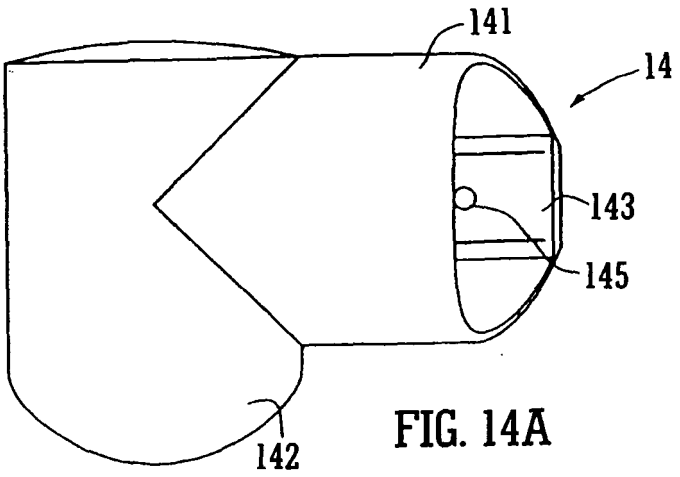

FIG. 14A

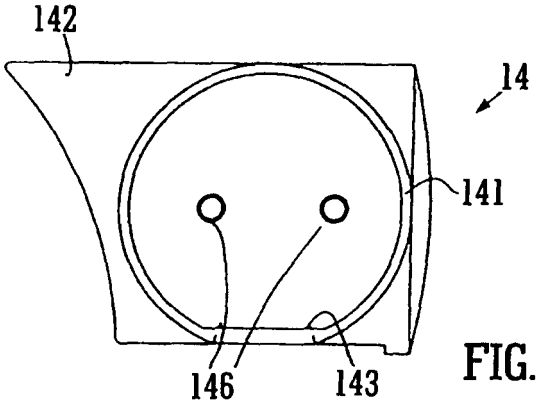

FIG. 14B

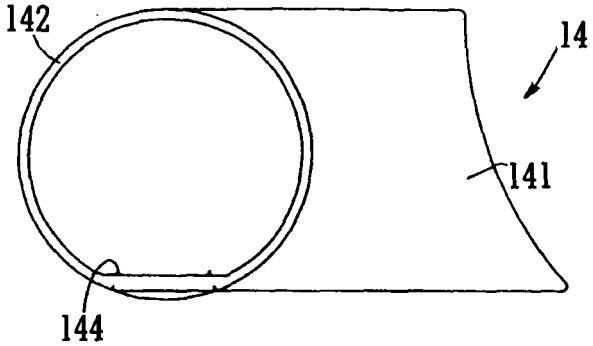

FIG. 14C

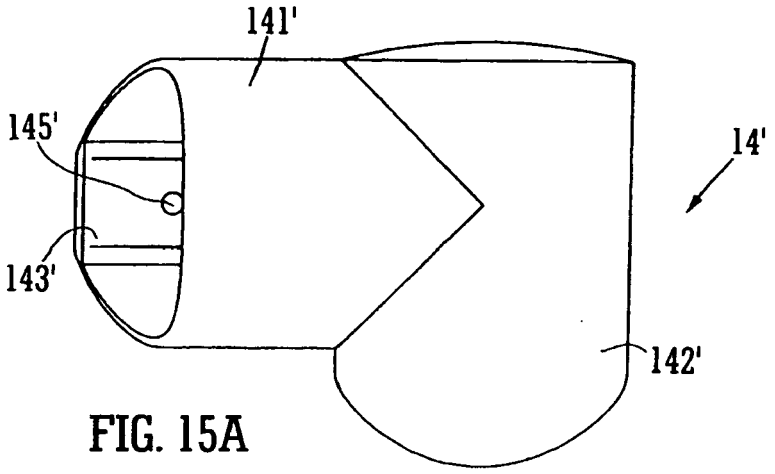

FIG. 15A

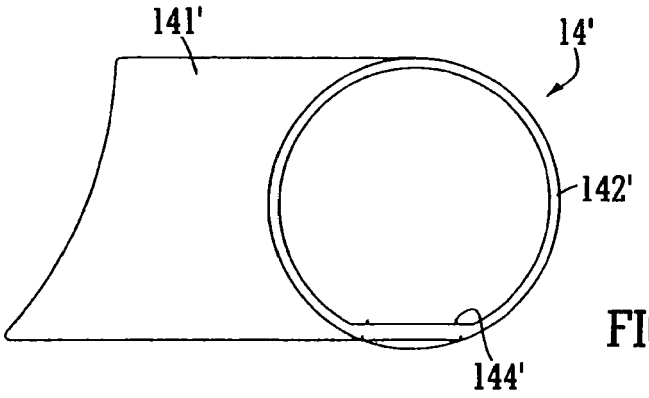

FIG. 15B

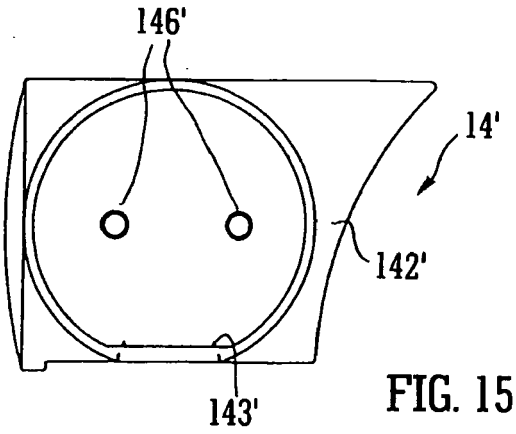

FIG. 15C

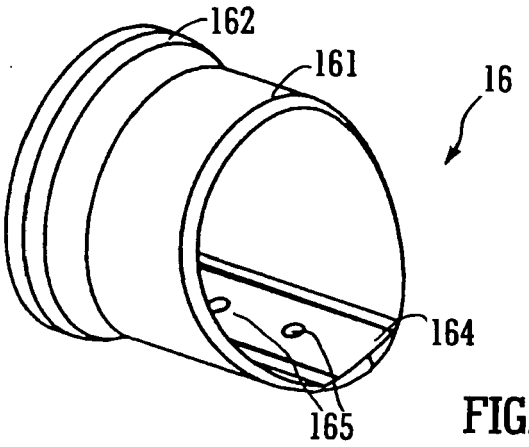

FIG. 16A

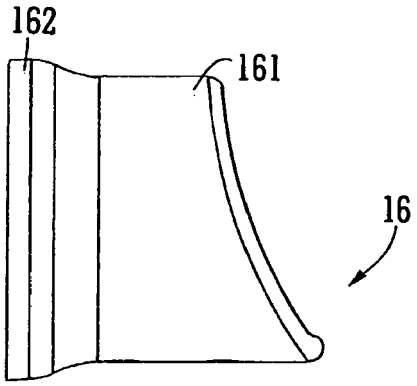

FIG. 16B

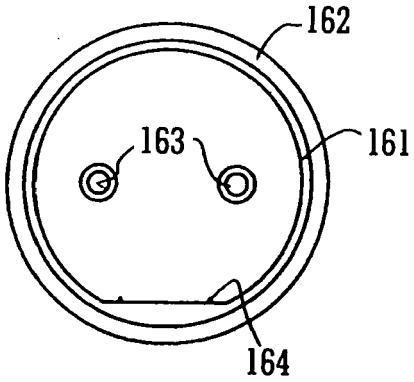

FIG. 16C

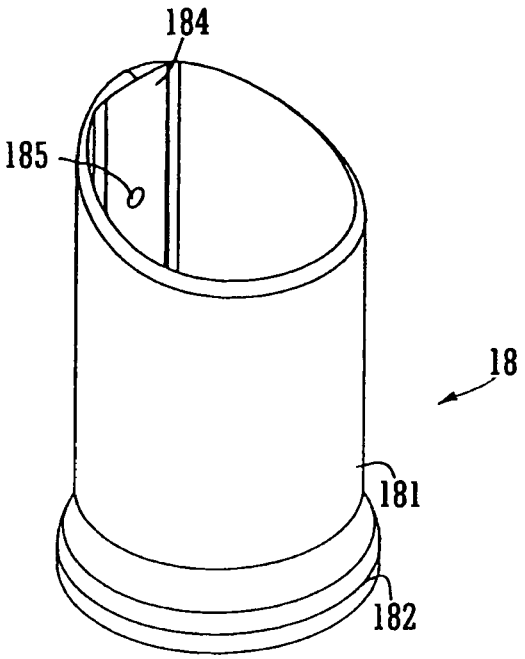

FIG. 17A

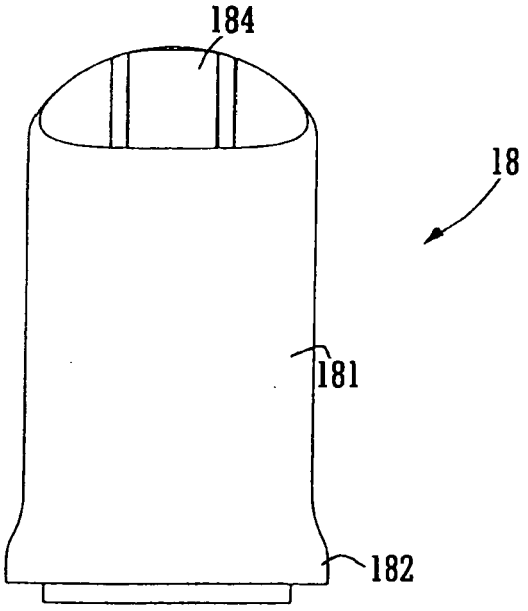

