PATENT SPECIFICATION (11) 1 561 985

1 561 985

(21) Application Nos. 19514/76 (22) Filed 12 May 1976
6201/77 15 Feb. 1977

(19)

(23) Complete Specification filed 10 May 1977

(44) Complete Specification published 5 March 1980

(51) INT. CL³. F16B 12/16

(52) Index at acceptance

F2M 202 225 226 232 246 276 B2
F2H 16A1 16E 16F2 16F5 34

(72) Inventor DAVID NORMAN HARLEY

(54) GROMMETS FOR FURNITURE CONNECTORS

(71) We, ITW LIMITED, a British company, of 470 Bath Road, Slough, SL1 6BJ, Berkshire, 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:—

The invention concerns connectors for use in home-assembly furniture, and is particularly concerned with injection-moulded plastics inserts for use in such connectors.

In order that home-assembly furniture may be quickly and easily constructed by a relatively unskilled person, it has been found to be essential that joints between panels are provided by the use of connectors applied to the panels at the factory where automatic insertion of the parts of the connector to the appropriate panels can be employed.

Various devices are currently used, but the security of the joint obtained is not always commensurate with the degree of complexity of the connector assembly.

The constructions of the previous application have also been found to have a number of disadvantages when in use, particularly with materials other than wooden panels, their main problem being that the exposed panel edge and the exposed face of the other panel are not always flush.

Accordingly, it is the aim of the present invention to provide a furniture connector of a simple, rugged construction which ensures a secure joint between two panels and requires a minimum of skill on the part of the installer.

The connector, which comprises a first and a second insert is readily adaptable to automatic insertion in wooden panels, in that alignment of the two parts is facilitated by the moulded configurations of the plug and grommet. To allow insertion of inserts by machine, and second inserts may be joined together in side-by-side rows, or sticks, each insert aligned in the same way as the others. Inserts may then be fed to an inserting machine rapidly, with correct alignment ensured.

The first insert is of a shape which can only be inserted in its correct alignment in a panel with an aperture in a face and open to one edge, so that alignment of the insert is easily ascertained and ensured.

According to the present invention, a furniture connector assembly includes a first insert a second insert and a fastener, the first insert being a substantially cylindrical component with planar top and bottom surfaces and having at least one flat side face extending between the top and bottom surfaces, a spigot extending radially from the side face and being penetrated by a bore extending obliquely to the axis of the first insert, and the second insert comprising a substantially cylindrical shank having a socket at one of its ends of complementary configuration to the spigot of the first insert, and the second insert being further formed with a bore extending through its shank, the bore being inclined to the axis of the shank, the fastener passing, in use, through the bore in the first insert and extending into the bore in the second insert.

In the preferred embodiment of the present invention, furniture connector includes a first insert which is a substantially cylindrical body having one flat side face, a spigot extending radially and obliquely from the flat side face and being penetrated by a longitudinal bore, the body portion being formed with circumferentially extending external ribs, the ribs preferably extending in planes parallel to the axis of the bore in the spigot.

Preferably, the first insert is substantially circular in plan, but it may be configured in other ways to suit different panel materials. For example, a keyhole or a "T" type of configuration may be used to bring highly stressed areas away from the edge of the panel when the material of the panel is susceptible to tearing.

To allow the first insert to be formed simply by an injection moulding process

using a simple two-part mould, it is necessary to adopt a configuration which allows the mould parts to be made in such a way that they separate in directions along the axis of the bore in the spigot.

The second insert of the preferred furniture connector comprises a substantially cylindrical shank, having a socket at one of its ends, the shank being further formed with a circular bore extending through the shank and penetrating the ends of the shank, the axis of the bore being inclined to, and intersecting, the axis of the shank. The axes of the bore and the shank may intersect at a point within or outside the length of the shank. The shank may also include a transverse slot extending completely or partially across the shank at its end remote from the locating surfaces.

Circumferential ribs may be formed on the outer surface of the shank of the second insert, the ribs either extending completely around the shank, or formed in longitudinal rows separated by flattened areas or flutes.

