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(54) Laminar article of manufacture, gasket made thereof and process of fabrication

(57) Perimetral gasket (la) to be applied on the edge of a panel or a glass pane (1b) to be installed in supporting frame (1c) may be easily fabricated in the size and length needed from a laminated ribbon-like composite article of manufacture that can be stored in rolls.

The laminated composite article comprises an outer sealing portion (2) of elastically deformable material covering a core portion (3) of a plastically deformable material. The core (3) is preferably a metal ribbon of aluminium, enveloped in an elastomer (2). The ribbon-like composite may be plastically deformed to realize a channel-shaped gasket (1a) to be fitted on the perimetral edge of the panel.

Various embodiments and processes of fabrication are disclosed.

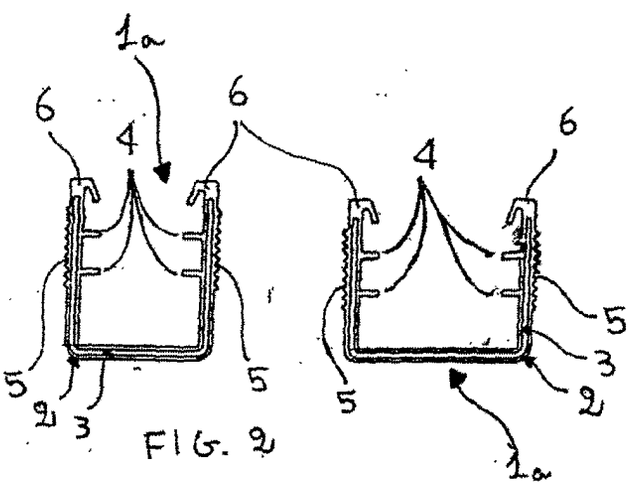

FIG. 2

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Description

[0001] The present invention relates to a laminated article of manufacture as well as to a gasket that may be fabricated from said laminated article of manufacture.

[0002] Moreover this invention relates to a process for fabricating such a laminated article and to a process for forming a gasket from said laminated article.

[0003] Panel structures employing support frames on which panels are eventually installed are employed in innumerable situations, for example to realize sliding doors, alantable windows and/or fixed closures.

[0004] Often panel structures contemplate the use of at least partially transparent panels, usually made of glass or of transparent plastic materials such as for example polystyrene, polycarbonate and the like, to define interior spaces to be sealed by the panels from wind and/or rain infiltrations.

[0005] Glass or plastic panels for fabricating doors, windows, glass walls for interior or exterior and the like are familiar examples.

[0006] At present, for installing the panels in the supporting frames, common glass panel stopper gaskets are used, commonly in the form of extruded gasketing articles that may be fitted between the perimetral edge portion of the panel and a corresponding receiving seat of the supporting frame.

[0007] These gaskets may have the function of mechanically restraining the panel fitted in the frame as well as preventing infiltrations of water (rain) and the passage of air.

[0008] From the manufacturing point of view, these gaskets are fabricated according to known processing of extruded or co-extruded plastic material, either homogeneous or composed of two different materials.

[0009] The panel assembler ordinarily cuts the extruded gasket in segments of appropriate lengths to be placed along the four sides of the generally rectangular panel. appropriate lengths to be placed along the four sides of the generally rectangular panel.

[0010] These known techniques have drawbacks.

[0011] The fitting of the gaskets around the perimeter of the panel is normally made manually implying relatively long working times and relative manpower costs.

[0012] Moreover, the known techniques require the use of a non negligible amount of adhesives and/or sigillants for ensuring the absence of discontinuities of the sealing at corners as well as in the area of mutual engagement of the gasket with the panel surface and with the surface of the supporting frame. Application of sigillants increases costs and constitutes a significant work burden. Adhesives and/or sigillants when accidentally applied in excess may be squeezed out of the abutment areas causing inesthetisms.

[0013] Another major drawback of know techniques is that a gasket is fabricated with an appropriate cross sectional shape to be used on a well defined type of panel. This is a great inconvenient in terms of the rigidity it implies in programming fabrication and in keeping adequate inventories of gaskets of different size.

[0014] Storage and transportation of gaskets are also burdened by the fact that the various types of gaskets are produced in rectilinear segments of generally great length.

[0015] The main aim of the present invention is to provide a laminated article of manufacture and a gasket formable therefrom overcoming at lessening the above-noted drawbacks of the known techniques.

[0016] Object of this invention is a laminated article of manufacture from which it is possible to form in a simple way and by simple tools a gasket to be readily mounted along the perimetral of the panel and able to ensure upon the assembly of the panel an effective sealing.

[0017] Another important objective of the invention is that the laminated article of manufacture be formable in a way to freely adjust the geometry and dimensions of the resulting gasket, according to need.

[0018] Another objective of this invention is a gasket that may be directly mounted on the edges of the panel and upon assembly of the panel prevent infiltrations of air, water and/or other atmospheric agents without the use of adhesives and/or sigillants or with an extremely limited use of these materials.

[0019] Another objective of this invention is a laminated article as well as a gasket formable from said laminated article having structure and function characteristics allowing an enhanced automation of the fabrication processes not only limited to the laminated article but also to gaskets or even panels prefitted with perimetral gaskets.

