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(54) IMPROVEMENTS IN OR RELATING TO FRAMES

(71) We, MARLER HALEY EXPOSYSTEMS LIMITED, a British company of Exposystems House, 7 High Street, Barnet, Hertfordshire, EN5 5UF, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement;

THIS INVENTION relates to frames and is particularly, but not exclusively, concerned with temporary, light structures such as may be employed for display purposes at exhibitions or in shops.

It is among the objects of the invention to provide an improved frame which can be readily assembled and is rigid when assembled, and can readily be disassembled and which nevertheless can be made inexpensively.

According to the invention there is provided a frame including a plurality of interconnected members, one of which provides a socket and another of which provides a plug received in said socket to provide a plug and socket connection, at least one wedging member disposed in the socket being resiliently deformed between the periphery of the plug and the opposing socket wall, at least one of the surfaces between which the wedging member is wedged being substantially cylindrical, the wedging member being provided with a point or edge which penetrates said substantially cylindrical surface and is forced into the member providing said surface, thereby preventing relative rotation, about the axis of said substantially cylindrical surface, between, on the one hand, the wedging member and, on the other hand, the member providing said substantially cylindrical surface, the wedging member being non-rotatably engaged with the other of the members between which the wedging member is wedged, whereby relative rotational movement between the plug and socket is prevented.

The said first members are preferably lengths of hollow cylindrical tubing, thus providing a respective said socket at the end of each said length and the said second members may conveniently also be lengths of tubing each having cylindrical spigots, forming plugs, secured at each end transversely to the length of the tubing so that said second members each have the general form of a flattened 'H'.

In a preferred embodiment, a rectangular frame according to the invention forms a semi-permanently assembled part of a system of parts which can readily be assembled to form a display structure and readily disassembled for packing. The rectangular frame may receive within it a correspondingly dimensioned rectangular panel secured along its edges to the sides of the frame, for example by detachable clips.

In the preferred embodiment the plug and socket of each said plug and socket connection are both cylindrical and each said connection comprises a longitudinally split collet, the two half round parts of which constitute respective resilient wedging members, the collet parts having dimples on their inner sides which engage corresponding depressions in the surface of the socket, and the curvature of the collet parts decreases from the end which, during assembly enters the socket first, towards the other end, whereby during insertion of the plug, with the collet parts located thereabout, into the socket, there is a progressive wedging effect causing progressive resilient deformation of the collet parts and at the same time the relatively sharp outer edges of the lateral margins of the collet parts cut into the softer material of the sockets to prevent, in the assembled joint, relative rotational movement between the plug and socket, and whereby warping distortion of a flat rectangular frame comprising such plug and socket joints is minimised.

An embodiment of the invention is described below with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of part of modular display system, said part including a structural frame embodying the invention,

Figure 2 is a perspective view showing the part of Figure 1 in an assembled state and also illustrating the manner in which that part can be connected with similar parts via connecting members to form a temporary, extended structure,

Figure 3 is a perspective view to an enlarged scale showing a plug and socket joint incorporated in the part of Figure 1,

Figure 4 is a front elevation view of a collet part incorporated in the joint of Figure 3,

Figure 5 is a side elevation view of the collet of Figure 4,

Figure 6 is a plan view from above of the collet part of Figures 4 and 5 and

Figure 7 is a plan view from below of the collet part of Figures 4 to 6.

Referring to Figure 1, generally flat, rectangular unit, constituting a module of a modular, temporary display system, comprises a rectangular frame of metal tubing consisting of two side members 10, a top member 12 and an identical bottom member 14, and a rectangular panel 16 which fits snugly within the rectangular frame and is held in place relative to the side members and top and bottom members by respective resilient clips 18 which are in the form of length of resilient plastics extrusion of constant, generally hairpin-shaped cross section comprising a part circular portion which fits around the respective tubular side or top or bottom member and resilient arms extending from the first-mentioned portion and between which the respective edge portion of the panel 16 is received. The clips 18 are fitted over the respective frame members and the respective edge portions of a panel by pushing the clips over their respective frame member, with the panel 16 located within the frame, in a direction transverse to the longitudinal extent of the respective clip and the associated side member and directed towards the middle of the panel 16.

