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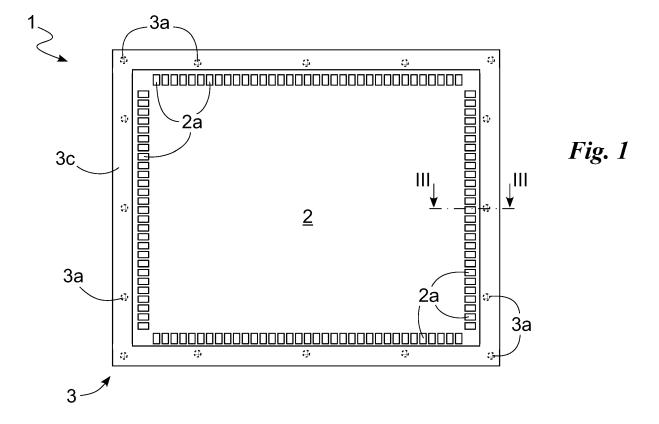
### Remarks:

The references to the drawing(s) no. 4 and 5 are deemed to be deleted (Rule 56(4) EPC).

### (54) A silk screen thin sheet

(57) A silk-screen thin sheet (1) comprising a plate (2) provided with a perimeter and comprising a plurality of grip openings (2a) suitable to enable said silk-screen thin sheet (1) to be tensioned and positioned at an en-

gagement distance from said perimeter; and a stiffening frame (3) suitable to stiffen said plate (2), at least partly surrounding said perimeter and external to and not overlapping said grip openings (2a).



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[0001] The present invention relates to a silk-screen thin sheet of the type recited in the preamble of Claim 1. [0002] In particular, the invention relates to a thin sheet suitable to be machined by machining centres which, by performing laser or water cutting, form a die for the positioning of glues for electronic components or other substances.

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**[0003]** As is known, silk-screen thin sheets are composed of plates, generally rectangular and made, for example from stainless steel, nickel silver, polyamide or nickel characterised by a thickness to the order of several micron.

**[0004]** On account of such limited thickness, silk-screen thin sheets are extremely flexible and thus have a reduced capacity to firmly maintain a specific position. Said thin sheets, during use, are placed under tension by a specific tensioning instrument which comprises tensioning arm suitable for stretching said thin sheets at least along two opposite edges and preferably along all four edges.

**[0005]** Said thin sheets have, for the purpose of permitting the tensioning thereof, a series of through openings along the lateral edges, appropriately distanced from said edges and suitable for enabling the plate to be gripped by the tensioning arms.

**[0006]** In detail, the tensioning arms comprise specific gripping teeth which engage in the through openings and thus place the plate in tension before it is machined. The prior art described above has several significant drawbacks.

**[0007]** A first significant problem is the fact that the silk-screen thin sheets are extremely difficult and dangerous to handle.

**[0008]** In fact, the thin sheets are extremely flexible and when moved manually by the operator, are subject to buckling and bending which complicates the work.

**[0009]** A further problem is represented by the fact that silk-screen thin sheets, both on account of their reduced thickness and of the difficulty in handling, are hazardous to the operator who is, in fact, prone to possible cuts or other injury.

**[0010]** To overcome such drawbacks, silk-screen thin sheets are known of fitted with a frame connected to the edges of the plate and defining a different gripping point for the tensioning arms.

**[0011]** Such frames, while resolving the problems described above, have other drawbacks.

**[0012]** A first significant drawback is the fact that the frames cannot be used with standard type arms.

**[0013]** Moreover, the use of said frames leads to an increase in the purchase and machining costs of the silk-screen thin sheets.

**[0014]** In this situation the technical purpose of the present invention is to devise a silk-screen thin sheet able to substantially overcome the drawbacks mentioned above.

**[0015]** Within the sphere of said technical purpose one important aim of the invention is to provide a silk-screen thin sheet that is both easy and simple to handle. Another important aim of the invention is to create a simple and economical silk-screen thin sheet.

**[0016]** The technical purpose and specified aims are achieved by a silk-screen thin sheet as claimed in the appended Claim 1.

**[0017]** Preferred embodiments are described in the dependent claims.

**[0018]** The characteristics and advantages of the invention are clearly evident from the following detailed description of a preferred embodiment thereof, with reference to the accompanying drawings, in which:

**Fig. 1** shows a silk-screen thin sheet according to the invention;

Fig. 2 shows an exploded view of the silk-screen thin sheet in Fig. 1;

**Fig. 3** shows the cross-section III-III of the silk-screen thin sheet in Fig. 1;

**Fig. 4** shows another silk-screen thin sheet according to the invention; and

**Fig. 5** is the cross-section V-V of the silk-screen thin sheet in Fig. 4.

**[0019]** With reference to said drawings, reference numeral 1 globally denotes the silk-screen thin sheet according to the invention.

