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(71) Applicant: **K.B. Research en Marketing B.V.**
Faradayweg 5
NL-2627 AX Delft(NL)

(71) Applicant: **H.G.R. Research en Marketing B.V.**
CH.-van-Montpensierlaan 65
NL-1181 RP Amstelveen(NL)

(72) Inventor: **Krupe, Jurrie**
Van-der-Dussenweg 6
NL-2614 XE Delft(NL)

(72) Inventor: **Hiensch, Rudolf Gerardus**
Ch-van-Montpensierlaan 65
NL-1181 RP Amstelveen(NL)

(74) Representative: **Mommaerts, Johan Hendrik, Dipl.-Phys.**
Octrooibureau Lux Nassau-Odyckstraat 38
NL-2596 AJ Den Haag(NL)

(54) An assembly for forming a ceiling.

(57) An assembly for forming a ceiling with longitudinal and transversal girders to be suspended on hangers, adapted for supporting ceiling panels, the longitudinal girders being hollow and being adapted for accommodating wires therein, said longitudinal girders consisting of two substantially U-shaped channels adapted to be secured with their flat bottoms together by means of coupling elements provided with claws which can be inserted through corresponding keyholes in both bottoms and can be fixed therein by being rotated, which coupling elements can, moreover, be adapted for supporting wires. Columns can be connected to the lower channel of a girder by means of tensioning plates to be inserted in lateral openings of this channel, and transversely directed girders can be secured to longitudinal ones by means of coupling elements to be hooked to the longitudinal girders.

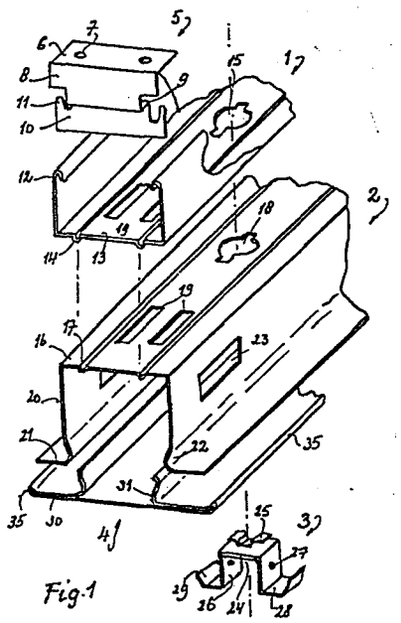

Fig.1

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An assembly for forming a ceiling.

For forming ceilings at a given distance from the upper wall of a space, many assemblies of elements have become known. Such ceilings are often used in office buildings and the like, and above the ceiling remains a free space for wiring and the like, and the height of the ceiling can be freely chosen. Often the separation walls between different spaces can be chosen freely too.

An example of such an assembly, comprising hangers with an adjustable length to be fixed to the upper wall, hollow longitudinal girders with outwardly extending ledges for supporting ceiling panels, if required utilising transverse girders extending between the longitudinal girders, means for coupling said hangers with the longitudinal girders, means provided in the hollow longitudinal girders for supporting wires, and closing lids which can be snapped at the lower side into the cavity of the longitudinal girders, can be found in NL-A 80 02 018.

The longitudinal girders are, there, formed by two profiled rods with a cross-section resembling that of a railway rail, which profiled rods are fixed in a mutually parallel manner by means of coupling pieces each forming part of a hanger and gripping around said profiles, and, furthermore, being provided with lateral extensions which are to be inserted through slots in the girder profiles, and are fixed therein by means of bent tabs. Said girder profiles define, in this manner, a hollow space in which a wire duct can be suspended in recesses of the coupling pieces, and said coupling pieces can support, at their upper sides, additional wires or the like. The outer flanges of the girder profiles serve as supports for the ceiling panels, and closing lids can be fixed on the inner flanges.

A draw-back of this known system is that assembling the girder profiles is rather time consuming, since at each coupling piece four fixing tabs are to be bent, and, moreover, such a tab connection can never be absolutely rigid so that always a certain longitudinal play will remain in the assembled girder. This can considerably hamper the connection of heavier objects to or the suspension thereof on such an assembly. In said hollow girders electric wires can be accommodated, but then they will not or only

difficultly be accessible from below, so that ceiling panels are always to be removed in order to allow said wires to be reached from above.