[0020] Another objective of the present invention is to provide a laminated article that may be fabricated, stored and transported in a more flexible and less burdensome manner than prior art gasket material and in particular a laminated article capable of being stored for indefinite time in an outstandingly compact form.

[0021] Finally an objective of this invention is to provide a laminated article, a gasket formable from the laminated article and processes of fabrication and assembly of relatively simple and quick execution such to reduce working times and costs.

[0022] The above objectives are effectively reached by a laminated article of manufacture and a gasket that may be formed from said laminated article having the characteristics defined in one or more of the annexed claims.

[0023] A description of preferred embodiments of the invention will follow now for the only purpose of better illustrating the invention, with reference to the attached drawings, wherein:

- **Figures 1a, 1b** and **1c** show cross section of several alternative embodiments of the laminated article of manufacture of this invention;

- **Figure 2** shows two alternative embodiments of gaskets obtained from the laminated article of Figures 1a, 1b and 1c:

- **Figure 3** shows the gasket of Figure 2 fitted on the perimeter of panels;

- **Figure 4** shows gasket + panel + supporting frame assemblies made according to the present invention;

- **Figure 5** is a schematic view of a plant for forming a gasket according to the present invention;

- **Figure 6** is a schematic plan view of a plant for forming a gasket and for mounting the gasket on a panel;

- **Figure 7** is a schematic plan view of an alternative embodiment of the plant of Figure 6;

- **Figure 8** is a perspective view of a panel provided with a perimetral gasket according to the present invention;

- **Figure 9** is a perspective view of a panel being provided with perimetral gasket according to the present invention.

[0024] With reference to the above figures, the composite laminated article of manufacture of this invention is indicated as a whole with number 1.

[0025] The article has an outer part providing for the sealing 2 and a core 3. The latter is at least partially surrounded by the outer part 2 and in practice constitutes the part of the laminated article 1 having significant mechanical resistance to traction, elasticity, rigidity and so forth.

[0026] The core 3 is made of a material that is, on the other hand, able to undergo plastic deformation such that the core may be easily and permanently shaped from a substantially laminar original form to a channel-shaped form through a forming process that is performed to produce a channel-shaped gasket suitable to be installed onto the perimeter of a generally flat panel 1b, for example a glass pane.

[0027] Going into construction details, it should be noted that the core 3 may originally be in the form of a lamina. According to a particularly effective embodiment of this invention, the lamina constituting the core 3 of the composite laminated article is made of metal and preferably of aluminium.

[0028] The sealing portion 2 of the composite laminated article is of an elastic material such as an elastomer or in many case a material having an iperelastic behaviour. For example siliconic rubber or any other rubber-like material, such as for example soft PVC and the like, may be employed. As will be described more in detail later, the laminated article 1 may advantageously be used for making a gasket.

[0029] For reasons that will become more evident in the following description, the sealing part 2 covers at least partially the core 3 and more precisely at least one of the edge or lateral portions 3b of the core, as referred to the middle or central portion 3a of the core. In any case, a particularly preferred embodiment of this invention contemplates that the sealing part 2 extends itself to completely envelop the core 3 like an envelope or outer coat. The sealing part 2 may substantially be formed as an envelope of elastomer surrounding completely the core 3. According to this embodiment, the metallic lamina constituting the core 3 remains completely sealed from the atmosphere and possible corrosion and/or passivation phenomena of the metallic lamina may be prevented.

[0030] With the laminated article 1 having the above described characteristics, a gasket 1a may be fitted between the perimetral portion of a panel and a support frame 1c (for example a cabinet door, a shower box glass pane) may be formed.

[0031] Such a gasket 1a will be composed of a core 3 which is at least partially plastically shaped such to define a channel-shaped cross section matching the edge geometry of the panel and by a sealing part 2 joined by lamination to at least a portion of the core 3.

[0032] It must be remarked that by the expression perimeter, perimetral portion and edge portion, as referred to the panel, is intended in practice the edge of the panel which may have any cross sectional shape (for example rectangular, square, elliptical and so forth).

[0033] The core 3 of the laminated article 1 is formed by permanent plastic deformation of the originally flat or ribbon-like article such to produce substantially a counter shape of the edge of the panel onto which the gasket 1a must be fitted. Appropriate dimensioning cause the sealing part of the shaped gasket formed from the laminated article to abut against surfaces of the perimetral portions of the panel contributing in a decisive manner in insuring an effective isolation between two spaces separated by the panel. The sealing part 2 being on the surfaces of the receiving seat of the supporting frame 1c of the panel, will prevent air and/or water infiltrations between the surfaces of the gasket and of the frame.

[0034] It should be remarked that by virtue of the outstandingly simple structure of the gasket 1a of this invention of the fitting of the gasket 1a to the panel and of the gasket panel to the supporting frame 1c, promotes the establishment of a perfect seal against infiltration of air and rain over relatively ample zones. It should also be remarked that to achieve such a technical effect it is even possible to envelop with the elastomer of the sealing part 2 only the more "external" portions, that is only the side portions 3b of the core 3.