A furniture connector according to the present invention will now be described, with reference to the accompanying drawings, in which:—

Figure 1 shows a cross-section of a preferred connector.

Figures 2 and 3 are end and side views of a preferred embodiment of the second insert, respectively.

Figure 4 is a part-sectional view of a plurality of second inserts joined by frangible webs.

Figure 5 is a top view of the first insert of the connector seen in Figure 1;

Figure 6 is a view of the insert of Figure 5, seen in a direction normal to its flat side face;

Figure 7 is a cross-section taken along the line 7—7 of Figure 5;

Figure 8 is a cross-section taken along the line 8—8 of Figure 5; and

Figures 9 and 10 are side and top views respectively of a further type of first insert for use in connectors according to the invention.

Referring now to the drawings, in Figure 1 there is seen a furniture connector joining two panels B and C at right angles. The connector comprises a first insert 1, a second insert 2, and a screw 13 extending through an inclined bore 5 in the first insert and into a bore 12 in the second insert, in the direction of the arrow A. Preferably, the screw has a head and a cylindrical shank of a diameter substantially equal to the diameter of the bore in the second insert, and has a screw thread extending from a point near the tip of the shank to the base of the head, leaving a cylindrical shank portion at the leading end of the screw. This shank portion ensures that the screw is driven into the bore in the second insert in correct alignment with the bore.

The first insert 1, seen in plan in Figure 5, is a generally disc-like component formed with a segment removed to provide a flat side face 3 on which is formed a spigot 4, extending radially with respect to the insert and inclined to the flat side face 3, the inclined bore 5 passing through the spigot 4. The bore 5 communicates with a depression 6 in the insert best seen in Figure 8, allowing access to the screw head for driving.

Reinforcing ribs 7 extend across the insert 1 on each side of the bore 5, the ribs dividing a web 9 into three parts. The web 9 and ribs 7 serve to strengthen the insert, and prevent it from being deformed under stress.

The insert 1 has a number of ridges 10 formed on its outer surface, the ridges 10 extending circumferentially round the body and being also formed to extend in planes parallel to the axis of the bore 5.

The web 9 preferably also extends in a plane parallel to the axis of the bore 5, and this configuration allows the body, spigot, ribs, web and ridges to be formed integrally in a two-part mould, the mould parts separating in directions parallel to the axis of the bore 5 in the plug.

The second insert 2, seen in Figures 1 to 3, is a generally cylindrical component, formed with a socket at its end, the base 11 of which abuts the end of the spigot 4 on the first insert when the connector is assembled. The bore 11 of the socket is aligned in a plane perpendicular to the axis of the bore 12, so that the end surface of the spigot 4, and the locating surface 11 are not urged to slide relative to one another when the screw 13 is tightened. External circumferential teeth 8 grip the panel, to ensure that the insert is held securely against withdrawal from the panel. Flutes 15 separate the teeth 8 into four longitudinal extending rows. The presence of the flutes prevents the insert rotating about its axis after it is inserted in a panel, and thus maintains the correct alignment between the first and second insert. A bore 12 is formed in the second insert, inclined to the axis of the insert at an angle of approximately 20° to be in alignment with the direct of insertion of the screw.

The insert is also formed with a radial or diametral slot 14, intersecting the bore 12, at the end of the insert remote from the socket. This slot provides for expansion of the end of the grommet when the screw is driven in to the bore 12, so that a firm grip on the panel is ensured. It will be appreciated that alignment of the bores in the two parts of the connector is important. This is greatly facilitated by a feature of the inven-

tion to be described below, in relation to automated insertion techniques.

To install the connector, a blind bore is drilled to the panel B to receive the second insert, and a recess is formed in the edge of the panel C to receive the first insert. The second insert 2 is then driven into the blind bore, with the socket exposed and bore 12 in the grommet aligned as shown in Figure 1. The first insert is driven into the recess in the panel C, with its flat side 3 face substantially flush with the edge of panel C. Then the two panels are offered up together so that the end of the spigot 4 abuts the base 11 of the socket in the second insert to align the bores 5 and 12 in the two components. Then, a screw 13 is placed in the recess 6 in the plug and is passed through the bore 5 in the first insert and driven into the bore 12 in the second insert, to secure the inserts together, and thus complete the joint.

