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(54) System for realizing the coupling of duct sections for air conditioning systems

(57) A system, and an angular element used in it, are described, for the mutual fixing of sections (1,2) of a duct for conveying air, wherein the adjacent ends (3) of two sections (1,2) have projections and/or recesses (14A,14B) which cooperate for defining an engagement seat wherein at least a portion (18,18',19) of a structural joining element (4) has to be inserted. According to the invention, said adjacent ends (3) have a portion (16) which is apt for realizing the external coverage of the coupling area between said projections and/or recesses (14A,14B) and the portion (18,18',19) of said structural joining element (4) inserted in said seat.

Moreover, said structural joining element (4) is realized for allowing its easy insertion and/or removal in parallel direction with respect to a ceiling and a wall, when the canalization is placed next to a wall and a ceiling.

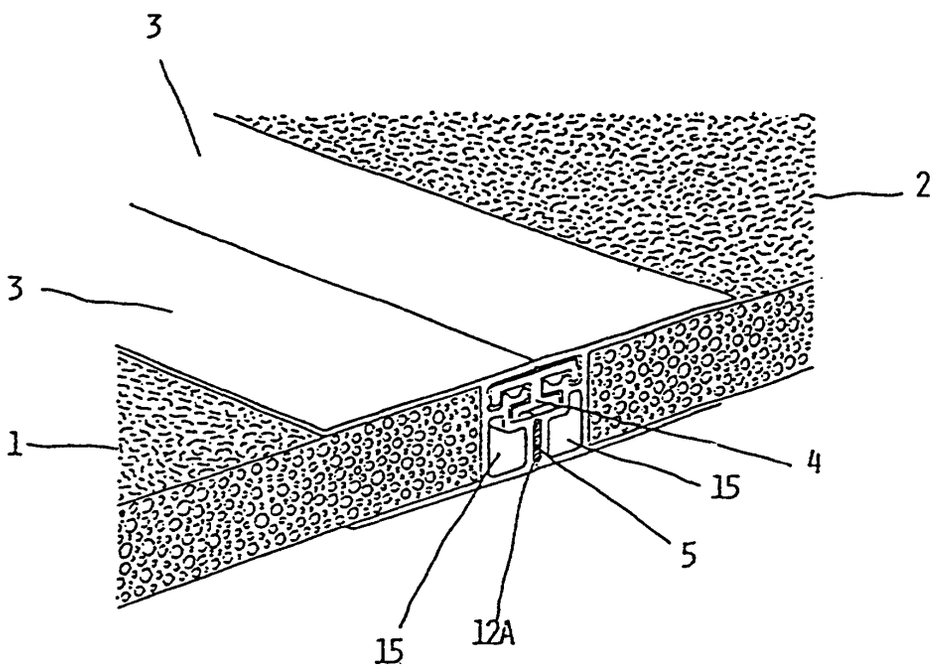

FIG. 1

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Description

[0001] The present invention relates to a system, and an angular element used in it, for the mutual fixing of sections of a duct for conveying air in air conditioning systems, where for air conditioning also simple heating and/or ventilation are intended, in particular for those ducts being obtained starting from polyurethane foamed plates.

[0002] The ducts for air conditioning systems are generally obtained using squared or rectangular sections made of insulating material coupled to each other.

[0003] The connection between the various sections must be strong and of easy execution. Moreover, such a connection must be hermetically sealed as much as possible, in order to avoid leakage or blow-by of the air passing in the canalization; finally, it should also have an aesthetical appearance, since these canalizations are often placed in sight.

[0004] As known, various methods are generally provided for connecting the various sections of a canalization between them.

[0005] Said methods provide the assembly of structural elements on the section headers and then using other appropriately shaped structural elements, which engage the elements mounted on the headers and keep the sections jointed between them.

[0006] Such structural joining elements are generally inserted in a seat defined by the interacting projections and/or recesses, resulting from the shape of the structural elements mounted on the headers when coupled for connecting the two sections together.

[0007] The length of the structural joining elements is generally equal to the length of the structural elements mounted on the sections headers.

[0008] The angles of the joint coupling the ducts are normally open, since the length of the structural elements mounted on the headers is equal to the duct internal size.

[0009] Therefore, plastic angles hooked to the structural elements are used to cover such openings. Such angles have merely an aesthetical function.

[0010] However, such systems are unable to meet all the requirements requested for a good connection. In fact, they may comply with the coupling stability and the appearance requirements, but they may not meet the need of easy assembly or dismantling for the replacement and/or repairing of sections of the canalization, whenever such an operation is required under special conditions, for instance when a canalization is located in the corner between a ceiling and a wall.

[0011] Such known solutions may also not ensure the sealing being necessary against air leakage. Moreover, in the instances of ducts having a reduced cross section, it is necessary to obtain joints being simple, which use just a few components, but ensuring a good operation and an aesthetical appearance.

