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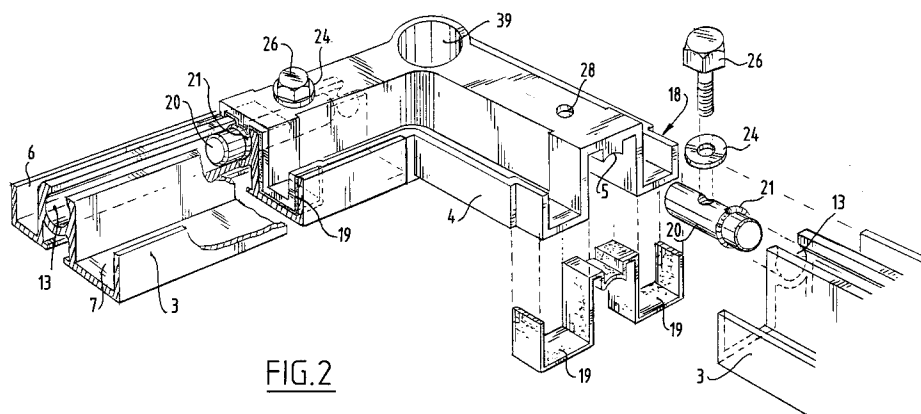
**EUROPEAN PATENT APPLICATION**(21) Application number: **92202350.2**(51) Int. Cl.<sup>5</sup>: **E04B 9/02, E04B 9/14,  
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NL PT SE**(71) Applicant: **AAF-INTERNATIONAL B.V.**  
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**NL-2517 GK Den Haag (NL)**(54) **Ceiling system.**

(57) The invention provides a ceiling system for instance for a lowered filter ceiling (1) consisting of flat profile pieces (3) supporting filter parts, coupling pieces (4) connecting the profile pieces (3) in airtight manner, suspending means connectable to the profile pieces and/or the coupling pieces, and locking means for locking the coupling piece (4) and the profile piece (3) relative to one another, wherein the locking means take the form of a locking pin (20) engaging in a substantially cylindrical open channel (13) and provided on its periphery with a sealing ring (21), and the coupling piece (4) has a portion (5) complementing the open channel and that in this complementing portion a passage (28) is provided for a screw bolt (26) engaging in the locking pin

(20).

The profile pieces (3) are substantially U-shaped, and the likewise substantially U-shaped coupling pieces (4) have portions which can be arranged clampingly between the legs of the profile pieces in close-fitting manner and which are preferably received in the profile pieces (3) with interposing of a sealing element (19).

The system is easy to assemble, comprises a limited number of components that are simple to manufacture and is easily adaptable to the situation prevailing at a particular place. The use of an O-ring (21) results in a certain sealing, whereby air leakages are substantially excluded.

**FIG.2****EP 0 528 474 A1**

The present invention relates to a ceiling system for instance for a lowered ceiling system consisting of flat profile pieces supporting filter parts, coupling pieces connecting the profile pieces in airtight manner, suspending means connectable to the profile pieces and/or the coupling pieces, and locking means for locking the coupling piece and the profile piece relative to one another.

For ceiling systems for lowered ceilings used in so-called clean-room technology strict requirements are laid down in respect of the sealing between outside air side and clean air side. Because it is important that all air passes through the filters of the ceiling, air leakages via the ceiling system are not desired.

Current ceiling systems consist for instance of a number of prefab profiles which are connected at intersections with each other by means of angle pieces. Air leakage via the angle pieces is prevented by arranging a mastic between the angle pieces and the profile extremities. The drawback to such ceiling systems is that they are wholly prefabricated in production, whereby eventual alterations at the assembly location are only possible to a very limited extent. In addition the application of the mastic requires great accuracy during assembly.

Other systems, which are known for instance from the German utility design 90 02122.3, make use of identically shaped profile rails with straight extremities which are joined at intersections by cruciform connecting pieces. For sealing the connecting pieces have a body core with a bore wherein an add-on piece for receiving a seal is arranged on the top in the assembled situation. Sealing results in that an insert placed in a T-shaped groove has a trapezium-shaped groove into which engages a correspondingly formed rib. The insert has a complicated form and the manufacture thereof therefore entails relatively high costs and do not make the fixing of the ceiling system any simpler. Air leakages can moreover still occur.