Driving the screw into the second insert causes the insert to expand radially, due to the presence of a slot 14 in the insert. The slot 14 is preferably smaller in width than the diameter of the bore 12 and extends radially with respect to the axis of the insert, intersecting the bore 12. The radial expansion of the grommet ensures that the teeth 8 grip the panel B, preventing the insert from being pulled out of the panel by normal loads.

The joint is readily released by withdrawal of the screw.

A cover plate (not shown) may be added to conceal the first insert and the screw head after the joint is assembled. The cover plate is preferably a slightly dished plate of 'D' shape and is positioned to conceal the otherwise exposed first insert 1. The straight edge of the cover plate lies in the plane of the flat side face 3 of the insert 1 abutting the panel BB (Figure 1). The cover plate is preferably retained by a bifurcated projection extending from the concave face of the cover plate and being retained in a slot 17 in the webs 9 of the insert 1.

Referring now to Figures 2 and 3, there is shown a preferred embodiment of the second insert. This preferred insert has flutes 15, separating the teeth 8 into four longitudinal rows. The teeth are preferably formed near the end of the insert remote from the socket, so that when the insert is driven into a panel, the teeth are spaced below the surface of the panel. This helps to prevent fractures appearing in any veneer applied to the face of the panel B.

The socket, inclined bore 12, and slot 14 are all as previously described with reference to the second insert shown in Figure 1.

Figure 4 shows the insert of Figures 2 and 3 in a form adapted for automatic insertion. As can be seen, the inserts are moulded as a 'stick', i.e. as a plurality of inserts formed identically and joined by the thin, frangible webs 16. This feature greatly facilitates automatic placement of the inserts into preformed apertures, in the inserts can be fed to an applicator from a magazine. It is stressed that the inserts moulded in the stick are all aligned in the same way, i.e. both the axes of all the inserts are parallel, and the axes of all the bores 12 are parallel, ensuring identical alignment of inserts fed to the applicator. During placement, the webs 12 will break to separate each successive insert from the remainder of the stick.

To allow re-alignment of an insert installed incorrectly, a radial slot or other configuration may be provided in the end of the insert, the slot being engaged by a tool to permit rotation of the grommet to the desired orientation.

The main advantages obtained by using the connectors of the present invention are that firstly a more accurate location of the two panels is achieved, the surfaces E and F seen in Figure 1 may be precisely aligned to produce a flush joint before the screw is driven home, and secondly the problem of cracking veneers on the panels is overcome, because the inclined ridges 10 tend to draw the first insert deeper into the panel, concentrating stresses away from the surface.

Joint accuracy is achieved by using the end surface of the spigot 4 and the base 11 of the socket to locate the two inserts together. These surfaces are perpendicular to the axis of the screw, thus side forces on the locating surfaces due to the force exerted by the screw are eliminated.

Due to the inclined configuration of the ridges 10, on the first insert 1, no resistance is offered by them to the force exerted by the screw when it is driven in and tightened, as the force exerted by the screw is totally parallel to the ridges. This causes the insert to be urged into tighter engagement with the panel by moving deeper into the recess in which it is situated. Thus, stresses are channelled away from the surface of the panel and this reduction of surface stress ensures that a veneer applied to the surface of the panel will not be cracked when the screw is tightened to secure the joint.

Figures 9 and 10 show an alternative configuration of the plug, intended for use in panels of softer materials than wood. In this type of material, the substantially circular first insert seen in Figures 1 and 5 would tend to split the edge of the panel, but with the insert shown in Figures 9 and 10 this problem is overcome, as the edge of the panel is not subjected to such high stresses. The main stress-bearing areas are shown by the arrows 18, and it can be seen that the stressed areas are well spaced from the edge of the panel into which this insert is driven,

the edge of the panel lying along the line Z—Z in Figure 10.

