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⑤④ **Suspended ceiling structure.**

⑤⑦ The invention relates to a suspended ceiling structure consisting of hangers (54) to which supporting yokes (30) are attached. To the sides of the supporting yokes there are screwed leaf springs (33, 34) and side plates (35, 36) for the channels of the suspended ceiling. The upper ends of the side plates are bent inwardly (35a, 36a) for suspension from the side flanges of the supporting yoke. The lower ends of the side plates are bent outwardly to form a Z-section (35b, 36b) for supporting tiles (13) etc. The supporting yoke has punched out and bent-up fasteners (46-49) for attaching and fixing cable channels (32) in position. A cover (37) is formed as a channel consisting of an underside and two bent-up side flanges, said side flanges being compression-moulded to form longitudinal semicircular arches (60, 61) intended to be snapped against the leaf springs to secure the cover to the other parts of the suspended ceiling.

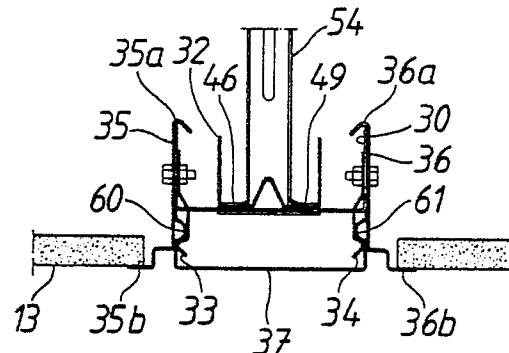


FIG. 6

Suspended ceiling structure

The invention relates to a suspended ceiling structure according to the precharacterising part of Claim 1.

In the case of new construction, renovation and reconstruction of office buildings, storehouses, industrial buildings and workshops, etc., a suspended ceiling plays an important role as a platform for modern installation technique. The suspended ceiling is to accommodate cables for electricity supply, lighting, loudspeakers, telephones, data installations, etc., as well as devices for ventilation, sprinklers, and so on. In addition, the suspended ceiling structure is to be capable of supporting light fittings of different kinds, sound absorbing plates, and baffles, etc. In other respects, the suspended ceiling is to be of flexible construction, be easily accessible, and have an aesthetically attractive shape.

In order to become familiar with the specific problems the present invention deals with a prior art embodiment of a suspended ceiling will first be described with reference to the Figures 1 to 3. The previous design, selected for this purpose, is produced by one of the major suppliers of suspended ceilings in the Nordic countries, namely JÄRNKOST AB, the design being described, inter alia, in JÄRNKONST AB'S pamphlet BSAB G 8.6, June -85.

Figure 1 shows a portion of the afore-mentioned suspended ceiling. It is built up in the form of a modular system consisting of a number of primary channels 1 and 2, and secondary channels 3 and 4 extending perpendicularly to the primary channels. These channels are often commonly designated "cable channels" or "power supply channels". The channels are suspended from the ceiling by means of supporting yokes 5, 6, 7 and 8 and vertically adjustable hangers 9, 10, 11 and 12. The suspended ceiling surface between the channels is formed in different ways depending on the type of premises, the desired lighting, sound damping, etc. In the example shown in Figure 1, acoustically damping plates or tiles 13 are suspended from so-called T-sections arranged on Z-sections 20 which are attached to the primary or secondary channels. Figure 1 also shows how a light fitting arm 15 supports a light fitting 16 and associated means for lighting control 17. The channels may be formed in a plurality of different ways depending on the cable arrangement and installation in question.

Figure 2 shows a section through a primary or cable channel along the line A-A in Figure 1. As will be clear from the Figures 1 and 2, it is possible to lay the cables in separate spaces in this channel provided by an inner U-V-shaped channel 18. As

will also be clear from both figures, both the primary and the secondary channels 1-4 are provided with external Z-sections 19 and 20 to be able to support, for example, acoustic tiles or arms for light fittings.

