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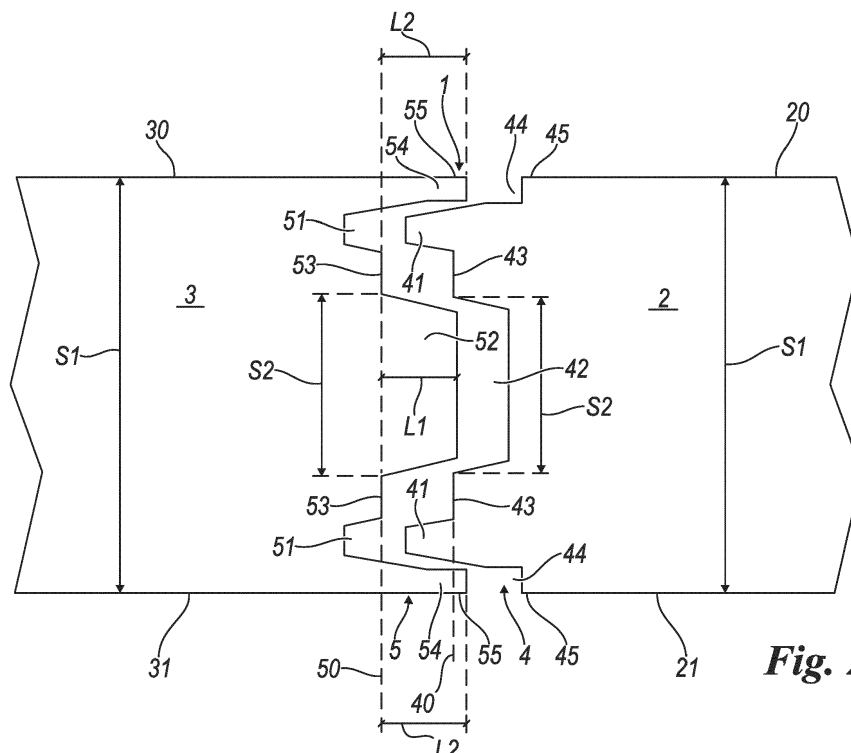
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(54) A FIREBREAK DEVICE

(57) A fire device comprises a first modular element (2, 2') equipped with a coupling element (4, 4') comprising a base plane (40, 40') and at least one coupling member (41, 41') projecting from the base plane (40, 40'); and a second modular panel (3, 3') equipped with a coupling counter-element (5, 5') comprising a base counter-plane (50, 50') and a counter-seat (51, 51') recessed with respect to the base counter-plane (50, 50') to receive the coupling member (41, 41') of the coupling element (4, 4').

The coupling element (4, 4') comprises a central coupling portion (42, 42') comprising a seat recessed in the base plane (40, 40'), and the coupling counter-element (5, 5') comprises a central coupling counter-portion (52, 52') comprising a coupling member projecting from the base counter-plane (50, 50') and suitable for being inserted into the seat of the central coupling portion (42, 42').

**Fig. 2**

Description

[0001] The present invention refers to a fire device according to the precharacterizing part of the main claim.

[0002] Fire devices are currently known such as, for instance, doors or fixed walls, which are formed of a plurality of modular panels coupled with each other. This type of fire devices is particularly suitable for industrial buildings, for operating the closing of big-size openings, of typically several meters in length and in height.

[0003] The modular panels which make-up the known devices are reciprocally coupled by way of coupling elements of the male-female type. These couplings represent a point of criticality in the fire structure, in that they constitute discontinuities in the structure of the fire device which might let smokes, heat, or flames pass through.

[0004] For this reason, it is convenient to realize couplings that define a blocked path between two modular panels. For instance, fire partitions are known wherein the male-female couplings comprise two male elements on one side, and two female elements suitable for receiving the two male elements, on the other side. An example of such type of male-female coupling is shown in figure 1.

[0005] Document DE 9013911.9 discloses a fire device known and conforming to what indicated above, which comprises a further coupling portion arranged between the two coupling portions as shown in figure 1 of the present patent application. The central coupling portion shown in DE 9013911.9 comprises a male element on the same side of the male elements of the remaining coupling portions, and vice versa a female element on the same side of the female elements of the remaining two coupling portions. However, this does not fully meet the requirements of this art, in that it does not impart a perfect structural continuity to the fire device.