Referring to Figure 2, the assembled module 8 provides, at top and bottom, spigots 20 each forming an axial extension of the respective side member 10 of the rectangular frame of the module, and the assembled module 8 can be readily combined with similar modules 8 and with auxiliary connecting elements to form, for example, a display screen for exhibition purposes. Thus, as shown in Figure 2, the module 8 shown in full may have the spigots 20 at its lower end fitted in respective sockets in respective connecting pieces 22, in the form of identical length of hollow extrusion each providing two parallel laterally spaced sockets to receive respective spigots 20. A module 8 disposed below that shown in full may be connected with the module shown in full by having the spigots 20 at its upper end inserted in the connecting pieces 22 from below, in axial alignment with the respective spigots 20 at the lower ends of the module 8 shown in full. Similarly, adjacent modules 8 can be connected side by side by fitting adjacent spigots 20 of adjoining modules into respective ones of the two sockets of a respective connecting piece 22. Thus a screen comprising a desired number of vertically extending sections connected side by side, and at desired angles with respect to each other viewed in plan, can be formed, each vertically extending section comprising a desired number of modules 8 arranged one above the other, adjoining modules in the screen being interconnected by connecting pieces such as shown at 22. Similarly, connecting pieces such as shown at 22 may be used to connect the adjoining corners of adjoining modules at the top and bottom of the screen, suitable finishing pieces being, for example, inserted in the connecting pieces at the top of the screen and, for example, supporting bases being inserted in the connecting pieces 22 at the bottom of the screen. Arrangements where three or four screen walls meet in a common vertically extending location may also be provided if connecting pieces providing three or four parallel transversely spaced sockets are employed.

Referring once more to Figure 1, the upper and lower members 12 and 14 of the module frame are identical and each comprises a length of hollow cylindrical tubing, for example of mild steel, having at each end thereof a respective end fitting providing short limbs, in axial alignment with each other extending in opposite directions from each other from opposite sides of the length of tubing providing the major part of the member 12 or 14 and perpendicular to the axis of the latter length of tubing. These short limbs at one end of each member 12, 14 are parallel with the corresponding short limbs at the other end of the respective upper or lower member 12, 14 so that each member 12, 14 has the general form of a flattened 'H'. One of the two short limbs provided by each said end fitting consitutes the respective spigot 20.

Referring to Figure 3, each end fitting comprises a generally cylindrical pin having, intermediate its ends, an enlarged cylindrical boss part 30 which is of substantially the same external diameter as the tubular side members 10 and the tubular major parts of the upper and lower members 12 and 14. Extending from axially opposite ends of the boss part 30 and of reduced diameter with respect to the part 30 are the spigot 20 and the other limb 32 of the end fitting. The spigot 20 is bevelled at its free end to facilitate insertion into the sockets or connect-

ing pieces such as 22. The limb 32 constitutes a plug which, in assembly of the frame of the module, is inserted into the socket afforded by the respective end of the respective side member 10, a collet, having the general form of a tube split axially into two identical parts being interposed between the periphery of the limb 32 and the opposing interior surface of the member 10. The split collet, the two identical parts of which are referenced 34 in Figure 3, is shown in greater detail and to an enlarged scale in Figures 4 to 7.

Each collet part 34 is formed of spring steel sheet material and comprises a strip of such material bent longitudinally into the form of a shallow channel, the circumferential extent of the collet part being substantially constant throughout its length but the curvature increasing progressively from the end shown uppermost in Figures 3 to 5 to the ends shown lowermost, so that when the collet parts 34 are fitted to the limb 32, the internal surfaces of the collet part 34 conform closely to the periphery of the limb 32 adjacent the free end thereof, (the lower, free ends of the collet part 34, when fitted to the limb 32, coinciding in position with the position of the lower end of the limb 32), but towards the opposite ends of the collet part 34, and thus towards the part 30, the lateral edges of the collet parts 34 are displaced increasingly outwardly from the peripheral surface of the cylindrical limb 32. Adjacent the part 30, the limb 32 is formed, on diametrically opposite sides thereof, with circular depressions 36, each of which receives, when the collet parts 34 are fitted, a respective protuberance 38 on the respective collet part 34, the protuberances 38 being formed by punching the sheet material of the collet part 34 so that depressions 40 are formed on the convex sides of the collet part 34 corresponding to the protruberances 38 formed on the concave sides.

