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CONNECTING ARRANGEMENT

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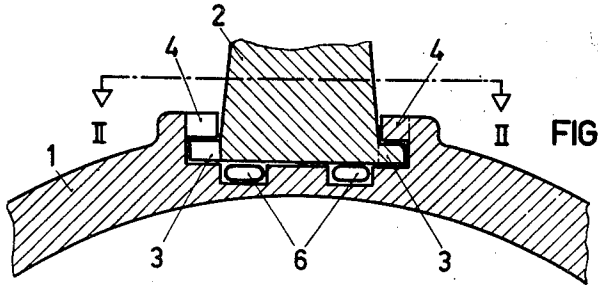


FIG.1

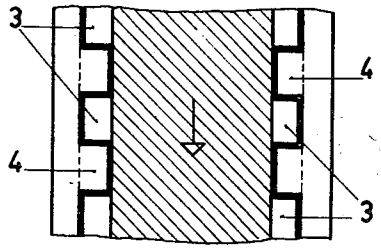


FIG.2

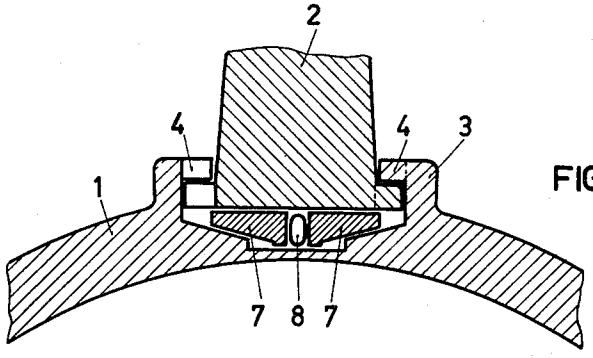


FIG.3

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CONNECTING ARRANGEMENT

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The present invention relates to connections and more particularly to structures for interconnecting a pair of members.

Connections such as bayonet connections, tongue and groove connections of the dovetail type, for example, and the like, are well known but cannot be used where it is essential to eliminate play from the connection between a pair of elements. For example, when transporting rockets it is customary to transport them without their fins which are stored and transported separately. The fins are joined to the rockets just before they are fired, and screw type connections are used for this purpose even though a great deal of time could be saved with a bayonet or tongue and groove type of connection. The time consuming screw type connections are used in such applications because it is essential to eliminate all play from the connection between the fins and rocket body, and tongue and groove or bayonet connections cannot be relied upon to eliminate play although they would be preferred because they enable the parts to be connected together very rapidly and without any tools.

One of the objects of the present invention is to provide a means which will eliminate play from tongue and groove or bayonet connections, so that these connections can now be used where the necessity for no play previously prohibited their use.

Another object of the present invention is to provide an exceedingly simple structure which reliably eliminates play in connections of the above type.

With these objects in view the present invention includes in a connecting arrangement a first member formed with a cutout and a second member having a portion located in this cutout. The second member has a second projecting means located in the cutout, while the first member also has a first projecting means which overlaps the second projecting means to prevent the second member from moving out of the cutout. According to the present invention, an expandable means is located in the cutout and acts on the second member to press the second projecting means against the first projecting means so as to eliminate play from the connection between the first and second members.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary sectional elevational view of a connecting arrangement according to the present invention;

Fig. 2 is a sectional plan view taken along line II—II of Fig. 1 in the direction of the arrows; and

Fig. 3 is a fragmentary sectional elevational view of another embodiment of a connecting arrangement according to the present invention.

Referring to Figs. 1 and 2, there is illustrated therein a first rigid member 1 which may be, for example, the fuselage of a rocket. This member 1 is formed with a cutout in the form of an elongated groove which receives a portion of a second member 2 which may be, for example, a stabilizing or control fin of the rocket. The member 2 has a projecting means 3 rigid therewith and located in the cutout of the member 1, and the projecting means 3 takes the form of flanges, ribs, or separate projections spaced longitudinally along opposite sides of member 2 at its bottom end, as viewed in Fig. 1, within the cutout of member 1.

The member 1 has a projecting means 4 rigid therewith, and, as is shown at the right in Fig. 1, the projecting means 4 overlap the projecting means 3 to prevent movement of member 2 out of the cutout of member 1. In the illustrated example the projecting means 4 takes the form of a plurality of bayonet projections. The member 2 is moved downwardly into the cutout of the member 1 by passing the members 3 down through the spaces between the members 4, as shown in Fig. 2, and then member 2 is shifted in the direction of the arrow shown in Fig. 2 until the projections 4 respectively overlie the projections 3. This bayonet connection interconnects members 1 and 2 but cannot reliably eliminate play in the connection.

In order to eliminate this play there is provided, in accordance with the present invention, an expandable means in the cutout of member 1 capable of receiving a fluid under pressure for expanding and pressing the projecting means 3 against the projecting means 4 to eliminate play in the connection. This expandable means may take the form of a closed container having at least one stretchable wall portion so that the fluid under pressure expands this wall portion to increase the volume and size of the container.