The present invention has for its object to provide a ceiling system which consists of only a limited number of different components, is easily adaptable to a situation occurring at the assembly location and is simple to assemble, while a simple and certain sealing is provided.

This is achieved by the invention by a ceiling system wherein the locking means take the form of a locking pin engaging in a substantially cylindrical open channel and provided on its periphery with a sealing ring, and the coupling piece has a portion complementing the open channel and that in this complementing portion a passage is provided for a screw bolt engaging in the locking pin.

The use of a simply formed locking pin in combination with an O-ring facilitates assembly and moreover reduces costs, whereby the total system

can be embodied more inexpensively, while a very certain sealing is ensured.

The ceiling system according to the invention comprises universal profile pieces, three types of coupling piece and universal locking means. The profile pieces are embodied such that it is possible to adapt them to the dimensions encountered on site by simply sawing to size.

The profile pieces are substantially U-shaped, as are the coupling pieces which have portions which can be arranged clampingly between the legs of the profile pieces in close-fitting manner. The clampingly arrangable portions are preferably received in the profile pieces with interposing of a gasket such as a rubber strip. The gasket may additionally be a sealing material applied by means of immersion or spraying on.

The open channel is also involved in the suspending of the ceiling system. In this case a suspending pin is situated in the channel at the position of a suspension point, which pin is provided with a passage such as a threaded hole for the suspending means. Because the open channel extends along the entire length of the profile pieces the position of the suspension points is very flexible. This in contrast to some known systems wherein the suspension points are fixed.

In a preferred embodiment of the invention the coupling pieces are provided with a passage opening for through-feed, for instance of cables or sprinkler installations. When a passage opening is not in use as such it is preferably closed off by a cylindrical insert having legs that run parallel. To remove the insert the flexible legs are pinched together. The seal between the coupling piece and the insert is ensured by an O-ring arranged therebetween. The inserts can in addition be adapted for through-feed of cables and the like.

Both the profile pieces and the coupling pieces are substantially U-shaped. Due to the presence of the open channel in the profile pieces and the complementing portion in the coupling pieces, both are divided into two compartments. The compartments are filled for instance with vaseline or a gel for receiving the filter sides therein.

The present invention will be further elucidated on the basis of the following drawings, wherein like reference numerals refer to like components and in which:

figure 1 shows a partly broken away perspective view of a ceiling system with filter panels according to the present invention;

figure 2 is a partly broken away perspective view of a coupling piece according to the invention;

figures 3a and 3b show two alternative methods for arranging the filter panels in the ceiling system; and

figures 4a to 4c show three embodiments of inserts for in the coupling piece.

Figure 1 shows a lowered filter ceiling 1 which consists of filter panels 2, profile pieces 3 and coupling pieces 4. The profile pieces 3 are substantially U-shaped and each sub-divided into two compartments 6 and 7 which are filled with a gel 8 into which the legs 9, 10 of the respective filter panels are received. The gel 8 provides an airtight seal between the clean air side 12 and the outside air side 11 of the room area. The profile piece 3 is provided with a substantially open channel 13 in which is received a suspending rod 14 which is connected to suspending means 16 via a screw bolt with eye 15. The ceiling further has coupling pieces 4 which are provided with a fully closed insert 17.

Figure 2 shows an angle-shaped coupling piece 4 according to the invention. The coupling piece is provided on its extremities 18 with a gasket 19 for providing an airtight closure between the coupling piece 4 and profile piece 3. Both pieces are mutually fixed by means of a locking pin 20 which is received in a substantially open channel 13 which is complemented to a cylinder by the ridge 5 on the coupling piece 4. The locking pin 20 is provided on its periphery with an O-ring 21. The locking pin 20 contains a passage 22 for receiving screw bolts 26 with interposing of a ring 24. After assembly the screw bolt 26 is situated in the opening 28 of coupling piece 4. The compartments 6 and 7 are filled with for instance vaseline or gel prior to arranging of the filter panels. The ceiling system according to the invention is very suitable for the use of gel. This in contrast to present systems where the gel, which is poured into the profile in liquid state, runs out again if the sealing mastic is not properly applied. The figure further shows the passage opening 39 for instance for cables or a sprinkler installation.