It is an object of the invention to provide an assembly of elements for this purpose not having these draw-backs. To that end the assembly according to the invention is characterised in that each longitudinal girder consists of a first U-shaped channel with a flat bottom and curled terminal edges which can be clamped on a plurality of hangers with its opening directed upwards, and a second U-shaped channel with a flat bottom which, with its bottom directed upwards, is placed against the bottom of the first channel, keyholes being provided at regular distances in the bottoms of both channels into which a coupling element provided with claws can be inserted and can be locked by rotation in order to interconnect both channels, the terminal edges of said second channel being provided with external ledges, and at least the second channels being adapted for accommodating wires.

Such channel profiles can be manufactured in a simple and economic manner, and mutually coupling both channel profiles by means of the coupling elements, after having secured the first channels together with the hangers on the upper wall and having aligned said channels, can be done very quickly, and the channels thus interconnected form a profiled girder having a high bending strength in which no play will occur, and, in particular, also heavier objects can be secured thereto or suspended thereon.

From DE-A 2 910 967 girders for forming a ceiling are known which consist of two substantially U-shaped channels placed with their flat bottoms against one another. However said channels are permanently interconnected by means of rivets, and must, therefore, be suspended as a unit. The girders according to the invention, on the other hand, consist of separate channels, and, initially, only the upper ones are to be suspended, after which the lower ones can be connected to the former ones by means of the coupling elements. This considerably simplifies the suspension work, since the separate channels are substantially lighter than the assembled known girders.

In particular the bottoms of the first and second channels are provided with interfitting ribs or slots resp. in order to allow said channels to be mutually aligned.

Said coupling elements can be provided, moreover, with laterally extending hooks for supporting wires, which elements can, in particular, be U-shaped, and in the legs thereof recesses for inserting additional wire supporting means can be provided. Wires supported in this manner are easily accessible after removing the closing lid.

Preferably the lateral walls of a second channel, where joining the external ledges, are slightly bent inwards, the closing lids then being provided with claws with a curvature adapted thereto.

The lateral walls of the second channels can be provided with additional openings for passing wires in order to allow to form connections with rafters or the like situated laterally of said channels.

Furthermore columns, separating walls etc. can be secured to such ceiling girders, which, in particular, can be provided with contact means for electric conductors, and fixing on a closing lid or a part thereof is possible; according to the invention an additional clamping plate can be used therefor, which, by means of a screw connection, can be connected to a short closing lid section, said clamping plate being adapted to be inserted into two apertures in the lateral walls of a second channel, and to be fixed by tightening the screw connection.

If connecting wire ducts directed transversely to the longitudinal girders are to be provided, auxiliary pieces can be used which, in the manner of the hangers, can be fixed in the curled edges of an upper channel, and for making a connection between mutually transversely directed girders coupling elements can be used which can be clamped in a terminal part of a girder, and are provided with a hook which can be hooked behind a curled edge of an upper channel of a girder directed transversely thereto.

The invention will be elucidated below by reference to a drawing, showing in:

Fig. 1 an exploded perspective view of different elements of an assembly according to the invention;

Fig. 2 a lateral view of a hanger for the assembly of Fig. 1;

Fig. 3 a section of the assembly of Fig. 1 in the assembled condition;

Fig. 4 a perspective view of an additional element; and

Fig. 5 a partial section of the assembly of Fig. 3 with an additional element.

The assembly of elements shown in Fig. 1 comprises an upper channel profile 1 with its opening directed upwards, a lower channel profile 2 with the opening directed downwards, a coupling bracket 3, a closing strip or lid 4, and a hanger 5.

The hanger to be connected to an upper wall of a space which should have an adjustable length can be constructed in any suitable manner, e.g. as a vernier hanger (as shown in the above-mentioned NL-A 80 02 016), or as one or more rods with screw adjustment or with an adjustable clamp or the like. In the case shown said hanger comprises a transverse part 6 with two holes 7 (see Fig. 2), to which suspension rods (not shown) can be screwed. The transverse part 6 is connected to a plate part 8 which, in the position of use, is vertically directed, and is, by means of a narrower transverse part 9, connected to an end part 10 directed parallel to the plate 8, and is as wide as the latter, which end part 10 is provided with upwardly directed projections 11. The plane of the end part 10 substantially extends through the axis of the holes 7. Preferably two suspension rods are used, in order to obtain a possibly rigid suspension.

The upper channel 1 possesses inwardly curled terminal edges 12 and a flat bottom 13 in which two parallel ribs 14 have been pressed. As follows from Fig. 2, the edges 12 fit around the projections 11, the lower edge of the part 8 then bearing on these channel edges. The hanger 5 can be mounted in a simple and strong manner by inserting the part 10 obliquely into the channel 1, and, thereafter, to turn it in such a manner that the projections 11 are being positioned below the edges 12. If, then, the hanger 5 is rotated into the upward direction, these projections snap into the edges 12, and then the hanger is strongly connected to the channel 1. Moreover keyholes 15 are provided at regular distances in the bottom 13.