[0012] Additionally, the insertion of the structural joining elements, whose length is equal to the length of the structural elements mounted on the headers, results in being quite difficult, since the seat defined by the interacting projections and/or recesses resulting from the shape of the structural elements mounted on the headers, is dependent on the shape of the sections, i.e. on their size and orthogonal shaping.

[0013] In fact, the orthogonal shaping and the dimensions are not always constant, as they change with the small differences arising during the manufacture of the section.

[0014] The differences may be due to the thickness of the panel used to manufacture the section, or to the cutting position of the angles for its bending and shaping.

[0015] It is the aim of the present invention to provide a solution to the above drawbacks.

[0016] Within this frame, it is a first aim of the present invention to provide a system for realizing the coupling of sections of a duct for conveying air in air conditioning systems, which does not have the drawbacks of the present state of the art, but on the contrary has advantages in terms of performance and easy assembly.

[0017] A further aim of the present invention is to provide a system for realizing the coupling of section of a duct for conveying air in air conditioning systems which, under particular conditions, can be manufactured in a simple way and by using a reduced number of components.

[0018] A further aim of the present invention is to provide an angular element for the use in a system for realizing the mutual fixing of sections of a duct for conveying air in air conditioning systems, which allows for obtaining a coupling between the sections and also provides an external finishing for the coupling system.

[0019] In order to achieve such aims, it is the object of the present invention a system for realizing the mutual fixing of sections of a duct for conveying air, incorporating the features of the annexed claims, which form an integral part of the present description.

[0020] Further aims, features and advantages of the present invention will become apparent from the following detailed description and the annexed drawings, which are supplied by way of non limiting example, wherein:

- Fig. 1 shows a cross section of the joining of two sections of the canalization according to the present invention;
- Fig. 2 shows a perspective view of a structural element mounted on the header of a section of the canalization according to the present invention;
- Fig. 3 shows a perspective view of a coupling of two sections of the canalization according to the present invention;
- Fig. 4 shows a perspective view of a structural element for coupling two sections of the canalization according to the present invention;

- Fig. 5 shows a perspective view of an angular element for closing the openings laying on the four angles of the joining and which result from the coupling of two sections, according to a preferred embodiment of the present invention;
- Fig. 6 partially shows in cross section a top view of the coupling of two sections of an air conveying duct in air conditioning systems, according to a variant embodiment of the present invention.

[0021] In figure 1, where a cross section of the joining of two sections of the canalization according to the present invention is represented, reference 1 indicates a first section of a duct, reference 2 indicates a second section of a duct to be coupled with said first section 1, reference 3 indicates a structural element mounted on the headers of sections 1 and 2, reference 4 indicates a structural element for the mutual coupling of said sections 1 and 2 for obtaining the canalization.

[0022] Reference 5 indicates a sealing gasket for hindering the air leakage of the air flowing inside the duct.

[0023] Such a gasket 5 extends all along the coupling outline of the two ducts.

[0024] In figure 2, where a structural element mounted on the header of a section of the canalization according to the invention is represented, reference 1 indicates the section and reference 3 a structural element mounted on the header of the section 1.

[0025] The structural element 3 is topped over the header of section 1, by inserting the section 1 in a recess delimited by two small wings indicated by 6 and 7, being parallel to each other.

[0026] The structural element is firmly held on the section 1 by two saw-tooth indentations 8 and 9 obtained on the internal surface of wings 6 and 7.

[0027] The length of the structural element 3 is equal to the internal width of the side of the duct on which the structural element is mounted.

[0028] In this way, the head or abutment of the structural element 3 is simply obtained by means of a straight cut perpendicular to the length of the structural element, thus avoiding any abutments requiring extra operations after cutting the length of the structural element.

[0029] The depth of insertion of the section 1 in the structural element 3 is given by a wall 10 being vertical with respect to the wings 6 and 7, delimiting their length.

[0030] A first projection 11, being an extension of the wing 7, departs from the wall 10 and terminates with a vertical wall 12, whose height is substantially equal to half the recess formed between wings 6 and 7; the vertical wall 12 ends in a wall 13 parallel to said first projection 11.

[0031] This first projection 11 has a small tooth 11A protruding over the vertical wall 12.

[0032] The wall 13 also has a small tooth 13A, whose dimensions equal those of the tooth 11A; as a result, a recess 12A (see figure 1) will be formed for housing the air sealing gasket 5 when connecting the structural elements 3 mounted on the headers of the two sections to be coupled together.

[0033] The recess 12A allows the assembly of the gasket 5 in a location predetermined and delimited by the structural element 3, for making its positioning during the assembly easier.

[0034] In this way, there will be no risk of the gasket interfering with other parts of the structural element 3 in the coupling of the two sections and so causing any problems when inserting a structural joining element 4 (see figure 1).