[0020] It comprises a plate 2 provided with a perimeter and comprising a plurality of grip openings 2a suitable to enable said silk-screen thin sheet 1 to be tensioned and a stiffening frame 3 at least partly surrounding the perimeter of the plate 2. The plate 2 is made from stainless steel, nickel silver, polyamide or other similar material and is characterised by a thickness of  $80~\mu m$  to  $300~\mu m$ , the plate 2 has a polygonal, preferably rectangular or square profile.

**[0021]** The grip openings 2a are composed of through holes having a circular, polygonal or other cross-section suitable to enable easy gripping by the insertion teeth of the tensioning arms on a machining centre for silk-screen thin sheets.

[0022] Such grip openings 2a are made at a suitable engagement distance from the perimeter of the plate 2 so as to prevent the silk-screen thin sheet 1 from breaking during the tensioning thereof. In detail, the grip openings 2a are made along the perimeter of the plate 2 and the engagement distance is substantially 0.5 cm to 3 cm, and more specifically, substantially 0.5 to 1.5 cm.

**[0023]** The plate 2 comprises, as well as said grip openings 2a, through cavities **2b** in correspondence of which the stiffening frame 3 is suitable for engaging the plate 2.

**[0024]** The through cavities 2b are at a lesser distance from the perimeter than the engagement distance so as to find themselves at a lesser distance from the perimeter in relation to the grip openings 2a.

[0025] In detail, the through cavities 2b are made be-

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tween the grip openings 2a and the perimeter.

**[0026]** Alternatively, the through cavities 2b are made along the perimeter and, in the case in which the plate 2 has a polygonal profile, at the corners of the polygonal profile of the plate 2.

**[0027]** In a further alternative, the through cavities are made both at the perimeter of the plate 2 and between the grip openings 2a and the perimeter, as shown in Fig. 2.

**[0028]** The stiffening frame 3 which surrounds at least partly and preferably totally, the perimeter of the plate 2, originally and advantageously does not overlap and is external to the grip openings 2a and is suitable to stiffen said plate 2.

[0029] In particular, the stiffening frame 3 is made from polymer material, preferably from PVC or the like, so as to be resistant to alcohols and similar corrosive agents. [0030] The connection between the plate 2 and the stiffening frame 3 is of the irresolvable type, preferably performed by thermal welding, and even more preferably by ultrasonic welding 3a as described below in more detail so as to make the plate 2 and the stiffening frame 3 integral with each other.

**[0031]** The stiffening frame 3 is preferably made by moulding two portions **3b**, in use one above the plane of the plate 2 and one below, and subsequent welding, as previously specified of the two portions 3b as schematised in Fig. 2; Alternatively, the stiffening frame 3 comprises one or more profiles suitable to engage the plate 2 along at least one portion of the perimeter of said plate 2 and preferably along the entire perimeter. The profiles are consequently, made by protrusion or other similar machining suitable to define, for said profiles, a cross-section extending along a main direction of extension.

[0032] The stiffening frame 3 installed comprises an engagement mouth substantially counter-shaped to the lateral profile of the plate 2 so as to enable the profiles 3b to be connected to the plate 2 substantially by engagement. In detail, the engagement mouth of the profiles 3b is a substantially rectangular shape of a height practically equal to the thickness of the plate 2, and preferably close to 0.3 mm, and of a width substantially less than 1cm, preferably 2 mm to 8 mm. The frame 3 rather is preferably of a total width of 5mm to 15 mm and a height of 3 mm to 15 mm.

**[0033]** Preferably, the connection between the ends of the profiles 3b is performed by ultrasonic welding 3a in correspondence with at least some of the through cavities 2b.

**[0034]** The preparation of a silk-screen thin sheet, described above in a structural sense is as follows and also defines a new process.

**[0035]** First of all the operator prepares the plate 2 making the grip openings 2a thereon at an appropriate engagement distance from the perimeter of the plate 2 and through cavities 2b on the perimeter and /or at a lesser distance from the perimeter than the engagement distance.

**[0036]** After completing the plate 2 the stiffening frame 3 is associated to the plate 2 by overlapping the two portions 3b and interposing the plate 2 and making, at said through cavities 2b, a joint, and in particular the welding described, of the stiffening frame 3.

[0037] In particular, the operator, by means of ultrasonic welding melts the frame 3 in correspondence with the cavities 2b. The molten material, as shown in Fig.3 crosses the through cavities 2b and once solidified, irresolvable connects the components of the stiffening frame 3 to each other and, at the same time, the stiffening frame 3 to the plate 2.

[0038] The invention achieves some important advantages.

15 **[0039]** A first advantage is the fact that the silk-screen thin sheet 1 is extremely practical and easy to handle.