[0006] Document FR 2976302 discloses a fire device similar to that of DE 9013911.9.

[0007] These two documents of the known art only support the possibility of having male elements on one side and female elements on the other side. They do not support the possibility of having one male central element with the female elements of the remaining two coupling portions, and vice versa.

[0008] The known devices do not offer an optimum reliability at these coupling zones. In case of fire, such structures might not be capable of sufficiently block smokes, heat transmission, or flames.

[0009] In addition, a further disadvantage of the known devices is in that they are not capable of phonically insulating rooms. This aspect, even if secondary when a fire develops, is however felt in the absence of fire, when the activities internally to a building take place normally.

[0010] An object of the present invention is therefore to provide a fire device equipped with modular panels that do not let smokes, heat, or flames pass through in case of fire.

[0011] Within the scope of this task, another object of the invention is to provide a fire device equipped with

modular panels that has a continuous structure, even between two successive panels.

[0012] Another object of the present invention is to provide a fire device that also allows to improve sound insulation between the individual rooms.

[0013] These objects and others are achieved by way of a fire device realized according to the technical teachings of the attached claims.

[0014] The concept underlying the present invention is to provide a fire device with improved male-female couplings, and in particular wherein the couplings are provided with, besides already known coupling members, a further coupling portion located in a central zone within the thickness of the panels that make up the fire device, and wherein the central portion of the male part comprises a female element, and reciprocally the central portion of the female part comprises a male element suitable for coupling with the female element of the central portion of the male part.

[0015] Further characteristics and advantages of the invention will be apparent from the description of a preferred but not exclusive embodiment of the fire device, here given for explanatory, hence non-limitative, purposes only in the attached drawings, wherein:

figure 1 is a cross sectional view of a coupling zone of two successive modular panels of a known fire device;

figure 2 is a cross sectional view of a coupling zone of two successive modular panels of a first embodiment of the fire device according to invention;

figure 3 is a cross sectional view of a coupling zone of two successive modular panels of a second embodiment of the fire device according to the invention.

[0016] Figure 2 depicts a detail of a first embodiment of the fire device according to the invention. In particular, figure 2 depicts a coupling zone 1 between two successive modular panels 2, 3 of the fire device.

[0017] It is worth pointing out that the fire device according to the invention can be a movable device, such as a door, or a fixed device, such as a wall.

[0018] The fire device comprises a first modular panel 2 formed of a front surface, a back surface equipped with a coupling element 4, and at least one second modular panel 3 provided at least with a coupling counter-element 5 suitable for co-operating with the coupling element 4.

[0019] Typically are the modular panels 2, 3 made from a composite material that is a bad heat conductor or a heat reflector, such as, for instance, treated mineral wools (stone, fiberglass, wood wools or others), and have a height ranging from 300 to 10,000 mm (i.e. 10 mt), and a thickness S1 generally ranging from 60 to 200 mm.

[0020] The coupling element 4 comprises in turn at least one base plane 40, at least one coupling member 41 projecting from the base plane 40, whereas the coupling counter-element 5 comprises at least one base

counter-plane 50 and at least one counter-seat 51 recessed in the base counter-plane 50 to receive the coupling member 41 of the coupling element 4.

[0021] It is worth pointing out that the base plane 40 and the base counter-plane 50 are properly parallel to each other, and are tilted with respect to the front surface 20, 30 and to the rear surfaces 21, 31 of their respective modular panels 2, 3, preferably perpendicular to said front and rear surfaces.

[0022] The coupling element 4 comprises at least one central coupling portion 42, arranged in a central section of the coupling element 4 with respect to the front surface 20 and to the rear surface 21 of the first modular element 2, and separated from the coupling member 41 by at least a section 43 of the base plane 40, and the coupling counter-element 5 comprises at least one central coupling counter-portion 52 arranged in a central section of the coupling counter-element 5 with respect to the front wall 30 and to the rear wall 31 of the second modular panel 3, and suitable for interacting with the central coupling portion 42 of the coupling element 4, the central coupling counter-portion 52 being separated from the counter-seat 51 at least by a section 53 of the base counter-plane 50.

[0023] Within the scope of the present invention, by coupling (counter-)member projecting from the base (counter-)surface we mean a male coupling member, whereas by (counter-)seat recessed in the base (counter-)surface, we mean a female coupling member.