[0035] At the end of the wall 13 a tooth 14 is provided, having the shape of an upturned L; the end of the horizontal wing 14A has a length so that, when it is approached to the corresponding wing of the structural element 3 mounted on the other header of the section to be coupled, a free space will be formed to let the stem of the upturned T of a structural joining element 4 go through (see figure 1).

[0036] The vertical stem of the tooth 14 is connected with a horizontal portion 14B to the wall 10, the horizontal portion 14B substantially departing from half the height of said vertical stem. A recess 15 is then defined by walls 10, 12, 13 and the first projection 11.

[0037] From the wall 10 a second projection 16 departs, being an extension of the wing 6, in parallel to said first projection 11 and ending at the height of the teeth 11A and 13A.

[0038] In figure 3, representing a perspective view of a coupling of two sections of the duct according to the invention, references 1 and 2 indicate the two coupled sections, reference 3 indicates the structural element mounted on the headers of sections 1 and 2, reference 4 indicates a structural element for joining said sections 1 and 2 and obtain the canalization, reference 20 indicates an angular element for closing the openings, which lie on the four angles of the joining and which result from the coupling of the two sections obtained through the structural elements 3, which have smaller dimensions than the length of the side of the sections.

[0039] In figure 4, representing a perspective view of a structural element for coupling two sections of the canalization according to the invention, reference 4 indicates the structural joining element.

[0040] This structural joining element 4 has a wall 17 whose ends are provided with two wings 18 and 18' perpendicular to the wall 17.

[0041] An upturned T-shaped structural element 19 is defined in the centre of the wall 17.

[0042] The height of wings 18 and 18' is substantially equal to the height resulting between the top of the horizontal portion 14A of the tooth 14 and the second projection 16 of the structural element 3, but is shorter than the length of the stem of the upturned T.

[0043] In this way, the structural joining element 4 may be inserted also in the instance of the structural elements 3 being slightly out-of-axis on the headers of the sections to be connected to each other, since it can be

inserted slightly inclined.

[0044] The structural joining element 4 is longer than the structural element 3 topped over the header of the section, so as to protrude over one end of the structural elements 3.

[0045] The structural joining element 4 has to protrude over one end of the structural element 3 to a certain extent; this will make it possible for a tool, such as a pliers, to grip it and draw it out of its seat when dismantling a portion of the canalization for repair purposes.

[0046] The protruding portion of the structural jointing element 4 should be smaller than the wall thickness of the duct, in order to avoid interfering with the assembly of an angular element 20 described later.

[0047] In this way, a removal of the structural joining element 4 may also occur in those situations where the duct is located in a comer between the ceiling and a wall, since it can be drawn out in parallel to the ceiling and the wall; as a result, replacement and/or repair of a section of the duct will be easier.

[0048] In figure 5, reference 20 indicates an angular element for closing the openings which lie on the four angles of the joint and which result from the coupling of the two sections through the structural elements 3, whose dimensions are smaller than the length of the sides of the sections.

[0049] Moreover, according to this embodiment, the angular element may also have a joining function of the two sections of the canalization as described later.

[0050] This angular element has two walls 20A and 20B perpendicular to each other, which form a substantially "L"-shaped.

[0051] From the wall 20A two extensions 21 and 22 depart perpendicularly, consisting each one of two parts perpendicular to each other, indicated with 21A-21B and 22A-22B, respectively, whose length protrudes substantially over the end of the wall 20B.

[0052] The extensions 21 and 22 have a reinforcing element 23 for the connection to the wall 20B, so making them integral to both the walls 20A and 20B of the angular element.

[0053] The length of the walls 20A and 20B is substantially equal to the thickness of the material forming the ducts wall, whereas the width is substantially equal to twice the measurement resulting from the sum of the depths of wings 6 and 16.

[0054] The width of extensions 21 and 22 is suitable for insertion in the recess 15 of the structural element 3 (see figure 2).

[0055] In a preferred embodiment of the invention, the internal distance D between the vertical portions 21B and 22B of extensions 21 and 22 is such that, when they are completely inserted within the recesses 15, they create an approaching of the two structural elements 3, so that the two structural elements 3 match each other realizing the coupling of the sections (see figure 6).

[0056] Two pins 24 are indicated with reference to a preferred embodiment of the invention, which depart perpendicularly from the wall 20A and are shorter than the thickness of the material forming the wall of the duct.

[0057] These pins 24 have a substantially tapered end in order to facilitate their insertion in the duct material when mounting the angular element 20, also in those instances where the duct is coated with a thin aluminium foil. Their function is to hinder a removal of the angular element 20 from its seat after it has been assembled.

