

A SET OF PARTS

The invention relates to a set of parts for constructing a support frame or grid, a support frame or grid constructed therefrom, a suspended ceiling formed therefrom and a method of constructing a suspended ceiling formed therefrom.

It may be used for example in all classes of clean room. It allows for substantially all operations of filter installation, accessory installation, air flow measurement and leakage testing to be accomplished quickly and easily from the clean room, and provides a ceiling grid system with fewer component parts and a simpler installation procedure than existing systems.

According to the invention there is provided a set of parts for constructing a support frame or grid, comprising at least one elongate support member, and connecting means for connecting said at least one elongate support member, or a part thereof, with another like elongate support member, wherein the elongate support member includes attachment means adapted to allow attachment of said connecting means at any point along its length.

This allows the construction of support frames or grids easily and quickly, requiring a minimum of construction steps.

According to a second aspect of the invention there is provided a support frame or grid, constructed from a set of parts as herein defined.

According to a third aspect of the invention there is provided a suspended ceiling, including a support frame or grid as herein defined.

According to a fourth aspect of the invention there is provided a method of constructing a suspended ceiling, including the use of a set of parts as herein defined.

The invention will be described further, by way of example, with reference to the accompanying drawings in which:

Fig. 1 is an isometric view of a set of parts according to one embodiment of the invention;

Fig. 2 is a sectional view of a part of the set of parts shown in Fig. 1;

Fig. 3 is a sectional view corresponding to Fig. 2, and including optional ancillary apparatus;

Fig. 4 is a sectional view of a suspended ceiling according to one embodiment of the invention;

Fig. 5 is a sectional view of part A of Figure 4;

Fig. 6 is a sectional view of part B of Figure 4;

Fig. 7 is a sectional view of part C of Figure 4;

Fig. 8 is a sectional view of part D of Figure 4;

Fig. 9 is a part sectional view of the ceiling of Fig.4;

Fig. 10 is a sectional view of part X of Figure 9;

Fig. 11 is an end view of a set of parts according to one embodiment of the invention, in assembled form; and,

Fig. 12 is a perspective view of the set of Figure 11.

Referring to the drawings, there is illustrated a set of parts 1 for constructing a support frame or grid, comprising at least one elongate support member 2, and connecting means 3 for connecting the at least one elongate support member 2, or a part thereof, to another like member, wherein the elongate support member 2 includes attachment means 4 adapted for attachment of said connecting means 3 at any point along its length.

The set 1 may be supplied with one long elongate support member 2, which in the illustrated embodiment is an aluminium rail, and which is cut to the desired length or lengths on site. Alternatively, a variety of pre-cut pieces can be supplied.

The member 2 is an elongate, rectangular section tubular rail. Attachment means 4 is provided in the form of an elongate channel part extending from and parallel with one outer surface 4a of the member 2. The attachment means 4 resembles an upturned "U", arms 8 of which are provided with two pairs of inwardly projecting flanges 8a, 9 which extend substantially the length of the channel. The lower (in use) pair 9 of flanges define with the arms 8 and the surface of the rail 2, a slot 12. The rail 2 is preferably formed by extrusion, the attachment means 4 being formed integrally therewith.

The connecting means 3 is illustrated in Figs. 1, 11 and 12, and comprises a channel shaped joint member 3 which is inverted and fits snugly over the elongate channel part 4 of the rail 2 which is received therein. The joint member 3 is provided with connecting means in the form of two bolts 10 which extend through apertures in the joint member, downwardly, in use. As illustrated, the joint member 3 can be provided in a number of different shapes, for the formation of joints at different parts of the frame under construction. Thus, there are illustrated T-joints 7 and X-joints 6. An X-joint can be used for a four-way intersection, whilst a T-joint can be used for a three-way intersection. Other configurations are possible.

When it is desired to join two rails 2 end to end, a straight joint member is used. The straight joint member can include one or more further joint part, in the form of a flat, elongate plate, known as a splice bar 5 (Fig. 1) which may be manufactured from any suitable material, an example of which is stainless steel. The stainless steel splice bars 5 are inserted about half way into slots of one rail 2 formed on the inner surfaces thereof, as illustrated. Then, the other halves of the splice bars are slid into another rail 2, into corresponding slots, the rails then being pushed together. The joint member 3 is then placed on the two rails 2 as described and the bolts are tightened into nuts 11 as described below, in order to hold the rails in place and also add rigidity to the joint formed by the rails 2 and joint member 3.

The bolts 10 are provided with nuts 11 which are dimensioned to fit into the slot 12 formed by the arms 8 of the attachment means 4 of the rails 2, below the lower flanges 9. The nuts 11 are formed such that, although they can be slid into the slots 12, from one end thereof, and moved along the length of the rail to a desired position, they cannot rotate in the slots. Alternatively, it can be inserted directly from above the upturned "U" arm 8 through the recess flanges 8a, 9 into the slots 12. This is achieved by forming them in a rhomboid, or diamond shape, the widest corners of the nuts impeding rotation. As will be appreciated, the heads of the bolts 10 may also be formed in this way, and the positions of the nuts and bolts reversed.

