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(54) **Modular handrail systems**

Modulare Handlaufsysteme

Systèmes modulaires pour la confection de mains courantes

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Description

[0001] The present invention relates to modular handrail systems and in particular to a kit of parts for assembly into such handrails, as well as a modular handrail system constructed therefrom.

Prior Art Known to the Applicant

[0002] The following prior art documents are acknowledged:

US-A-4,706,367 and EP-A-1 048 799

US-A-4,706,367 discloses a system and method for mechanically joining handrailing members which employs a mechanical joint for interconnecting rail members having a male end on one of the rail members, a female end on the other rail member, and an annular collar for constraining longitudinal movement. The male member has an external circumferential groove for receiving the annular collar. The female end has an internal circumferential groove which aligns with both the annular collar and the external circumferential groove on the male end.

EP-A-1 048 799 discloses a modular structure for making handrails which employs a modular structure for making handrails comprises a series of supports able to be applied along walls of a building and a series of bearing elements rigidly engageable to the supports by means of junction inserts provided with gripping projections and with auxiliary gripping projections. The gripping projections and the auxiliary gripping projections are inserted respectively in gripping seats obtained on the bearing elements and in auxiliary gripping seats obtained in the supports. The coupling of the bearing elements with the supports by means of the junction inserts allows to modify the angular position of the bearing elements with respect to the supports. To the supports are moreover internally associated lighting units able to be electrically connected to each other through cavities present in all the components of the structure.

Problem to be solved

[0003] For safety and other reasons handrails must be provided in a variety of temporary and permanent locations. One example is when providing ramps or steps for gaining access into buildings or otherwise. Such ramps and steps must now be provided with some form of handrail system to aid people using the ramps or steps and to improve their safety. Whilst handrails have previously been provided, the present invention aims to improve upon these and to provide a modular handrail system that may be easily constructed into a variety of different configurations to suite the particular circumstances of its use. It is a further aim to provide a handrail system that is light and strong as well as being resistant to atmospheric degradation and cost efficient to produce. It is a further aim to provide a handrail that may be easily and swiftly assembled and disassembled in situations where only a temporary construction is required.

[0004] As used herein the terms "handrail", "railings" or "handrail system" are used to describe a fence-line or barrier-like structure, usually but not exclusively vertically arranged, and having one or more leg and one or more rail running approximately perpendicular to the legs - and usually parallel to the surface. The purpose of such items is to provide a means of support to those holding it and to prevent accidental falls or improper passage of persons.

Summary of the Invention

[0005] Therefore, according to the present invention there is provided a kit for construction of a handrail assembly, said kit including:

a plurality of connectors, each with a male projection having a radially extending rib running parallel to the axis of projection; at least one of said plurality of connectors is a cross connector having male projections in an opposed pair; a plurality of elongate tubular sections each adapted to connect to the male projections of different connectors and a groove formed in the inner surface of said tubular sections and; wherein when said connectors are inserted into said tubular sections said radially extending rib engages in said groove; characterised in that the kit further comprises at least one T-shaped connector having at least one male projection; a base member that is adapted to connect to the end of a tubular section and to an external structure to mount the handrail assembly thereon and in that each male projection has four radially extending walls that run parallel to the axis of the projection and at a right angle with respect to each other, said walls intersecting two parallel disc-shaped walls which extend perpendicular to the axis of the projection, each male projection being substantially circular in profile; whereby when said connectors are inserted into said tubular sections snugfits are achieved and an assembly of intersecting legs and rails is formed.

[0006] Preferably a kit of parts as claimed in claim 1, wherein said two parallel disc-shaped walls are separated axially by a recess.

[0007] Preferably, a kit of parts for construction of a handrail assembly, said kit including at least one cross connector having male projections in an opposed pair; at least one T-shaped connector having at least one male projection; a plurality of elongate tubular sections each adapted to connect to the male projections of different connectors thereby to form an assembly of intersecting

legs and rails; and at least one base member that is adapted to connect to the end of a tubular section and to an external structure to mount the handrail assembly thereon, each male projection having an annular rib that engages in a groove formed in the inner surface of each tubular section.

[0008] In addition to the connectors described above it is preferred that the kit is also provided with one or more curved connector having two male projections formed at an angle, less than 180°, relative to each other. Such a curved projector will often have the male projections formed at substantially 90° relative to each other such that the connector may connect a horizontal and a vertical tubular section to form a smooth corner. The diameter of that curve may vary dependent upon the particular application. For example, a large diameter curve may be appropriate when terminating a rail at a free end by joining it to a rail below, but a small diameter curve is usually better when turning a horizontal corner on a rail.

[0009] There may further be provided with the kit a variable angle connector having two parts each provided with a male projection and each being moveable relative to the other. Such a variable connector would preferably comprise two parts pivotally connected to each other such that a desired relative angle of the male projections and hence any tubular sections to which they are connected can be achieved, by pivoting about a common axis of rotation.

[0010] The cross-connector and the T-shape connectors may comprise two opposed pairs of male projections and these may be generally regular in orientation with the connectors at right angles to each other such that the tubular sections connected thereto are also substantially at right angles. This is particularly appropriate where a railing is to extend along a flat surface and each rail is to run essentially parallel to that surface and perpendicular to each leg. However, in some circumstances such as when ascending stairs or a relatively steep incline it is appropriate to have the legs remain essentially vertical (rather than perpendicular to the general incline of the surface) but the rails should remain essentially parallel to that surface incline. To achieve this it is preferable that with respect to the cross-connector one opposed pair of male projections is at an acute angle to the other pair of opposed male projections, the male projections being all in the same plane. With respect to the T-shaped connector, this may comprise three male projections, and tubular sections may attach to each of these projections. The T-shaped connector often forms the upper end of a leg and connects to an uppermost rail. It may provide suitable angles and it is preferred that there is a pair of diametrically opposed male projections that connect to the tubular sections forming an upper rail and that the other male projection is formed at an acute angle relative to one of those male projections.

[0011] Again all male projections are in substantially the same plane. A kit may include both angles and regular T-connectors and cross connectors.

[0012] The kit of parts may include one or more half connector that defines a single male projection and is connectable to a middle portion of a tubular section. Such a half connector can be use in addition to the cross connectors and T-shaped connectors, but can also be used to form such connectors. For example, the cross connector may comprise two half connectors that each define a male projection, the two half connectors being attachable to opposite sides of a tubular section. Also a T-shaped connector may comprise a single half connector attached to the middle of one tubular section and the end of another.

[0013] Each half connector may preferably have a channel shaped base portion that locates around the external surface of the tubular section, and a male projection extending in the opposite direction therefrom. The channel shaped base portion will have a profile that matches the shape of the tubular section, and the male projection may be formed at a range of angles to the axis of the tubular section to which the half connector is attached.

[0014] It is possible that the constituent parts of the present invention can be constructed from a variety of different materials, including metal. However, it is particularly preferred that each component is constructed wholly or predominantly from a plastics material, due in part to their high strength to weight ratios. The plastics material may also include reinforcing filler materials such as fibres. Preferably the connectors are formed by moulding and the tubular sections, which are usually elongate and rectilinear, are formed by extrusion.

[0015] Preferably the tubular sections are generally circular in cross-section and define a generally circular hollow interior. It is preferred that the male projections are also generally circular in cross-section and are adapted to be a tight fit within the hollow interior of the tubular section.

[0016] The hollow interior of the tubular section has at least one groove formed therein to receive the rib on each male projection, which serves not only to ensure correct angular orientation but also prevents any rotation of the tubular section relative to the male projection. There may be more than one groove, which can be adapted to accommodate more than one rib on the male projections or may allow the tubular section to adopt a number of acceptable angular positions relative to the male projection.

[0017] It is preferred that each connector, with the possible exception of the variable angle connector and half connector, has a main body and male projections extending therefrom.

It is preferred that the main body is approximately equivalent in dimensions and profile to the tubular sections. This helps to ensure that there is a regular, smooth and continuous external profile regardless of whether it is a tubular section or a part of a connector. The male projections extend from the main body of each connector and are slightly smaller in diameter such that they are a

snug fit within the hollow tubular sections.

[0018] The tubular sections are usually intended to be gripped by the hand and consequently they may be provided with grip enhancing features such as ridges. Preferably the connectors are distinguishable by touch from the tubular sections so that someone of impaired sight can distinguish by touch alone when their hand passes over a connector, thus giving a guide to the distance travelled.

[0019] According to the present invention there is further provided a handrail when constructed from a kit of parts as previously defined.