Figure 3 shows two alternative possibilities for arranging the filter panels 2. In both examples compartments 30, 31 which are formed on the filter panel are filled with gel. It can be seen particularly in figure 3 that in this manner a completely flat bottom surface of the ceiling results. Figure 3a likewise clearly shows the groove 32 which is arranged in the profile piece 3 and which can for instance be used in clean room areas to receive partition walls.

Figure 4 shows three alternative embodiments of insert pieces.

Figure 4a shows a completely closed insert piece 17 which is provided with parallel flexible legs 33. On their extremities the legs have protruding portions 34 with which they are clamped into the passage opening 39. The insert 17 is situated in the passage opening with interposing of an O-

ring 27.

Figure 4b shows a provision for arranging for instance a sprinkler installation. A pipe 35 is fixed in the insert 36 by means of an open cap with snap-in fitting 37. The pipe 35 is received in the coupled insert-snap ring with interposing of a seal 38. The insert piece 36 is received in the passage opening with interposing of an O-ring 27.

Finally, figure 4c shows an insert piece 39 provided with screw thread 40 for receiving a cable coupling 41. The insert piece 39 is received in the passage opening with interposing of an O-ring 27.

The present invention therefore provides an easy to assemble ceiling system which is very flexible in various respects (adaptability, suspending options) and in addition provides a fully airtight seal between outside air side and clean air side.

## Claims

1. Ceiling system for instance for a lowered filter ceiling consisting of flat profile pieces (3) supporting filter parts, coupling pieces (4) connecting the profile pieces (3) in airtight manner, suspending means (15, 16) connectable to the profile pieces and/or the coupling pieces, and locking means for locking the coupling piece and the profile piece relative to one another, **characterized in that** the locking means take the form of a locking pin (20) engaging in a substantially cylindrical open channel (13) and provided on its periphery with a sealing ring (21), and the coupling piece has a portion (5) complementing the open channel and that in this complementing portion a passage (28) is provided for a screw bolt (26) engaging in the locking pin.
2. Ceiling system as claimed in claim 1, **characterized in that** the profile pieces (3) are substantially U-shaped, and the substantially U-shaped coupling pieces have portions which can be arranged clampingly between the legs of the profile pieces in close-fitting manner.
3. Ceiling system as claimed in claim 2, **characterized in that** the clampingly arrangeable portions are received in the profile pieces with interposing of a sealing element (19).
4. Ceiling system as claimed in claim 3, **characterized in that** the sealing element is a rubber strip.
5. Ceiling system as claimed in any of the claims 1-4, **characterized in that** the coupling piece has a passage opening (39) for an insert piece with interposing of a sealing ring.

6. Ceiling system as claimed in claim 5, **characterized in that** the insert piece is cylindrical and has flexible legs (33) that run parallel.
7. Ceiling system as claimed in any of the foregoing claims, **characterized in that the** U-shaped profile piece has a fixing groove (32) on its side remote from the legs. 5
8. Ceiling system as claimed in any of the foregoing claims, **characterized in that** the coupling piece is a T-piece. 10
9. Ceiling system as claimed in any of the claims 1-7, **characterized in that** the coupling piece is an angle piece. 15
10. Ceiling system as claimed in any of the claims 1-7, **characterized in that** the coupling piece is a cross piece. 20
11. Ceiling system as claimed in any of the foregoing claims, **characterized in that** in the open channel (13) a suspending pin (14) is received which is connected to suspending means (15, 16). 25