FIG. 17B

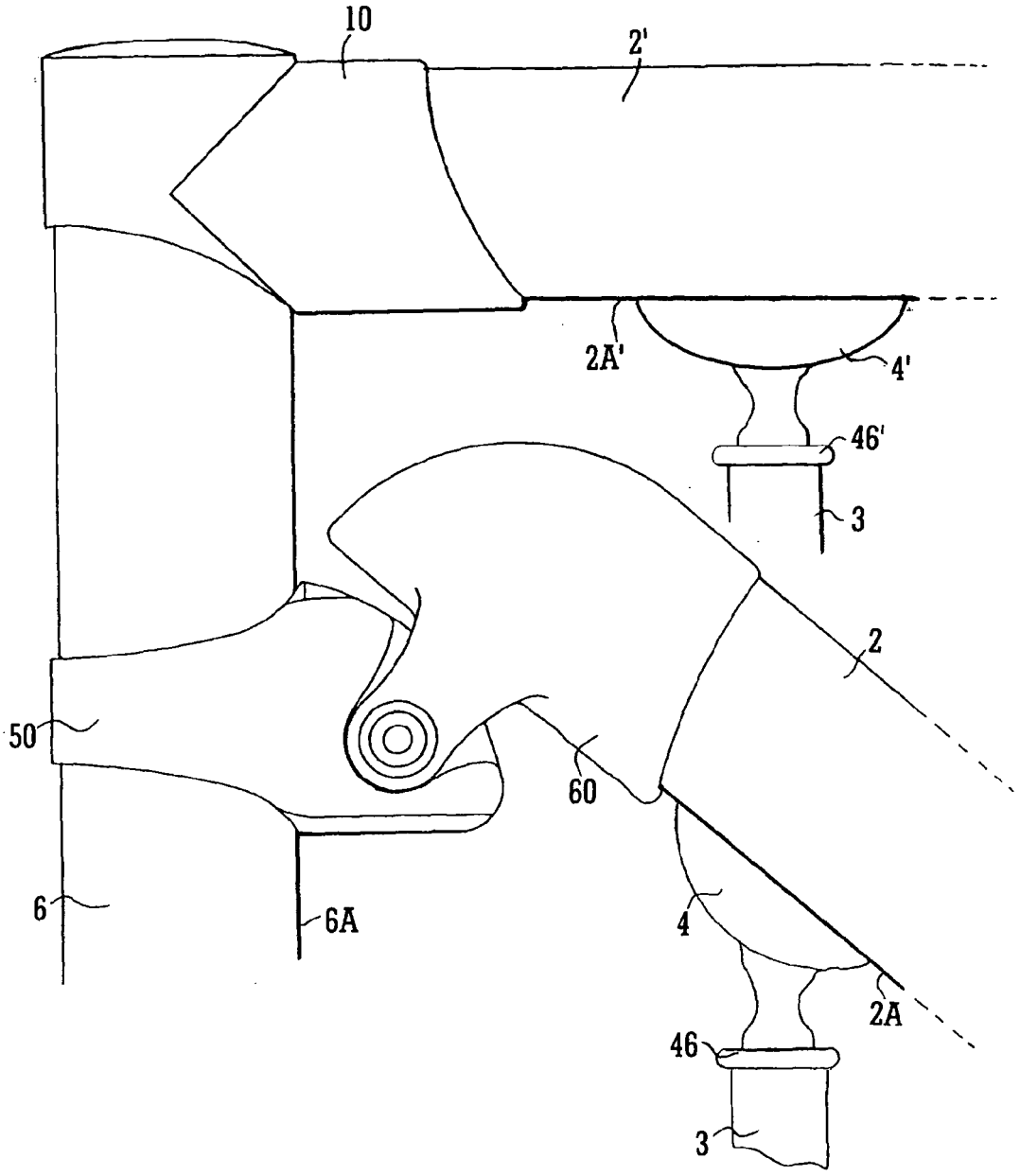

FIG. 18

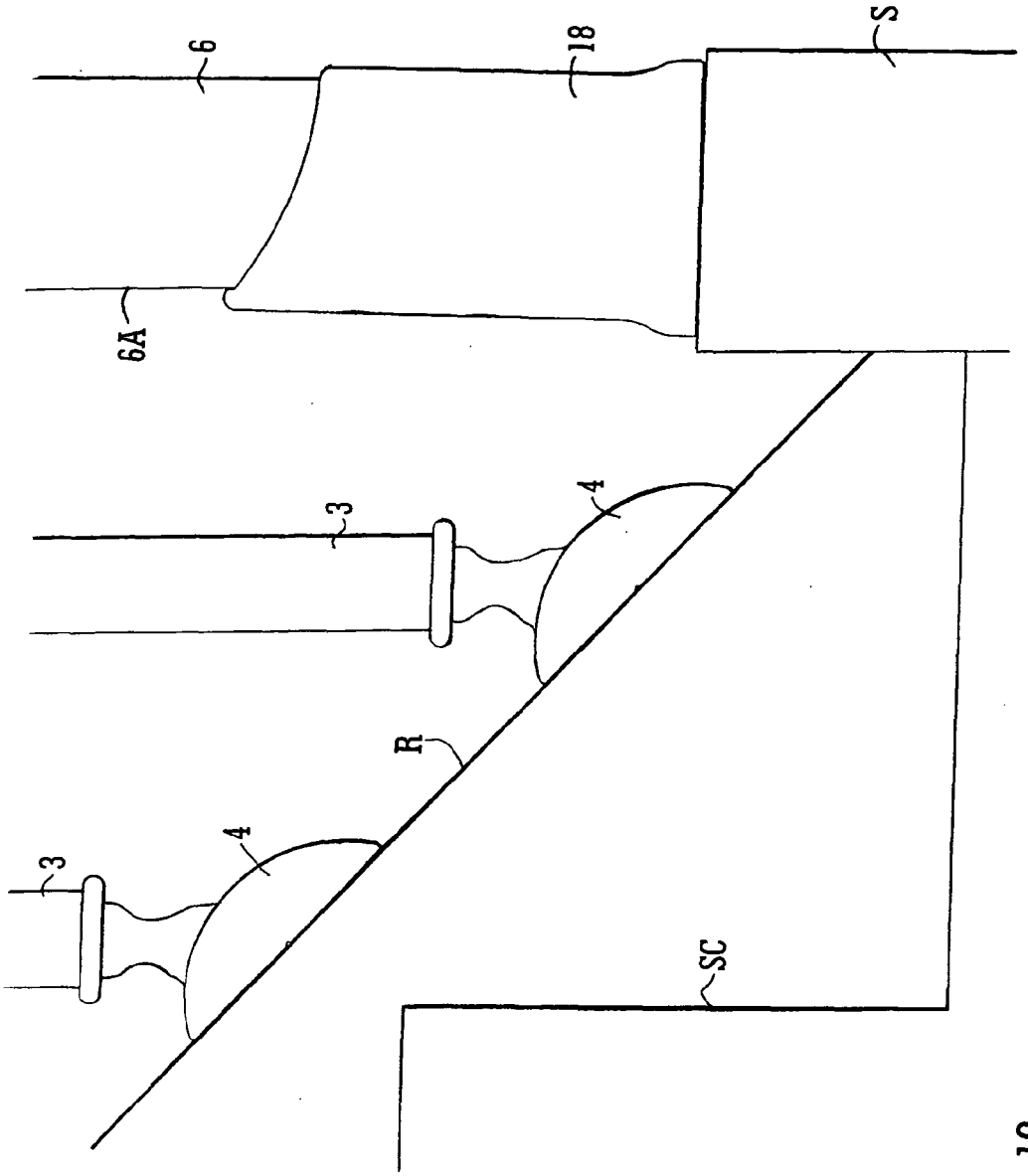

FIG. 19

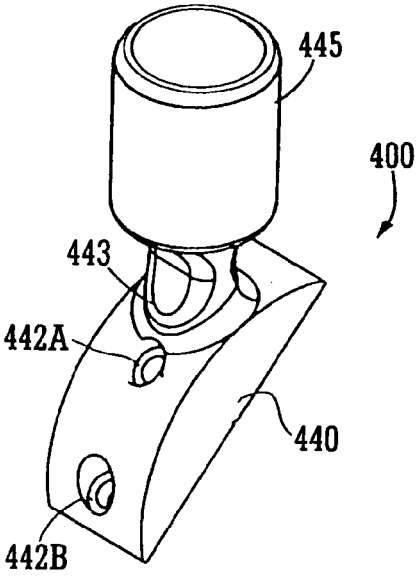

FIG. 20A

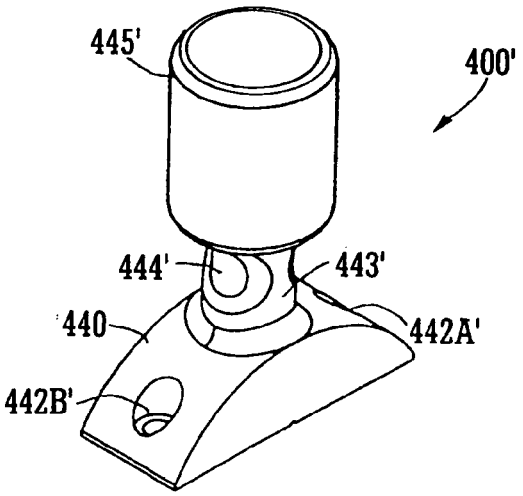

FIG. 21A

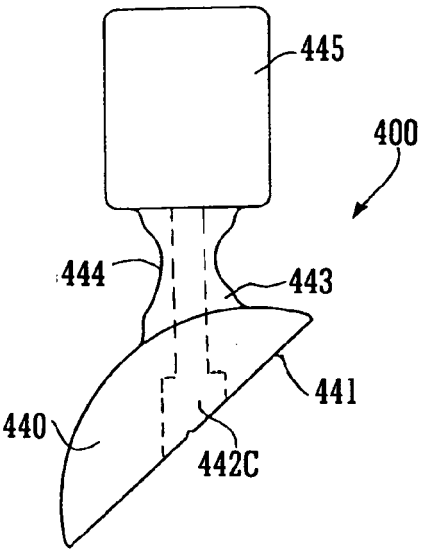

FIG. 20B

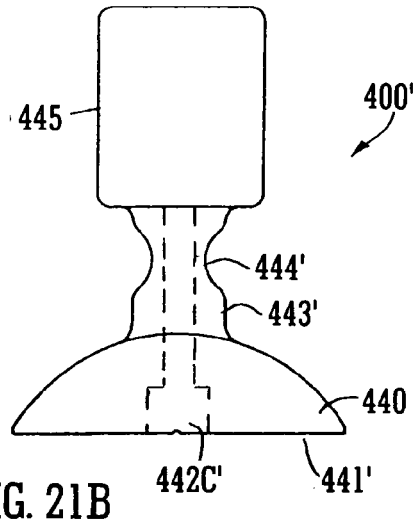

FIG. 21B

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EUROPEAN SEARCH REPORT

Application Number
EP 06 07 5725

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 738 862 A (GIBERT DIDIER) 21 March 1997 (1997-03-21) * page 4, line 28 - page 10, line 4; figures 1,2 *	2,3,13, 20	INV. E04F11/18 F16C11/12
