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(54) **FRAME STRUCTURE FOR SUPPORTING A SILKSCREEN PLATE**

RAHMENSTRUKTUR ZUR UNTERSTÜTZUNG EINER SIEBDRUCKPLATTE

STRUCTURE DE SUPPORT POUR UNE PLAQUE DE SÉRIGRAPHIE

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Description

[0001] The present invention relates to a frame structure or cornice for supporting a silkscreen plate, of the type as recited in the preamble of the first claim.

[0002] Similar frame structures are described in patent applications GB-A-2497086 EP-A-2529931 and WO-A-2011 /023964.

[0003] As is well known, silkscreen plates are thin sheets generally square or rectangular and made of, for example, metals or plastics, stainless steel, nickel silver, polyamide, nickel or other similar material.

[0004] These plates are suitable for machining using laser or water cutting, to create a matrix for positioning various substances, for example for electronic components. They are generally characterised by an extremely reduced thickness, less than a millimetre, generally between 80 μm and 300 μm.

[0005] On account of said reduced thickness, they are very flexible and, therefore, have a reduced ability to maintain a stable position.

[0006] For this reason, silkscreen plates are placed in traction during use by tensioning members suitable to engage at least two opposite edges, and preferably all four edges of the plates.

[0007] The tensioning arms are part of the work stations using the silkscreen plates and comprise for example fluid dynamic cylinders and/or elastic means connected to cross-members fitted with specially designed teeth and substantially parallel to the edges of the plates.

[0008] Said teeth can be inserted in specially designed through openings generally made adjacent to the perimeter of the plates.

[0009] The through openings are holes having a circular, polygonal or other calculated cross-section suitable to permit an easy grip by the insertion teeth. In addition, the through openings are placed at a suitable distance from the perimeter of the silkscreen plates, to avoid breakage during tensioning.

[0010] In detail, the through openings are preferably placed at a distance from the perimeter of the silkscreen plates between 0.5 cm and 3 cm.

[0011] Overall, although satisfactory in terms of work quality while performing silkscreen printing, the plates in question are a source of specific problems.

[0012] In particular they require precise workmanship, in which an important part is related to making said through openings, to be carried out with care so as not to damage even in the slightest said plates.

[0013] The silkscreen plates need then to be handled with extreme care and attention.

[0014] In fact, the plates - given their minimal thickness - are extremely flexible and, when handled manually, are subject to extensive flexing and bending.

[0015] This possible extensive flexing has many negative implications: it may damage the plates themselves, complicate the work and use of the same, and lastly the edges of the plates can easily cause cuts or other injury to an operator.

[0016] To remedy said problems and thus safeguard the integrity of the plates, protect workers and speed up silkscreen printing operations, it is known of to provide a frame constrained to the edges of the silkscreen plates.

[0017] When anchored close to the perimeter of the plates, it can leave the through openings free, thus permitting its use even in workstations fitted with tensioning arms provided for entirely free plates or with the through openings free.

[0018] In other versions, said frame defines gripping points for tensioning and thus makes the creation of said through openings unnecessary.

[0019] In any case the frame prevents or reduces the flexing of the plates, prevents damage or bending thereof, protects operators by preventing contact with sharp edges or corners of the plates, and allows faster handling and screen printing. The frame in question, despite being widespread and available in various and different types, and while substantially resolving the problems mentioned above, has some drawbacks.

[0020] The first drawback is noticeable - in many cases - in the excessive thickness of said frame, which may create obstructions during work phases.

[0021] For example, the thickness of the frame may extend both above and below the plate, thus making the positioning thereof more complex in the work phase and making the portions of the silkscreen plate near the edges less accessible.

[0022] Another drawback, very often associated with the previous, is the complexity of the frame, which can be composed of various elements and squares joined to each other.

[0023] These increase the production times and costs of the frame, and also the overall weight of the same. In the case of large sized plates the weight of the frame may become significant.

[0024] A further drawback can be identified in the functional uniqueness of the structures made: each frame has its own specific characteristics of rigidity and deformability and therefore specifically influences the various operations of preparing and performing a silkscreen print.

[0025] When a different deformability of a frame is desired for a specific tensioning need of a silkscreen plate in the work phase, a different frame must be used or significant modifications must be made to those available.

[0026] Moreover, the elements determining the stability and deformability of the frame are in many cases in full view and during the handling thereof may be damaged or incorrectly moved.

[0027] Lastly, the fact that the adhesion of the frame to the plate may require modifications and/or notches to be made on said silkscreen plate when the coupling is made by interlocking is a further disadvantage.

[0028] In the presence of a glue coupling instead, the utmost care must be taken to avoid spreading glue residues.

[0029] In this situation the technical purpose of the present invention is to devise a frame structure to support a silkscreen plate suitable to substantially overcome the drawbacks mentioned above.

[0030] A further purpose of the invention is to devise a simple frame structure of minimal cost and utilisable in a generalised manner in all situations and for all the specific needs of the silkscreen plates.

[0031] The specified aims are achieved by a frame structure as claimed in the appended Claim 1.

[0032] Preferred embodiments are evident from the dependent claims.

[0033] In the appended drawings a specific preferred embodiment of a frame structure according to the invention is shown by way of a non-limiting example. In particular, in the drawings:

Figure 1 shows a cross-section of a portion of the frame assembled and joined to the silkscreen plate;
Figure 2 shows the frame in its entirety;
Figures 3, 4, 5 show the assembly of the frame seen from the side thereof mounted flush with the silkscreen plate; and
Figures 6, 7, 8 show the same assembly seen from the opposite side to the previous figures.