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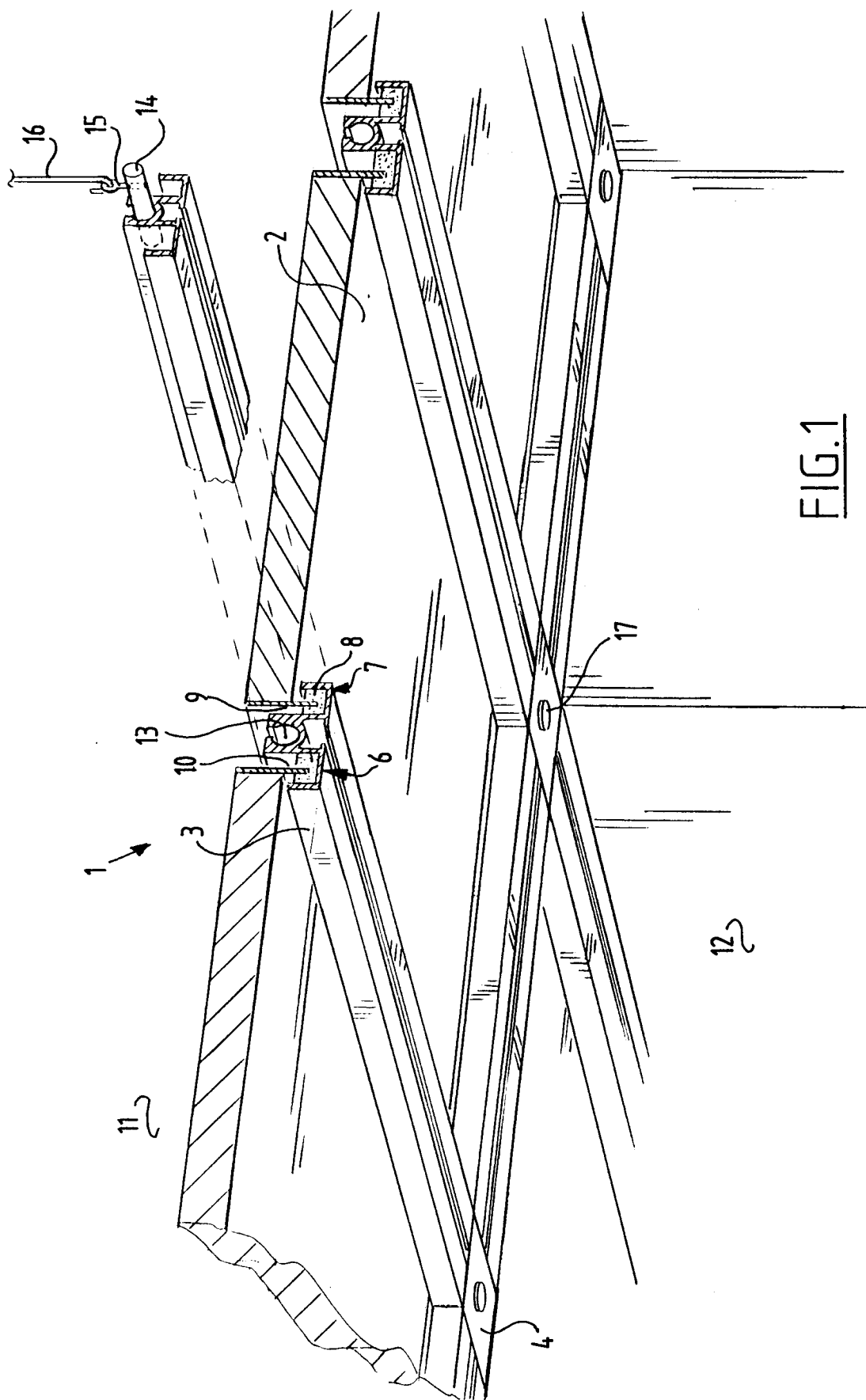