[0020] According to a third aspect of the invention there is yet further provided a modular handrail system having a plurality of legs and at least one rail, the system comprising a plurality of cross connectors having two projections in an opposed pair; elongate tubular sections, the open ends of which connect around the male projections of the cross connectors to interconnect them to form at least one rail, characterized in that each male projection has a radially extending rib running parallel to the axis of projection that engages in a groove formed in the inner surface of each tubular section; and that the system further comprises T-connectors having at least one male projection located at the upper end of each leg; elongate tubular sections, the open ends of which connect around the male projections of the T-connectors to form legs; and a base member adapted to connect to a free end of a tubular section either of a leg or a rail and to an external structure to connect the leg or rail thereto; and in that each male projection has four radially extending walls that run parallel to the axis of the projection and at a right angle with respect to each other, said walls intersecting two parallel disc-shaped walls which extend perpendicular to the axis of the projection, each male projection being substantially circular in profile ; whereby when said connectors are inserted into said tubular sections snug-fits are achieved.

[0021] Preferably a modular handrail system having a plurality of legs and at least one rail, the system comprising T-connectors having at least one male projection and located at the upper end of each leg, a plurality of cross connectors having at least two male projections in an opposed pair; elongate tubular sections, the open ends of which connect around the male projections of the T-connectors and cross connectors to interconnect them to form the legs and at least one rail, and a base member adapted to connect to a free end of a tubular section either of a leg or a rail and to an external structure to connect the leg or rail thereto, each male projection having an annular rib that engages in a groove formed in the inner surface of each tubular section.

[0022] The modular handrail system as described above is subject where possible to the same preferred features as described with reference to the kit of parts of the first aspect of the invention.

[0023] In order that the present invention be better understood, but by way of example only, an embodiment of the invention will now be described in more detail with reference to the accompanying drawings in which:

Brief Description of the Figures

[0024]

Figure 1 is a perspective view of a 90° curved connector;
Figure 2 is a perspective view of an alternative smaller diameter 90° curved connector;
Figure 3 is a perspective view of a 90° T-connector;
Figure 4 is a perspective view of an angled T-connector;
Figure 5 is a perspective view of a 90° cross-connector;
Figure 6 is a perspective view of an angled cross-connector;
Figure 7 is a perspective view of a base member in the form of a connector plate;
Figure 8 is cross section through a tubular section;
Figure 9 is a perspective view of one half of a variable angle connector;
Figure 10 is an exploded view of one possible assembly of components to form a handrail;
Figure 11 is a similar view to that of Figure 10 but showing the handrail fully assembled, with the components interconnected;
Figure 12 is a side view of a half connector;
Figure 13 is a plan view of the half connector of Figure 12; and
Figure 14 is an exploded view of leg of a handrail assembly utilising the half connector of Figures 12 and 13.

Detailed Description of the Figures

[0025] Figure 1 shows a large diameter 90° curved connector generally indicated 15. This curved connector 15 will usually be used as an end bend and is of a relatively large diameter of curvature. The curved connector 15 comprises a main body 16 which is generally curved and circular in cross-section, with a diameter equivalent to the tubular section described below. A series of depressions 17 are formed in the main body 16 and male projections 18 extend from the two ends. The male projections 18 are generally circular in profile and each has a radially extending rib 19 provided thereon that runs parallel to the axis of the projection. One or more recess 20 is provided on each male projection 18 to receive a fixing screw (not shown). The male projections 18 are inserted into the hollow interior of the tubular sections and the fixing screws if needed pass through the wall of the tubular section to engage in the recess 20. The recesses may be provided with a thread or may be adapted to receive a self-tapping screw.

[0026] The smaller diameter curved connector shown in Figure 2 is generally indicated 22 and, apart from the

length of the main body 16 and the radius or curvature, is essentially identical to that described in Figure 1 and like parts have been given like reference numerals.

[0027] Figure 3 shows a 90° T-connector generally indicated 25 and Figure 4 shows an alternatively angled T-connector generally indicated 26. These T-connectors are usually intended to form the upper end of a leg (which itself comprises one or more tubular section and other connectors). Each T-connector 25, 26 has three male projections 18, two of which are formed at 180° to each other in an opposed pair, which pair connects to tubular sections to form the upper rail of a handrail assembly. The third or middle connector, labelled 18A for convenience, is intended to connect to the upper end of an upper tubular section of a leg of the rail assembly. In the regular 90° embodiment labelled 25 the middle male projection 18A is formed at 90° to the other male projections.

[0028] However, in the angled embodiment shown in Figure 4 the middle male projection 18A is formed at an acute angle with respect to one of the others and an obtuse angle to the other. Each connector still comprises a main body which is essentially similar to that of the curved connectors but is herein labelled 27 and 28 due to their alternative configurations. Although not all visible in this view, each male projection 18 and 18A have a rib 19 formed thereon as well as screw recesses 20. T-connectors could also be used to terminate a rail section in a leg, such that the opposed pair connect to tubular sections forming part of the leg and the middle male projection 18A connects to a tubular section forming part of the rail.

[0029] Figures 5 and 6 show regular and angled embodiments of cross-connectors. In the regular embodiment of Figure 5, which is generally indicated 30, each male projection 18 is formed at substantially right angles to each other in opposed pairs, all male projections being in the same plane. This cross connector 30 would be used to connect four tubular sections together and generally one opposed pair would connect together tubular sections forming part of a leg and the other opposed pair would connect tubular sections form part of an intermediate (i.e. not upper) rail. Again, each male projection would be provided with the rib 19 and the screw recesses 20, even though not all parts are visible in Figures 5 and 6.

[0030] The embodiment of Figure 6 is essentially equivalent to that shown in Figure 5, but this angled cross-connector generally indicated 31 has one pair of opposed male projections 18 formed at an acute angle to the other pair. This arrangement allows a leg and a rail of the assembly to be formed at an angle relative to each other, other than 90°, such that a leg may remain essentially vertical whilst the rail that it supports may run parallel to the surface adjacent which the railing assembly is constructed.

[0031] Figure 7 shows a base member in the form of a connector plate generally indicated 35. This connector plate 35 is adapted to receive the end of a tubular section within an aperture 36 formed by an upstanding sleeve 38 and the connector plate 35 may then be connected by screws or other suitable fixings passing through apertures 37 to an external structure such as a floor. Such a connector plate 35 can be used to connect the lower end of a leg to a floor or ramp, but also can be used to connect the end of a rail to a vertical surface such as a wall. It is also possible for the connector plate 35 to be provided with a male projection equivalent to those described above such that the joined tubular section connects around the male projection rather than locating into the recess 35.

[0032] A cross-section through a tubular section 40 generally indicated is shown in Figure 8. In this particular embodiment of tubular section 40, the external surface is provided with raised and lowered regions in order to improve the grip. The tubular section 40 has an equivalent cross-section along its entire length, and formed by extrusion of like technique. It can be formed in long sections that may be cut to an appropriate length to suit particular requirements. The tubular section 40 is generally circular and has a hollow interior 41. Channels 42 are formed on the inner surface 43 of the tube and the ribs 19 provided on the male projections 18 are adapted to locate within one of these channels 42 to prevent rotation of the tubular section 40 about the male projection 18.

[0033] Figure 9 shows one half of a variable angled connector. The half, which is generally indicated 45, has a male projection 18 and associated components such as the rib 19 and is adapted to connect at a variety of pivotal angles to a second like half (not shown). The main body of the half 45 has a flat plate 46 and a pivot bore 47. The equivalent parts of a second half are aligned such that the pivot bores 47 coincide and the two halves can be connected together by a pivot pin (not shown), or by a male part on one half locating into the pivot bore of the other. This provides a connector that can be used to alter the angle at which a rail or leg extends.

[0034] Figures 10 and 11 show respectively an exploded and a constructed view of part of a rail assembly constructed from some of the components previously discussed. As can be seen, a series of intersecting legs and rails are constructed. Each leg is formed from a T-connector 25, a cross-connector 30, a connector plate 35 and two tubular sections 40. Generally horizontal rails are then formed by inter-connecting the laterally extending male projections 18 on the T-connectors 25 and the cross-connectors 30 with further tubular sections 40.

[0035] A curved free end of the rail assembly is formed using two curved connectors 15 and a shortened tubular section 40 in a U-shaped configuration to connect the ends of the substantially parallel rails. A variable angle connector generally indicated 60, formed from two constituent halves 45 and is used to alter the angle of the rails.

[0036] The lower ends of the lowermost tubular sections 40 are located into the aperture 36 of the connector plates 35 which, as best shown in Figure 11, are connected to a surface 61 upon which the rail assembly overall is mounted.