[0035] Conveniently, whenever required, it is even possible to envelop entirely the core 3 with a layer of the sealing material 2.

[0036] The gasket 1a may even include, as shown,

primary gripping means 4, that may be molded on the sealing part 2, functionally enhancing the fastening of the gasket to the edge portion of the panel on which the gasket is forcibly fitted. Moreover, besides said primary gripping means 4, there may be formed also secondary gripping means 5, molded on the sealing part 2 for promoting a close fitting of the gasketed perimeter of the panel in the seat of the supporting frame 1c to enhance the sealing.

[0037] A sealing lips 6 may be formed along the edges of 3b of the core 3 for more effectively establishing a secure sealing against infiltrations of air, rain and other atmospheric agents between the edge portion of the panel and the channel-shaped gasket.

[0038] The gripping means 4 and 5 as well as the sealing lips 6 may have different shapes, for example in form of extended teeth, parallel crests and trapezoidal shaped engrossment of the thickness of the elastomer outer layer 2. These protrusions may be formed in a simple and precise manner during an eventual co-extrusion process of the elastomer material of the sealing part 2 and of the core 3.

[0039] According to the present invention, once the core 3 of the laminated article 1 has been shaped by plastically deforming it to define a gasket 1a, the core 3 will have assumed a cross section that at least partially will match the shape of the cross section of the perimetral portion or edge of the panel on which the gasket must be fitted.

[0040] According to particularly preferred embodiments of this invention, the core 3 may be shaped in the form of a "C" or of a "U". In this case, the lateral portions 3b will, after having been bent, constitute substantially the lateral arms (parallel or divergent) of the "C" or "U" cross section, while the central portion 3a of the lamina will substantially constitute the middle portion of the "C" or of the "U" cross section (that is the portion comprised between the lateral arms).

[0041] The invention includes also a panelling element 1b (re: Figures 8 and 9) that may be set in a supporting frame 1c (for example to compose a wall, a panel of a shower box and the like). From the structural point of view, such a panelling element 1b comprises a pane (of any shape, for example rectangular or square) provided with a gasket 1a of the type described above disposed on at least part of its perimeter or edge 8. Such a gasket 1a may be fitted around the entire perimeter or only on part of it, for example on one or several sides of the perimetral edge 8 of the panel, according to the particular application.

[0042] It is part of this invention also a process for fabricating a laminated article 1 as described above.

[0043] According to such a process, firstly a flat ribbon-like core 3 is procured, preferably of a metal or in any case of a material suitable to be plastically deformable into a different permanent shape and to this core 3 an outer sealing layer 2 of an elastomer or of a material having a iper-elastic behaviour is associated by lamination.

[0044] Such a sealing part 2 may be laminated over part of the core and may surround partially or entirely the core 3 which will either be partially or completely coated by the layer of sealing material 2.

[0045] The association of the sealing part 2 to the core 3 may be made by co-extrusion. The core 3 is co-extruded with the extrudable material of the sealing part 2 such o be at least partially (or entirely) enveloped by the sealing material 2 thus laminated thereon.

[0046] Starting form the laminated article 1 so fabricated, a gasket 1a of the type described above may be realized by an appropriate process.

[0047] Substantially, such a process consists in deforming the laminated article to shape it into a form that is practically complementary to the shape of the edge of the panel on which the gasket so-formed 1a must be fitted.

[0048] Alternatively it is even possible to merge the processes of fabrication of the laminated article 1 and of subsequent plastic deformation thereof to shape the desired gasket, for example by procuring a specially designed co-extrusioned head wherein, ribbon-like lamina core 3 fed therethrough is progressively deformed to shape it in a channel of desired geometry by virtue of the particular geometry of the passage or throat of the extrusion head, the cross section of which (lumen) may, for example progressively vary from a substantially plan form to become a "C" shaped form, the elastomer in a fluid state or in any case not yet chemically and/or thermically stabilized, is injected through appropriate conduits to meet the advancing channel-shaped plastically deformed core and the composite is eventually extruded out of the head to produce sealing layer 2 intimately joined to the core 3.

[0049] Alternatively plastic deformation of the core 3 may be preformed immediately in cascade to the co-extrusion step by arranging a series of shaping rolls 9, at the exit of the co-extrusion head properly arranged and oriented in such a way to progressively bend the laminated co-extruded article to the desired channel shape. According to embodiments of particular usefulness, the core 3 of the article 1 is eventually shaped to assume a "C" or a "U" cross sectional shape.

[0050] According to this invention even a process for fabricating panelling elements 1b provided with perimetral gaskets is possible by sequentially feeding a laminated ribbon-like article 1 of the type described above along a certain direction of advancement 10, that in practice is the direction along which the fabrication line develops The line may include at least a station of co-extrusion and one or several gasket forming stations 11, organized in cascade of the co-extrusion station, each provided with a plurality of shaping rolls 9 arranged along the advancement direction 10.

[0051] The perimetral gaskets are associated to a panelling element 1b by fitting the gasket 1a along the perimeter 8 of the panel (re.: figures 6 and 7). This is

done by bending (by the action of the shaping rolls 9) the laminated article 1 around the edge of the panel, thus precisely conforming the gasket to the edge exploiting the ability to yield of the elastomer outer layer 2.