The external diameter of the limb 32, the internal diameter of the tubular members 10 and the thicknesses of the collet members 34 are so selected that when the collet parts 34 are fitted around the limb 32 with the protuberances 38 engaged in the respective depressions 36, the free end of the assembly comprising the limb 32 and the two collet parts 34 can be fitted snugly within the open end of the respective side member 10 and the last-mentioned assembly can thereafter be driven longitudinally into the member 10 so that each collet part 34 is progressively bent resiliently about the longitudinal axis of the member 10 to decrease its curvature, remote from the free end of member 32, to correspond with its curvature adjacent the free end of member 32. At the same time, the longitudinally extending radially outermost edges of the collet part 34 cut into the softer material of the tube providing the socket, so that in the fully inserted position, in which the respective end face of the part 30 bears upon the end of the respective side member 10, the outer lateral edges of the collet part 34 are resiliently held in engagement with corresponding grooves, cut by these edges, formed in the interior of the side member 10, so that the collet parts 34 are fixedly retained within the end of the respective side member 10 and are retained non-rotatably therein, with the result that the limb 32 and the end fitting as a whole is retained non-rotatably within the respective end of the respective side member 10. It will be observed that at the end of each collet part 34 shown uppermost in Figures 3 to 5, the corners of each collet part are cropped along arcuate edges 40, the cropping being so effected as to leave burrs on the convex sides of the collet parts 34 which enhance the resistance to rotation between the collet parts and the member 10.

It will be appreciated that if desired, each collet part 34 may have two or more protuberances 38, the limb 32 having, for each collet part 34, a corresponding number of depressions 36. Similarly, the form of the protuberances and the corresponding depressions on the limb 32 may differ from those shown.

It will be appreciated that in the discussion with reference to Figures 3 to 7, it has been assumed that the end fitting is attached to one end of a top member 12. In the case of an end fitting attached to a bottom member 14, the latter would, of course, be arranged with the limb 32 extending upwardly and the spigot 20 downwardly, the collet parts 34 being similarly inverted, assuming, of course, the orientation of the module to be shown in Figures 1 and 2.

The invention is naturally not to be considered limited to use of the module in any particular orientation so that, for instance, the module might be used in a horizontal position or any position with its major planes vertical but with the members 10 extending horizontally and the members 12 vertically.

It will be appreciated that the modular system may comprise modules of various different lengths and heights with corresponding various lengths of top and bottom members 12, 14 and side members 10, and that, in at least some of the modules, rectangular panels within the rectangular frames may be omitted. In such open frames, the non-rotational engagement of the limbs 32 in the sockets provided by the tubes 10 prevents, or minimises, "warping" distortion of the respective rectangular

frames.

WHAT WE CLAIM IS:

1. A frame including a plurality of interconnected members, one of which provides a socket and another of which provides a plug received in said socket to provide a plug and socket connection, at least one wedging member disposed in the socket being resiliently deformed between the periphery of the plug and the opposing socket wall, at least one of the surfaces between which the wedging member is wedged being substantially cylindrical, the wedging member being provided with a point or edge which pentrates said substantially cylindrical surface and is forced into the member providing said surface, thereby preventing relative rotation, about the axis of said substantially cylindrical surface, between, on the one hand, the wedging member and, on the other hand, the member providing said substantially cylindrical surface, the wedging member being non-rotatably engaged with the other of the members between which the wedging member is wedged, whereby relative rotational movement between the plug and socket is prevented.

2. A frame according to claim 1 wherein, in said plug and socket connection, a collet formed by said wedging member or members is disposed within said socket around the plug and is slit longitudinally at at least one location around its periphery, said slit providing, by at least one of its edges, a said edge which penetrates said substantially cylindrical surface.