[0037] Although not shown, the angled T-connectors 26, angled cross-connectors 27 and the smaller diameter curved connectors 22 could all be used to make different or more complicated handrail assemblies dependent upon the requirement. Similarly, the connector plates 35 can be attached to a wall at a termination of a generally horizontal rail as well as supporting the lower end of a leg section 50.

[0038] Figures 12 and 13 show a half connector generally indicated 70. This half connector comprises a curved base region 71 and a male projection 18 extending therefrom for connection to a tubular section as described above. The curved base region locates around the curved surface of a tubular section and is connected thereto using suitable means such as bolts, screws or adhesive.

[0039] Figure 14 shows a leg of a possible assembly using two half connectors 70 to form a cross connector. A length 73 of tubular section connects to the male projection 74 of a base member 75 to fix the leg down to an external structure. A T-connector 25 connects to the upper end of the length 73 for forming a top rail. Approximately half way up the length 73 two half connectors 70 are connected to opposed sides thereof. A bolt 76 passes through each half connector and a transverse hole in the length 73, and a nut 77 is threaded thereon. Tubular sections may be attached to the male projections 18 of the half connectors 70 to form a lower rail (not shown).

Claims

1. A kit for construction of a handrail assembly, said kit including:

a plurality of connectors, each with a male projection (18) having a radially extending rib (19) running parallel to the axis of projection; at least one of said plurality of connectors is a cross connector having male projections in an opposed pair;

a plurality of elongate tubular sections (40, 73) each adapted to connect to the male projections (18) of different connectors and a groove (42) formed in the inner surface (43) of said tubular sections (40, 73) and; wherein when said connectors are inserted into said tubular sections said radially extending rib (19) engages in said groove (42); **characterised in that** the kit further comprises least one T-shaped connector (25) having at least one male projection (18); and a base member (35) that is adapted to connect to the end of a tubular section (40, 73) and to an external structure to mount the handrail assembly thereon and **in that** each male projection (18) has four radially extending walls that run parallel to the axis of the projection and at a right angle with respect to each other, said walls intersecting two parallel disc-shaped walls which extend perpendicular to the axis of the projection (18), whereby each male projection is substantially circular in profile; whereby when said connectors are inserted into said tubular sections snugfits are achieved and an assembly of intersecting legs and rails is formed.

2. A kit of parts as claimed in claim 1, wherein said two parallel disc-shaped walls are separated axially by a recess (19c).

3. A kit of parts as claimed in either of the preceding claims, which further comprises one or more curved connector (15, 22) with two male projections (18) at an angle of less than 180 deg. with respect to each other.

4. A kit of parts as claimed in any of the preceding claims, which further comprises a variable angle connector (45) having two movable parts each provided with a male projection (18), and each being moveable relative to the other to change the relative angle of each male projection (18).

5. A kit of parts as claimed in any of the preceding claims wherein the connectors (15, 22, 25, 26, 30, 31, 45, 70), tubular sections (40 and 73) and base member (35) are formed from plastics material.

6. A kit of parts as claimed in claim 5 wherein the connectors (15, 22, 25, 26, 30, 31, 45, 70) and base member (35) are formed by moulding and the tubular sections (40 and 73) are formed by extrusion.

7. A kit of parts as claimed in any of the preceding claims, wherein the tubular sections (40 and 73) are generally circular in cross section, and have more than one groove to receive the rib (19) on the male projection (18).

8. A kit of parts as claimed in any of the preceding claims wherein the cross connector (30 and 31) comprises two pairs of opposed male projections (18), and tubular sections (40 and 73) attach to each of these.

9. A kit of parts as claimed in any of the preceding claims wherein the T-connector (25) comprises defines three male projections (18), and tubular sections (40 and 73) attach to each of these.

10. A kit of parts as claimed in any of the preceding claims wherein there is included a half connector (70) that defines a single male projection (18) and is connectable to a middle portion of tubular section (73).

11. A kit of parts as claimed in any of claims 1 to 7, where-

in the cross connector comprises two half connectors (70) that each define a male projection (18), the two half connectors (70) being attachable to opposite sides of a tubular section (73).

12. A kit of parts as claimed in claim 10 or claim 11 wherein the or each half connector (70) has a channel shaped base portion (71) that locates around the external surface of the tubular section (73), and a male projection (18) extending therefrom.

13. A kit of parts as claimed in any of the preceding claims wherein at least some of the connectors (15, 22, 25, 26, 30, 31, 45, 70) have a main body (16), that is approximately equivalent in dimensions to the outer dimensions of the tubular sections (40 and 73), and the male projections (18) are slightly smaller and are a snug fit within the open end (41) of a tubular sections (40 and 73).

14. A kit of parts as claimed in any of the preceding claims, in which the tubular sections (40 and 73) are tactilely distinguishable from the main bodies (16) of the connectors (15, 22, 25, 26, 30, 31, 35, 45, 70).

15. A handrail constructed from a kit of parts as claimed in any of the preceding claims.

16. A modular handrail system having a plurality of legs and at least one rail, the system comprising a plurality of cross connectors (30 and 31) having two projections (18) in an opposed pair; elongate tubular sections (40), the open ends (41) of which connect around the male projections (18) of the cross connectors (30, 31) to interconnect them to form at least one rail, **characterized in that** each male projection (18) has a radially extending rib (19) running parallel to the axis of projection that engages in a groove (42) formed in the inner surface (43) of each tubular section (40, 73); and that the system further comprises T-connectors (25) having at least one male projection (18) located at the upper end of each leg; elongate tubular sections, the open ends of which connect around the male projections of the T-connectors to form legs; a base member (35) adapted to connect to a free end of a tubular section (40, 73) either of a leg or a rail and to an external structure to connect the leg or rail thereto; and **in that** each male projection (18) has four radially extending walls that run parallel to the axis of the projection and at a right angle with respect to each other, said walls intersecting two parallel disc-shaped walls which extend perpendicular to the axis of the projection (18), each male projection (18) being substantially circular in profile; whereby when said connectors are inserted into said tubular sections snugfits are achieved.

17. A modular handrail system as claimed in claim 16, wherein tubular sections (40 and 73) are also connected to each other using variable angle connectors (45) having two movable parts each provided with a male projection (18), and each being moveable relative to the other to change the relative angle of each male projection (18), and or curved connectors (15 and 22) with two male projections (18) at an angle of less than 180 deg. with respect to each other.

18. A modular handrail system as claimed in claim 16 or claim 17 wherein the connectors (15, 22, 25, 26, 30, 31, 45, 70), tubular sections (40 and 73) and base member (35) are formed from plastics material.

Patentansprüche

1. Bausatz zum Aufbau einer Handlaufbaugruppe, der Bausatz umfassend:

eine Vielzahl von Verbindungselementen mit jeweils einem zum Einführen vorgesehenen Vorsprung (18), der eine sich radial erstreckende Rippe (19) aufweist, welche parallel zur Achse des Vorsprungs verläuft; wobei mindestens eines aus der Vielzahl von Verbindungselementen ein kreuzförmiges Verbindungselement ist, das die zum Einführen vorgesehenen Vorsprünge als ein gegenüberliegendes Paar aufweist;
eine Vielzahl von langen rohrförmigen Abschnitten (40, 73), die jeweils so ausgelegt sind, dass sie die zum Einführen vorgesehenen Vorsprünge (18) von unterschiedlichen Verbindungselementen miteinander verbinden und dass eine Nut (42) in der Innenfläche (43) der rohrförmigen Abschnitte (40, 73) ausgebildet ist; und wobei, wenn die Verbindungselemente in die rohrförmigen Abschnitte eingeführt werden, die sich radial erstrekkende Rippe (19) in die Nut (42) eingreift; **dadurch gekennzeichnet, dass** der Bausatz des Weiteren mindestens ein T-förmiges Verbindungselement (25) umfasst, das mindestens einen zum Einführen vorgesehenen Vorsprung (18) aufweist; sowie ein Basiselement (35), das so ausgelegt ist, dass es mit dem Ende eines rohrförmigen Abschnitts (40, 73) und mit einer externen Struktur verbunden wird, um die Handlaufbaugruppe daran zu montieren, und **dadurch**, dass jeder zum Einführen vorgesehene Vorsprung (18) vier sich radial erstrekkende Wände aufweist, die parallel zur Achse des Vorsprungs und in einem rechten Winkel im Verhältnis zueinander verlaufen, wobei die Wände zwei parallele scheibenförmige Wände schneiden, die sich senkrecht zur Achse des Vorsprungs (18) erstrecken, wodurch jeder zum Einführen vorgesehene Vorsprung ein im Wesentlichen kreisförmiges Profil aufweist; wo-

durch, wenn die Verbindungselemente in die kreisförmigen Abschnitte eingeführt werden, ein Passsitz erzielt wird und eine Baugruppe aus sich schneidenden Schenkeln und Geländerstangen gebildet wird.