[0058] Coupling of the sections occurs as follows:

- the two sections to be coupled together are approached, with the structural element 3 being already assembled on the four sides of the header, and after having mounted on the structural elements 3 of a section the gasket 5 in the portion of the recess 12 provided on said structural elements 3;
- the upturned T profile of the structural joining element 4 is inserted in the seat resulting from the two upturned L-shaped structural elements 14, which is obtained by approaching the structural elements 3 of the two headers of the sections to be connected,
- the structural joining element 4 is made to slide for all the length of a side of the duct, so that it results in line with one end of the structural element end 3 and protrudes over the other end,
- another structural joining element 4 is inserted and made to slide for all the length of a second side of the duct; a third structural joining element 4 is inserted for the third side of the duct and, finally, another structural joining element 4 is inserted for the fourth side of the duct,
- four angular elements 20 are inserted for closing the angular openings resulting from the coupling of the two sections, by inserting the extensions 21 and 22 in the respective recesses 15 of the two approached structural elements 3, until the angular element abuts against the external wall of the two sections, and pins 24 are driven into the body of the sections.

[0059] The features of the system for realizing the coupling of sections of a duct for conveying air in air conditioning systems are clear from the above description and the annexed drawings.

[0060] According to the above description also the advantages of the system for realizing the coupling of sections of ducts for conveying air in air conditioning systems according to the present invention are clear.

[0061] In particular these advantages consist in that:

- the coupling of sections can be realized so that the structural element 4 results in being covered by the second projection 16 of the two approached structural elements 3, with obvious aesthetical advantages;
- the manufacturing of the headers of the structural elements 3 does not require an additional abutment

operation, with obvious costs advantages;

- the coupling of sections can be realized also in those situations where the duct is located in a corner between the ceiling and a wall, as it is enough to have access to two duct sides only, since insertion of the structural joining element 4 is parallel to the wall and the ceiling;
- the dismantling, for repair and/or replacement purposes, of a section of a canalization which is located between the ceiling and a wall, is easier, since it is sufficient to have access to two sides of the duct only, and the structural joining element 4 can be pulled out in a parallel direction with respect to the wall or ceiling, with the possibility of gripping it with a tool, such as a pliers, by virtue of the fact that it protrudes over the end of the two structural elements 3 coupled together;
- the positioning and the assembly of the sealing gasket is easier by virtue of the realization of a seat defined on the structural elements topped over the header of the section;
- no air leakage nor air loss through the joints occurs.

[0062] It is obvious that many changes are easily applicable and usable for the man skilled in the art to the system for the mutual fixing of sections of a duct for conveying air in air conditioning systems described above by way of example, without departing from the novelty spirit of the innovative idea.

[0063] For example, when coupling sections of reduced dimensions, more or less having their sides equal to or shorter than 400 mm, they can be simply joined together using the angular element 20 only, since their weight will not cause stability problems for the connection.

[0064] In fact, the insertion of the extensions 21 and 22 of the angular element 20 in the respective recess 15 allows for keeping the two sections joined together, while the two pins 24, i.e. one driven in the section 1 and the other in section 2, lock the coupling position so hindering a removal of the angular element 20.

[0065] Thus, the use of the structural joining element 4 is no longer required, since the coupling obtained through the angular element will suffice.

[0066] Therefore, the achievement of the coupling according to the above variant embodiment of the present invention provides the steps of:

- approaching the two sections to be coupled together, which have their structural element 3 already assembled on all four sides of the header, and after having mounted on the structural elements 3 of a section the gasket 5 in the portion of the recess 12 A provided on the structural elements;
- assembling a first angular element 20, by inserting the two extensions 21 and 22 in the seat 15 of the two structural elements 3 present on the headers of the sections to be coupled, until the angular element will abut against the external wall of the two sections and pins 24 are driven into the body of the sections to be coupled,
- mounting another angular element 20 on a second angle of the ducts; then a third angular element 20 is mounted for the third angle of the duct and, finally, another angular element is mounted for the fourth angle of the duct, so as to have the pins 24 of each angular element 20 driven each one in a section opposite the other.

[0067] From the above, also the advantages of the system and the angular element utilized in it, for realizing the coupling of ducts for conveying air are also clear, according to such a variant embodiment are clear.

[0068] In particular they consist in that:

- the realization of the coupling is obtained by means of a component which was previously utilized as a simple aesthetical element,
- a component of difficult employment can be removed;
- the realization manufacture of the headers of the structural elements 3 does no longer require an additional abutting operation, with obvious economic advantages,
- the coupling of sections may also occur in those situations where the duct is located in a comer between the ceiling and a wall, since a small space will suffice for inserting the angular joining element,
- the dismantling of a section of a canalization for repair and/or replacement purposes which lies between the ceiling and a wall is easier, since only the angular connecting elements have to be removed, which require a small space,
- the positioning and the assembly of the sealing gasket is easier through the seat obtained on the structural elements topped over the header of the section;
- there is no air leakage nor air loss through the joints.

[0069] It is obvious that many changes and applications can be easily performed and applied by the man skilled in the art to both the system and the angular element used in it, for realizing the mutual fixing of sections of a duct for conveying air in air conditioning systems described by way of example, without departing from the novelty spirit of the innovative idea contained in the invention.