[0052] For further enhancing stability of the assembly and the sealing, it is even possible to apply, at a number of points glue and/or sigillant between the gasket and the edge of the panel on which the gasket is going to be fitted. It should be remarked though that because of intrinsic abilities of the gasket assembly to provide for a good stability and sealing, such optional additions of sigillant and/or glue, may be limited only to the points of discontinuity between opposite ends of the gasket 1a, thus limiting the use of these materials and simplifying altogether the assembly work compared to prior art processes.

[0053] According to the above process, the core 3 of the laminated composite 1 is plastically deformed and simultaneously the gasket 1a is fitted over the perimetral edge of the panel by passing the perimetral edge 8 of the panel and the laminated composite 1 through the forming rolls 9 such to bend the latter countershaping it around the edge of the panel itself, thus fastening the gasket thereon.

[0054] It is also to be remarked that it is possible to fasten the gasket 1a to the panel simultaneously along more than one side of the panel. In the example schematically illustrated in Figure 7, two shaping and fitting stations of the gasket 1a may be arranged parallel to one another along the same direction of advancement 10 (to be traversed eventually in opposite directions). The panel (that in Figure 7 has a rectangular shape) may be moved in such a way to receive the gasket 1a on its parallel sides simultaneously.

[0055] It is even possible to cut a series of juxtaposed indentations or die stamp them along the opposite sides of the flat laminated article 1 (or of the already formed channel-shaped gasket 1a), in cascade (1d in Figures 5, 6 and 7)of the co-extrusion head or of the shaping station or while the laminated ribbon-like article is being enrolled from a roll (a form used for storing an inventory of laminated articles 1). These cuts or indentations may even be produced in the shaping stations 11 disposed along the advancement direction 10 of a fabrication line. These juxtaposed cuts have the purpose of defining segments of laminated article 1 or of pre-shaped gasket 1a, of predetermined length (for example corresponding to the length of the side of the panel on which the segments of gasket must be fitted), or even to define and prearrange zones in which the channel-shaped gasket may be bent to follow a rounded portion of the perimeter 8 of the panel.

[0056] By prearranging a plurality of juxtaposed pairs of opposing indentations closely spaced along the laminated article 1, it is possible to bend the resulting gasket 1a to match curvilinear edges of panels (e.g. elliptical, circular and alike).

[0057] The invention produces important advantages.

[0058] First of all it is to be remarked that the particular structure of the laminated article coupled with the peculiar physical and mechanical characteristics of the materials employed for fabricating the composite article provide for an outstanding formability and consequently a great flexibility to adopt the gasket to different thicknessess that the panels may have.

[0059] The characteristics of the laminated article 1 and of the gasket 1a made from it enhance sealing against air, water and/or other atmospheric agent infiltrations. This important result is achieved practically without employing glues and/or sigillant (or limiting their use to negligible quantities).

[0060] The laminated article 1 of this invention may be readily and economically be fabricated with substantially common machines commercially available with extremely high productivity. The simplicity and ease of fabrication are also reflected in the process of this invention for making a gasket and even more so in the process of this invention for fabricating panelling elements already fitted with perimetral gaskets.

[0061] By virtue of the employed materials and geometries of the articles of the present invention the fabrication processes are all amenable to a high level of automation with evident advantages in terms of cost reduction and workmanship.

[0062] A further advantage consists in that the laminated article of this invention by virtue of its planarity and plastic deformability characteristics may be most conveniently stored in the form of rolls rendering possible a far more efficient exploiting of logistic storage spaces, besides facilitating the distribution of the product on the market.

[0063] It should also be remarked that the possibility of having rolls of any length optimizes the production of gaskets that may be programmed at the most appropriate moment while minimizing the amount of discarded materials.

[0064] It should also be remarked the fact that the articles of manufacture made according to this invention are all flexibly adaptable to an ample range of applications enhancing ease of fabrication and cost reduction.

Claims

1. A laminated ribbon-like composite article of manufacture storable in rolls, comprising an outer sealing portion (2) and a core portion (3) at least partially covered by said sealing portion (2), **characterized in that** said core (3) is of a plastically deformable material for realizing a channel-shaped gasket to be fitted on the perimetral edge of a panel (1b).

2. The article of manufacture of claim 1 wherein said sealing portion (2) is of a elastomer belonging to the group composed of siliconic rubber, polyvinilchloride, and the core portion (3) is of a metallic material,

preferably aluminium.

3. The article of manufacture according to any of the preceding claims, wherein said sealing portion (2) covers at least a side portion (3b) referred to a central portion (3a) of said core (3).

4. The article of manufacture according to claim 3, wherein said sealing portion (2) envelops completely said core (3).

5. A laminated composite article of manufacture comprising:

a core (3) of a material plastically deformable from an original flat geometry to a geometry defining a channel-shaped gasket to be fitted on part or the all perimeter of a panel (1b);
and a sealing portion (2) of elastically deformable material covering said core (3).