2. Bausatz aus Einzelteilen gemäß Anspruch 1, wobei die zwei parallelen scheibenförmigen Wände durch eine Aussparung (19c) axial voneinander getrennt sind.

3. Bausatz aus Einzelteilen gemäß einem der beiden vorherigen Ansprüche, des Weiteren umfassend ein oder mehrere gekrümmte Verbindungselemente (15, 22) mit zwei zum Einführen vorgesehenen Vorsprüngen (18) in einem Winkel von weniger als 180 Grad im Verhältnis zueinander.

4. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, des Weiteren umfassend ein Verbindungselement mit variablem Winkel (45), das zwei bewegliche Teile aufweist, die jeweils mit einem zum Einführen vorgesehenen Vorsprung (18) versehen sind und die jeweils im Verhältnis zueinander beweglich sind, um den relativen Winkel von jedem zum Einführen vorgesehenen Vorsprung (18) zu verändern.

5. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, wobei die Verbindungselemente (15, 22, 25, 26, 30, 31, 45, 70), die rohrförmigen Abschnitte (40 und 73) und das Basiselement (35) aus Plastikmaterial gefertigt werden.

6. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, wobei die Verbindungselemente (15, 22, 25, 26, 30, 31, 45, 70) und das Basiselement (35) durch Formpressen gefertigt werden und die rohrförmigen Abschnitte (40 und 73) durch Strangpressen gefertigt werden.

7. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, wobei die rohrförmigen Abschnitte (40 und 73) im Allgemeinen einen kreisförmigen Querschnitt haben und mehr als eine Nut aufweisen, um die Rippe (19) auf dem zum Einführen vorgesehenen Vorsprung (18) aufzunehmen.

8. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüchen, wobei das kreuzförmige Verbindungselement (30 und 31) zwei Paare von gegenüberliegenden zum Einführen vorgesehenen Vorsprüngen (18) umfasst und die rohrförmigen Abschnitte (40 und 73) an jeweils einem von diesen befestigt werden.

9. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, wobei das T-förmige Verbindungselement (25) drei zum Einführen vorgesehene Vorsprünge (18) umfasst und die rohrförmigen Abschnitte (40 und 73) an jeweils einem von diesen befestigt werden.

10. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, wobei ein halbes Verbindungselement (70) enthalten ist, das einen einzelnen zum Einführen vorgesehenen Vorsprung (18) definiert und das mit einem mittleren Teil des rohrförmigen Abschnitts (73) verbunden werden kann.

11. Bausatz aus Einzelteilen gemäß einem der Ansprüche 1 bis 7, wobei das kreuzförmige Verbindungselement zwei halbe Verbindungselemente (70) umfasst, die jeweils einen zum Einführen vorgesehenen Vorsprung (18) definieren, wobei die zwei halben Verbindungselemente (70) an den gegenüberliegenden Seiten eines rohrförmigen Abschnitts (73) befestigt werden können.

12. Bausatz aus Einzelteilen gemäß Anspruch 10 oder Anspruch 11, wobei das oder jedes halbe Verbindungselement (70) einen kanalförmigen Basisabschnitt (71) aufweist, der um die Außenfläche des rohrförmigen Abschnitts (73) positioniert wird, sowie einen sich ausgehend von diesem erstreckenden zum Einführen vorgesehenen Vorsprung (18).

13. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, wobei mindestens einige der Verbindungselemente (15, 22, 25, 26, 30, 31, 45, 70) einen Hauptkörper (16) aufweisen, der in seinen Abmessungen in etwa äquivalent zu den Außenabmessungen der rohrförmigen Abschnitte (40 und 73) ist, und die zum Einführen vorgesehenen Vorsprünge (18) geringfügig kleiner sind und einen Passsitz im Inneren des offenen Endes (41) der rohrförmigen Abschnitte (40 und 73) ermöglichen.

14. Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche, wobei die rohrförmigen Abschnitte (40 and 73) fühlbar unterscheidbar von den Hauptkörpern (16) der Verbindungselemente (15, 22, 25, 26, 30, 31, 45, 70) sind.

15. Handlauf, der aus einem Bausatz aus Einzelteilen gemäß einem der vorherigen Ansprüche aufgebaut wird.

16. Modulares Handlaufsystem, das aus einer Vielzahl von Schenkeln und mindestens einer Geländerstange besteht, das System umfassend: eine Vielzahl von kreuzförmigen Verbindungselementen (30 und 31), die zwei Vorsprünge (18) als ein gegenüberliegendes Paar aufweisen; lange rohrförmige Abschnitte (40), deren offene Enden (41) eine Verbindung um die zum Einführen vorgesehenen Vor-

sprünge (18) der kreuzförmigen Verbindungselemente (30, 31) herum ermöglichen, um diese miteinander zu verbinden und mindestens eine Geländerstange zu bilden, **dadurch gekennzeichnet, dass** jeder zum Einführen vorgesehene Vorsprung (18) eine sich radial erstreckende Rippe (19) aufweist, welche parallel zur Achse des Vorsprungs verläuft und in eine Nut (42) eingreift, die in der Innenfläche (43) von jedem rohrförmigen Abschnitt (40, 73) ausgebildet ist; und **dadurch**, dass das System des Weiteren umfasst: T-förmige Verbindungselemente (25), die mindestens einen zum Einführen vorgesehenen Vorsprung (18) aufweisen, der sich am oberen Ende von jedem Schenkel befindet; lange rohrförmige Abschnitte, deren offene Enden die Verbindung um die zum Einführen vorgesehenen Vorsprünge herum ermöglichen, um Schenkel zu bilden; ein Basiselement (35), das so ausgelegt ist, dass es mit einem freien Ende eines rohrförmigen Abschnitts (40, 73) entweder eines Schenkels oder einer Geländerstange und mit einer externen Struktur verbunden wird, um den Schenkel oder die Geländerstange daran zu montieren; und **dadurch**, dass jeder zum Einführen vorgesehene Vorsprung (18) vier sich radial erstreckende Wände aufweist, die parallel zur Achse des Vorsprungs und in einem rechten Winkel im Verhältnis zueinander verlaufen, wobei die Wände zwei parallele scheibenförmige Wände schneiden, die sich senkrecht zur Achse des Vorsprungs (18) erstrecken, wobei jeder zum Einführen vorgesehene Vorsprung (18) ein im Wesentlichen kreisförmiges Profil aufweist; wodurch, wenn die Verbindungselemente in die kreisförmigen Abschnitte eingeführt werden, ein Passsitz erzielt wird.

17. Modulares Handlaufsystem gemäß Anspruch 16, wobei auch rohrförmige Abschnitte (40 und 73) miteinander verbunden werden, wozu Verbindungselemente mit variablem Winkel (45) verwendet werden, die zwei bewegliche Teile aufweisen, die jeweils einen zum Einführen vorgesehenen Vorsprung (18) aufweisen und die jeweils im Verhältnis zueinander beweglich sind, um den relativen Winkel von jedem zum Einführen vorgesehenen Vorsprung (18) zu verändern, oder wozu gekrümmte Verbindungselemente (15 und 22) mit zwei zum Einführen vorgesehenen Vorsprüngen (18) in einem Winkel von weniger als 180 Grad im Verhältnis zueinander verwendet werden.

18. Modulares Handlaufsystem gemäß Anspruch 16 oder Anspruch 17, wobei die Verbindungselemente (15, 22, 25, 26, 30, 31, 45, 70), die rohrförmigen Abschnitte (40 und 73) und das Basiselement (35) aus Plastikmaterial gefertigt werden.

Revendications

1. Un kit pour la construction d'un assemblage de garde-fou, ledit kit comprenant :

une pluralité de raccords, chacun avec une saillie mâle (18) ayant une nervure (19) s'étendant de façon radiale disposée parallèlement à l'axe de saillie ; au moins un de ladite pluralité de raccords est un raccord croisé ayant des saillies mâles en paire opposée ; une pluralité de sections tubulaires allongées (40, 73) chacune adaptée pour se raccorder aux saillies mâles (18) de différents raccords et une rainure (42) formée dans la surface interne (43) desdites sections tubulaires (40, 73) et ; dans lequel quand lesdits raccords sont insérés dans lesdites sections tubulaires, ladite nervure (19) s'étendant de façon radiale se met en prise dans ladite rainure (42) ; **caractérisé en ce que** le kit comporte de plus au moins un raccord en forme de T (25) ayant au moins une saillie mâle (18) ; et un membre de base (35) qui est adapté pour se raccorder à l'extrémité d'une section tubulaire (40, 73) et à une structure externe pour monter l'assemblée de garde-fou sur cette dernière et **en ce que** chaque saillie mâle (18) a quatre parois s'étendant de façon radiale qui sont disposées parallèlement à l'axe de la saillie et à angle droit l'une par rapport à l'autre, lesdites parois croisant deux parois en forme de disque parallèles qui s'étendent perpendiculairement à l'axe de la saillie (18), grâce à quoi chaque saillie mâle est essentiellement circulaire en profil ; grâce à quoi quand lesdits raccords sont insérés dans lesdites sections tubulaires des ajustements serrés sont obtenus et un assemblage de montants et de barres entrecroisés est formé.