[0034] With reference to the Figures mentioned, the frame according to the invention is globally denoted by reference numeral **1** while reference numeral **2** indicates the silkscreen plate surrounded by said frame.

[0035] The silkscreen plate 2 may be of the smooth type devoid of the gripping through openings at the edges, or possibly even provided with the traditional gripping openings if the same are at a distance of more than a centimetre from the perimeter of the plate as explained below.

[0036] It is made for example from stainless steel, nickel silver, polyamide, nickel or other similar material.

[0037] The frame 1 is made of a metal, such as aluminium or a polymer material, such as PVC.

[0038] It comprises a plurality of single cornice elements **3,** identical to each other in structure, width and height, and possibly diversified in pairs by length, the size of rectangular silkscreen plates 2.

[0039] Each cornice element 3 is defined by a single component or flattened strip having a length or main longitudinal extension direction.

[0040] The cornice element ends on both sides with ends or end faces **4** inclined to the main longitudinal extension direction. The inclination is typically substantially 45° in the general case of a rectangular or square silkscreen plate 2.

[0041] This way the cornice elements 3 can fit consecutively to each other at the ends 4, to define a continuous, uninterrupted, cornice surrounding the silkscreen plate 2.

[0042] More specifically, each of the strips or flattened cornice elements 3 comprises two main faces **5** and **6,** which can also be defined as the top face and a bottom face with a width or breadth-transversal to said main direction of extension and parallel to the silkscreen plate 2 - preferably substantially between 1.5 - 2.0 cm.

[0043] The two main faces 5 and 6 are preferably spaced from each other by about 0.4 - 0.7 centimetres, a dimension which corresponds to the maximum thickness of each flattened cornice element 3.

[0044] The first main face 5 is at least partially flat and is surmounted and engaged - when in use - by an edge **2a** of the silkscreen plate 2, as indicated below.

[0045] The second main 6 face extends so as to contour or outline a relatively wide cavity 7 in practice defining a groove in the cornice element 3, said groove approaching the first main face 5 up to a distance to the order of a millimetre.

[0046] The cavity 7 is in addition tooth-shaped so that it can be engaged by tensioning means of the silkscreen plate 2.

[0047] In each cornice element 3 at least one shaped channel **8** is then provided, extending at least partly inwards and longitudinally to each cornice element 3. The shaped channel 8 is always provided at least at the ends 4 and preferably extends along the length of each cornice element 3, until it comes out in the ends 4.

[0048] The shaped channel 8 is flattened in a concordant manner with the cornice element 3 which it is inserted in and extends in width substantially parallel to the first main face 5. For example it has a thickness of little more than a millimetre and a width or breadth to the order of a centimetre or more.

[0049] Preferably the shaped channel 8 is adjacent and consecutive to the cavity 8 and expands from it so as to define undercuts **8a** in each cornice element 3, as in the preferred embodiment shown.

[0050] The frame 1 comprises then connection members suitable to engage the cornice elements to each other when the same form a square around the silkscreen plate 2.

[0051] The connection members are defined by retractable, embeddable brackets **9** slidingly interlocking between consecutive cornice elements 3, at the shaped channels 8 of the ends 4 facing each other.

[0052] The brackets 9 are made of a similar material to that of the cornice elements 3 and in any case in material which can be accurately machined or moulded.

[0053] It is in fact provided for that the size of the brackets 9 determines the possibilities of deformation and tensioning of the frame 1 each time. According to the invention, the brackets 9 are dimensioned so as to be insertable retractably and by forcing into shaped channels 8 facing each other. For example, if the shaped channels 8 have a thickness of 1.2 cm, the brackets 9 inserted in them are forced if they have a thickness of about 1.25 cm and sliding if they have a thickness of about 1.15 cm.

[0054] In any case the brackets 9 stabilise the frame 1, preventing twisting and bending of the same.

[0055] There is no danger of the brackets 9 slipping or danger of reciprocal random detachment of the cornice

elements 3, even when the brackets would be inserted loose between the cornice elements 3.

[0056] In fact the brackets 9 would be still embedded between consecutive cornice elements 3 and the cornice elements 3 held in place by the silkscreen plate 2, to which they are engaged at the first main faces 5.

[0057] As mentioned earlier the first main face 5 is at least partially flat and is surmounted and engaged - when in use-by an edge **2a** of the silkscreen plate 2.

[0058] In order to house the edge 2a, the first main face 5 has a recessed portion **5a** having preferably a breadth close to but less than a centimetre, and a height the size of the thickness of the silkscreen plate 2, i.e. close to a millimetre.

[0059] The first main face 5 thus preferably has a flat, smooth extension.

[0060] The engagement means of the silkscreen plate 2 to the cornice element 3 may be chosen, for example, between thermal welding and ultrasonic welding. However, according to the invention, the engagement means are defined by gluing and the recessed portion 5a of the first main face 5 has niches **10** for the accumulation of glue.

[0061] The construction of the frame and of the silkscreen printing unit including the silkscreen plate is as follows.

[0062] Firstly the cornice elements 3 the size of the perimeter of the silkscreen plate 2 with the ends 4 notched at 45° are prepared.

[0063] Subsequently the cornice elements 3 are attached to each other at the ends 4 by means of the brackets 9.

[0064] The brackets 9 are inserted and embedded in shaped channels 8 facing each other and dimensioned slightly oversized compared to the shaped channels 8 for a forced insertion. It is to be noted that it is possible to make a frame 1 with varying rigidity simply and immediately, simply by using brackets 9 of different thicknesses. The silkscreen plate 2 is then firmly engaged on the embedded portions 5a of the first main faces 5.