Claims

1. A system for the mutual fixing of sections (1,2) of a duct for conveying air, wherein the adjacent ends (3) of two sections (1,2) have projections and/or recesses (14A,14B) which cooperate for defining an engagement seat wherein at least a portion (18,18',

19) of a structural joining element (4) has to be inserted, characterized in that said adjacent ends (3) have a portion (16) which is apt for realizing the external coverage of the coupling area between said projections and/or recesses (14A,14B) and the portion (18,18',19) of said structural joining element (4) inserted in said seat.

2. A system according to claim 1, characterized in that said ends (3) are realized using a structural element (3) inserted in the four sides of the header of the section (1,2).

3. A system according to claim 2, characterized in that said structural element (3) has a first wing (6) and a second wing (7) being parallel to each other, each one of them having a saw-tooth indentation for holding said structural element (3) on the edge of the header of the section (1,2), where the length of said first wing (6) and second wing (7) is delimited by a vertical wall (10), said wall (10) delimiting the insertion of said structural element (3) in the edge of the section.

4. A system according to claim 1, characterized in that said portion (16) consists of a second projection (16) departing from said wall (10), said second projection (16) being an extension of said first wing (6).

5. A system according to claim 3, characterized in that a first projection (11), being an extension of said second wing (7), departs from said wall (10).

6. A system according to claim 3, characterized in that a vertical wall (12) departs from said first projection (11), whose height is substantially half the recess existing between said first and second wings (6,7), said vertical wall (12) being connected to a wall (13) parallel to said first projection (11), and an upturned L-shaped tooth (14) being provided at the end of said wall (13).

7. A system according to claim 1, characterized in that for the coupling of two sections (1,2) a gasket (5) is inserted between the structural elements (3) facing each other, in order to hinder the leakage of air towards the outside of the duct.

8. A system according to one or more of the previous claims, characterized in that said first projection (11) and said wall (13) have a respective tooth (11A, 13A), the two teeth (11A,13A) forming a half of a recess (12A) for mounting said gasket (5).

9. A system according to claim 1, characterized in that said structural joining element (4) is inserted between the adjacent ends (3) of two sections (1,2) for the coupling of said sections.

10. A system according to claim 9, characterized in that said structural joining element (4) is longer than said structural element (3).

11. A system according to claim 9, characterized in that said structural joining element (4) has a wall (17), whose ends have two wings (18,18') perpendicular to said wall (17), said wall (17) having in the middle a structural element (19) being upturned T-shaped, said wings (18,18') having a height being smaller than the length of the stem of said structural element (19).

12. A system according to claim 2, characterized in that said structural elements (3) have dimensions being smaller than the length of the sides of said section (1,2).

13. A system for the mutual fixing of sections of a duct for conveying air (1,2), wherein the adjacent ends (3) of two sections (1,2) have projections and/or recesses (14A,14B) which cooperate for defining an engagement seat, wherein at least a portion (18,18', 19) of a structural joining element (4) has to be inserted, characterized in that said structural joining element (4) is realized for allowing its insertion and/or removal according to a parallel direction with respect to a ceiling and a wall, when the canalization is positioned next to a wall and the ceiling.

14. A system according to claim 13, characterized in that said structural joining element (4) is longer than said structural element (3).

15. A system according to claim 1, characterized in that an angular element (20) is provided for closing the angle openings resulting from the coupling of two sections (1,2).

16. A system for the mutual fixing of sections of a duct for conveying air (1,2), wherein the adjacent ends (3) of two sections (1,2) have recesses (15) wherein a joint element (21,22) has to be inserted, characterized in that said joint element (21,22) is realized by means of a portion of an angular element (20) which is provided for covering the coupling area of the sections (1,2).

17. A system according to claim 16, characterized in that said portion comprises two extensions (21,22) departing from inside the angular element (20), and are apt for being inserted in said recesses (15).

18. A system according to claim 16, characterized in that said angular joint element (20) has two walls (20A,20B) perpendicular to each other, which form a substantially "reshaped section.

19. A system according to claim 18, characterized in that said walls (20A,20B) have a length substantially equal to the thickness of the material forming the wall of the ducts, and a width substantially twice the size resulting from the sum of the depth of the wings (6,16) of the structural element (3).

20. A system according to claim 17, characterized in that said extensions (21,22) departing from a wall (20A) of said angular element (20) have a length so as to protrude over the end of the other wall (20B).

21. A system according to claim 18, characterized in that the angular element (20) has a reinforcing element (23) connecting said extensions (21,22) to the wall (20B) of the angular element (20), so making them integral to the walls (20A,20B) of the angular element (20).

22. A system according to claim 17, characterized in that the width of said extensions (21,22) can be inserted in the recess (15) of the structural element (3).