[0024] The central coupling portion 42 and the central coupling counter-portion 52 possibly comprise a male element or a female element (and a female counter-element or a male counter-element, suitable for interacting with the element of the central portion). The presence of the central (counter-)portion 42, 52 makes it possible to create a further obstacle in the potential path of heat through the fire device 1.

[0025] According to the present invention, the central coupling portion 42 comprises at least one seat 42 recessed in the base plane 40 of the coupling element 4, and the central coupling counter-portion 52 comprises at least one coupling member 52 projecting from the base counter-plane 50 and suitable for being inserted into the seat 42 of the central coupling portion 42.

[0026] Having the seat 42 located in the base plane 40 of the coupling element 4, which already comprises at least one coupling member 41, makes it possible to add a female component to this male coupling element 4, and vice versa. This allows to realize an interpenetration of the coupling element 4 and of the coupling counter-element 5, thus improving the continuity of the structure of the fire device.

[0027] In the example shown in figure 2, the coupling members 41 and the counter-seats 51, as well as the seats 42 and the coupling counter-member 52, have a cross section having a substantially trapezoidal shape. However, it is possible to have another type of shape, provided it is capable of creating an obstructed path be-

tween two modular panels 2, 3.

[0028] Advantageously the coupling element 4 comprises two coupling members 41, and the coupling counter-element 5 comprises two corresponding counter-seats 51, as shown in the attached figures.

[0029] Even more advantageously is the seat 42 of the coupling element 4 arranged in an intermediate position between the two coupling members 41, and the coupling counter-member 52 of the coupling counter-element 5 is arranged in an intermediate position between the two counter-seats 51.

[0030] As shown in figure 2, preferably is the seat 42 of the coupling element 4 separated from both coupling members 41 by corresponding sections 43 of the base plane 40, and the coupling counter-member 52 of the coupling counter-element 5 is separated from both counter-seats 51 by corresponding sections 53 of the base counter-plane 50.

[0031] It is worth pointing out that in the example here illustrated the coupling element 4 comprises one base plane 40 only, from which the coupling members 41 project. However, it is possible to provide a coupling element having two base planes, each per side with respect to the central coupling portion 42, which are not coincident with each other but are parallel. In other words, the coupling element might have two base planes at different heights. The same considerations also apply to the coupling counter-element 5 indeed.

[0032] In the examples illustrated in figures 2 and 3, the seat 42 of the coupling element 4 and the coupling counter-member 52 of the coupling counter-element 5 have a thickness S2, preferably ranging from 30% to 60% of the thickness S1 of the modular panels 2, 3, preferably ranging from 40% to 55% of the thickness S1 of the modular panels 2, 3. Such thickness S2 of the seat 42 and of its corresponding coupling counter-element 52 is measured at their bases, i.e. at the base plane 40 and at the base counter-plane 50 respectively.

[0033] It is worth pointing out that other embodiments can be implemented wherein the thickness S2 can have a value whatsoever. For instance, it is also possible to support the presence of two or several seats 42 or coupling counter-members 52 between the coupling members 41 and the counter-seats 51.

[0034] As shown in figure 2, the coupling element 4 advantageously comprises at least one edge seat 44 recessed with respect to the base plane 40 and arranged between a coupling member 41 and an edge 45 of the coupling element 4, and the coupling counter-element 5 comprises at least one edge coupling counter-member 54 projecting from the base counter-plane 50 and arranged between a counter-seat 51 and an edge 55 of the coupling counter-element 5.

[0035] Such edges 45, 55 of the coupling (counter-)element 4, 5 coincide with a section of the front surfaces 20, 30 and of the rear surfaces 21, 31 of the modular panels 2, 3.

[0036] In the example of figure 2, the coupling element

4 comprises two edge seats 44, directly placed side-by-side to their respective coupling member 41, i.e. there is no section of the base plane 40 between the edge seats 44 and the coupling members 41. Likewise, the coupling counter-element 5 comprises two edge coupling members 54 directly placed side-by-side to the seats 51, without any section of the base counter-plane 50 interposed between each other.

[0037] It is advantageous to specify that the coupling counter-member 52 of the coupling counter-element 5 have a length L1, in a direction perpendicular with respect to the base counter-plane 50, less than or equal to the length L2, in a direction perpendicular with respect to the base counter-plane 50, of the edge coupling counter-member 54. In this way, the coupling counter-element 52 is confined within the space occupied by the coupling counter-element 5, which allows to limit scraps as well as to protect such coupling counter-element 52 while the modular panels 3 are transported, until assembling the fire device 1.