[0065] The plate may be made smooth, with the tensioning during the work phase acting on the frame 1 coupled at the cavity 7.

[0066] Alternatively, the silkscreen plate 2 may be provided with the traditional gripping through-openings and the same are directly couplable for the tensioning of said plate if the embedded portions 5a have a breadth less than a centimetre, and the gripping through openings are at a distance from the perimeter of the plate of more than one centimetre.

[0067] The invention achieves some important advantages.

[0068] In fact the frame 1 has a minimal thickness, extends on one side only of the silkscreen plate 1, has a simple structure and is defined by a minimum number of elements. Therefore, it is also economical.

[0069] The brackets that determine the rigidity are then embedded and protected inside the frame, so that during handling of the frame they are not subject to shock or displacements.

[0070] The frame is thus versatile and of universal use as it not only has small dimensions and can easily vary its rigidity, but can also be combined with traditional plates provided with through holes.

Claims

1. Frame structure (1) for the support of a silkscreen plate (2), comprising:

   - cornice elements (3) each having a main extension in a longitudinal direction and ends (4) inclined with respect to said longitudinal direction, so as to consecutively fit to each other,
   - and coupling means of said cornice elements (3) to said silkscreen plate (2),
   - said cornice elements (3) comprising:

     - a first main face (5) at least partially surmountable by an edge (2a) of said silkscreen plate (2),
     having a recessed portion (5a) with the thickness of said silkscreen plate (2), said silkscreen plate (2) having edges (2a) engaged on said recessed portion (5a) so as to be suitable to form a substantially flat surface in correspondence with said first main face (5),
     - a second main face (6), opposite the first, contouring a cavity (7) suitable to be engaged by tensioning means of said silkscreen plate (2), and a contoured channel (8) extending in a longitudinal direction in each of said cornice elements (3) and coming out in said ends (4),
     - connection members suitable to engage said cornice elements (3) to each other, made of brackets (9) suitable to be embedded for the sliding interlocking of said ends (4) in correspondence with said contoured channels (8),

   - said frame (1) being **characterised in that** said brackets (9) are dimensioned so as to be suitable to be forcibly inserted into contoured channels (8) facing each other,
   - said coupling means between said silkscreen plate and each said cornice element (3) are defined by gluing and
   - said recessed portion (5a) has niches (10) suitable for the accumulation of glue.

2. Frame structure (1) according to the previous claim, wherein said cavity (7) and said contoured channel (8) extend for the entire length of each of said cornice

elements (3).

3. Frame structure (1) according to one or more of the previous claims, wherein said contoured channel (8) is contiguous to said cavity (7) and expands from said cavity (7) so as to be suitable to define undercuts (8a) in each of said cornice elements (3).

4. Frame structure (1) according to one or more of the preceding claims, wherein said brackets (9) are dimensioned so as to be suitable to be slidingly inserted into contoured channels (8) facing each other.

Patentansprüche

1. Rahmenstruktur (1) zur Unterstützung einer Siebdruckplatte (2), umfassend:

- Einfassungselemente (3), jedes mit einer vorherrschenden Längsverlaufsrichtung und im Verhältnis zu der genannten Längsrichtung geneigten Enden (4), so dass diese nacheinander miteinander zusammengefügt werden können,
- und Elemente zum Verbinden der genannten Einfassungselemente (3) mit der genannten Siebdruckplatte (2), den genannten Rahmen (1),
- wobei jedes der genannten Einfassungselemente (3) Folgendes umfasst:

- eine erste, wenigstens teilweise von einem Rand (2a) der genannten Siebdruckplatte (2) überragbare Hauptfläche (5), die einen tiefer gelegten Abschnitt (5a) passend zur Stärke der genannten Siebdruckplatte (2) aufweist, wobei die genannte Siebdruckplatte (2) auf dem genannten tiefer gelegten Abschnitt (5a) eingreifende Ränder (2a) aufweist, die so geeignet sind, eine im Wesentlichen flache Oberfläche auf der genannten ersten Hauptfläche (5) zu bilden,
- eine zweite, der ersten gegenüberliegende Hauptfläche (6), die einen Hohlraum (7) bildet, der geeignet ist, Spannungselementen der genannten Siebdruckplatte (2) als Eingriff zu dienen, und einen Profilkanal (8), der in Längsrichtung jedes genannten Einfassungselements (3) verläuft und in die genannten Enden (4) mündet,
- Verbindungsorgane, die geeignet sind, die genannten Einfassungselemente (3) miteinander in Eingriff zu bringen und aus Winkeln (9) bestehen, die geeignet sind, durch einen Schiebesteckmechanismus zwischen den genannten Enden (4) auf den genannten Profilkanälen (8) versenkt zu werden,
- wobei der genannte Rahmen (1) **dadurch gekennzeichnet ist, dass** die genannten Winkel (9) so bemessen sind, dass sie durch Kraftanwendung in die sich gegenüberliegenden Profilkanäle (8) eingesetzt werden können,
- wobei die genannten Verbindungselemente zwischen der genannten Siebdruckplatte und jedem genannten Einfassungselement (3) durch Verkleben definiert werden und
- der genannte tiefer gelegte Abschnitt (5a) zum Aufnehmen von Klebstoff geeignete Nischen (10) aufweist.

2. Rahmenstruktur (1) nach dem vorangegangenen Anspruch, bei der der genannte Hohlraum (7) und der genannte Profilkanal (8) auf der gesamten Länge jedes der genannten Einfassungselemente (3) verlaufen.