In the example illustrated in Fig. 1 the expandable means take the form of a pair of elongated stretchable tubular enclosures 6 which are respectively located in elongated recesses formed in the base of the elongated groove of member 1 and extending longitudinally of this groove. Each member 6 is in the form of an elongated completely closed tube of soft rubber or the like having at one end a non-return valve similar to that of the inner tube of an automobile tire. After the parts are assembled as shown in Figs. 1 and 2, compressed air, for example, is supplied to the interior of the tubes 6 through the non-return valves thereof so as to expand the tubes and thus eliminate play in the manner described above.

In the embodiment of the invention which is illustrated in Fig. 3, the expandable means acts on a wedge means to move the latter to a wedging position eliminating the play from the connection. Thus, referring to Fig. 3, it will be seen that the projecting portion 4 of member 1 overlies a pair of longitudinal oppositely inclined surfaces of the groove of member 1, these surfaces having their adjacent ends located at the deepest part of the groove. A pair of wedge members 7 are located in the groove in engagement with the oppositely inclined surfaces thereof, respectively, and an elongated tube 8 which may be identical with one of the tubes 6 is located in the groove between the wedge members 7. When compressed air is supplied to the interior of tube 8 to expand the latter, the expanding tube 8 engages the members 7 and moves them away from each other respectively toward the sides of the groove to a wedging position where they press the projecting means 3 against the projecting means 4 to eliminate play from the connection.

Although the invention has been described above in connection with bayonet connections, it is evident that it is equally applicable to tongue and groove connections such as a connection where a dovetail projection of one member is received in a dovetail groove of another member.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of connections differing from the types described above.

While the invention has been illustrated and described as embodied in connections without play, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A connecting arrangement comprising, in combination, a first member formed with a cutout; a second member having a portion located in said cutout; a plurality of spaced projections rigid with and projecting from said second member and located in said cutout of said first member; a plurality of spaced projecting portions rigid with said first member and overlapping said second projecting means to prevent movement of said second member out of said cutout of said first member, the spaces between said projections and said projecting portions having respectively a configuration and being respectively spaced from each other so that upon movement of said members relative to each other, said projecting portions on said second member may be brought in alignment with the spaces between said projections on said first member so that said portion of said second member may be moved out of said cutout; and expandable means located in said cutout, engaging only said first and said second member and cooperating with said members for pressing said second projecting means against said first projecting means to eliminate play in the connection between said members.

2. A connecting arrangement as recited in claim 1 and wherein said expandable means includes at least one container having a stretchable wall and adapted to receive a fluid under pressure to expand said wall for increasing the volume and the outer dimensions of the container.

3. A connecting arrangement comprising, in combination, a first member formed with an elongated groove having a base surface formed with an elongated recess extending longitudinally of said groove; a second member having at one end an elongated flange wider than the thickness of the remainder of said second member and extending beyond opposed side surfaces thereof, said flange being longitudinally shiftable together with said second member in said groove, said second member extending outwardly beyond said groove; projecting means rigid with said first member and overlapping said flange to prevent movement of said second member out of said groove; and an elongated stretchable tubular enclosure located in said recess and adapted to receive a fluid under pressure which expands said enclosure to press said flange against said projecting means for eliminating play from the connection between said members.

4. A connecting arrangement comprising, in combination, a first member formed with a cutout; a second member having a portion located in said cutout; second projecting means rigid with and projecting from said second member and located in said cut out of said first member; first projecting means rigid with said first member and overlapping said second projecting means to prevent movement of said second member out of said cutout of said first member; wedge means located in said cutout for movement to a wedging position engaging said members and pressing said second projecting means against said first projecting means to eliminate play in the connection between said members; and expandable inflatable means located in said cutout and cooperating with said wedge means for moving the latter to said wedging position during inflation of said expandable inflatable means.

5. A connecting arrangement comprising, in combination, a first member formed with an elongated groove having in its interior a pair of opposed longitudinal oppositely inclined surfaces having outer edges respectively located adjacent the sides of the groove and inner edges respectively located adjacent each other and at a deeper part of the groove than said outer edges, said member having a pair of projecting portions respectively overlying and spaced from said inclined surfaces; a second member having a portion located in said groove and having a pair of opposed longitudinal ribs one of which is located between one of said inclined surfaces and the projecting portion overlying the same and the other of which is located between the other of said inclined surfaces and the projecting portion overlying said other inclined surface, so that said projecting portions respectively overlap said ribs to prevent movement of said second member out of said groove; a pair of wedge members respectively engaging said inclined surfaces and said second member and movable transversely of said inclined surfaces away from each other respectively toward the sides of said groove to a wedging position pressing said ribs respectively against said projecting portions to eliminate play in the connection between said member; and an elongated stretchable tubular enclosure located between said wedge members and adapted to receive a fluid under pressure which expands said enclosure to cause the latter to move said wedge members to said wedging position.

6. A connecting arrangement comprising, in combination, a first member formed with an elongated cutout; a second member having a portion located in said cutout; second projecting means rigid with and projecting from said second member and located in said cutout of the first member; first projecting means rigid with said first member and overlapping said second projecting means to prevent movement of said second member out of said cutout of the first member in a direction transverse to said cutout; and inflatable expandable means located in said cutout between said members and cooperating therewith for pressing said second projecting means against said first projecting means to eliminate play in the connection between said members and to prevent sliding movement of said members relative to each other in direction of said cutout so that said members will be held in fixed position relative to each other only by the pressure exerted by said inflatable means.

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