FIG. 1

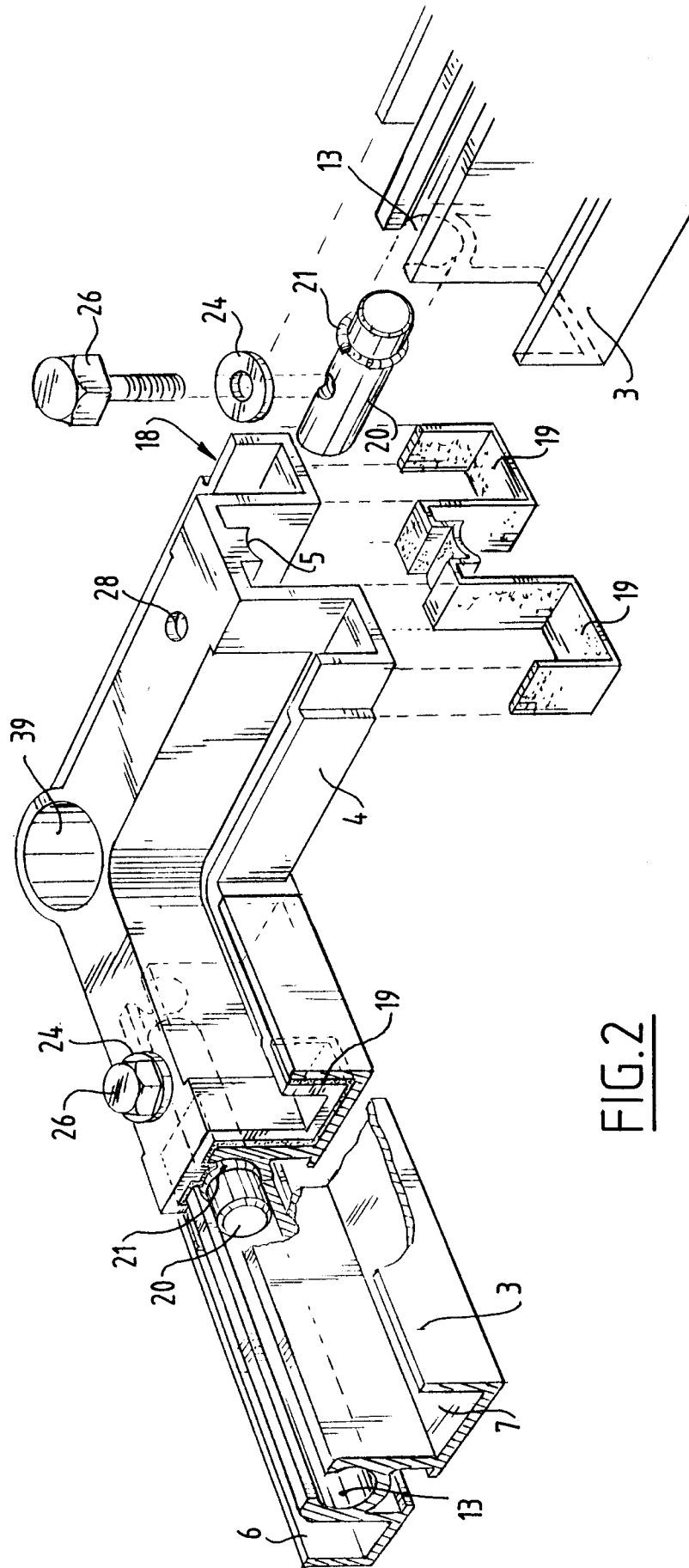


FIG. 2

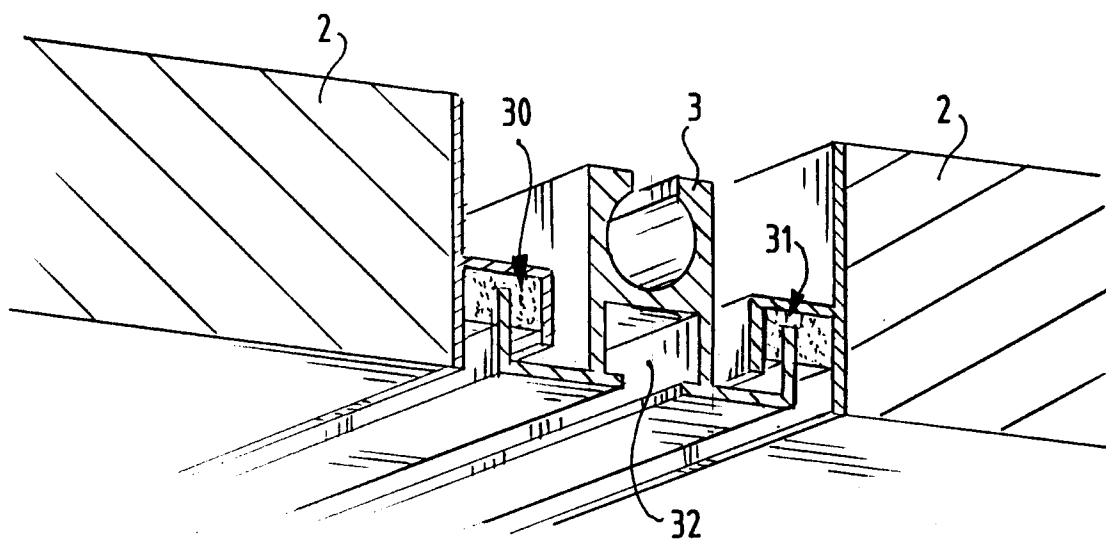


FIG. 3a

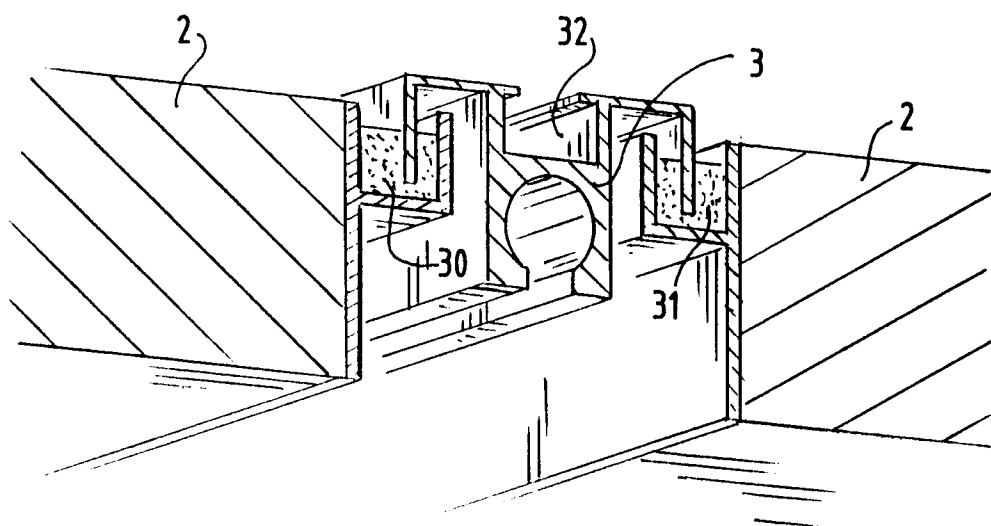