3. Rahmenstruktur (1) nach einem oder mehreren der vorangegangenen Ansprüche, bei der der genannte Profilkanal (8) an den genannten Hohlraum (7) angrenzt und von dem genannten Hohlraum (7) aus so verläuft, dass Hinterschneidungen (8a) in jedem der genannten Einfassungselemente (3) definiert werden.

4. Rahmenstruktur (1) nach einem oder mehreren der vorangegangenen Ansprüche, bei der die genannten Winkel (9) so bemessen sind, dass sie gleitend in die sich gegenüberliegenden Profilkanäle (8) eingesetzt werden können.

Revendications

1. Structure (1) de support d'une plaque de sérigraphie (2), comprenant :

- des éléments d'encadrement (3) ayant chacun une direction longitudinale de développement prédominante et des extrémités (4) inclinées par rapport à ladite direction longitudinale, de manière à coïncider consécutivement les unes avec les autres,
- et des moyens d'engagement desdits éléments d'encadrement (3) à ladite plaque de sérigraphie (2), de ladite structure (1),
- chacun desdits éléments d'encadrement (3) comprenant :

- une première face principale (5) au moins en partie surmontable par un bord (2a) de ladite plaque de sérigraphie (2), présentant une portion surbaissée (5a) selon la mesure de l'épaisseur de ladite plaque de sérigraphie (2), ladite plaque de sérigraphie (2) présentant des bords (2a) engagés sur la-

dite portion surbaissée (5a) de manière à réaliser une surface essentiellement plane au niveau de ladite première face principale (5),

- une seconde face principale (6), opposée à la première, façonnant une cavité (7) destinée à être engagée par des moyens de mise en tension de ladite plaque de sérigraphie (2), et une cannelure façonnée (8) se développant dans le sens longitudinal dans chacun desdits éléments d'encadrement (3) et aboutissant auxdites extrémités (4),
- des organes de liaison destinés à engager les uns avec les autres lesdits éléments d'encadrement (3) réalisés par des équerres (9) destinées à être noyées par encastrement à coulissement entre lesdites extrémités (4) au niveau desdites cannelures façonnées (8),

- ladite structure (1) étant **caractérisée en ce que** lesdites équerres (9) sont dimensionnées de manière à être insérées par forçage dans les cannelures façonnées (8) coïncidant les unes avec les autres,
- lesdits moyens d'engagement entre ladite plaque de sérigraphie et chacun desdits éléments d'encadrement (3) sont définis par collage et
- ladite portion surbaissée (5a) présente des niches (10) destinées à l'accumulation de la colle.

2. Structure (1) selon la revendication précédente, où ladite cavité (7) et ladite cannelure façonnée (8) se développent sur toute la longueur de chacun desdits éléments d'encadrement (3).

3. Structure (1) selon une ou plusieurs des revendications précédentes, où ladite cannelure façonnée (8) est contiguë à ladite cavité (7) et s'étend à partir de ladite cavité (7) de manière à définir des contre-dépouilles (8a) dans chacun desdits éléments d'encadrement (3).

4. Structure (1) selon une ou plusieurs des revendications précédentes, où lesdites équerres (9) sont dimensionnées de manière à pouvoir être insérées par coulissement dans lesdites cannelures façonnées (8) coïncidant les unes avec les autres.