6. A gasket between a perimetral portion of a panel (1b) and a supporting frame (1c) comprising a core (3) of a plastically deformable material for defining a channel-shaped gasket conforming to said perimetral portion of the panel and a sealing portion (2) of an elastically deformable material covering at least partially said core (3).

7. The gasket according to claim 6, **characterized in that** it is made from a laminated article of manufacture (1) according to any of the claims from 1 to 5 by laminated article of manufacture (1) according to any of the claims from 1 to 5 by plastically deforming said core (3).

8. The gasket according to claim 7 wherein side portion (3b) of said core (3) are bent such to define a channel-shaped gasket having a cross section in form of a "C" or "U".

9. The gasket according to any of the claims form 6 to 8, further comprising

primary gripping protrusions (4) of said sealing portion (2) engageable between said sealing portion and opposite faces of said panel;

secondary gripping protrusions (5) of said sealing portion (2) engageable between the sealing portion and the supporting frame (1c); and

an engrossment (6) of said sealing portion (2) along at least one of the two edges of said core (3) for establishing a sealing by elastic compression of the engrossment (6) of said sealing portion (2) against at least a face of said panel against infiltrations of air and/or rain and/or other atmospheric agents.

10. The gasket according to claim 9, wherein said core (3) is shaped in form of a "C" or "U", said side portions (3b) constituting arms, parallel or divergent, said "C" or "U" and the central portion (3a) constituting the part of said "C" or "U" comprised between said arm portions.

11. A gasket applicable on at least part of the perimeter of a panel, comprising:

a core (3) of plastically deformable material; and
a sealing portion (2) of an elastically deformable material entirely covering said core (3).

12. A panelling element (1b) comprising a panel to be installed in a supporting frame (1c), the panel having a main portion (7) and a perimetral or edge portion (8), **characterised in that** said panelling element (1b) further comprises at least a gasket (1a) fitted on the all or at least a part of said perimetral portion (8), said gasket (1a) being as defined in any of the claims from 6 to 10.

13. A process for making a laminated, ribbon-shaped, composite article of manufacture (1) according to any of the claims from 1 to 5, comprising the steps of:

procuring said core (3); and
laminating on said core (3) said sealing portion (2) such to covers at least partially said core (3).

14. The process according to claim 13, wherein the two steps are performed in sequence or simultaneously.

15. The process according to claim 13 or 14, wherein the lamination of said sealing portion (2) to the core portion (3) is carried out by co-extruding the material of said sealing portion (2) around said core (3).

16. A process for making a gasket (1a) according to any of the claims from 6 to 11, comprising the steps of

procuring a laminated article (1) according to any of the claims from 1 to 5, and laminating on said core (3) of plastically deformable material said sealing portion (2) of elastically deformable material;

plastically deforming the laminated article (1) to shape it into a channel-shaped form whereby two side portions (3b) in respect to a central portion (3a) of said core are bent at a certain angle in respect to the plane of said central portion (3a).

17. The process according to claim 16 wherein the step of laminating said sealing portion (2) on the core portion (3) and the operation of plastically deforming the laminated composite (3) take place in an uninterrupted sequence.

18. The process according to claim 16 or 17, wherein the plastic deformation take place by passing the laminated article (1) to a plurality of shaping rolls (9) of appropriate geometry and spatial arrangement.

19. The process according to any of the claims from 16 to 18 or according to any of the claims from 13 to 15, further comprising forming by die stamping juxtaposed indentations or cuts along the laminated article (1) or the channel-shaped gasket formed therefrom (1a), defining segments of predetermined length.

20. The process for making a panelling element (1b) according to claim 12, comprising the following steps:

moving a laminated article (1) according to any of the claims from 1 to 5 along a direction of advancement (10);
plastically deforming the core (3) of said laminated article (1) in a shaping station (11) disposed along said direction of advancement (10) such to obtain a gasket (1a) according to any of the claims from 6 to 10, along said direction of advancement (10); and
fitting said gasket on a perimetral portion (8) of a panel.

21. The process according to claim 20, wherein the deformation of the laminated article (1) precedes the fitting of the gasket (1a) to the panel, the fitting of the gasket (1a) to the panel being made by forcing the channel-shaped gasket (1a) over the edge of the perimetral portion (8) of the panel.

22. The process according to claim 20, wherein the plastic deformation of the core (3) of the composite laminated article (1) and the fitting of the gasket on the perimetral portion (8) of the panel are performed in a single operation.

23. The process according to claim 21, wherein said plastic deformation step of the core (3) and fitting of the gasket (1a) to the panel includes the following operations:

resting the laminated article (1) on an edge of the panel; and
plastically conforming the laminated article countershaping it around the edge of the panel by bending and pressing devices of the laminated article around the edge of the panel.