The inserts may be made from any rigid thermoplastics material.

WHAT WE CLAIM IS:—

1. A furniture connector assembly including a first insert a second insert and a fastener, the first insert being a substantially cylindrical component with planar top and bottom surfaces and having at least one flat side face extending between the top and bottom surfaces, a spigot extending radially from the side face and being penetrated by a bore extending obliquely to the axis of the first insert, and the second insert comprising a substantially cylindrical shank having a socket at one of its ends of complementary configuration to the spigot of the first insert, and the second insert being further formed with a bore extending through its shank, the bore being inclined to the axis of the shank, the fastener passing, in use, through the bore in the first insert and extending into the bore in the second insert.

2. A furniture connector assembly according to claim 1, in which the sum of the acute angles between the axis of the first insert and the axis of the bore therein, and the axis of the second insert and the axis of the bore therein, is 90°.

3. A furniture connector according to claim 1 or claim 2, in which the first insert includes a planar web extending across the first insert in a plane parallel to the axis of the bore therein.

4. A furniture connector according to any preceding claim, in which the first insert includes reinforcing ribs extending across the first insert in planes parallel to the axis of the bore and parallel to the axis of the first insert.

5. A furniture connector according to any preceding claim in which the first insert is formed with circumferentially extending peripheral ridges extending in planes parallel to the axis of the bore therein.

6. A furniture connector according to any preceding claim in which the base of the socket in the second insert is planar, and is arranged to be perpendicular to the axis of the bore in the second insert.

7. A furniture connector according to any preceding claim in which the second insert is formed at its end remote from the socket with a slot extending radially with respect to the axis of the second insert, the slot intersecting the bore in the second insert.

8. A furniture connector according to claim 7, in which the slot in the second insert has a width less than the diameter of its bore.

9. A furniture connector according to any preceding claim in which the second insert has circumferentially extending peripheral ribs formed on its outer surface.

10. A furniture connector according to claim 9, in which longitudinal flutes separate the ribs into longitudinally arranged rows.

11. A furniture connector according to any preceding claim in which the fastener is a screw with a self-tapping threaded shank.

12. A furniture connector according to any preceding claim in which the second insert has a radial slot adjacent its socket.

13. A plurality of furniture connectors according to any preceding claim, in which the second inserts are connected together by frangible webs, the second inserts being so oriented that the axes of the second inserts are all parallel, and the axes of the bores in the second inserts are all parallel.

14. A furniture connector substantially as herein described with reference to Figures 1, 2 to 4, or Figures 4 to 10 of the accompanying drawings.

For the Applicants:
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
53 to 64 Chancery Lane,
London WC2A 1HN.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1980.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