[0038] It is also worth pointing out that preferably is the length L2 of the edge coupling counter-member 54 substantially equal to the length of the edge seat 44, i.e. the distance between the base plane 40 and the bottom of the edge seat 44. In this way, the labyrinth created by the cross section of the device 1 is even more efficient in preventing smokes from passing through.

[0039] The coupling element 4 and the coupling counter-element 5 of the device according to the invention are more compact, and provide a better continuity in the structure of the device between the modular panels 2, 3 that make it up.

[0040] The operation of the invention is the following.

[0041] The first operation consists of preparing a plurality of modular panels 2, 3 provided with coupling elements 4 and/or coupling counter-elements 5, which are reciprocally fitted in to assemble the modular panels 2, 3 between each other.

[0042] Such panels 2, 3, having so been assembled, are subsequently coupled together and erected in a building.

[0043] Should a fire develop, the continuous structure of the fire device makes it possible to effectively block flames, smokes, and heat. As a matter of fact, the only discontinuities that exist are the cracks in every coupling zone 1, such cracks being thin and featuring an obstructed path.

[0044] Figure 3 depicts a variant of the fire device according to the present invention. The elements that are common to the previously described first embodiment will not be described again and will be identified by the same reference numbers, to which a prime has been added.

[0045] In the variant depicted in figure 3, the coupling element 4' also comprises an intercalated seat 46' and the coupling counter-element 5' also comprises an intercalated counter-seat 56'. Such intercalated seat 46' and intercalated counter-seat 56' are suitable for co-operating with each other to form a space 6' where an interca-

lated element 7' can be inserted, once the modular panels 2', 3' are reciprocally assembled.

[0046] Preferably the intercalated seat 46' and the intercalated counter-seat 56' have a rectangular cross section, as well as the intercalated element 7' intended for being inserted inside the space 6'.

[0047] Such intercalated seat and counter-seat 46', 56' are located in a position that is substantially central with respect to the thickness S'1 of the modular panels 2', 3', hence in correspondence with the seat 42' and with the coupling counter-member 52', the latter being depicted in an intermediate position with respect to the coupling members 41' and to the counter-seats 51', respectively.

[0048] It is also worth saying that it is advantageous to specify that the coupling element 4' and the coupling counter-element 5' have a cross section symmetrical with respect to a central axis parallel to the front and rear surfaces of the modular panels 2', 3'.

[0049] Obviously, it is convenient to specify that the fire device be also equipped with an intercalated element 7' inserted in the intercalated space 6'. Such intercalated element 7', also made from a material featuring a poor thermal conductivity, besides improving the fire performances of the device, also makes it possible to stop the sound waves, thus giving a sound insulation property to the fire device.

Claims

1. A fire device, comprising
 - a first modular panel (2, 2') equipped with a coupling element (4, 4');
 - at least one second modular panel (3, 3') equipped at least with one coupling counter-element (5, 5') suitable for co-operating with said coupling element (4, 4');
 - wherein said coupling element (4, 4') comprises in turn at least one base plane (40, 40') tilted with respect to a front surface (20, 20') and to a rear surface (21, 21') of said first modular panel (2, 2');
 - at least one coupling member (41, 41') projecting from said base plane (40, 40');
 - and said coupling counter-element (5, 5') comprises at least one base counter-plane (50, 50') tilted with respect to a front surface (30, 30') and to a rear surface (31, 31') of said second modular panel (3, 3') and parallel to said base plane (40, 40');
 - a counter-seat (51, 51') recessed with respect to said base counter-plane (50, 50') to receive said coupling member (41, 41') of the coupling element (4, 4');
 - wherein said coupling element (4, 4') comprises at least one central coupling portion (42, 42'), arranged in a central section of said base plane (40, 40') with respect to said front surface (20, 20') and rear surface (21, 21') of said first modular panel (2, 2'), and separated from said coupling member (41, 41') at least by a section (43, 43') of said base plane (40,

40'); and wherein said coupling counter-element (5, 5') comprises at least one central coupling counter-portion (52, 52'), arranged in a central section of said base counter-plane (50, 50') with respect to said front surface (30, 30') and rear surface (31, 31') of said second modular panel (3, 3'), and suitable for interacting with said central coupling portion (42, 42'), said central coupling counter-portion (52, 52') being separated from said counter-seat (51, 51') at least by one section (53, 53') of said base counter-plane (50, 50');

said device being **characterized in that**

the central coupling portion (42, 42') comprises at least one seat (42, 42') recessed in the base plane (40, 40'), and **in that** the central coupling counter-portion (52, 52') comprises at least one coupling member (52, 52') projecting from the base counter-plane (50, 50') and suitable for being inserted into said seat (42, 42') of the central coupling portion (42, 42').