2. Un kit de pièces tel que revendiqué dans la revendication 1, dans lequel lesdites deux parois en forme de disque parallèles sont séparées de façon axiale par un creux (19c).

3. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes, qui comporte de plus un ou plusieurs raccords courbes (15, 22) avec deux saillies mâles (18) à un angle de moins de 180 degrés l'une par rapport à l'autre.

4. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes, qui comporte de plus un raccord à angle variable (45) ayant deux pièces mobiles chacune munie d'une saillie mâle (18), et chacune étant mobile relativement à l'autre pour changer l'angle relatif de chaque saillie mâle (18).

5. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes dans lequel les raccords (15, 22, 25, 26, 30, 31, 45, 70), les sections tubulaires (40 et 73) et le membre de base (35) sont formés de matière plastique.

6. Un kit de pièces tel que revendiqué dans la revendication 5 dans lequel les raccords (15, 22, 25, 26, 30, 31, 45, 70) et le membre de base (35) sont formés par moulage et les sections tubulaires (40 et 73) sont formées par extrusion.

7. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes, dans lequel les sections tubulaires (40 et 73) sont généralement circulaires en coupe transversale, et ont plus d'une rainure pour recevoir la nervure (19) sur la saillie mâle (18).

8. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes dans lequel le raccord croisé (30 et 31) comporte deux paires de saillies mâles opposées (18), et les sections tubulaires (40 et 73) s'assujettissent à chacune de ces dernières.

9. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes dans lequel le raccord en forme de T (25) comporte trois paires de saillies mâles (18), et les sections tubulaires (40 et 73) s'assujettissent à chacune de ces dernières.

10. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes dans lequel est inclus un demi-raccord (70) qui définit une saillie mâle unique (18) et est raccordable à une portion de milieu de section tubulaire (73).

11. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications 1 à 7, dans lequel le raccord croisé comporte deux demi-raccords (70) qui définissent chacun une saillie mâle (18), les deux demi-raccords (70) pouvant être assujettis aux côtés opposés d'une section tubulaire (73).

12. Un kit de pièces tel que revendiqué dans la revendication 10 ou la revendication 11 dans lequel le ou chaque demi-raccord (70) a une portion de base en forme de canal (71) qui se trouve autour de la surface externe de la section tubulaire (73), et une saillie mâle (18) s'étendant à partir de là.

13. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes dans lequel certains au moins des raccords (15, 22, 25, 26, 30, 31, 45, 70) ont un corps principal (16), qui est approximativement équivalent en dimensions aux dimensions externes des sections tubulaires (40 et 73), et les saillies mâles (18) sont légèrement plus petites et sont un ajustement serré à l'intérieur de l'extrémité ouverte (41) des sections tubulaires (40 et 73).

14. Un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes, dans lequel les sections tubulaires (40 et 73) peuvent être distinguées au toucher des corps principaux (16) des raccords (15, 22, 25, 26, 30, 31, 35, 45, 70).

15. Un garde-fou construit à partir d'un kit de pièces tel que revendiqué dans n'importe lesquelles des revendications précédentes.

16. Un système de garde-fou modulaire ayant une pluralité de montants et au moins une barre, le système comportant une pluralité de raccords croisés (30 et 31) ayant deux saillies (18) en paire opposée ; des sections tubulaires allongées (40), dont les extrémités ouvertes (41) se raccordent autour des saillies mâles (18) des raccords croisés (30, 31) pour les raccorder entre eux afin de former au moins une barre, **caractérisé en ce que** chaque saillie mâle (18) a une nervure (19) s'étendant de façon radiale disposée parallèlement à l'axe de saillie qui se met en prise dans une rainure (42) formée dans la surface interne (43) de chaque section tubulaire (40, 73), et que le système comporte de plus des raccords en forme de T (25) ayant au moins une saillie mâle (18) située au niveau de l'extrémité supérieure de chaque montant ; des sections tubulaires allongées, dont les extrémités ouvertes se raccordent autour des saillies mâles des raccords en forme de T pour former des montants ; un membre de base (35) adapté pour se raccorder à une extrémité libre d'une section tubulaire (40, 73), soit un montant soit une barre, et à une structure externe pour raccorder le montant ou la barre à cette dernière ; et **en ce que** chaque saillie mâle (18) a quatre parois s'étendant de façon radiale qui sont disposées parallèlement à l'axe de la saillie et à angle droit l'une par rapport à l'autre, lesdites parois croisant deux parois en forme de disque parallèles qui s'étendent perpendiculairement à l'axe de la saillie (18), chaque saillie mâle (18) étant essentiellement circulaire en profil ; grâce à quoi quand lesdits raccords sont insérés dans lesdites sections tubulaires des ajustements serrés sont obtenus.

17. Un système de garde-fou modulaire tel que revendiqué dans la revendication 16, dans lequel les sections tubulaires (40 et 73) sont également raccordées l'une à l'autre à l'aide de raccords à angle variable (45) ayant deux pièces mobiles chacune munie d'une saillie mâle (18), et chacune étant mobile relativement à l'autre pour changer l'angle relatif de chaque saillie mâle (18), et un ou plusieurs raccords

courbes (15, 22) avec deux saillies mâles (18) à un angle de moins de 180 degrés l'une par rapport à l'autre.

18. Un système de garde-fou modulaire tel que revendiqué dans la revendication 16 ou la revendication 17 dans lequel les raccords (15, 22, 25, 26, 30, 31, 45, 70), les sections tubulaires (40 et 73) et le membre de base (35) sont formés de matière plastique.