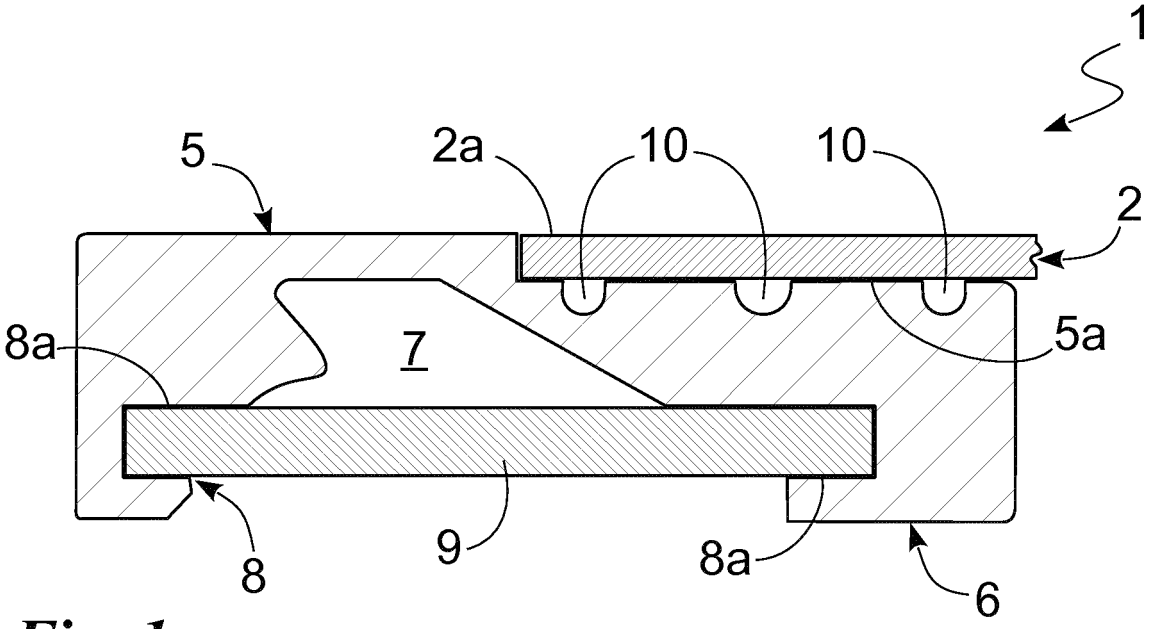
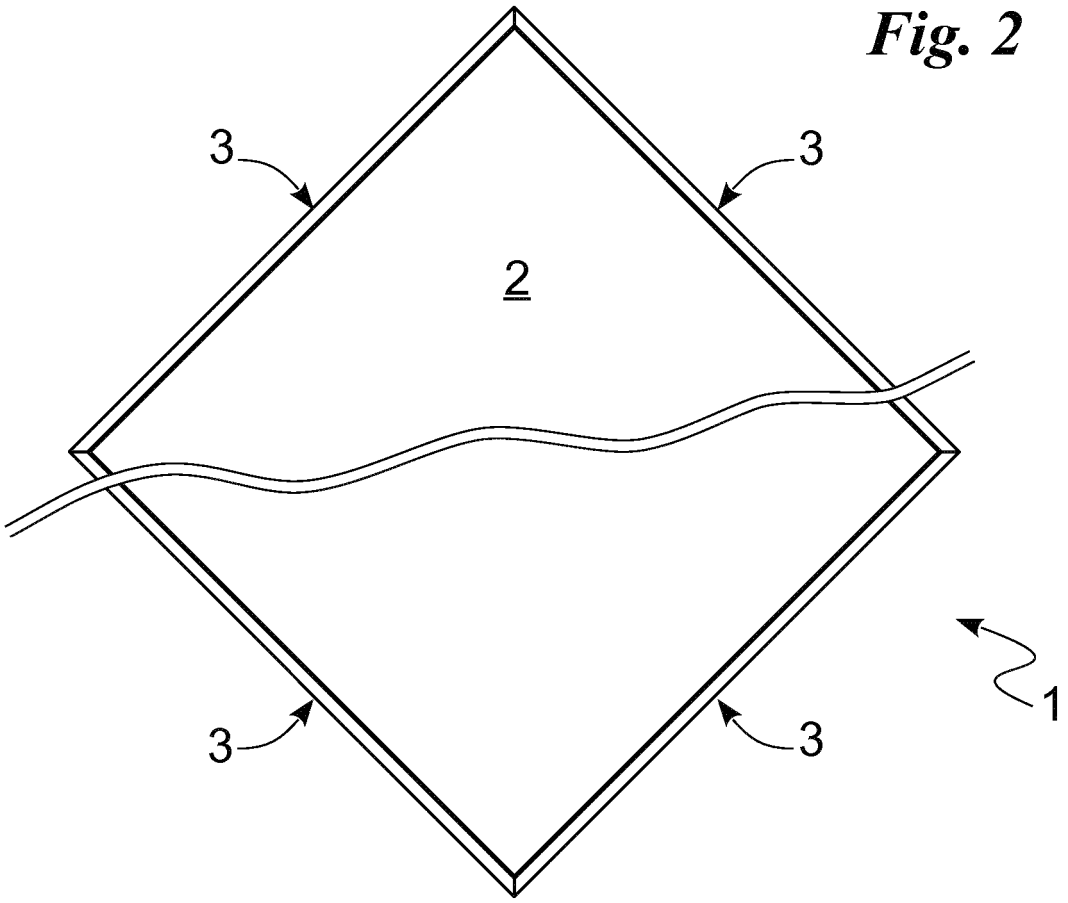