In use, to make a joint between two rails 2, a joint member 3 is placed over the attachment parts 4 of the two rails 2, bridging the rails 2, and nuts 11 are placed in the

slots 12 of the rails 2, one at each end of the rails to be joined, and moved into position by sliding to where the joint is required, beneath the joint member 3. The ends of the bolts are then engaged in the nuts on either side of the joint so formed, and can be tightened using a single tool, the arms 8 of the attachment parts 4 substantially preventing rotation of the nuts as described, and obviating the need to use an additional tool such as pliers or a spanner to hold the nuts still. It is preferred that the nuts are rhomboid, or diamond shaped, and a diamond shape nut may be applied for every bolt. When the bolt is tightened into the diamond shape nut, the nut may rotate slightly but will stall in the slot 12 of the aluminium extrusion rail 2, allowing tightening to continue. In the same way, the bolt can be loosened without the need to immobilise the nut in the slot.

A ceiling grid 24 so formed can be suspended from a ceiling and levelled with threaded rods 14 and turnbuckles 15. The rods 14 may also be threaded into diamond shape nuts, as illustrated in Fig. 10 to achieve the same advantageous effect.

After the ceiling grid system is assembled, blank ceiling panels 16 and fan filter units 17 can be set in place. The fan filter unit can sit directly on the aluminium extrusion rails 2 and the gasket at the face side of the fan filter unit provides an airtight seal. The blank ceiling panels can also sit on the rails and can be locked into position by panel clamps 18 as shown in Fig. 7. The ceiling grid is connected to the walls of the room by an "L" shape wall angle 18a. These wall angles may be riveted or screwed into the wall and sealed (Fig 5).

The ceiling grid system also has provisions for attaching other ancillary devices such as lights 19 (Fig 3), anti-static devices (not shown), isolation curtains (not shown) etc., from within the room without modification to the installed components. For example, it can accommodate continuous rows of light fixtures with ballasts. Each fixture can be attached directly and securely to the aluminium extrusion rails 2 using a "U" bracket 20, bolt and nut (see Fig. 3). Where no ancillary device is attached, an aluminium cover 21 with a spring clip 22 can be used to cover the opening at the bottom of the aluminium extrusion rails.

If a gel seal system is required, as for example in a clean room, a "U" channel 23 can be installed on the aluminium extrusion rails in the form of a trough. The trough is filled with gel on site, and, for example a fan unit having a knife-edge filter skirt is placed in the gel as illustrated in Figure 10. Thus, an entire clean room upgrade can be accomplished without changing the whole ceiling grid layout.

It will be apparent that the system as illustrated and described is relatively easy to install, requiring simple connection of the aluminium extrusion rails, suspending them and tightening the bolts, without the need for specialist equipment, and can be undertaken by a single worker. Assembly time is significantly reduced while minimizing the potential for human error.

CLAIMS

1. A set of parts for constructing a support frame or grid, comprising at least one elongate support member, and connecting means for connecting said at least one elongate support member, or a part thereof, with another like elongate support member, wherein the elongate support member includes attachment means adapted to allow attachment of said connecting means at any point along its length.
2. A set of parts according to Claim 1, wherein the attachment means comprises an elongate part extending substantially parallel to the length of the elongate support member.
3. A set of parts according to Claim 2, wherein the attachment means comprises a pair of substantially parallel walls, upstanding from an outer surface of the elongate member, forming an elongate channel thereon.
4. A set of parts according to claim 3, wherein the channel includes flange means defining a slot with the surface of the elongate member.
5. A set of parts according to any preceding claim, wherein the connecting means includes nut and bolt means for attachment to the attachment means.



6. A set of parts according to claim 5, wherein the nut means, or the head of the bolt means is adapted to fit into the slot, for sliding engagement therein.
7. A set of parts according to Claim 6, wherein the slot is dimensioned to substantially prevent rotation of the nut means, or bolt head means therein, when the nut and bolt means are tightened or slackened.
8. A set of parts according to any of Claims 4 to 7, wherein the nut means and/or the bolt head means is substantially rhomboid.
9. A set of parts according to any preceding claim, wherein the connecting means includes a substantially U-shaped part, dimensioned to receive the channel of the elongate support within the arms of the U.
10. A set of parts according to any preceding claim, wherein the elongate support member includes a substantially hollow body part.
11. A set of parts according to any preceding claim, wherein the elongate support member includes an elongate aperture in a surface thereof.
12. A set of parts according to Claim 11, wherein the elongate support member includes means for removably attaching a cover to the aperture.



13. A set of parts according to any preceding claim, wherein the elongate support member and attachment means are integrally formed.
14. A set of parts according to any preceding claim, wherein the elongate support member is formed by extrusion.
15. A set of parts according to any preceding claim, wherein the elongate support member is formed substantially from aluminium.
16. A set of parts for constructing a support frame or grid, substantially as hereinbefore described with reference to the accompanying drawings.
17. A support frame or grid, constructed from a set of parts as defined in any of Claims 1 to 16.
18. A suspended ceiling, including a support frame or grid as defined in Claim 17.
19. A suspended ceiling, substantially as hereinbefore described with reference to the accompanying drawings.
20. A method for constructing a suspended ceiling, including the use of a set of parts as defined in any of Claims 1 to 16.