The channel 2 has a flat bottom 16 in which grooves 17 have been pressed, having such dimensions and mutual distances that, if the bottom 16 is positioned against the bottom 13 of the channel 1, the ribs 14 of the latter fit in the grooves 17. In the bottom 16 keyholes 18 are provided corresponding to the keyholes 15 of the

bottom 13, and being situated at the same mutual distances. Besides the holes 15 and 18, holes 19 for passing wires can be provided.

At their extremities the lateral walls 20 of the channel 2 are bent outwardly to form ledges for supporting ceiling panels etc., the connecting part between the walls 20 and the ledges 21 being formed by an inwardly directed bend 22. In the lateral walls 20 holes 23 for passing wires are provided at regular distances which can be closed with a lid or can be constructed as windows closed by a rupturable wall.

The coupling element 3 is, as shown, substantially U-shaped. The transverse wall 24 thereof is provided, at the upper side, with a claw 25 which, when rotated 90°, can be inserted into the keyholes 15 and 18 of the channels 1 and 2 placed against one another. After being rotated backwards, the element 3 compresses the bottoms 13 and 16 between the transverse wall 24 and the claw 15 strongly against one another. The lateral walls 26, in which apertures 27 are provided, join respective transverse ledge planes 28 with upturned terminal edges 29.

The closing strip 4 has doubled rims 30 forming a rigid supporting rim which, in the mounted condition, will bear against the flanges 21 of a channel 2, the inner end 31 thereof being turned upwards and being curved so that at will resiliently bear against a bend 22 of the channel 2.

Fig. 3 shows the various elements in the assembled condition. The space 32 inside the channel 1 below the lower edge of the hanger 5 can be used for wires which, if required, can be led outwards through the holes 19 or through the upper opening of the channel.

The inner space 33 of the channel 2 can also be used for taking up wires which, after removal of the lid 4, become accessible. These wires can be laid on the ledge parts 28, and, for example, telephone lines or the like can be laid at one side, and wires at the mains voltage at the other side. If required hanger straps 34 can be hooked into the holes 27, in which straps still other wires can be supported. Moreover in the interior of the coupling element 3 a wiring duct with conductors supported therein in an insulated manner can be secured, in which duct branching plugs can be inserted in the desired points.

In the drawing a special embodiment of the closing strip 4

is shown, in which the extremities 35 of the doubled rims 30 extend past the extremities of the ledges 21, and are bent slightly upwards, and this is such a manner that these rims each will bear against a ceiling panel supported on the ledge 21 in question, so that a seamless support is obtained.

The channels 1 and 2 consist of a metal, e.g. galvanised iron, which is cheapest. Such channels can be manufactured in a simple and economical manner. In the assembled condition a strong girder is obtained which can support ceiling panels, lamp armatures etc. without bending. Also the cover strips 4 can consist of a metal, in particular galvanised iron, but are generally provided at their outer sides with an enamel layer.

If the channels 1 are too short, they can be extended in a simple manner by using a coupling piece fitting clampingly in two aligned channel sections 1. Also T or cross pieces can be used for forming transverse connections.

In Fig. 4 a simple cross-connection element is shown, having a bottom 36 and walls 37 fitting in an upper channel 1, the terminal edges 38 of the lateral walls 37 being bent inwardly and fitting in the curled edges 12 of a channel 1.

At one side of the bottom 36 a narrower transverse piece 39 is present, which is provided with an outwardly curled edge 40. Said transverse piece is slightly longer than the lateral walls 37, this in such a manner that, if the curled edge 40 is hooked on an edge 12 of a channel 1, the channel into which the lateral walls 37 are inserted will be supported at the same height but transversely to the former channel.

Between parallel longitudinal girders consisting of channels 1 and 2, transverse girders can be provided, e.g. in the form of profiled rods fitting in marginal recesses of adjoining ceiling panels. Their extremities can be provided with hooks gripping behind the curled edges 12, and it is also possible to provide adapted apertures in the lateral walls of the channels 1 or 2 in which the extremities of such transverse girders or the like are retained against toppling.

The longitudinal girders consisting of channels 1 and 2 and bridging a space are, preferably, extended towards an adjoining corridor where the wires provided in the channels 1 and/or 2 can be connected to supply lines. These supply lines are, for instance,

supported in cable ducts extending transversely to the channels 1, and can, in a simple manner, be clamped in the edges 12 of these channels, e.g. by means of the hangers shown in Figs. 1 and 2.