Figure 1

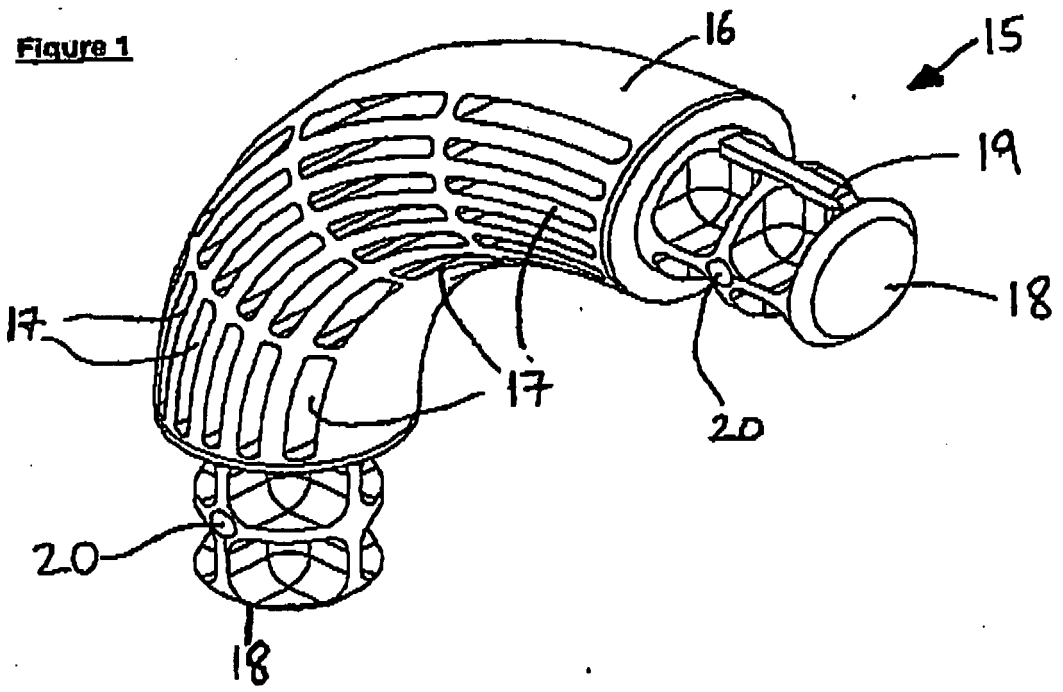


Figure 2

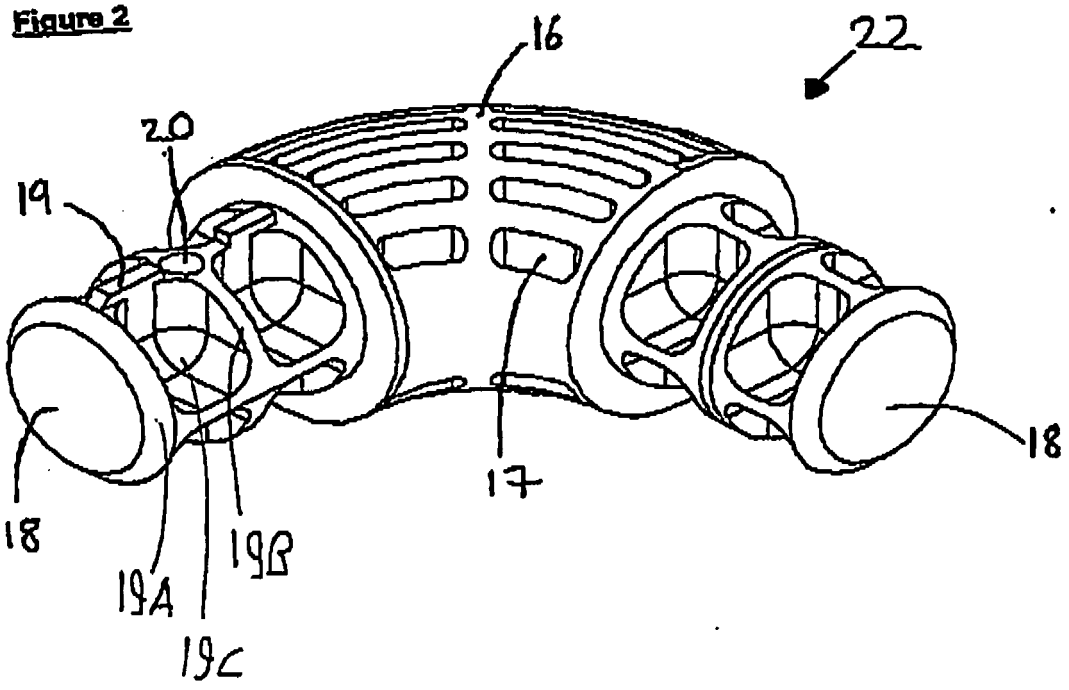


Figure 3

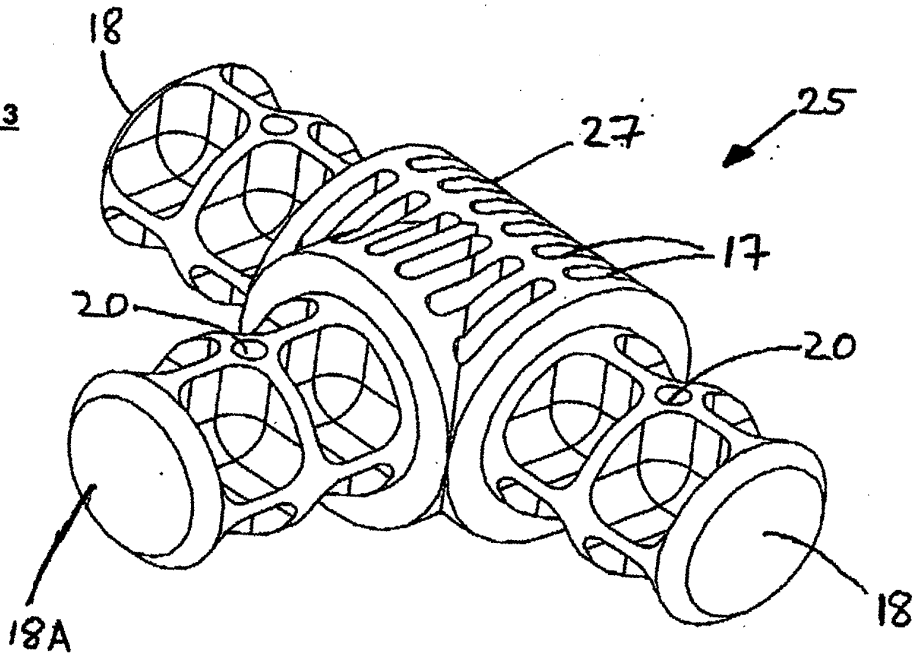


Figure 4

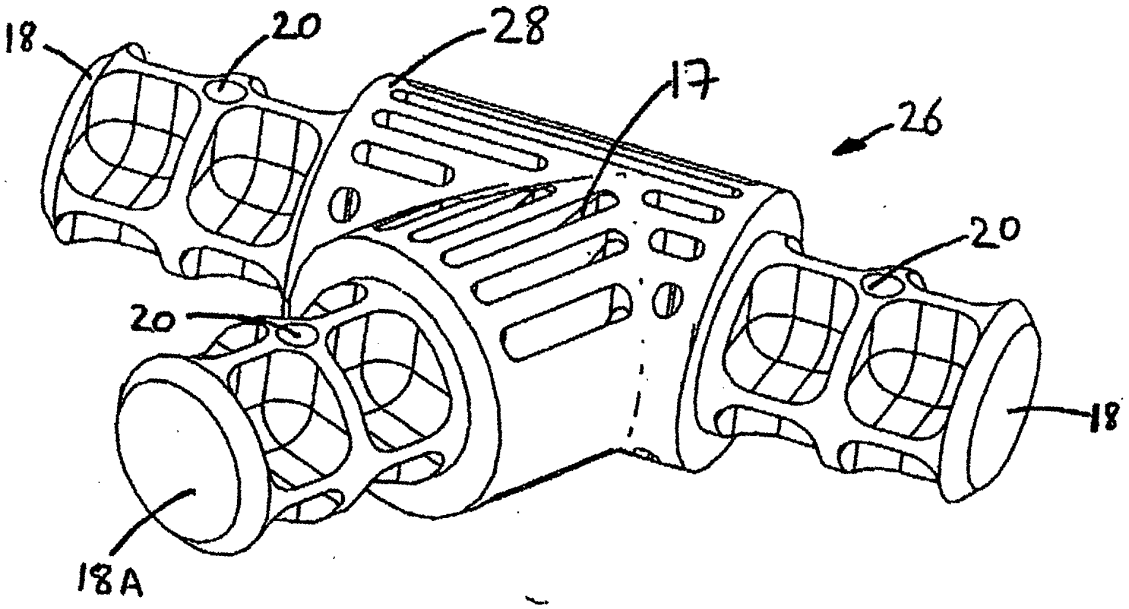


Figure 5