3. A frame according to claim 2 wherein at least in an unstressed condition said collet at one end thereof conforms closely to an imaginary cylindrical surface corresponding to said substantially cylindrical surface provided by said member and wherein the or each said edge of said slit, and the adjoining parts of the collet, on the side of said collet which engages said member providing said substantially cylindrical surface, diverge progressively from said imaginary cylindrical surface towards the other end of the collet, whereby a progressive wedging action is obtained during assembly of the structure.

4. A frame according to claim 2 wherein said collet is a diametrically split collet formed by two similar half-round parts, whereby in the assembled structure the collet has a said longitudinal slit on opposite longitudinal sides thereof, each said collet being of greater curvature at one end than at the other so that each said edge of each said slit forms a cutting edge to penetrate said cylindrical surface.

5. A frame according to claim 4 wherein said member providing said socket is in the form of a hollow tube providing internally said cylindrical surface penetrated by said longitudinal edges of the collet and wherein said plug is also cylindrical but has recesses thereon to accommodate corresponding internal projections on said half-round parts of said collet to prevent rotation of the collet with respect to the plug about the axis of the latter.

6. A frame according to any of claims 1 to 5 wherein the interconnected members providing said plug and socket are elongate first and second members one of which provides the plug and the other of which provides the socket, the respective plug and socket connection being effected by relative movement of the first and second members in the longitudinal direction of the first member.

7. A frame according to claim 6 which is of generally rectangular form and which includes a pair of generally parallel elongate first members spaced apart transversely of each other and connected together via their respective ends by a pair of second elongate members generally parallel with each other and extending transversely of said first elongate members, said second members being spaced apart in the longitudinal direction of the first-mentioned members, each said second member extending between respective ends of the two first elongate members and being connected with each of said first members via a respective said plug and socket connection including a respective said wedging member, each said plug and socket connection being effected by relative movement of the respective first and second elongate member in the longitudinal direction of said first member.

8. A frame according to claim 7 wherein each said second member has, at each end thereof, two said relatively short limbs aligned with each other and extending in opposite directions from the respective said spar perpendicular to the longitudinal extent of the latter, whereby the said second member has the form of a flattened 'H' of which said spar forms the cross-piece.

9. A frame according to claim 8 wherein the socket of each said plug and socket connection is provided by a longitudinal bore in the respective said first member extending from the respective end thereof, and the corresponding plug is provided by the respective said short limb of the respective second member.

10. A frame substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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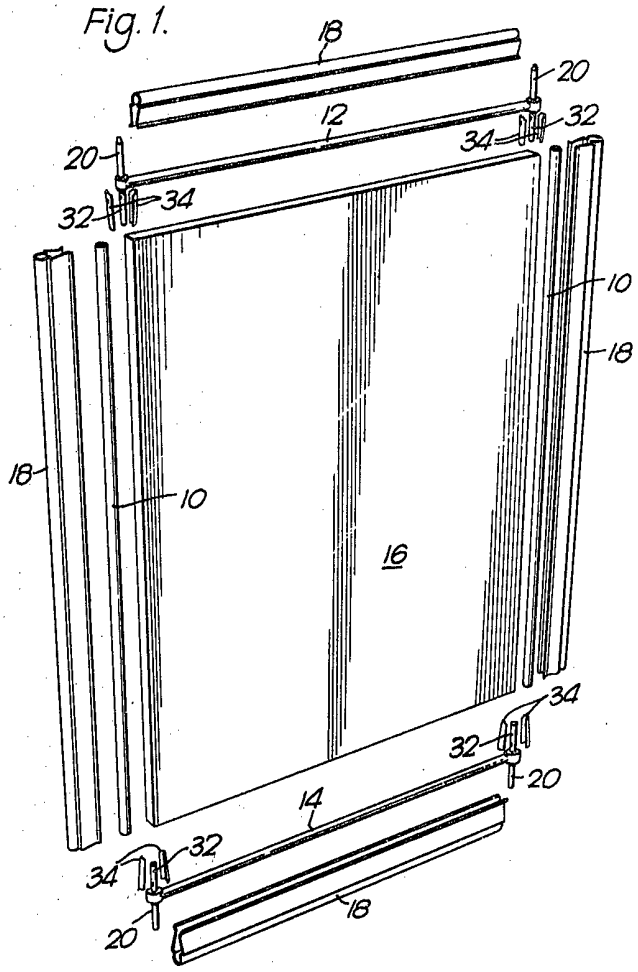
1586738 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig. 1.