Figure 3 shows a section taken along line B-B in Figure 1, i.e. at the hanger 9. This figure also shows how the primary channel 1, via the bent edges 21 and 22, is suspended from the supporting yoke and how the secondary channels 3 are screwed through the primary channel 1 and the supporting yoke.

As is clear from Figure 1, the supporting yokes, which are used when the secondary channels are to be connected to the primary channels, having sides with punched out openings 23 and 24 and corresponding openings for the other supporting yokes in Figure 1. These openings are necessary for laying cables from a primary channel to a secondary channel, as for example the cable 24 between the lighting control 17 and the light fitting 16.

The prior art also comprises supporting yokes with no punched openings, which will be used in suspended ceilings in which, for various reasons, no secondary channels are included.

As will also be clear from Figures 2 and 3, space-separating partition walls 26 are mounted directly against the underside of the cable channels. To fix the partitions 26 against the suspended ceiling, holes for screws etc. are provided in the underside of the channels. In view of the turbulence that characterizes management organization and in order to adapt to a changed production demands etc., it occurs relatively frequently that space separating partitions have to be moved. Because the flexible and modular construction of the suspended ceilings, premises can be easily relocated in view of the location of the partitions, lighting, telephones, etc. However, the holes which have been provided in the underside of the channels for fixing partitions will remain when moving the partitions and will constitute a disturbing feature in the aesthetic appearance. To avoid this with existing constructions the respective primary and/or secondary channels have to be replaced by new channels. Such a replacement is a relatively complex measure since it influences the actual laying of cables as well as the primary and secondary channels and the rest of the ceilings structure, such as acoustic tiles, light fittings, etc.

Figure 4 which is identical with Figure 2 in the SE-B-7214120-3 with publication number 383 410 demonstrates the use of snap-on connecting elements 27 and 28 for suspended ceilings to fix

sound-damping or absorbing tiles 29 in position. However, as will also be clear from the construction, it must be practically impossible to separate the connecting elements, once they have hooked onto each other, without destroying them.

In order to overcome the afore-mentioned shortcomings of the prior designs, the invention aims at developing a suspended ceiling structure of the above-mentioned kind which permits replacement of such channel parts, in which it has been necessary to make holes for attachment of partitions, without having to replace the entire cable channel.

To achieve this aim the invention suggests a suspended ceiling structure according to the introductory part of Claim 1, which is characterized by the features of the characterizing part of Claim 1.

Further developments of the invention are characterized by the features of the additional claims.

A suspended ceiling structure according to the invention enables the relocation of partitions without having to replace entire cable channel to remove the unsightly drill holes of prior partition wall attachments.

A suspended ceiling structure according to the invention, seen from below, has the same appearance as the structure already described. On the other hand, the channels and the associated parts are formed in quite a new way, which permits a considerably simpler procedure during installation and service and when moving partitions.

The new structure includes newly formed supporting yokes, cable channels of a simpler design, channel side plates with a new profile comprising the above-mentioned Z-section for supporting tiles etc., a number of snap-on leaf springs and a cover formed as a channel, the sides of which are formed in a special way.

The newly designed supporting yokes are screwed, as in existing suspended ceiling structures, to a hanger. The supporting yokes are provided with punched out, bent-up clamp fasteners, under which cable channels of different designs, depending on how the cables in question are laid, can be inserted and fixed. Further, the supporting yokes are provided with punched-out holes, through which the bendable leaf springs extend, which are screwed to the side flanges of the supporting yokes, to both side flanges of the supporting yoke, the side plates of the channels are fixed with the same screws as the leaf springs. At their lower end these plates are formed with an outwardly-turned Z-section for supporting tiles, baffles, etc. The cover is formed as a channel consisting of an underside and bent-up side flanges which are compression-moulded to form horizontally extending, semicircular arches adapted to engage with the snap-on leaf-springs and adapted to

the remaining part of the suspended ceiling.