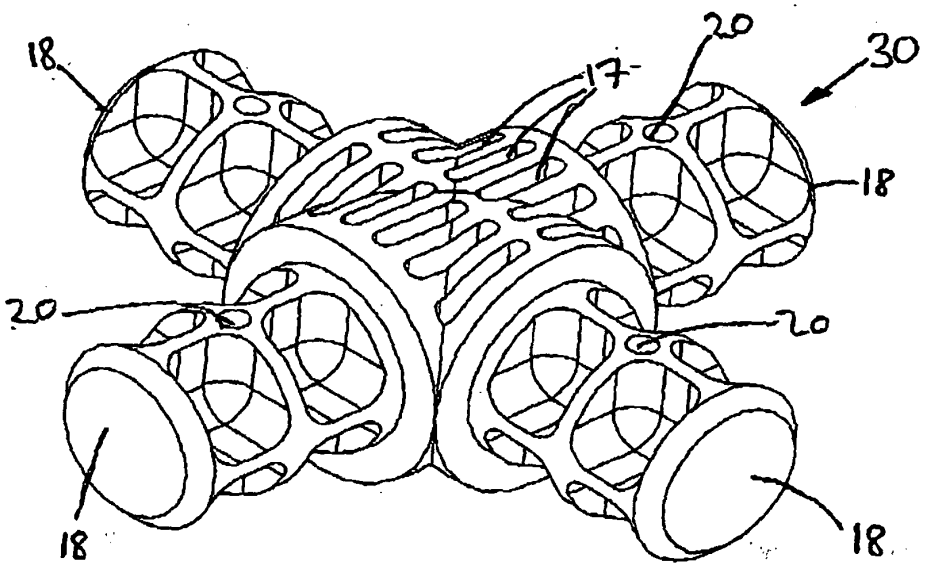


Figure 6

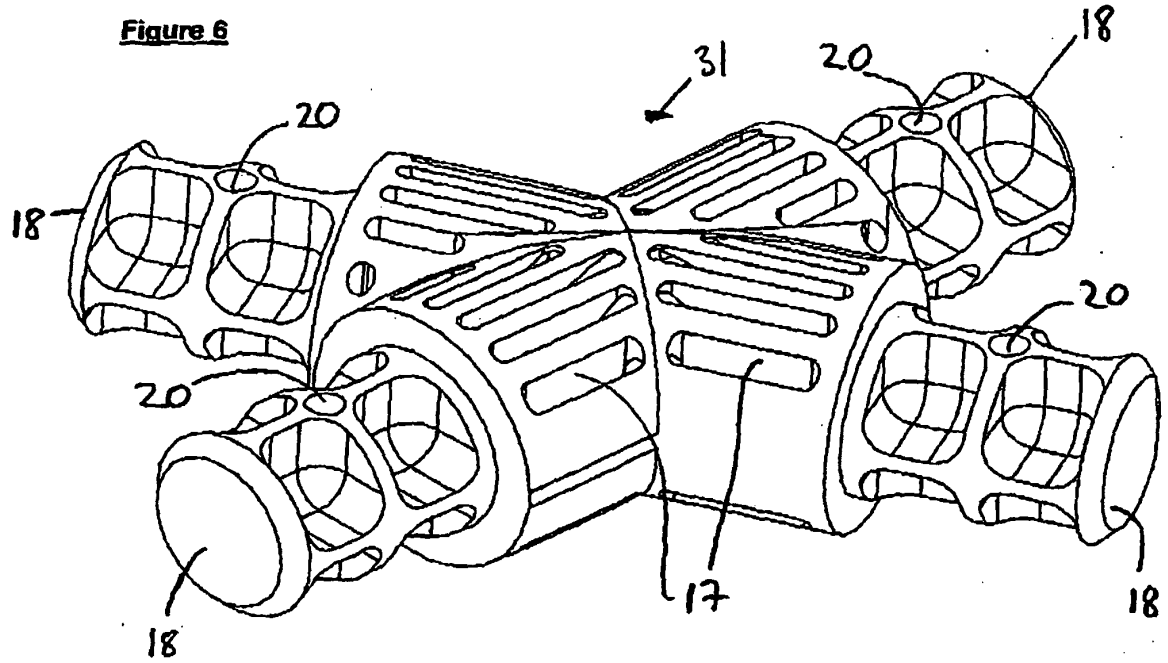


Figure 7

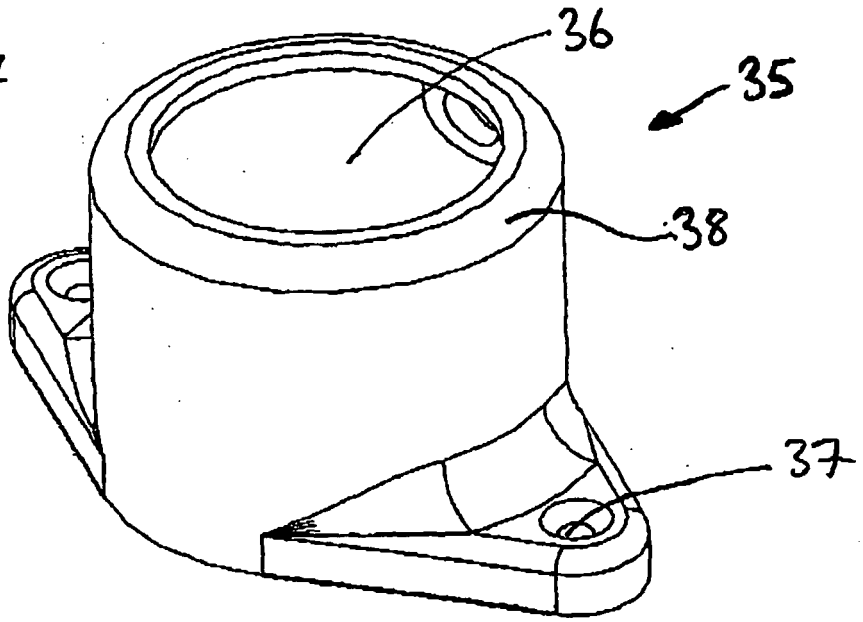


Figure 8

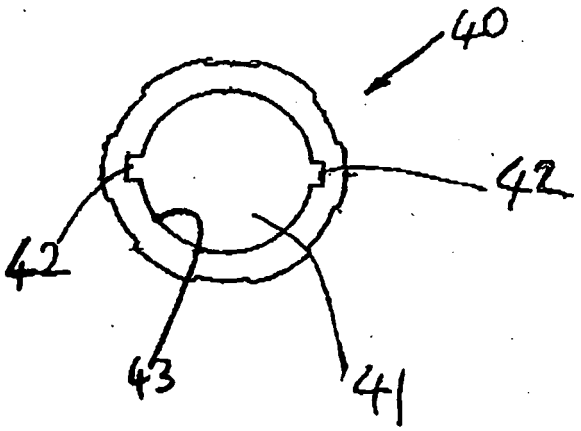
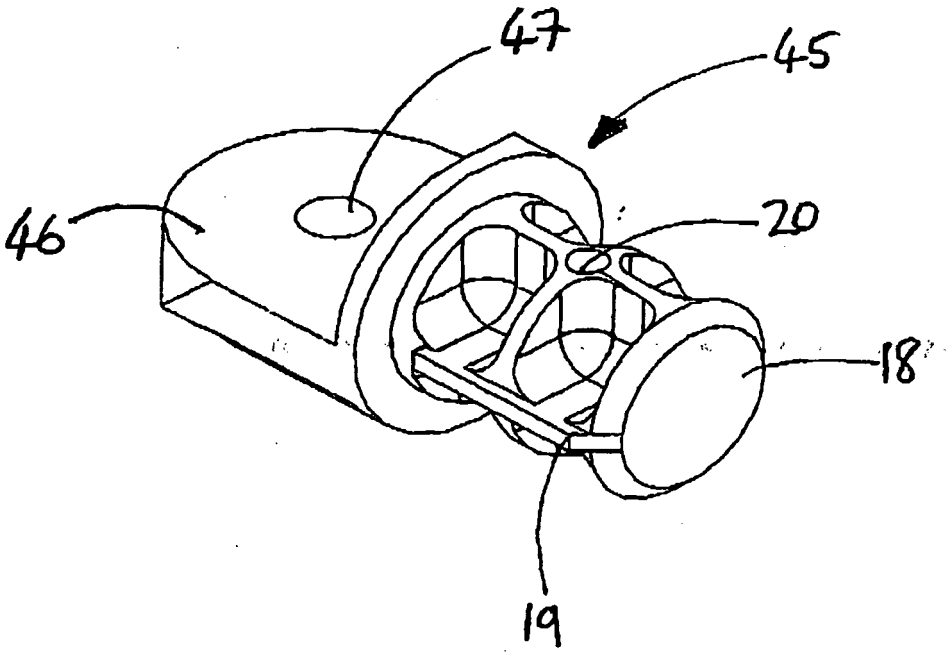