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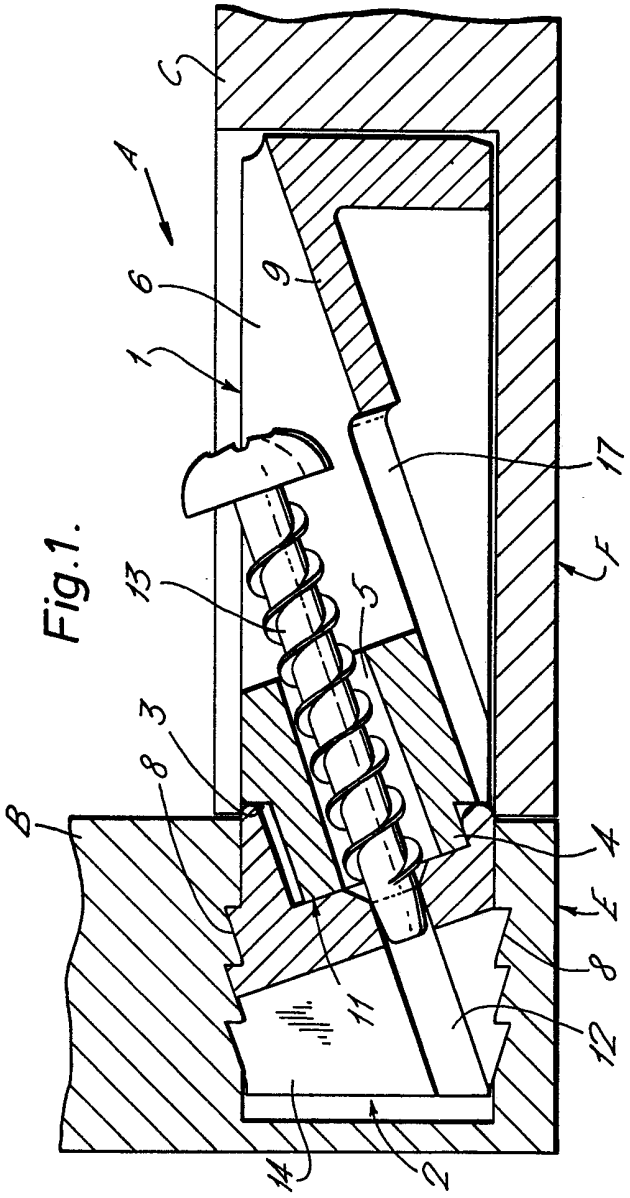

Fig.1.

1561985 COMPLETE SPECIFICATION
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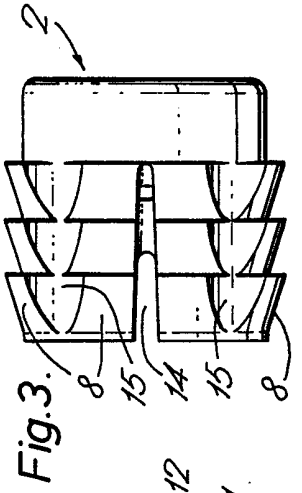


Fig.3.

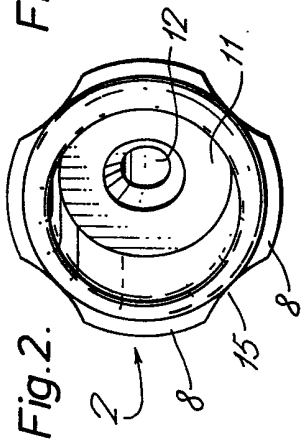


Fig.2.

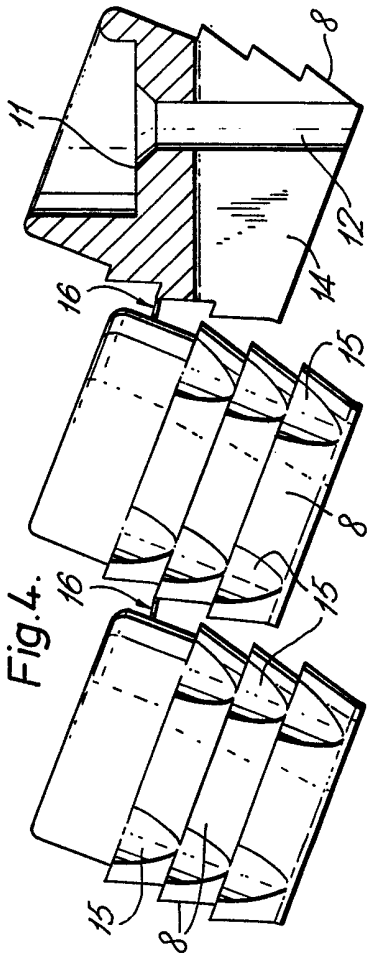


Fig.4.

Fig.5.

