

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,190,375



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COMPLETE SPECIFICATION

Improvements relating to Connections between Structural Components

We, DEXION LIMITED, of Empire Way, Wembley Park, Middlesex, a Company incorporated under the laws of Great Britain, 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 concerns improvements relating to connections between structural components, particularly of racking of the type in which the basic components, namely uprights and beams, are held together by means of hooks provided on the one component and engageable in holes provided in the other component. An object of the invention is to provide means for the establishment of tight and reliable, although releasable, connections, which means are simple to produce and easy to manipulate, as they do not involve loose parts such as bolts or require the use of tools such as spanners. The invention thus seeks to facilitate easy assembly and disassembly of racking of the aforesaid type, for instance robust racking intended more especially for the storage of goods on pallets.

Connections means for such purposes are described and claimed in our Patent No. 1,125,861.

According to this invention, connection means for connecting structural components comprises at least one hook member integral with and projecting from one flat face of a first said component and engageable in a hole in a flat face of a second said component, the said hook member having the form of a hollow nose which consists of side walls which are convergent towards the free end, which walls are connected together by a bridging portion and at side edges of a root portion to the said flat face of the first component, the free portion of

the nose not connected to the said face of the said first component being spaced therefrom. Such a hook member can be produced, relatively simply and inexpensively, integrally with the said one component, i.e., from the material of the component itself, for example by blanking and forming operations only. No welding of a separate part to the component is necessary.

If the inclination of the side walls of the hook member matches the inclination of the side edges of the hole in which the said member engages, a double-sided wedging effect can be achieved. This may be arranged to be of either a non-jamming or a tight-jamming nature. In either case, the hollow member has the advantage over a solid hook that the side walls can spring slightly under load and thus permit the hook member to bed down in the hole. This is of particular advantage when two or more vertically spaced hook members are provided on the first component for engaging in two or more holes in the second component, as it avoids the necessity for very precise location of the said members and holes with respect to spacing and alignment. As the side walls are connected by the bridging portion of the nose, the material of the hook member is efficiently utilised, since the load will always be distributed between the two sides of the said member.

A relatively small tip at the free end of the hook member will assist easy entry into the hole, in spite of slight variations in relative position as between the said member and hole. If inclined edges are also provided on the inside of the end portion, i.e. the side towards the said first component, this will further assist in guiding the said member into the hole. Inclined inner edges may also be utilised to provide a further wedging action, in this case in a direction

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normal to the hole. The side walls of the hook member may be flat and straight so that they will engage the side of a hole of complementary shape over a bearing area and not merely at a single point.

An abutment surface may be provided at the root end of the hook member to prevent unintentional dislodgement of the member due to an accidental movement of one of the components. Opposite to the other end, an opening may be formed in the component provided with the hook member. This will enable the nose to be seen, so that correct entry and seating can be checked. This opening, or an opening in the said component at the first-named end, may be used also to accommodate locking means.

One manner in which the invention can be carried into effect will now be more fully described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of part of a racking structure, showing portions of two uprights and a beam.

Figure 2 is a section on the line II-II in Figure 1 to a larger scale.

Figure 3 is a fragmentary perspective view, to an even larger scale, showing from the inside parts of a vertical bracket with two hook members, and

Figures 4, 5, 6 and 7 are a side elevation, front elevation, plan and horizontal sectional view of a hook member.

For the example illustrated, it will be assumed that the racking structure includes two kinds of basic components, namely uprights 1 and horizontal beams 2. As may be seen in Figure 1, the uprights are steel sections of rectangular channel shape with intumed lips 3 at the rear edges of their flanges 4 and with two vertical lines of equally pitched holes 5 in their front face 6. The holes 5 are of the shape of a vertically elongated symmetrical diamond with truncated top and bottom ends. The beams 2, which brace pairs of uprights 1 apart to form upright frames, may be of box or channel section. The beam 2 illustrated is composed of two lipped channels interlocked to form a box section. An angle-section vertical bracket 7 is welded to each end of the beam 2. The front flange 8 of each bracket is formed with a plurality, four as shown in Figure 1, of hook members 9 for joining the beam 2 to the upright 1 by co-operation with holes 5 in the latter.