By means of the additional Figures 5 to 8 the suspended ceiling structure according to the invention will now be described in detail, but at first a compiled survey over the total number of Figures will be given:

Figure 1 shows a perspective view of a suspended ceiling structure according to the prior art,

Figure 2 shows a sectional view of a channel of the construction along line A-A in Figure 1,

Figure 3 shows a sectional view of a crossing between two channels along line B-B in Figure 1,

Figure 4 shows a snap-on design solution for the suspended ceiling in Figure 1,

Figure 5 shows parts included in a suspended ceiling structure according to the invention,

Figure 6 shows section through an assembled suspended ceiling structure according to the invention and

Figure 7 shows an alternative embodiment of a suspended ceiling structure according to the invention.

The various components which together constitute the new suspended ceiling structure are clear from Figure 5. Two embodiments of the new supporting yokes are shown at 30 and 31, the yoke 30 being used in connection with a ceiling suspension when only one primary channel is to be installed, and the yoke 31 being used when both primary and secondary channels are to be installed. Further, there are shown a cable channel 32, leaf springs 33 and 34, side plates 34 and 36 with Z-shaped lower parts as well as a cover 37.

In both the supporting yokes there is a rectangular centre hole, indicated at 38 in supporting yoke 31, for the attachment of a hanger.

The supporting yoke 30 consists of a rectangular bottom plate 39 with two side flanges 40 and 41. The bottom plate 39 has four punched, rectangular holes 42, 43, 44 and 45 and four bent-up clamp fasteners 46, 47, 48 and 49. In each of the side flanges 40, 41, two holes 50, 51 and 52, 53, respectively, are aligned horizontally and positioned vertically above the holes 42, 43 and 44, 45, respectively.

Via the holes 50-53, leaf springs 33 and 34, respectively, are screwed to the side flanges 40, 41 of the supporting yoke 30 in such a way as to be enable the leaf springs to being elastically movable in the rectangular holes 42, 43, 44 and 45 through which they extend. The same screw attachment is used for fixing the side plates 35 and 36 of the channels to the supporting yoke 30. The upper edge of the side plates has an inwardly-bent edge 21 and 22, respectively, for suspending the side plates from the side edges 40, 41 of the supporting yoke 30, and the lower end of the side plates has

an outwardly extending Z-bent section 35b and 36b, respectively, for supporting tiles, etc.

The cable channel 32, or any other channel, is inserted and fixed under the bent-up clamp fasteners 46-49 on the bottom of the supporting yoke 30.

The cover 37 is formed as a channel with a plane underside and with bent-up side flanges which, as will be clear from Figure 5, are compression-moulded so as to attain a semicircular section 60, 61 in each side flange. This means that together with the leaf springs, 33, 34, the bent-up sides of the cover 37 form a snap-on mechanism enabling the cover 37 to be applied and removed, respectively, in a very simple manner.

The space in the cover channel, i.e. the space between the cover 37 and the underside of the supporting yoke and the cable channel, respectively, may suitably be filled with sound and fire insulating mineral wool. To achieve a suspended ceiling with improved sound absorbing properties, the plane underside of the cover 37 may be perforated in accordance with different configurations, for example in some form of triangular perforation.

Figure 6 shows a section of a suspended ceiling, as the one described above, with a supporting yoke 30 suspended from a hanger 54, with a cable channel 32, with leaf springs 33 and 34, with side plates 35 and 36 and with the cover 37 which is snapped on with the aid of these parts. On the lower Z-shaped part of the side plates 35, 36 tiles 13 of various kinds are resting.

The supporting yoke 31, which will be used in connection with a channel bifurcation between the primary and the secondary channel, is clear from Figure 5. This yoke 31 consists of a cruciform bottom plate 55 with angled and turned-up side flanges 56, 57, 58 and 59. In addition to the centrally placed hole 38 for a hanger, the bottom plate 55 is provided with openings for the leaf spring and bent-up clamp fasteners for fixing the cable channels. The side plates for the respective channels are mounted in the same way as when mounting against supporting yoke 30, i.e. against the angled side flanges using the same screws as are used for fixing the leaf springs.