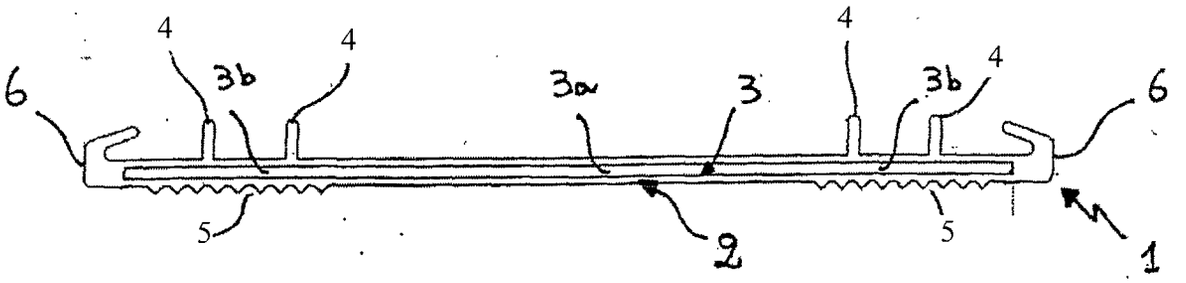

FIG. 1a

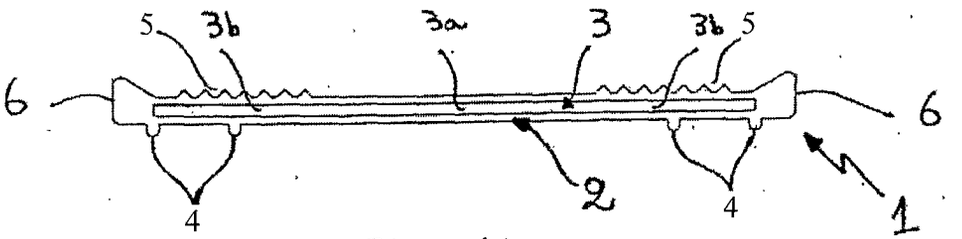

FIG. 1b

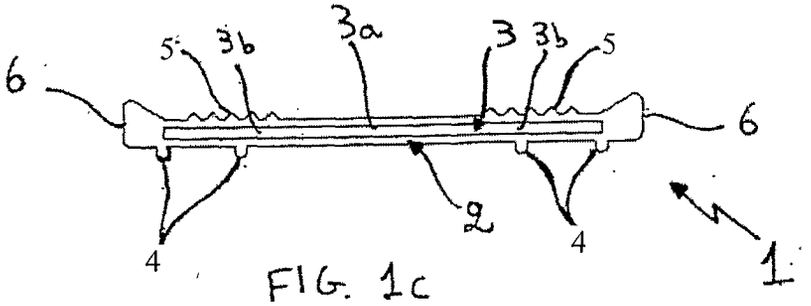

FIG. 1c

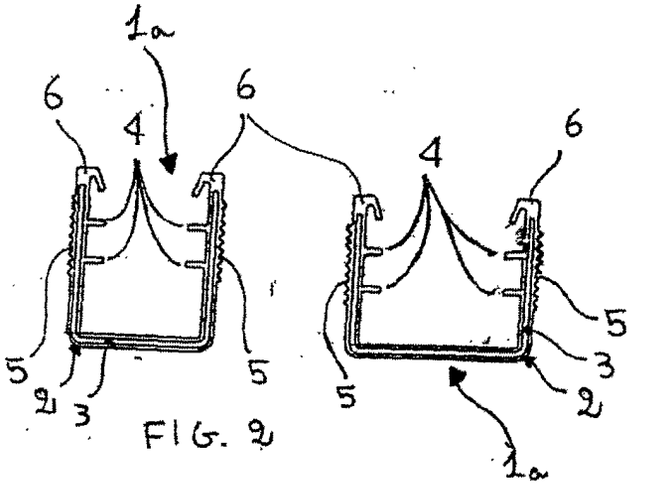