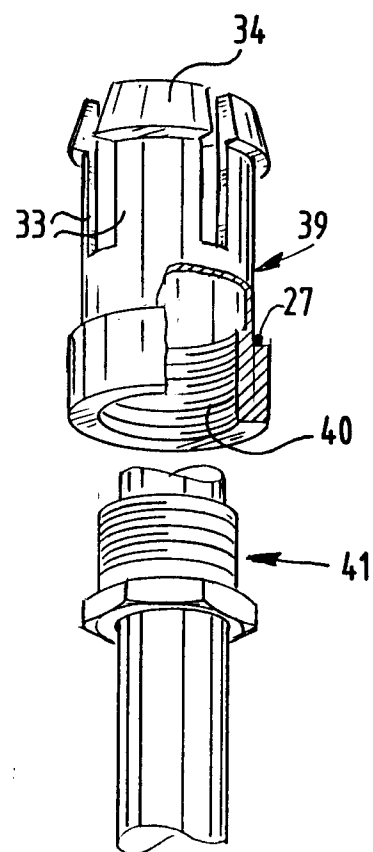
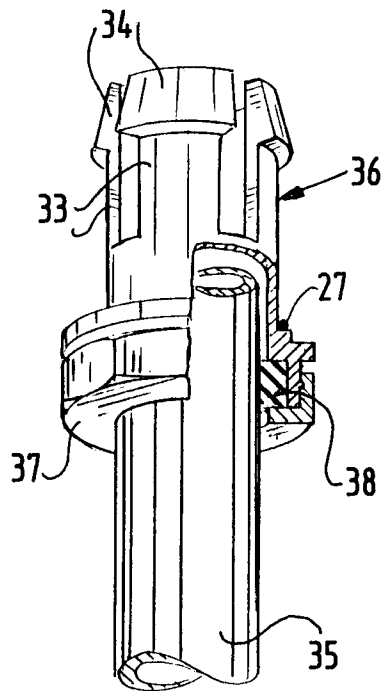
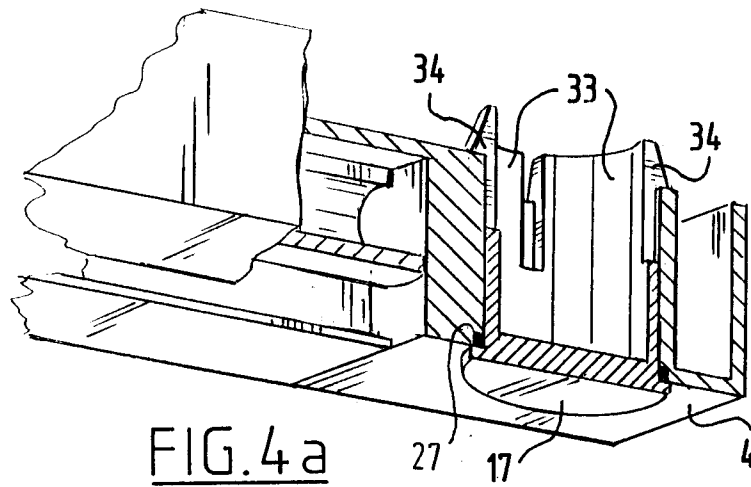