Figure 7 shows an alternative embodiment of the invention in which a supporting yoke 30, turned upside down, is used. The bottom plate 39 of the yoke 30 will then be positioned nearest the ceiling and the bent-up clamp fasteners 46, 47, 48 and 49 will be facing the ceiling. The side flanges 40, 41 of the yoke 30 are now facing downwards. To guide the springs 33, 34, the side flanges 40, 41 have been provided with inwardly-turned flaps 40a, 40b, in which openings corresponding to the holes 42, 43, 44 and 45 in Figure 5 are made.

Otherwise, it is clear from Figure 7 that the cable channel 32 (see Figures 5 and 6) has been

replaced by U-shaped channels 67 and 68, i.e. the cable can be laid both inside a primary and a secondary channel and above these channels. The cable channels 68 which are installed above the primary and secondary channels are somewhat narrower than the cable channels 67 mounted inside the primary or secondary channel. The cable channels 68 have punched openings on the bottom so as to fit over and be clamped by the bent-up fasteners 46, 47, 48 and 49. The side plates 35 and 36 have punched openings 62 for suspending the inner cable channels 67, which are formed with corresponding bent-out clamp or suspension fasteners 63, 64. In this embodiment, the upper bent edges 21, 22 of the side plates - as is shown at 65, 66 in Figure 7 - are bent 90° inwards towards the supporting yoke.

Claims

1. Suspended ceiling structure comprising hangers (54), supporting yokes (30, 31), cable channels (32, 60, 61), leaf springs (33), side plates (35, 36) and a cover (37), characterized in that a first kind of supporting yoke (30) comprises a rectangular bottom plate (39) with two bent-up side flanges (40, 41) opposite to each other, that said bottom plate (39) has a central, preferably rectangular opening (38) for attachment of a hanger (54) as well as preferably rectangular holes (42, 43 and 44, 45) close to each side flange, that through each of said holes a snap-on leaf spring (33) extends and is attached to the side flange of the supporting yoke such as to be elastically bendable in said holes, that clamp fasteners (46, 47, 48, 49) are provided at the bottom plate (39) of the supporting yoke for attaching and fixing in position cable channels leading towards the supporting yoke, that the side plates (35, 36) are formed with an upper, longitudinal bent edge (35a, 36a) adapted to suspend the side plate to a side flange of the supporting yoke and with a lower edge (35b, 36b), bent to form a Z-section for supporting ceiling elements, such as tiles, the side plates being further provided with holes for attachment of the side plates to the supporting yoke together with the leaf springs as well as holes (64, 65) for attachment of the inner cable channels (60), and that the cover (37) is formed as a channel with a preferably plane underside and bent-up flanges, with a semicircular or the like formed section (60, 61) to enable the leaf springs to be snapped thereon.

2. Suspended ceiling structure according to Claim 1, characterized in that it comprises a second kind of supporting yoke (31) formed with a cruciform bottom plate (55) having bent-up and angled side flanges (56, 57, 58, 59), that said

bottom plate (55) has a central, preferably rectangular opening (38) for attachment of a hanger (54), that preferably rectangular holes are provided at each of said bent-up side flanges, that through each of said holes a snap-on leaf spring (33) extends and is attached to the side flange of the supporting yoke such as to be elastically bendable in said holes, and that clamp fasteners (46, 47, 48, 49) are provided at the bottom plate (55) of the supporting yoke (31) for attaching and fixing in position four cable channels, arranged in pairs at right angles to each other and leading towards the supporting yoke.

3. Suspended ceiling structure according to Claim 1, **characterized** in that the number of preferably rectangular holes (42, 43 and 44, 45) positioned close to each side flange is two, and that the number of clamp fasteners (46, 47, 48, 49) provided at the bottom plate is four.

4. Suspended ceiling structure according to any of Claims 2 or 3, **characterized** in that the bottom plate (55) of the second kind of supporting yoke (31) is provided with a total of eight clamp fasteners with two of them associated to each arm of the cruciformed bottom plate.