Fig. 1

Fig. 2



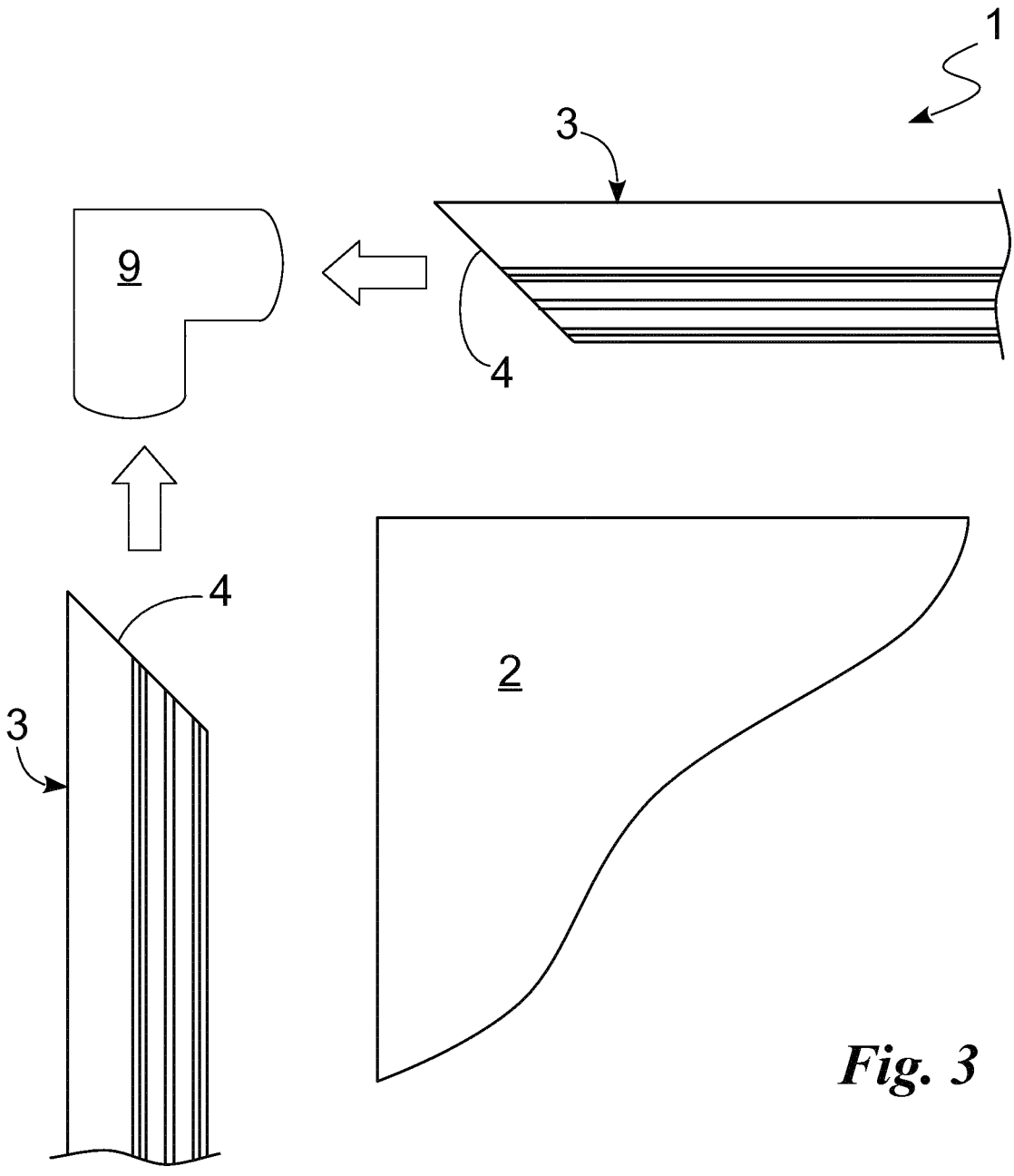


Fig. 3

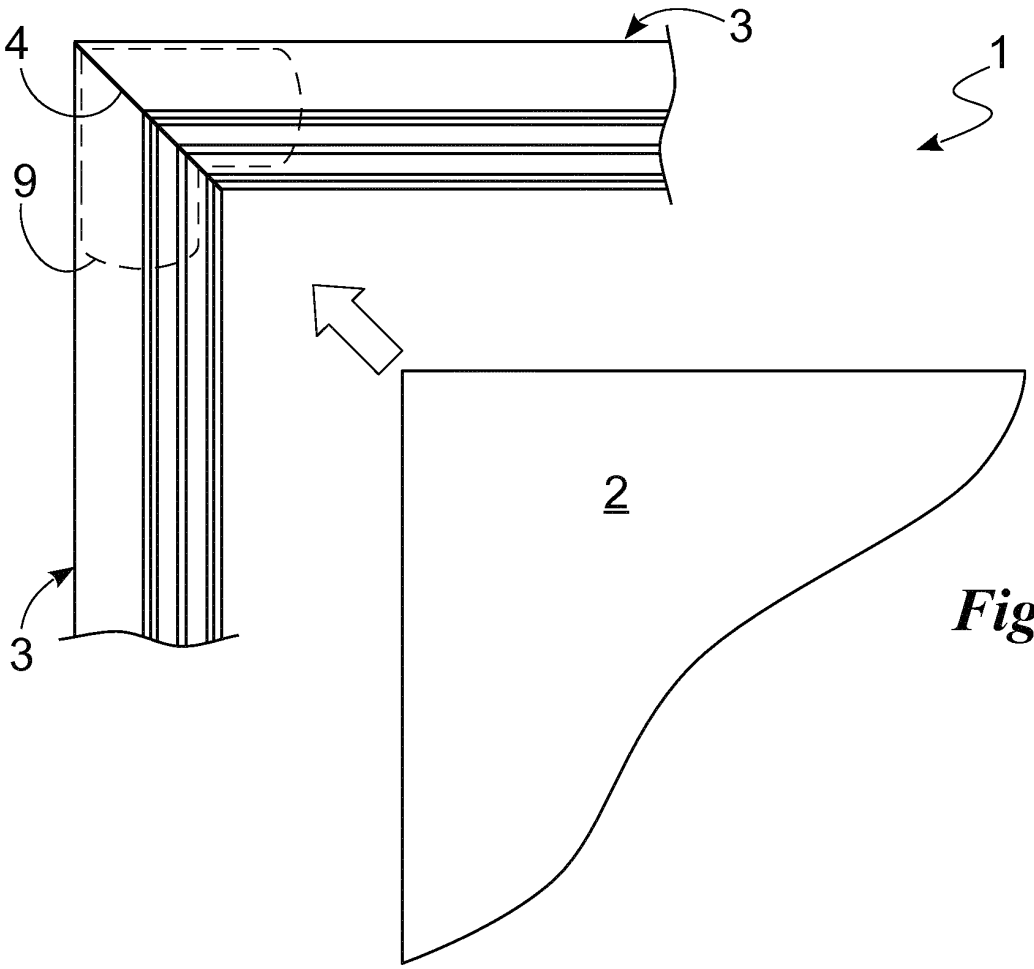


Fig. 4