FIG. 3b





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## EUROPEAN SEARCH REPORT

Application Number

EP 92 20 2350

| 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.5) |
| A,D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | DE-U-9 002 122 (FLÄKT AB)<br>* the whole document *<br>---                                                                                                                            | 1-5,7,10                                             | E04B9/02<br>E04B9/14<br>E04B9/06              |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US-A-4 511 380 (FETTER)<br>* column 2, line 30 - column 2, line 39 *<br>* figures 2,3,5 *<br>---                                                                                      | 1                                                    |                                               |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US-A-3 232 021 (WILSON)<br>* column 2, line 40 - column 2, line 66 *<br>* column 3, line 15 - column 3, line 29 *<br>* figures 2,7,13,14 *<br>---                                     | 1                                                    |                                               |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE-A-2 809 674 (METALLBAU RITTER<br>TRENNWÄNDE)<br>* page 11, paragraph 2 - page 13,<br>paragraph 1 *<br>* figures 2,3 *<br>---                                                       | 1                                                    |                                               |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US-A-4 978 265 (DE WAN)<br>* column 3, line 45 - column 4, line 26 *<br>* figures 1-4 *<br>---                                                                                        | 6                                                    | TECHNICAL FIELDS<br>SEARCHED (Int. Cl.5)      |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE-U-8 710 286 (KESSLER & LUCH)<br>* page 7, line 24 - page 8, line 20 *<br>* page 9, line 7 - page 9, line 30 *<br>* page 10, line 20 - page 10, line 25 *<br>* figures 1-8 *<br>--- | 8,9                                                  | E04B<br>F16B                                  |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE-A-2 742 504 (LA REDOUTE S.A.)<br>* page 8, paragraph 1; figure 5 *<br>-----                                                                                                        | 11                                                   |                                               |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                       |                                                      |                                               |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                       | Date of completion of the search<br>09 NOVEMBER 1992 | Examiner<br>HENDRICKX X.                      |
| <b>CATEGORY OF CITED DOCUMENTS</b><br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                                                                                                                                                       |                                                      |                                               |