5. Suspended ceiling structure according to any of the preceding Claims, **characterized** in that said holes in the bottom plate and close to the side flanges of the supporting yokes (30, 31) and said clamp fasteners on the bottom plate are manufactured by punching, the clamp fasteners consisting of bent-up portions partially punched free from the bottom.

6. Suspended ceiling structure according to any of the preceding Claims, **characterized** in that the semicircular or the like formed sections (60, 61) in the bent-up flanges of the cover (37) are manufactured by compression-moulding.

7. Suspended ceiling structure according to any of the preceding Claims, **characterized** in that in a structure with the supporting yokes (30,31) mounted upside down, the preferably rectangular holes (42, 43 and 44, 45) for accommodating the snap-on leaf springs (33) are provided in inwardly-projecting flaps of the downwards facing side flanges (40,41) of the supporting yokes (30,31).

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FIG. 1

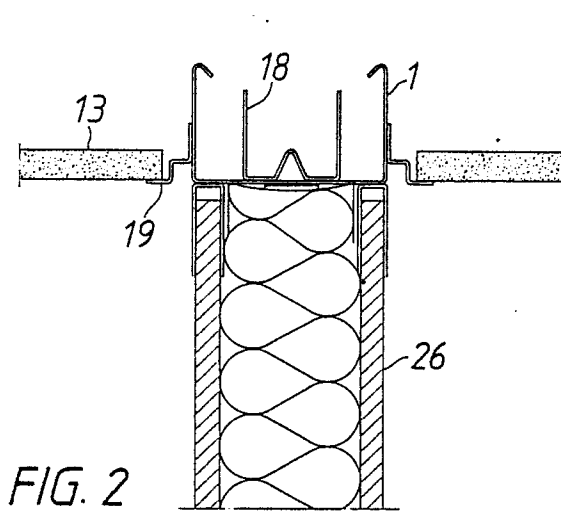
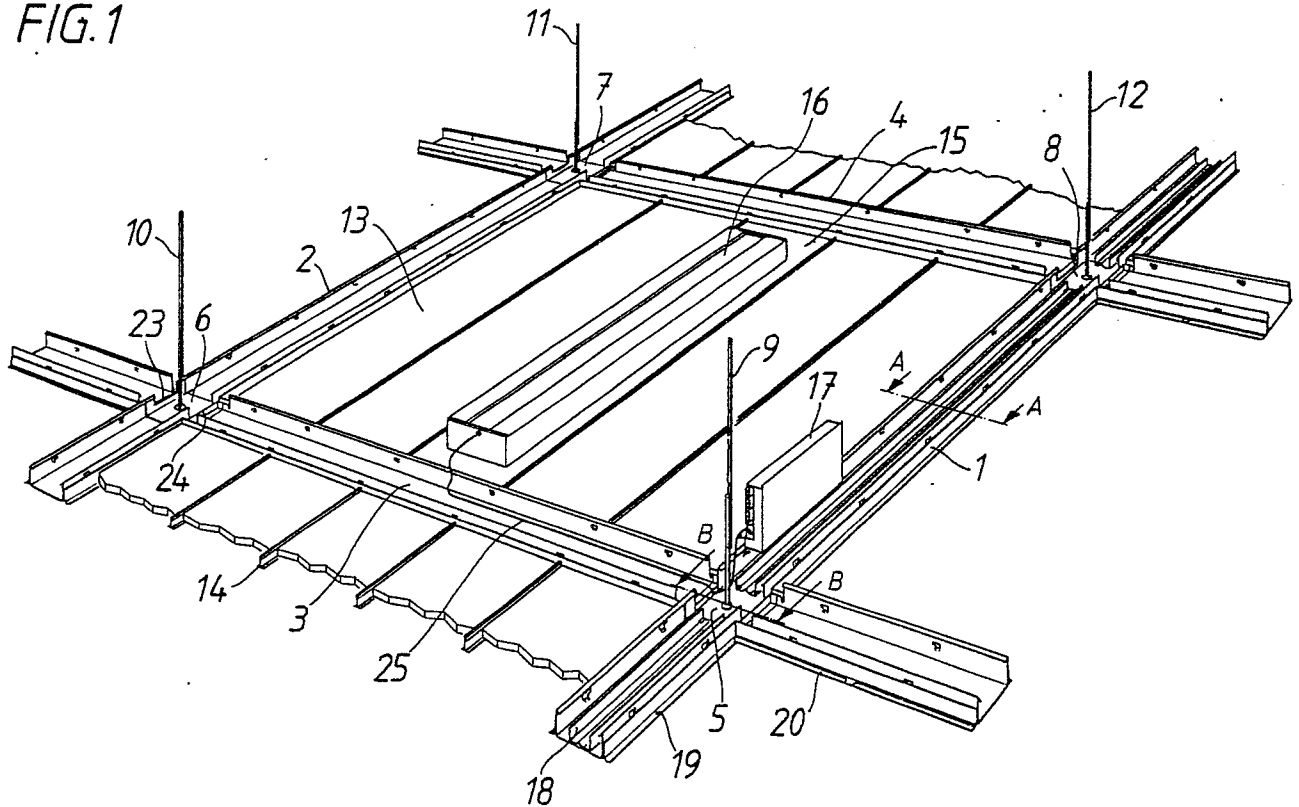