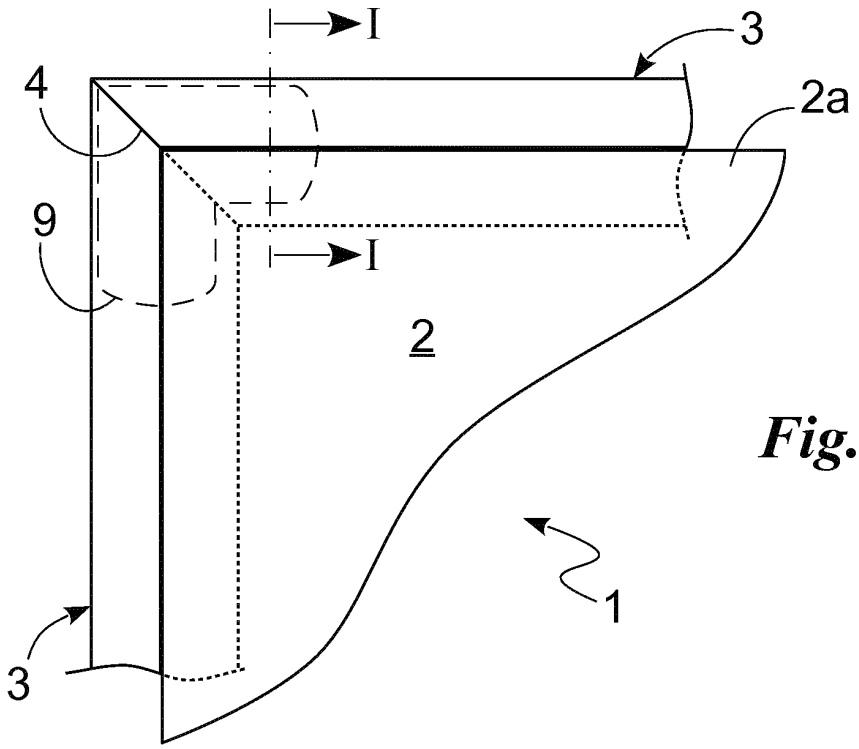


Fig. 5

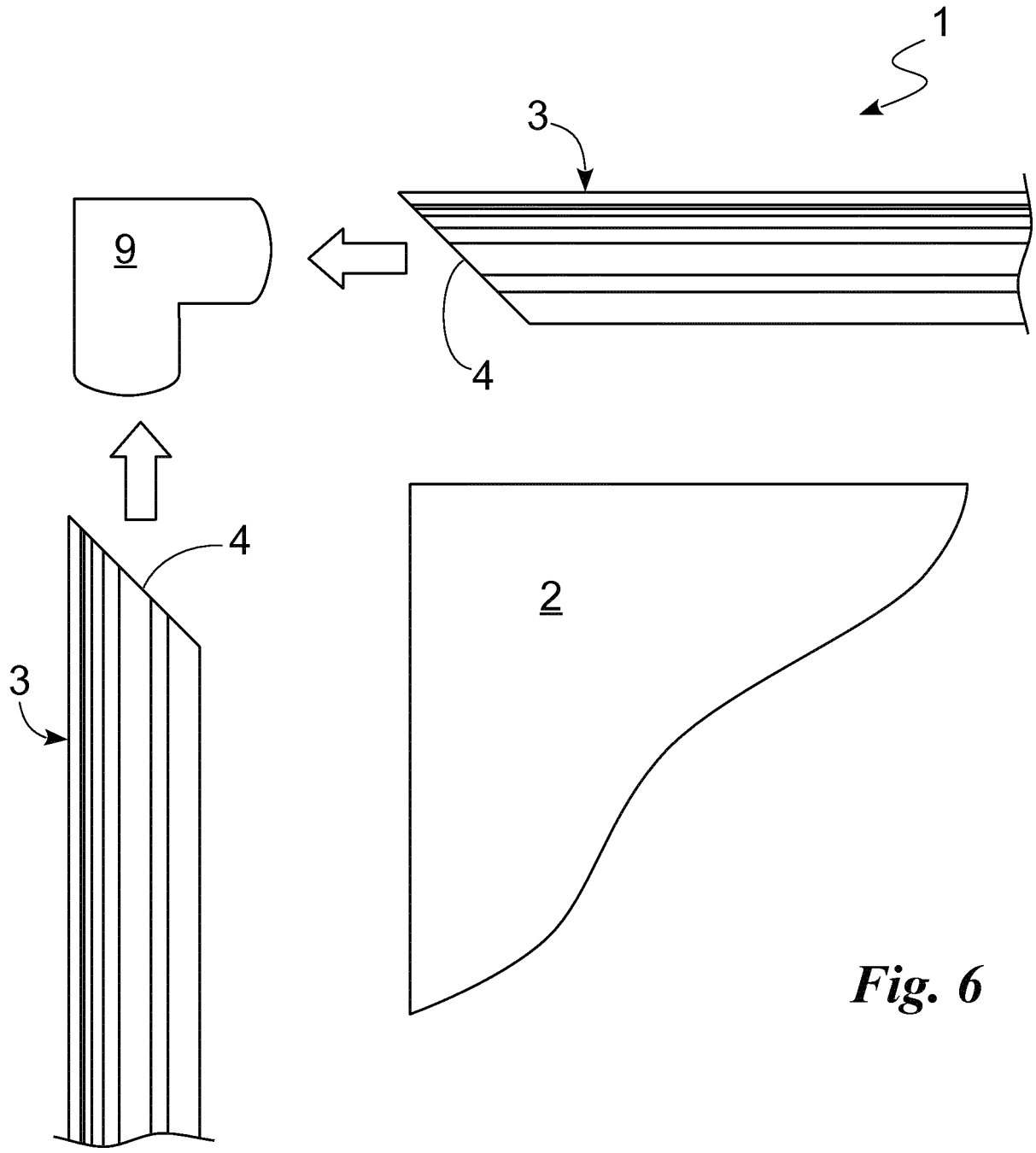


Fig. 6

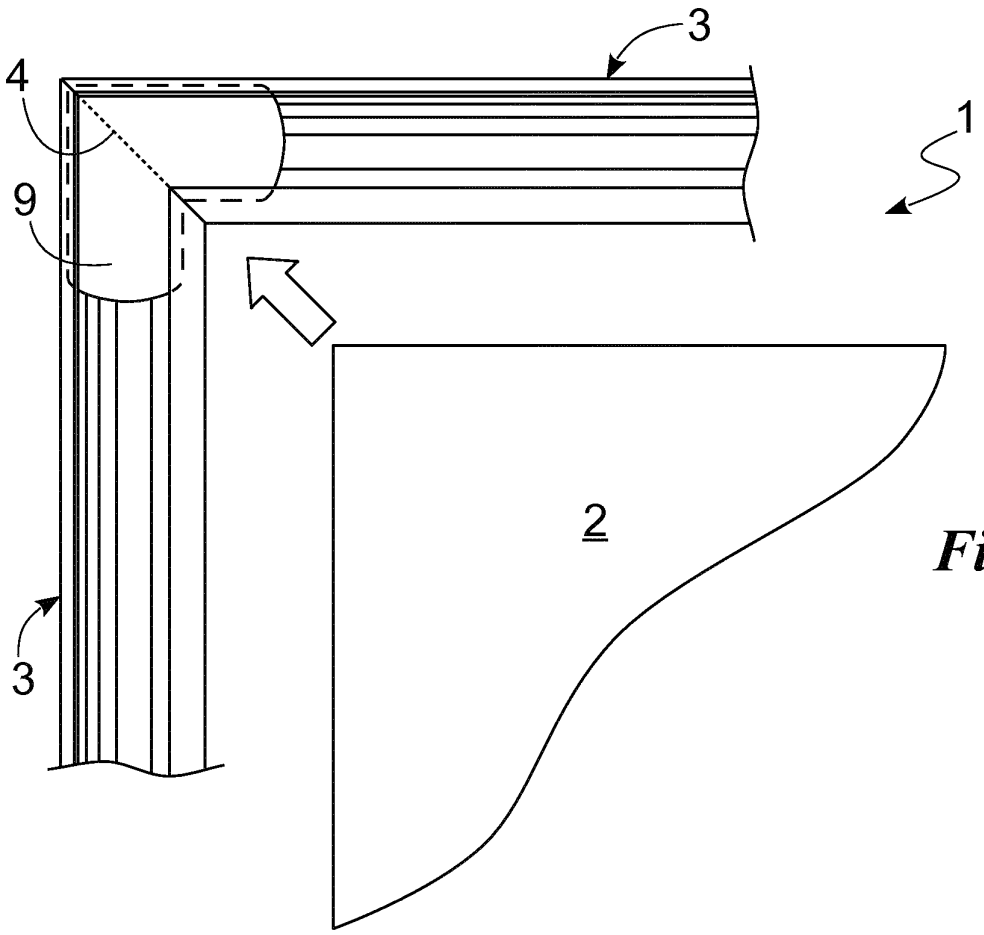


Fig. 7