FIG. 2

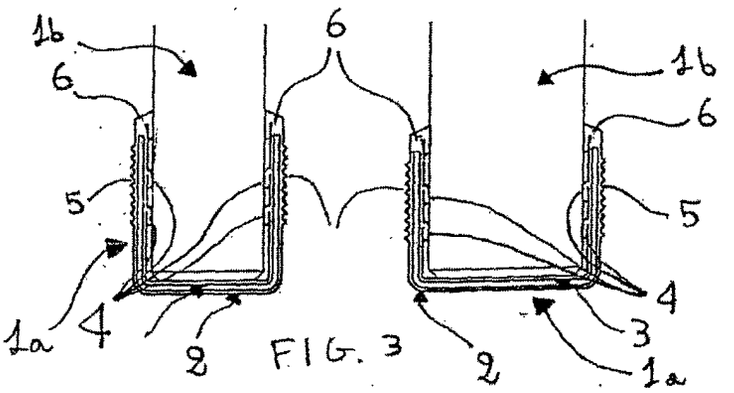

FIG. 3

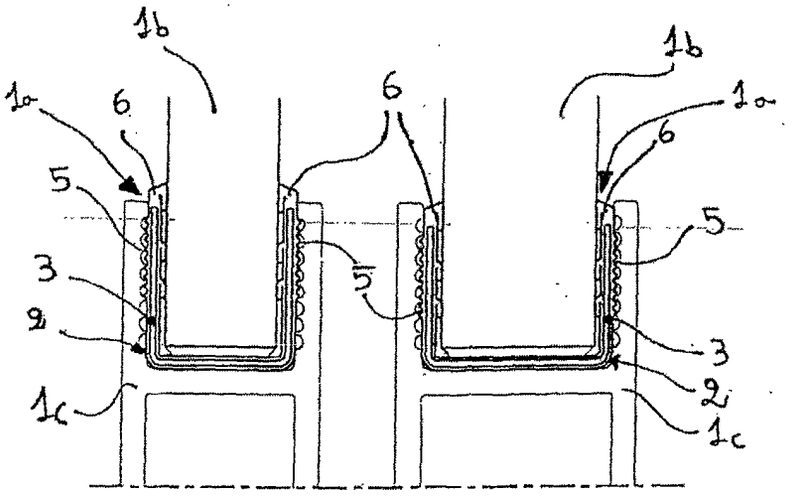

FIG. 4

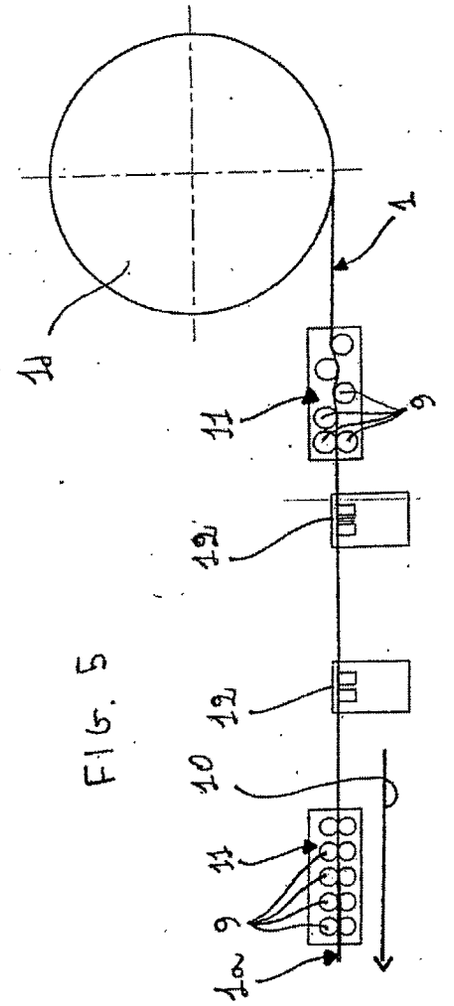

FIG. 5