FIG. 2

A-A

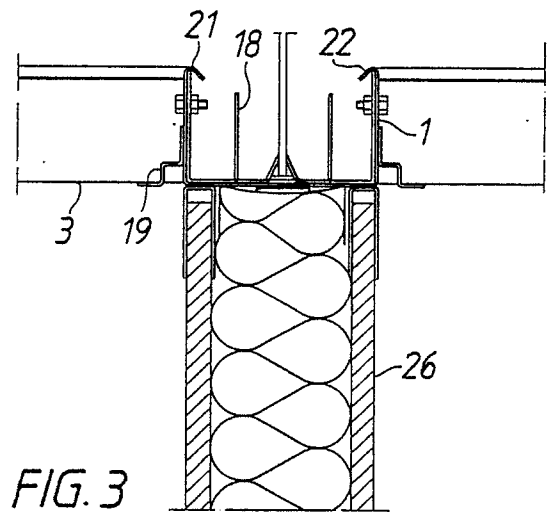


FIG. 3

B-B

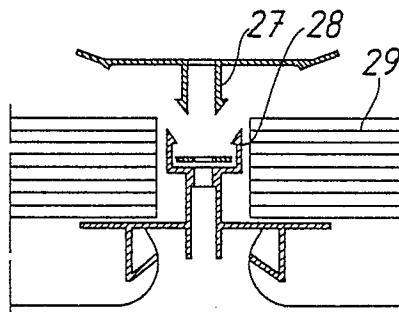


FIG. 4

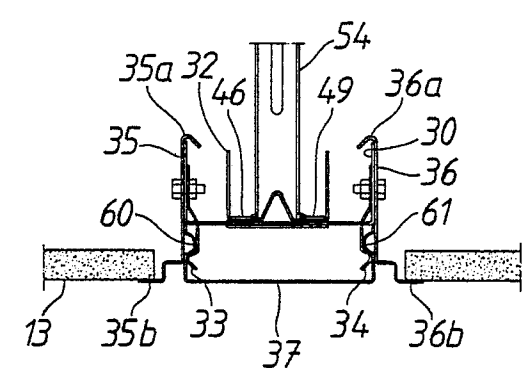
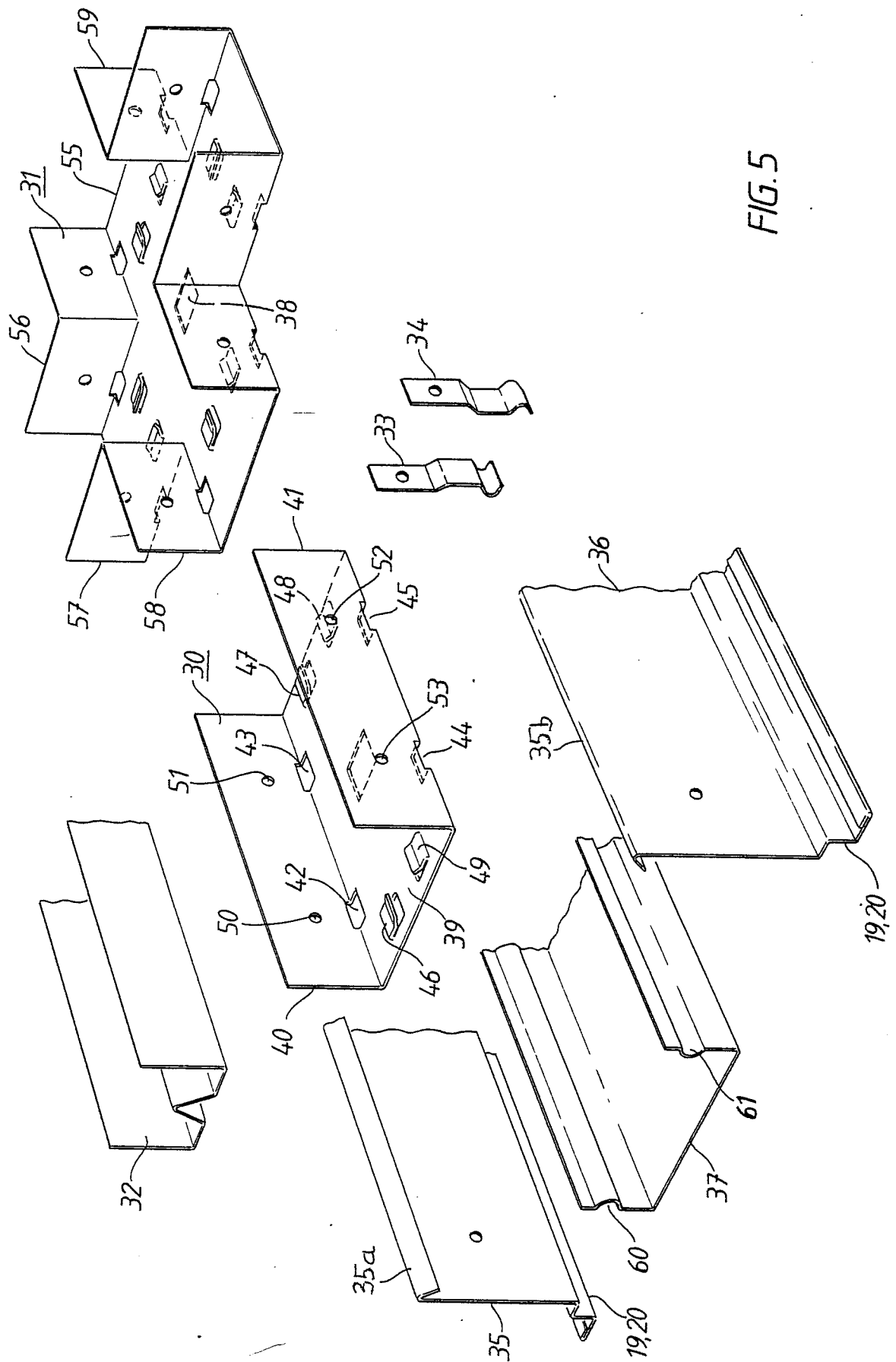
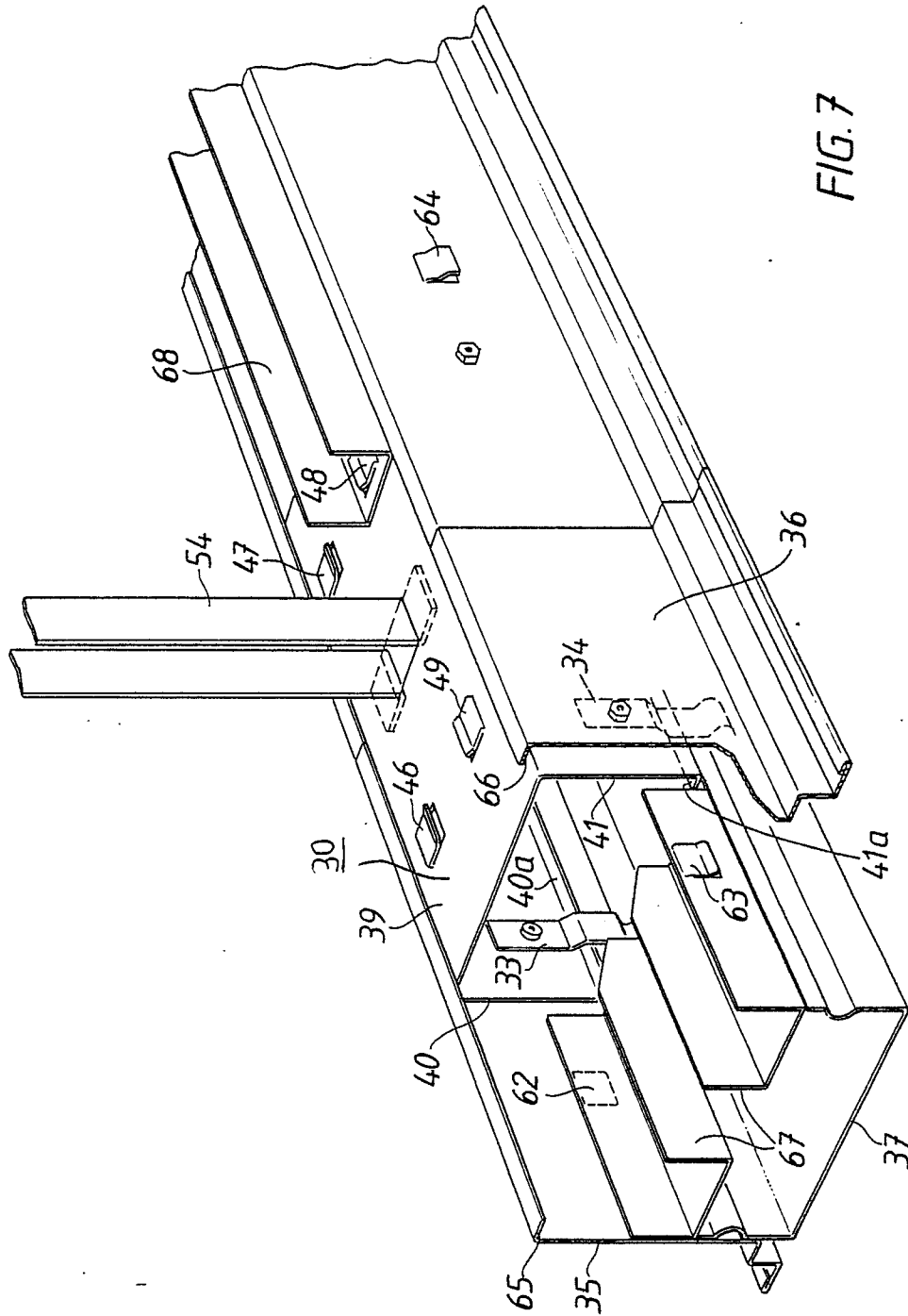


FIG. 6







DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	CH-A5- 578 660 (A. HENGgeler et al) ---		E 04 B 5/55
A	CH-A5- 589 762 (O. PABST) ---		
A	DE-B2-2 615 894 (SCHÄFER WERKE KG) ---		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 04 B
The present search report has been drawn up for all claims			
Place of search STOCKHOLM		Date of completion of the search 25-01-1988	Examiner HEDLUND I.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	