The cover strip 4 can, if required, be replaced by plates 5 to be clamped on the ledges 21 and bends 22 as well, and serving to fix separating walls, columns with electric contact means or the like. As shown in Fig. 5, an additional mounting means can be used in the form of a clamping plate 41 to be positioned on the edges of the apertures 23, and being provided with a screw 42 on which a 10 closing plate 43 can be fixed by means of a nut 44.

Since the girders consisting of the channels 1 and 2 are rigid, and can be firmly supported by means of special hangers, which girders have, moreover, a high bending strength, such separating walls, columns and the like can be secured thereto in the 15 above-mentioned manner without difficulties.

Since the hangers hooked in an upper channel 1 can be hooked therein without play, a suffucient lateral stability can be obtained when using a strong suspension, in particular by means of two rods or a profiled suspension element, and, in particular, 20 such suspension means can also be used for securing thereto additional elements, e.g. sound insulating partitions or the like, ceilings situated at a different height, e.g. for an adjoining corridor space or the like, additional cable supports and the like. If the hangers are suspended by means of two screw rods which, at 25 the same time, can be used for height adjustment, such additional supports can be fixed thereon at any desired height by means of additional nuts.

It can sometimes be favourable to provide the cover strips 4 at their inner side with a sound attenuating and/or fire- 30 proof layer in order to provide an additional suppression of sound transmission and fireproofing respectively.

Claims

1. An assembly for forming a ceiling to be connected to an upper wall of a building space, comprising hangers with an adjustable length to be fixed to the upper wall, hollow longitudinal girders with outwardly extending ledges for supporting ceiling panels, if required utilising transverse girders extending between the longitudinal girders, means for coupling said hangers with the longitudinal girders, means provided in the hollow longitudinal girders for supporting wires, and closing lids which can be fixed at the lower side in the cavities of the longitudinal girders, characterised in that each longitudinal girder consists of a first U-shaped channel (1) with a flat bottom (13) and curled terminal edges (12) which can be clamped on a plurality of hangers (5) with its opening directed upwards, and a second U-shaped channel (2) with a flat bottom (16) which, with its bottom directed upwards, is placed against the bottom (13) of the first channel (1), keyholes (15, 18) being provided at regular distances in the bottoms (13, 16) of both channels (1, 2) into which a coupling element (3) provided with claws (25) can be inserted and can be locked by rotation in order to interconnect both channels, the terminal edges of said second channel (2) being provided with external ledges (21), and at least the second channels (2) being adapted for accommodating wires.

2. The assembly of claim 1, characterised in that the bottoms (13, 16) of the first and second channels (1, 2) are provided with interfitting ribs (14) or slots (17) resp. in order to allow said channels (1, 2) to be mutually aligned.

3. The assembly of claim 1 or 2, characterised in that the parts of the coupling elements (3) situated in the second channel (1) are provided with laterally extending hooks (28, 29) for supporting wires.

4. The assembly of claim 3, characterised in that the parts of the coupling elements (3) to be provided in a second channel (2) are made U-shaped, and in the legs (26) thereof recesses (27) for inserting additional wire supporting means are provided.

5. The assembly of any one of claims 1..4, characterised in that the lateral walls (20) of the second channels (2) are provided with openings (23) for passing wires.

6. The assembly of any one of claims 1..5, characterised in that the suspension means of the hangers (5) are provided with securing means for additional parts which are adjustable in height.

7. The assembly of claim 5 or 6, with additional means for securing separating wall parts, columns etc., to a girder, in particular provided with contact means for electric conductors etc., said means comprising a closing lid section, characterised in that an additional clamping plate (41) is or can be connected to a closing lid section (43), by means of a screw connection (42, 44) said clamping plate (41) being adapted to be inserted into two apertures (23) in the lateral walls (20) of a second channel (2), and to be fixed by tightening the screw connection (42, 44).

8. The assembly of any one of claims 1..7, with additional means for forming a connection with connecting wire ducts directed transversely to the longitudinal girders, characterised in that the securing means for the walls of such a wire duct can be hooked in the curled edges (12) of a first channel (1).

9. The assembly of any one of claims 1..8, comprising coupling elements for making a connection between mutually transversely directed girders, characterised in that said coupling elements are provided with parts (36, 37, 38) fitting in an upper channel (1) as well as with a hook shaped part (39, 40) which can be hooked around a curled edge (12) of an upper channel (1) of a girder directed transversely to the first-mentioned girder.