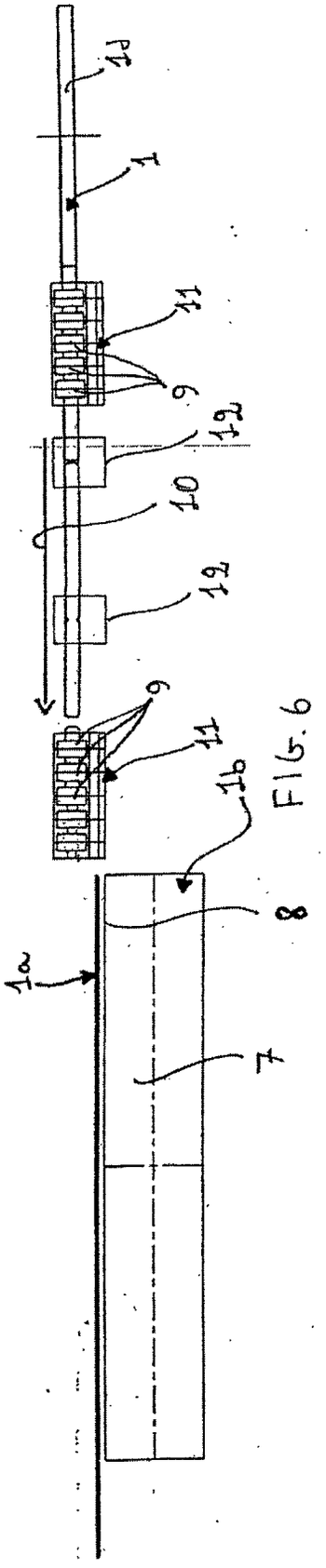

FIG. 6

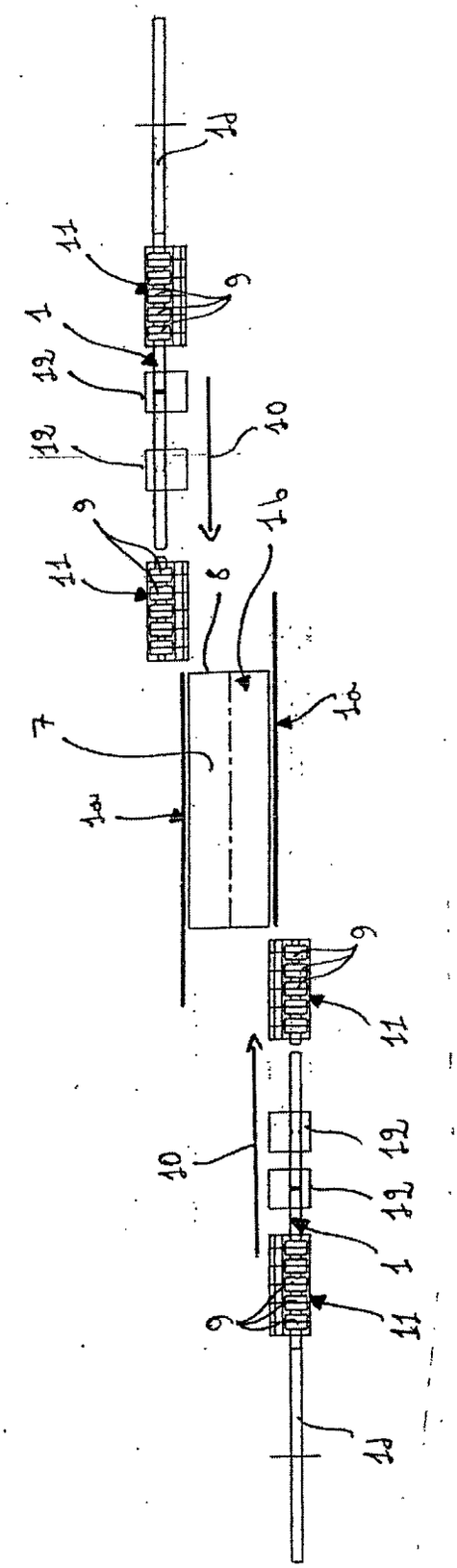

FIG. 7

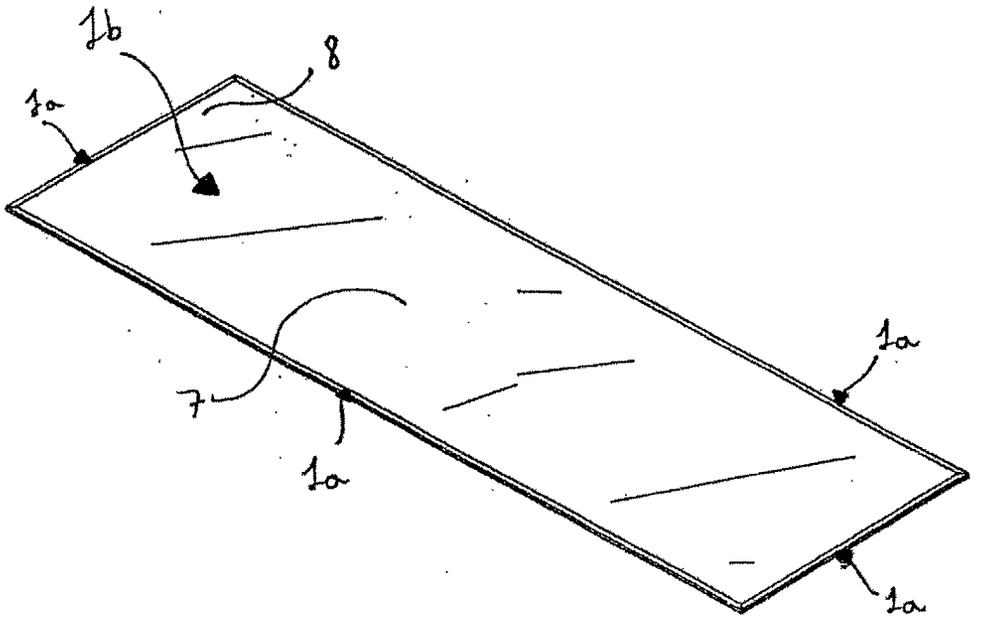

FIG. 8

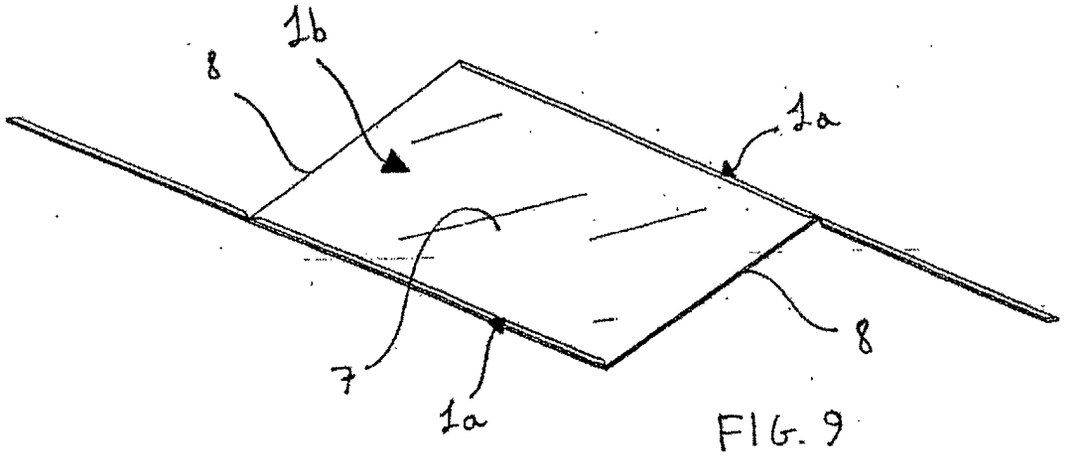

FIG. 9