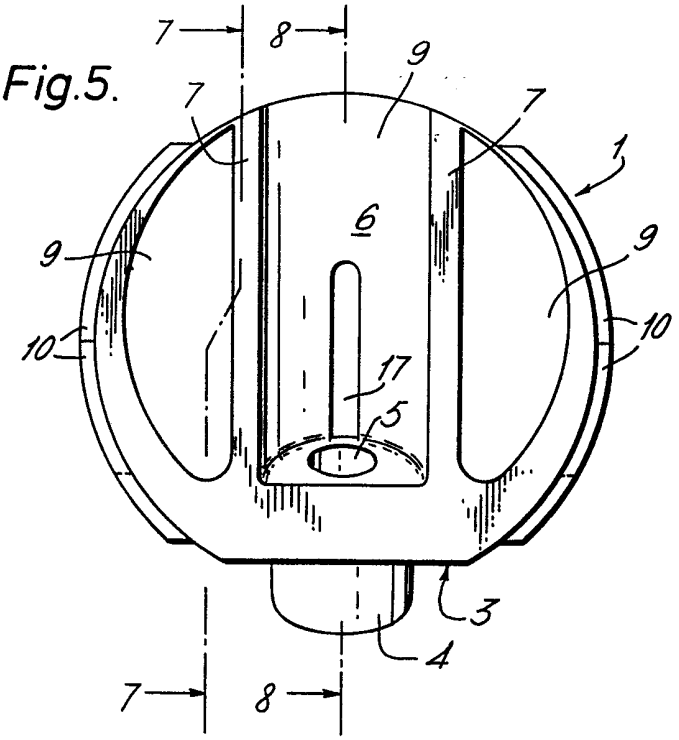
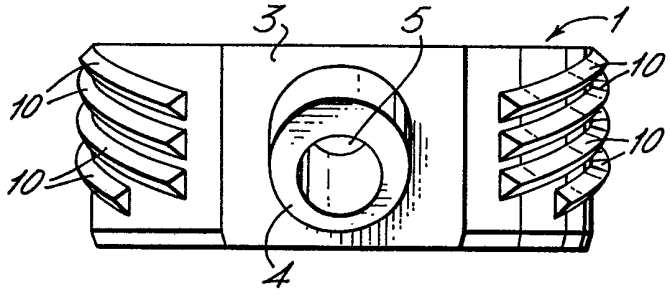


Fig.6.



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Sheet 4

Fig.7.

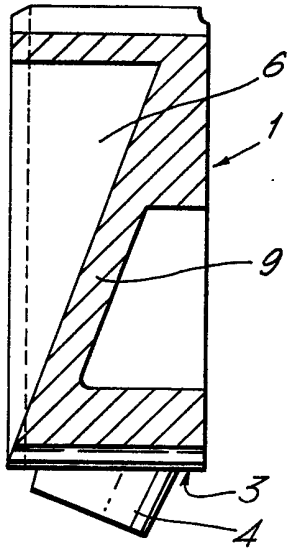

Fig.8.

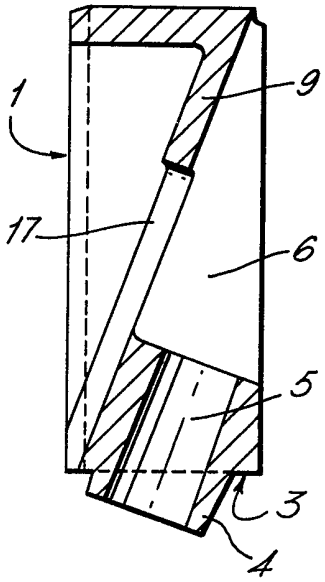

Fig.9.

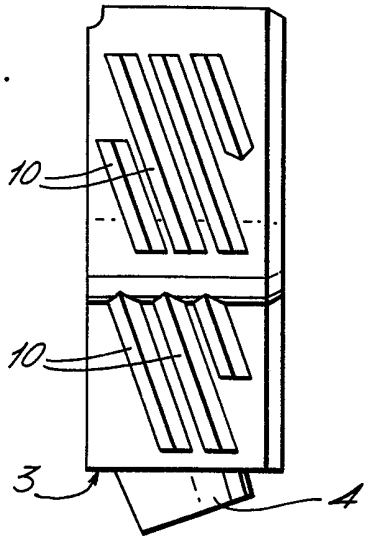

Fig.10.