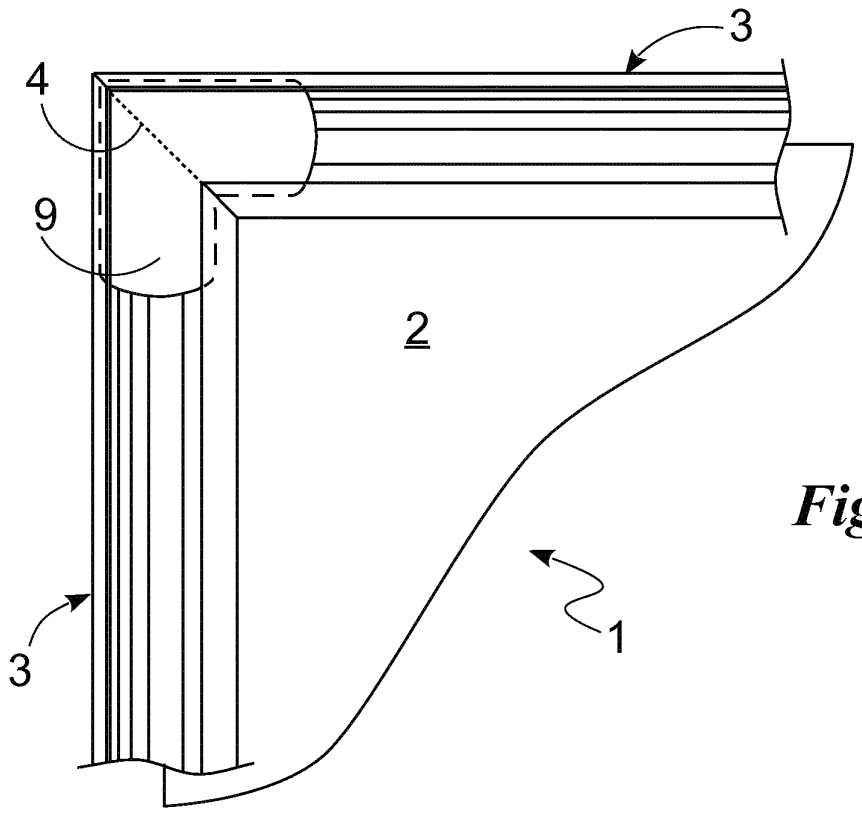


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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