As may be seen in detail from Figures 3 to 7, each hook member 9 is of hollow nose-like shape and is integral with the flange 8, from the material of which it is produced simply by blanking and forming. In this connection, the cold working in the

vicinity of each hook member is advantageous from the standpoint of strength. In the example illustrated, the forming of the hook member 9 is arranged to leave a hole 10 of substantially square shape in the face of the flange 8 opposite to the lower part of the said member, but this is not essential. A substantially rectangular hole 11 may also be formed in the flange 8 above the root end of one or more hook members, as shown for the lower member 9 in Figure 3 and in Figures 4 to 6.

As seen in front elevation (Figure 5), the hollow member 9 is also of a vertically elongated truncated diamond shape, the outer edges of the side walls or cheeks 12 having an external taper which, at least in the lower part of the member, corresponds to that of the edges of the holes 5. In the upper part of the hook member, side-wall parts 13 follow the shape of the upper portion of the diamond shape. The lower end of the hook member is bevelled at 14, as shown, a rounded to facilitate entry into the hole 5. The upper end of the diamond shape is cut across to provide a flat 15 and the cut may, as shown at 16 in Figure 6, penetrate to the interior of the hollow member 9. The flat 15 will serve as an abutment surface to prevent accidental dislodgement of the hook member 9, due to an upward force or blow, by engaging with the flat upper end of the hole 5. To avoid risk of jamming of the hook member 9 in the top of the hole 5 during removal, the width of the flat 15 is made slightly less than the width of the top of the hole.

As seen in side elevation (Figure 4), the outer contour of the nose-like shape comprises an upper portion 17 with a downward and outward inclination and a lower portion 18 which is vertical, as shown, or has a steep inclination. The wall thickness (Figure 7) is substantially uniform. For the lower half of the hook member, straight flat flank portions 19 of the side walls each have a part cut away to leave a downwardly open cavity, in relation to the plane of the inner face of the flange 8, such cavity having the appearance of a slot 20 (Figure 4). The slot 20 has a rounded upper end 21. It may, if desired, flare slightly downwardly. Inclined edges 22 (Figure 4) on the inside of the nose shape, in conjunction with the aforesaid bevelled or rounded lower end, facilitate entry of the hook member 9 into the hole 5. The flank portions 19 taper downwardly towards each other at the same angle as the sides of the lower half of the hole 5, so that the said portions will wedge in the hole and afford rigidity of connection from side to side. A suitable included angle between the flank portions 19 as seen in Figure 5 is 14°, which will not produce such tight jamming that the hook member 130

cannot be released from the hole. The inner edges 23 (Figure 4) of the flank portions 19 engage with the inner face of the part 6 of the upright. If desired, edges 23 may be inclined to give a wedging action normally to the part 6, thus affording additional rigidity of connection from front to back. Externally, the nose shape may be rounded (Figure 6), the rounded surface merging into the flat side surfaces.

Use may be made, in conjunction with the hook members 9, of automatic locking devices 24 such as are indicated in Figures 1 and 2, but which are not, per se, the subject of this invention. In this case, holes 10 in the flange 8 can be utilised for the mounting of the locking means and a hole 11 to permit the projection of the locking element 25 (Figure 2) through the flange into a hole 5 in the part 6 of the upright.

With hook members of the kind described above, the mounting of a beam 2 between two uprights 1 is a simple task for a single operator. The beam 2 is offered to the uprights 1 at the required level so that the members 9 of each of the brackets 7 can enter selected holes 5 in the said uprights and, when the beam is pressed downwardly, interengage therewith. The several downwardly inclined surfaces on the hook members assist in guiding the beam into its final position, even if the beam is presented slightly high or otherwise slightly inaccurately. The side walls 12, connected by the bridge portion of the nose, can spring slightly under load and thus permit each hook member to bed down. Also the load will be distributed between the two sides of the said member.

Removal of the beam 2 is also a simple matter, in which the shape of the hook members assists their withdrawal from the holes 5. In particular, the inclined portions 17 will tend, when they engage the tops of the holes 5 during lifting of the beam, to deflect the hook members 9 and, consequently, the beam 2 away from the uprights 1.

As the holes 5 are symmetrical, an upright 1 can be used either way up.