23. A system according to claim 18, characterized in that two pins (24) depart perpendicularly from one of said walls (20A).

24. A system according to one or more of the previous claims, characterized in that said extensions (21,22) of said angular joint element (20) are inserted in said recess (15) between the adjacent ends (3) of two sections (1,2) for their coupling.

25. A system according to claims 16 and 23, characterized in that said pins (24) of said angular joint element (20) are driven into the body of the sections (1,2) for their coupling.

26. A system for the mutual fixing of sections (1,2) of an air conveying duct, wherein the adjacent ends (3) of two sections (1,2) have recesses (15) wherein at least a joint element (21, 22) has to be inserted, characterized in that said joint element (4) is manufactured in the form of a covering angular element (20), which can be inserted and/or removed in a parallel direction with respect to a ceiling and a wall when the canalization is positioned next to a wall and a ceiling.

27. An angular element for covering the edges of two sections (1,2) facing each other being parts of an air conveying duct, characterized in that it provides a portion (21,22) apt to interact with recesses (15) provided in structural elements (3) inserted at the ends of said sections (1,2) for realizing the coupling of said sections (1,2).

28. An element according to claim 27, characterized in that said portion comprises two extensions (21,22) departing from inside the angular element (20) and which can be inserted in said recesses (15).

29. An element according to claim 27, characterized in that said angular joint element (20) has two walls (20A,20B) perpendicular to each other, which form a substantially "L"-shaped section (20A), and that two pins (24) depart perpendicularly from one of said walls (24).

30. An element according to claim 28, characterized in that said extensions (21,22) extend substantially over the end of a wall (20B) of said angular element (20).