2. A device according to claim 1, **characterized in that** said coupling element (4, 4') comprises two coupling members (41, 41'), and said coupling counter-element (5, 5') comprises two corresponding counter-seats (51, 51').
3. A device according to claim 2, **characterized in that** said seat (42, 42') of the coupling element (4, 4') is arranged in an intermediate position between the two coupling members (41, 41'), said coupling counter-member (52, 52') of said coupling counter-element (5, 5') being arranged in an intermediate position between the two counter-seats (51, 51').
4. A device according to claim 3, **characterized in that** said seat (42, 42') of the coupling element (4, 4') is separated from both coupling members (41, 41') by corresponding sections (43, 43') of the base plane (40, 40'), said coupling counter-member (52, 52') of the coupling counter-element (5, 5') being separated from both counter-seats (51, 51') by corresponding sections (53, 53') of the base counter-plane (50, 50').
5. A device according to any of the previous claims, **characterized in that** said seat (42, 42') of the coupling element (4, 4') and said coupling counter-member (52, 52') of the coupling counter-element (5, 5') have a thickness (S2, S'2) at the base plane (40, 40') and at the base counter-plane (50, 50') respectively, ranging from 30% to 60% of the thickness (S1, S'1) of the modular panels (2, 2', 3, 3'), preferably from 40% to 55% of the thickness (S1, S'1) of the modular panels (2, 2', 3, 3').
6. A device according to any of the previous claims, **characterized in that** the coupling element (4, 4') comprises at least one edge seat (44, 44') recessed

with respect to the base plane (40, 40') and arranged between a coupling member (41, 41') and an edge (45, 45') of the coupling element (4, 4'), and **in that** the coupling counter-element (5, 5') comprises at least one edge coupling counter-member (54, 54') projecting with respect to the base counter-plane (50, 50') and arranged between a counter-seat (51, 51') and an edge (55, 55') of the coupling counter-element (5, 5').

7. A device according to claim 6, **characterized in that** the coupling counter-member (52, 52') of the coupling counter-element (5, 5') has a length (L1, L'1), in a direction perpendicular with respect to the base counter-plane (50, 50'), less than or equal to the length (L2, L'2), in a direction perpendicular with respect to the base counter-plane (50, 50'), of the edge coupling counter-member (54, 54').
8. A device according to any of the previous claims, **characterized in that** the coupling element (4') also comprises an intercalated seat (46') and **in that** the coupling counter-element (5') also comprises an intercalated counter-seat (56'), said intercalated seat (46') and intercalated counter-seat (56') being suitable for co-operating with each other to form a space (6') for inserting an intercalated element (7') therein.
9. A device according to claim 8, **characterized in that** it comprises an intercalated element (7') inserted into the intercalated space (6').