As may be seen from Figure 1, there is a slight gap between the side flange 26 of each beam bracket 7 and the adjacent side flange 4 of the upright 1. This avoids risk of jamming of a beam 2 when introduced between two previously fixed uprights 1. It affords some latitude when the beam 2 is offered up and facilitates both positioning and removal of the beam. As will be understood, the two lines of holes 5 permit beams to be mounted on either or both sides of an upright 1.

Generally, a plurality of such hook members 9 will be provided in a vertical line, as shown, or in two or three lines. How-

ever, single such members could be used. The hook members need not be on a flange or other face part of a component. They may be provided on an end face thereof. They could be used, for instance, for connecting a cantilever component to a support. In this case, two oppositely directed hook members may be arranged so that they can be brought into tight engagement with corresponding holes by a relative turning movement of the components after the said members have been entered into the holes. For some connection purposes, the hook members may be provided in an inverted position on the supporting component and the holes in the supported component.

WHAT WE CLAIM IS:—

1. Means for connecting structural components comprising at least one hook member integral with and projecting from one flat face of a first said component and engageable in a hole in a flat face of a second said component, the said hook member having the form of a hollow nose which consists of side walls which are convergent towards the free end, which walls are connected together by a bridging portion and at side edges of a root portion to the said flat face of the first component, the free portion of the nose not connected to the said face of the said first component being spaced therefrom.

2. Connection means according to claim 1, wherein the hook member is formed integrally with the first component.

3. Connection means according to claim 1 or 2, wherein the inclination of the side walls of the hook member substantially matches inclination of the side edges of the hole in the second component in which the said member is engageable, so that a wedging effect can be achieved.

4. Connection means according to any one of claims 1 to 3, wherein two or more spaced hook members are provided on the first component for engaging in two or more holes in the second component.

5. Connection means according to any one of claims 1 to 4, wherein inclined edges are provided on the inside of the free end of the hook member.

6. Connection means according to any one of claims 1 to 5, wherein an abutment surface is provided at the root end of the hook member to prevent accidental dislodgement from the hole.

7. Connection means according to any one of claims 1 to 6, wherein an opening is formed in the first component opposite to the free end of the hook member.

8. Connection means according to any one of claims 1 to 7, wherein an opening is formed in the first component at the root end of the hook member.

cannot be released from the hole. The inner edges 23 (Figure 4) of the flank portions 19 engage with the inner face of the part 6 of the upright. If desired, edges 23 may be inclined to give a wedging action normally to the part 6, thus affording additional rigidity of connection from front to back. Externally, the nose shape may be rounded (Figure 6), the rounded surface merging into the flat side surfaces.

Use may be made, in conjunction with the hook members 9, of automatic locking devices 24 such as are indicated in Figures 1 and 2, but which are not, per se, the subject of this invention. In this case, holes 10 in the flange 8 can be utilised for the mounting of the locking means and a hole 11 to permit the projection of the locking element 25 (Figure 2) through the flange into a hole 5 in the part 6 of the upright.

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2. Connection means according to claim 1, wherein the hook member is formed integrally with the first component.

3. Connection means according to claim 1 or 2, wherein the inclination of the side walls of the hook member substantially matches inclination of the side edges of the hole in the second component in which the said member is engageable, so that a wedging effect can be achieved.

4. Connection means according to any one of claims 1 to 3, wherein two or more spaced hook members are provided on the first component for engaging in two or more holes in the second component.

5. Connection means according to any one of claims 1 to 4, wherein inclined edges are provided on the inside of the free end of the hook member.

6. Connection means according to any one of claims 1 to 5, wherein an abutment surface is provided at the root end of the hook member to prevent accidental dislodgement from the hole.

7. Connection means according to any one of claims 1 to 6, wherein an opening is formed in the first component opposite to the free end of the hook member.

8. Connection means according to any one of claims 1 to 7, wherein an opening is formed in the first component at the root end of the hook member.



9. Connection means according to any one of claims 1 to 8, wherein the free end of the hook member is bevelled to facilitate entry into the hole in the second component.
- 5 10. Connection means according to any one of claims 1 to 9, wherein the hook member is inclined on the outside of the root portion to facilitate removal of the said member from the hole.

11. Means for connecting structural 10 components substantially as hereinbefore described with reference to the accompanying drawings.

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