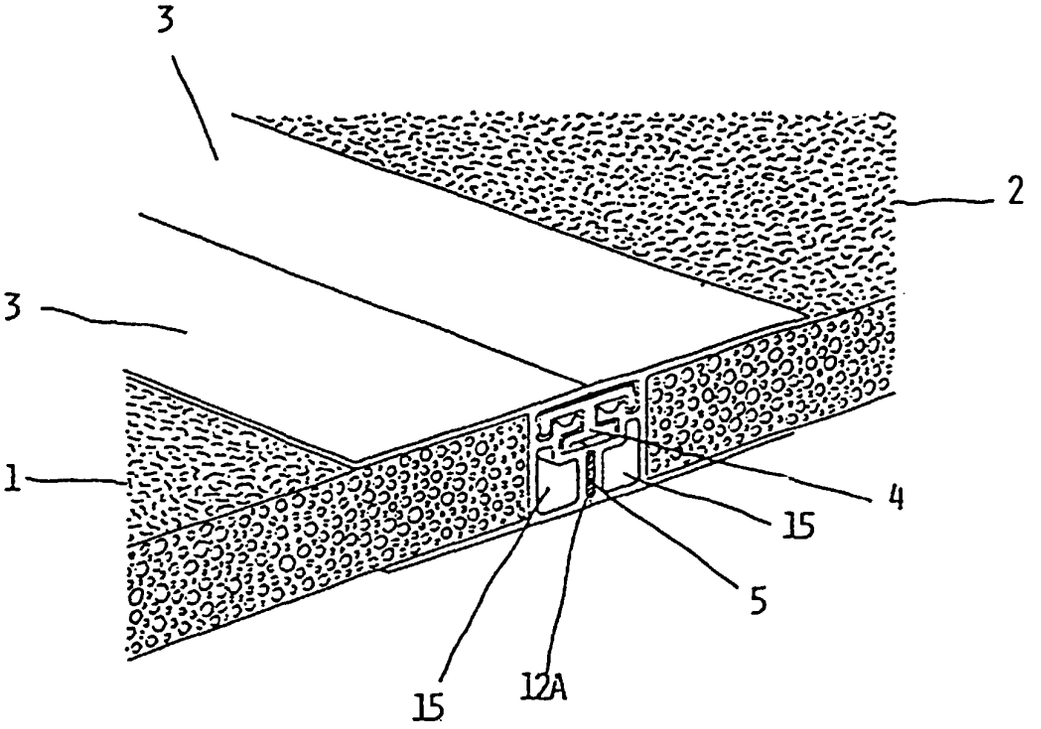

FIG. 1

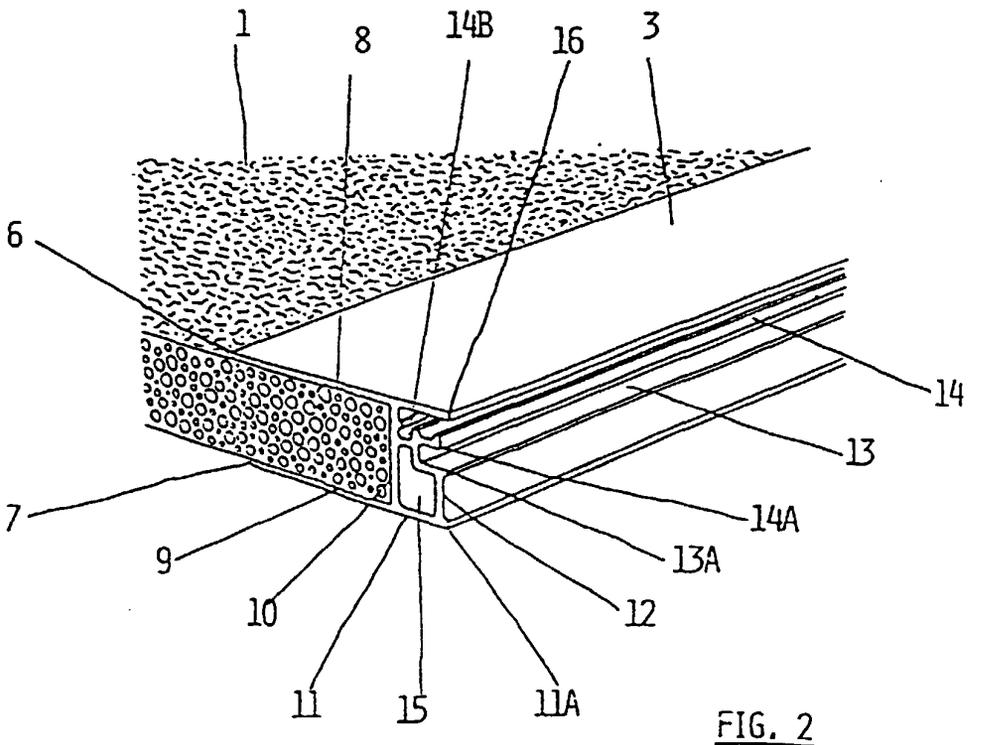

FIG. 2

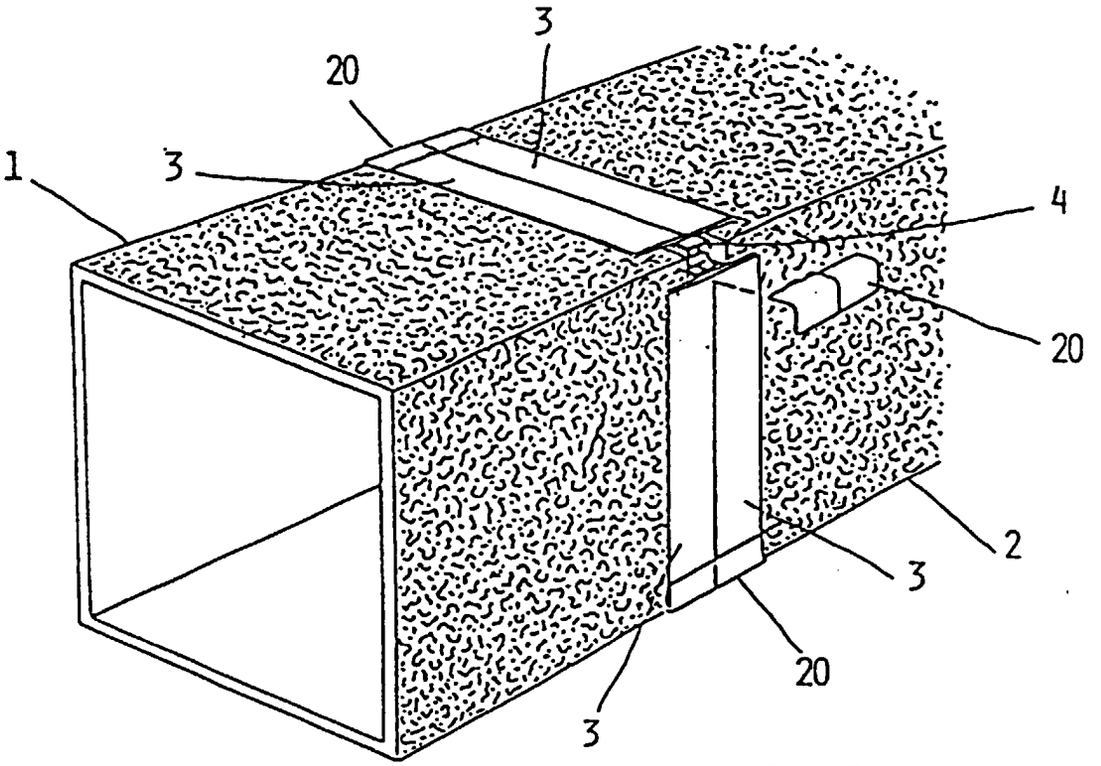

FIG. 3