Y		1,4,5,9, 15,21	
A		10	

Y	DE 94 19 943 U (GLOCKNER DIETER ING GRAD) 2 February 1995 (1995-02-02) * page 3, line 22 - page 9, line 32; figure 1 *	1	
A		6,8,10, 18,19	

X	EP 0 495 577 A (NORTHERN JOINERY LTD) 22 July 1992 (1992-07-22) * column 6, line 34 - column 8, line 58; figures 1,11-18 *	6-8,18	
Y		4,5,9,21	
A		1	TECHNICAL FIELDS SEARCHED (IPC)

X	DE 26 00 057 A (MEYER BERND) 14 July 1977 (1977-07-14) * page 9, line 15 - page 13, line 20; figures 1-8 *	6,8,18, 19	E04F F16B
A		1	

D,Y	GB 2 299 370 A (KEE KLAMPS LTD) 2 October 1996 (1996-10-02) * page 1, line 8 - line 12 * * page 3, line 29 - page 4, line 2; figures 1,4-6,8 *	15	
A		1-3,10, 13,20	

	-/--		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 June 2006	Ayiter, J

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EUROPEAN SEARCH REPORT

Application Number
EP 06 07 5725

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 244 733 A (* VISADOR COMPANY) 11 December 1991 (1991-12-11) * page 4, line 24 - page 7, line 32; figures 1-9 *	6-8,18	
A		1	