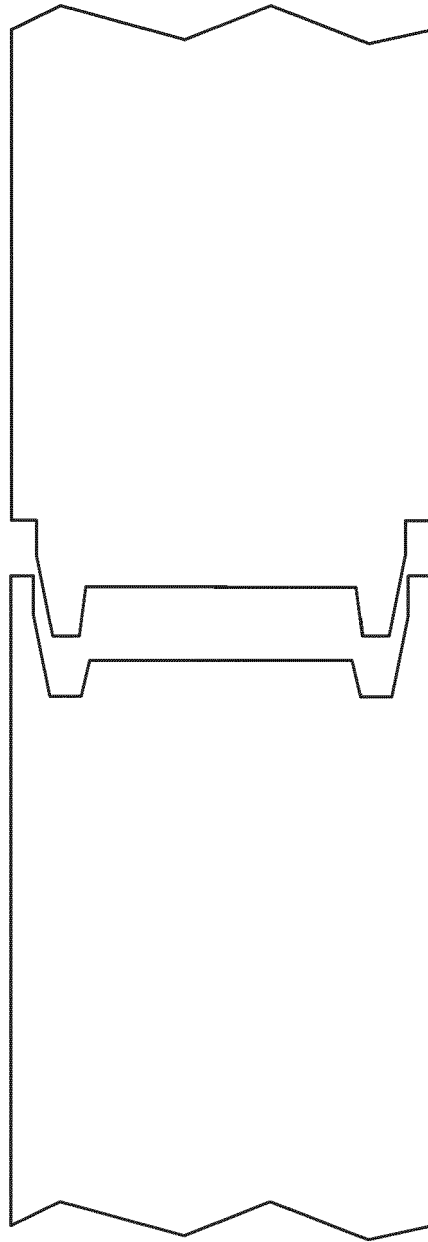


Fig. 1

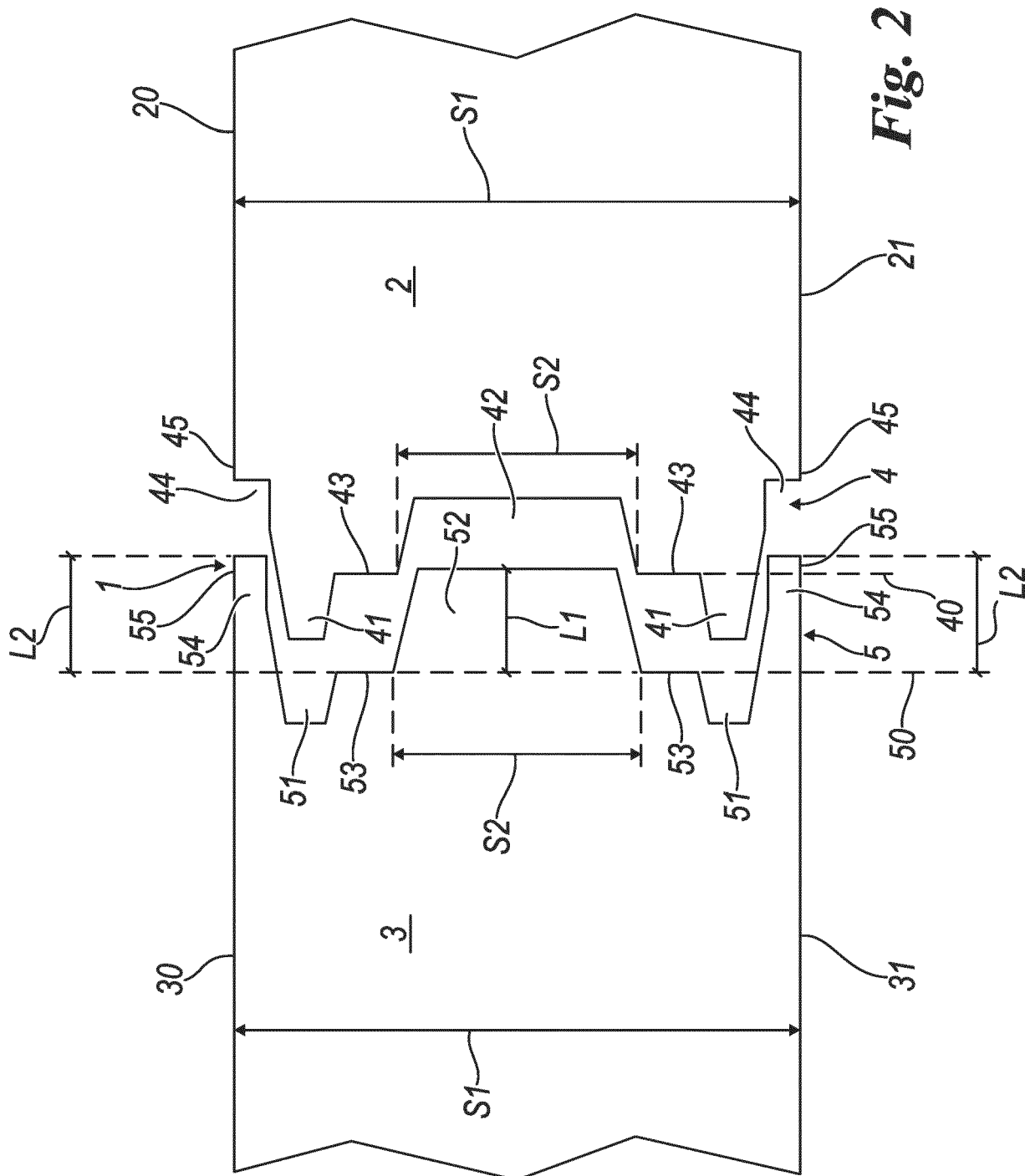


Fig. 2

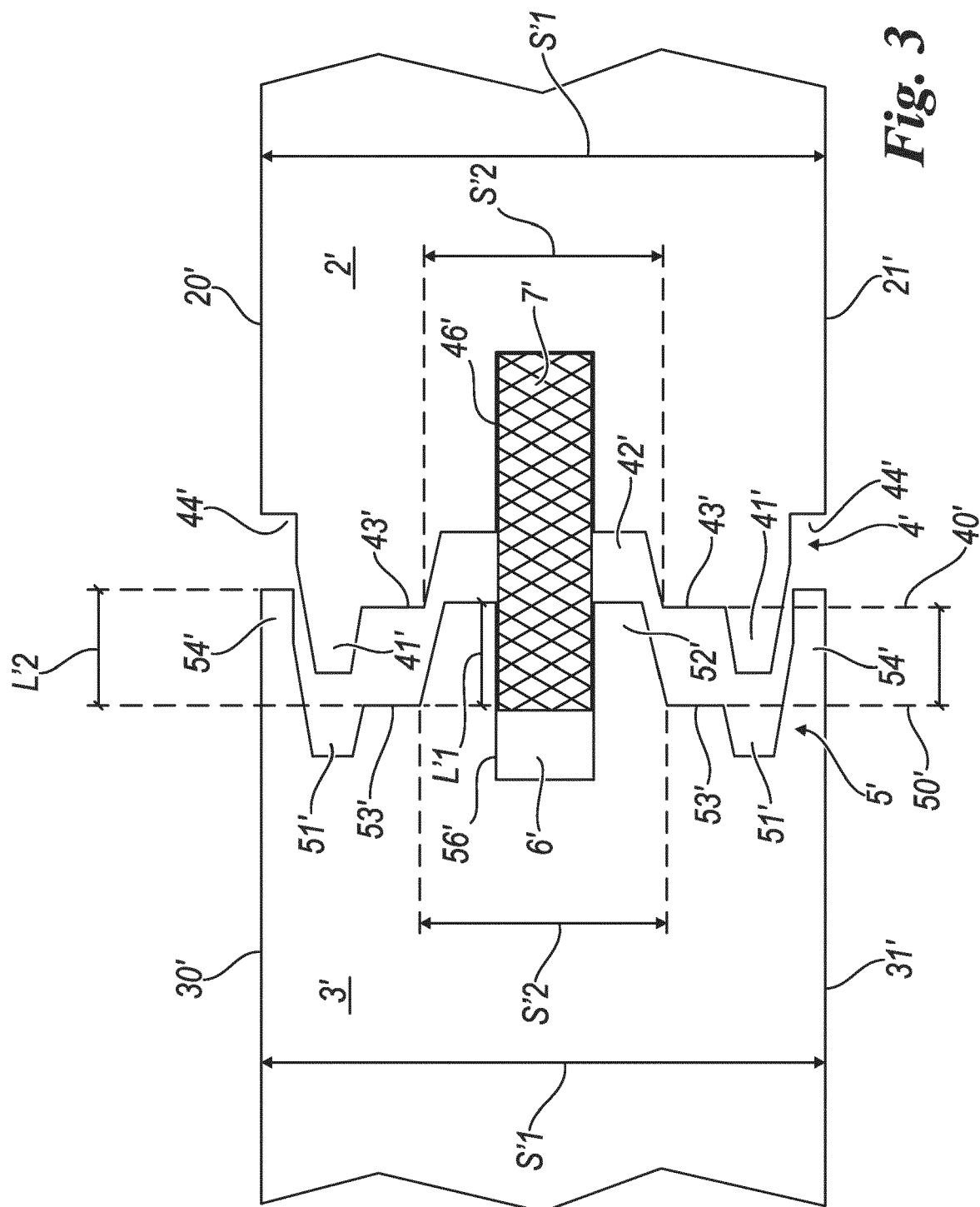


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 17 16 5081

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 May 2017	Examiner Manera, Marco
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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