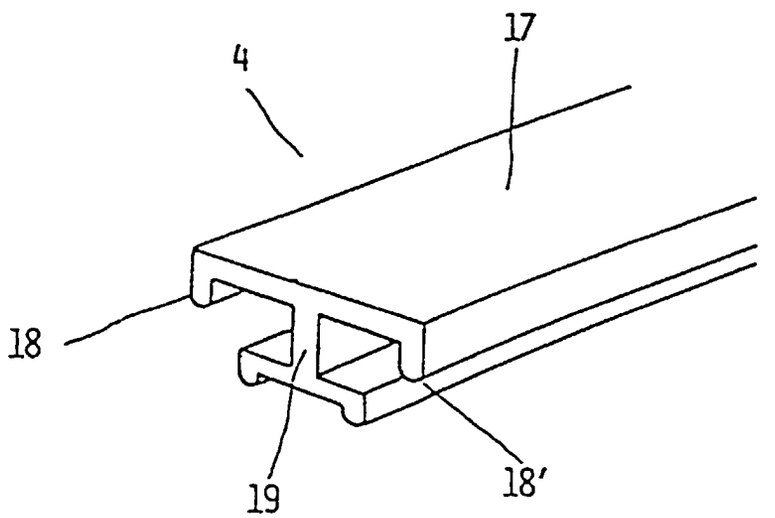

FIG. 4

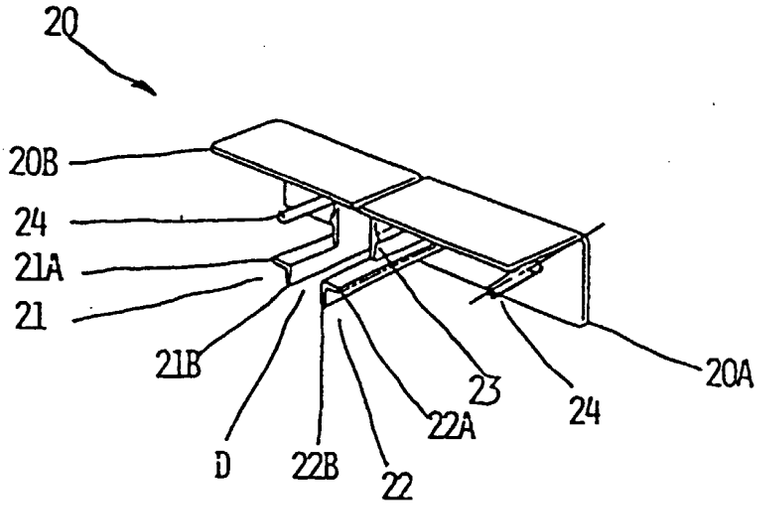

FIG. 5

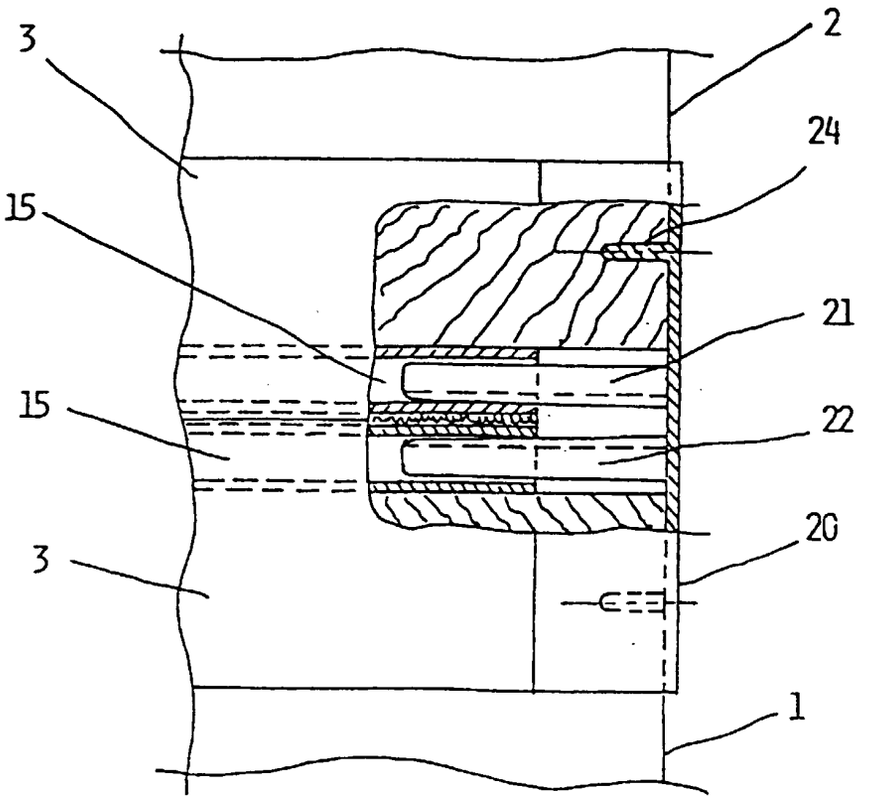

FIG. 6