X	US 4 050 828 A (NORO ET AL) 27 September 1977 (1977-09-27) * column 3, line 63 - column 4, line 43; figures 6-9 *	6,7,18	
A		1	

X	GB 2 226 062 A (* YOSHIDA KOGYO K K) 20 June 1990 (1990-06-20) * page 5, line 19 - page 10, line 11; figures 1-5 *	13,14,20	
A		1-3, 10-12	

TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 June 2006	Ayiter, J

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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27-06-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2738862 A	21-03-1997	NONE	
DE 9419943 U	02-02-1995	NONE	
EP 0495577 A	22-07-1992	CA 2059064 A1	13-07-1992
		DE 69209098 D1	25-04-1996
		DE 69209098 T2	31-10-1996
		GB 2251638 A	15-07-1992
		IE 920043 A1	15-07-1992
		US 5340087 A	23-08-1994
DE 2600057 A	14-07-1977	NONE	
GB 2299370 A	02-10-1996	NONE	
GB 2244733 A	11-12-1991	CA 2038558 A1	07-12-1991
		US 5056283 A	15-10-1991
US 4050828 A	27-09-1977	NONE	
GB 2226062 A	20-06-1990	AU 627525 B2	27-08-1992
		AU 4691689 A	21-06-1990
		CA 2005852 A1	19-06-1990
		JP 2083935 U	28-06-1990
		JP 6035033 Y2	14-09-1994
		US 5026028 A	25-06-1991

EPO FORM P0459

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