Figure 9



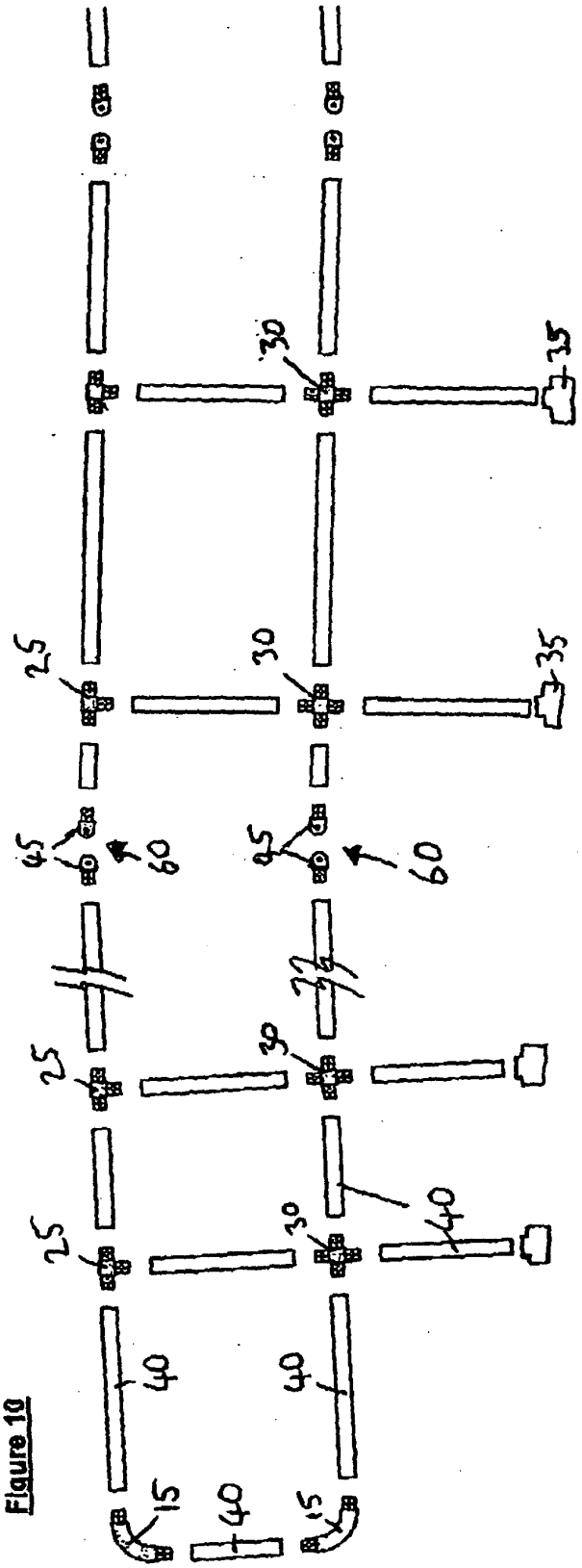


Figure 10

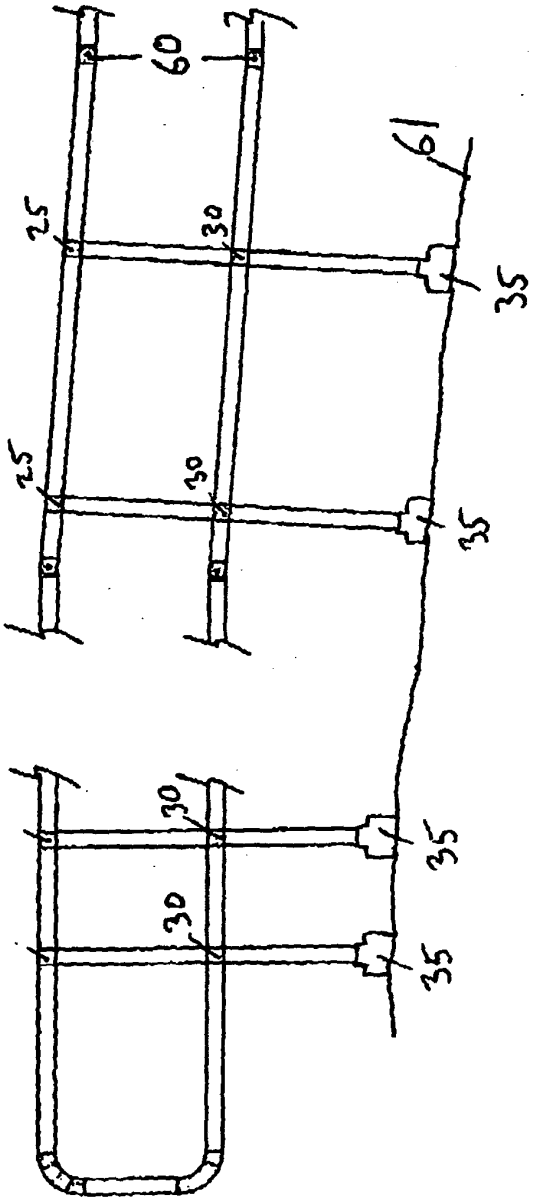


Figure 11

Figure 12

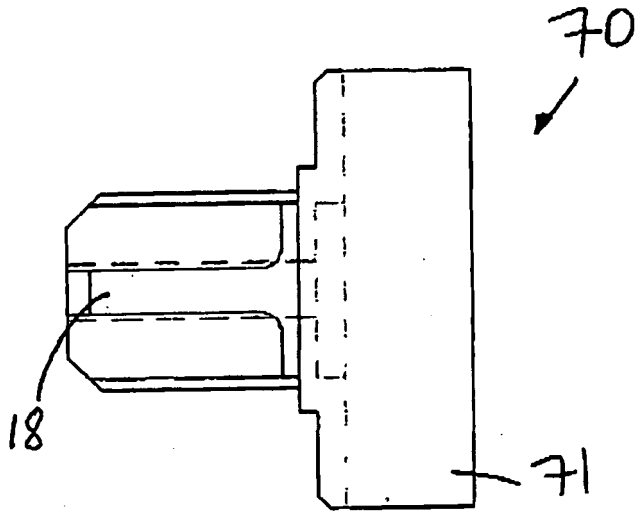
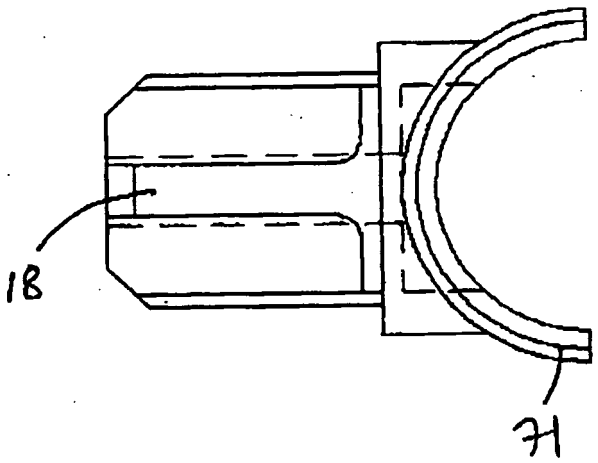


Figure 13



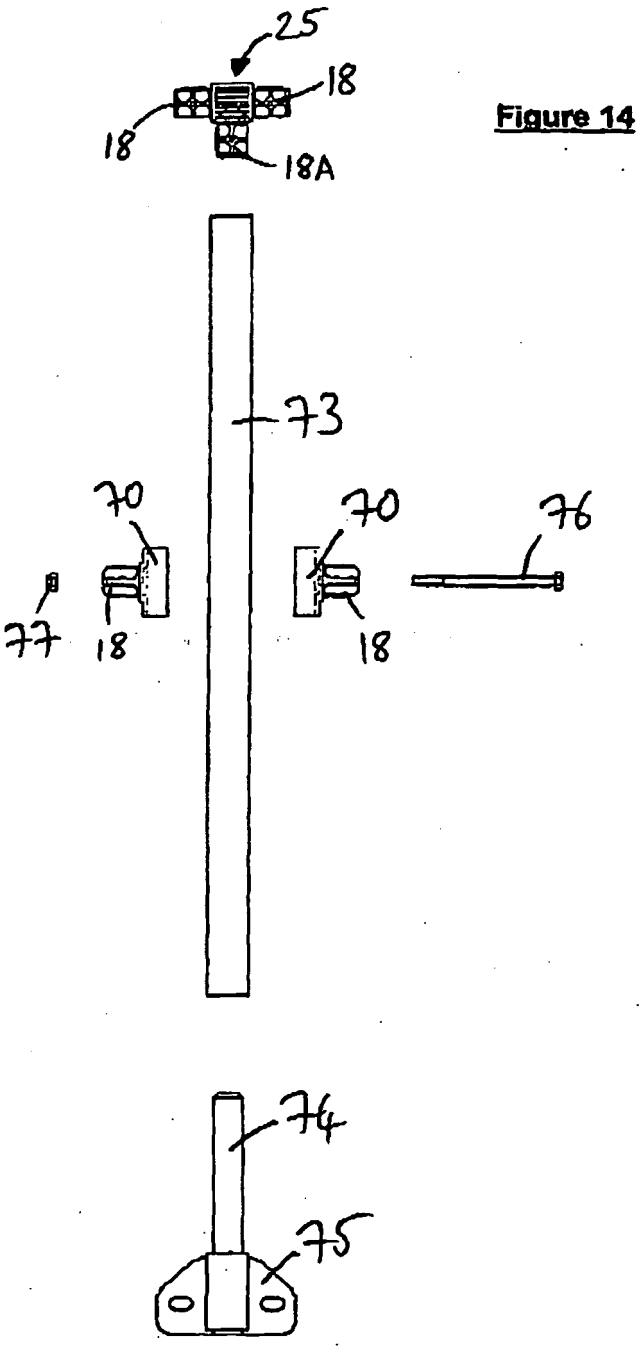


Figure 14

REFERENCES CITED IN THE DESCRIPTION

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