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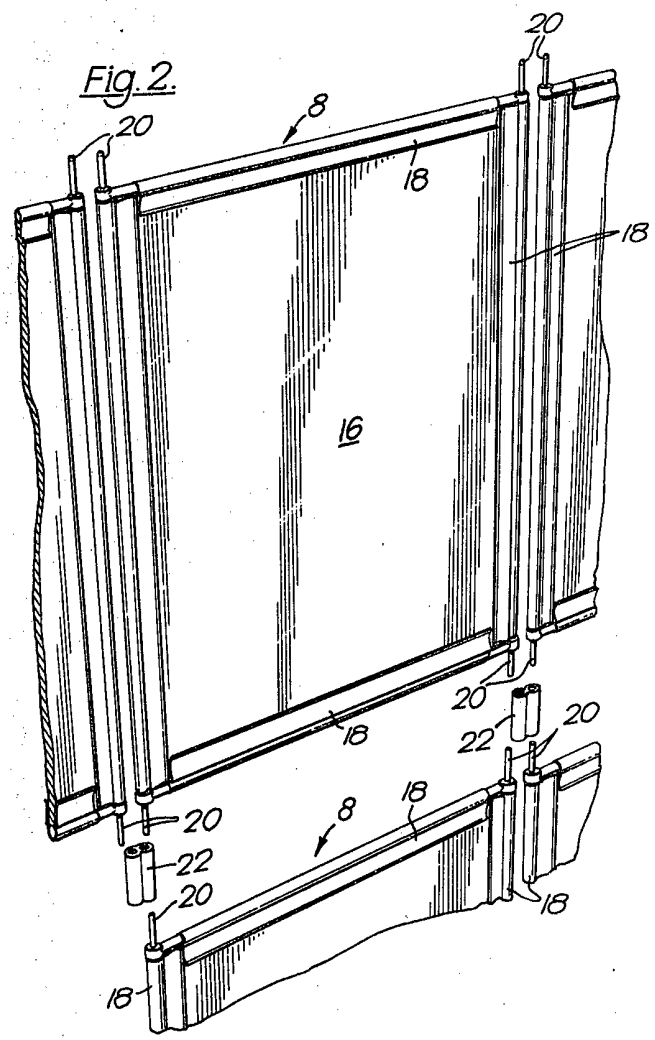
Sheet 2

Fig.2.



1586738 COMPLETE SPECIFICATION
3 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 3

Fig.3.

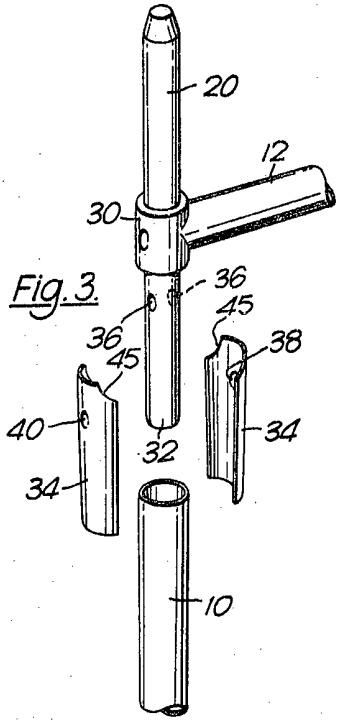


Fig.5.

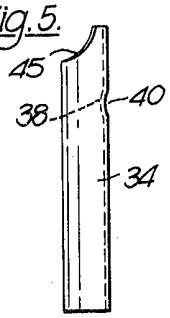


Fig.4.

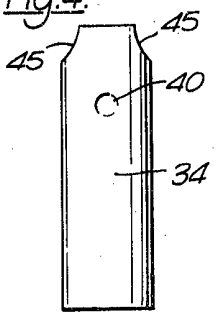


Fig.6.

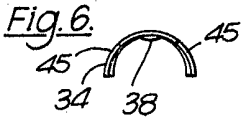


Fig.7.