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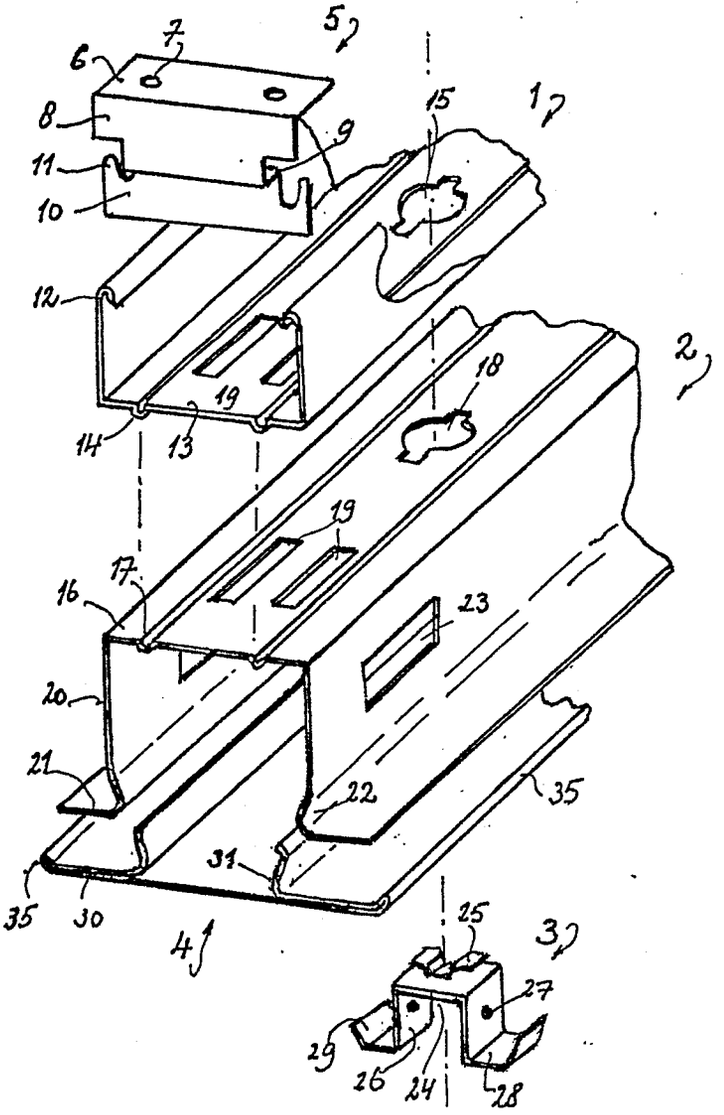

Fig.1

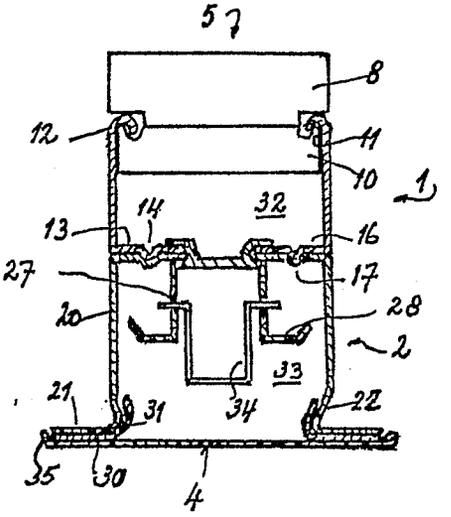

Fig.3

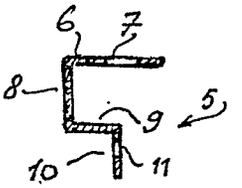

Fig.2

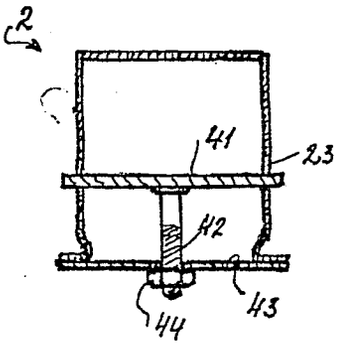

Fig.5

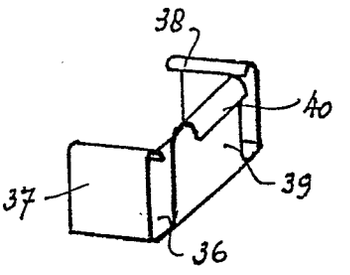

Fig.4