[0040] Such advantage is represented by the presence of the stiffening frame 3 which, surrounding the plate 2, lends rigidity to the silk-screen thin sheet 1 and, thus, ease of handling of said thin sheet 1. In particular, the presence of the stiffening frame 3 prevents the silk-screen thin sheet 1 from flexing and curving thus enabling it to maintain a substantially flat shape.

**[0041]** Another advantage is the extreme safety when handling the silk-screen thin sheet 1.

**[0042]** In fact, the presence of the stiffening frame 3 makes it possible to conceal the edge of the plate 2 and, thus, to prevent the operator from injury or cuts when handling.

**[0043]** Above all, one advantage is the fact that the silk-screen thin sheet 1 can be used with the tensioning instruments and, in particular, can be tensioned with the tensioning arms currently provided.

**[0044]** Such advantage is achieved thanks to the particular stiffening frame 3 which, by leaving the grip openings 2a free, makes it possible to tension the thin sheet 1 with the tensioning arms without the need for modifications.

**[0045]** A further and no less important advantage, deriving from the possibility of using machining centres without performing modifications, is thus the reduced production costs.

**[0046]** Modifications and variations may be made to the invention described herein without departing from the scope of the inventive concept. All the elements as described and claimed herein may be replaced with equivalent elements and the scope of the invention includes all other details, materials, shapes and dimensions.

### Claims

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A silk-screen thin sheet (1) comprising a plate (2) provided with a perimeter and comprising a plurality of grip openings (2a) adapted to enable said silk-screen thin sheet (1) to be tensioned and disposed to an engagement distance from said perimeter, characterised in that it comprises a stiffening frame

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- (2b) adapted to stiffen said plate (2), at least partly surrounding said perimeter and external to and not overlapping said grip openings (2a).
- 2. A silk-screen thin sheet (1) as claimed in claim 1, wherein said plate (2) comprises through cavities (2a) having a lower distance from said perimeter than said engagement distance and wherein said stiffening frame (3) is suitable for engagement with said plate at said through cavities (2a).
- 3. A silk-screen thin sheet (1) as claimed in the preceding claim, wherein said stiffening frame (3) is fastened to said plate by ultrasonic welding operations (3a) carried out at said through cavities (2b).
- 4. A silk-screen thin sheet (1) as claimed in one or more of claims 2-4, wherein said plate (2) has a polygonal profile and wherein said through cavities (2b) are formed at the corners of said polygonal profile.
- **5.** A silk-screen thin sheet (1) as claimed in one or more of the preceding claims, wherein said stiffening frame (3) is of polymeric material.
- 6. A silk-screen thin sheet (1) as claimed in one or more of the preceding claims, wherein the stiffening frame (3) is preferably obtained through moulding of two portions (3b), an upper one and a lower one relative to the plane of said plate (2) when installed, and subsequent welding of said portions (3b).
- 7. A silk-plate thin sheet (1) as claimed in the preceding claim, wherein said stiffening frame (3) comprises two of said at least one frame (3c) and wherein said frames (3c) are fastened to said plate through ultrasonic welding (3a).
- 8. A process for manufacturing a silk-screen thin sheet (1) as claimed in one or more of the preceding claims, comprising manufacture by moulding of two portions (3b) of polymeric material of said frame (3), overlapping of said two portions (3b) with interposition of said plate (2), mutual joining of said portions (3b).
- **9.** A process as claimed in claim 8, wherein said plates are joined by thermal welding.
- **10.** A process as claimed in claim 9, wherein said plates are joined by ultrasonic thermal welding.

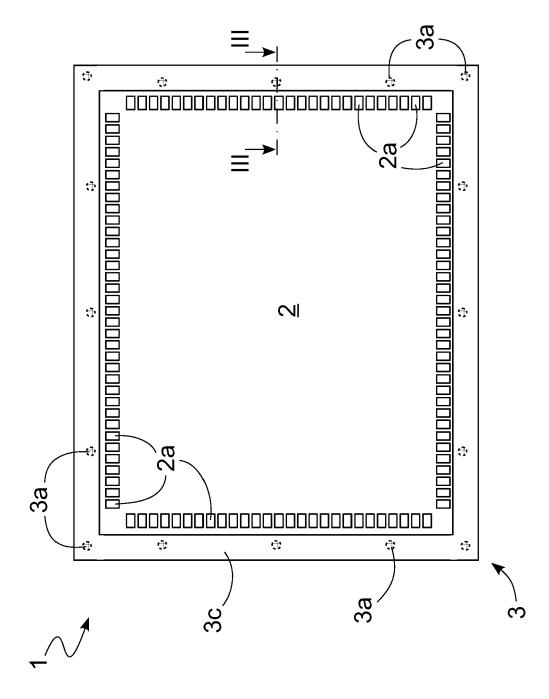
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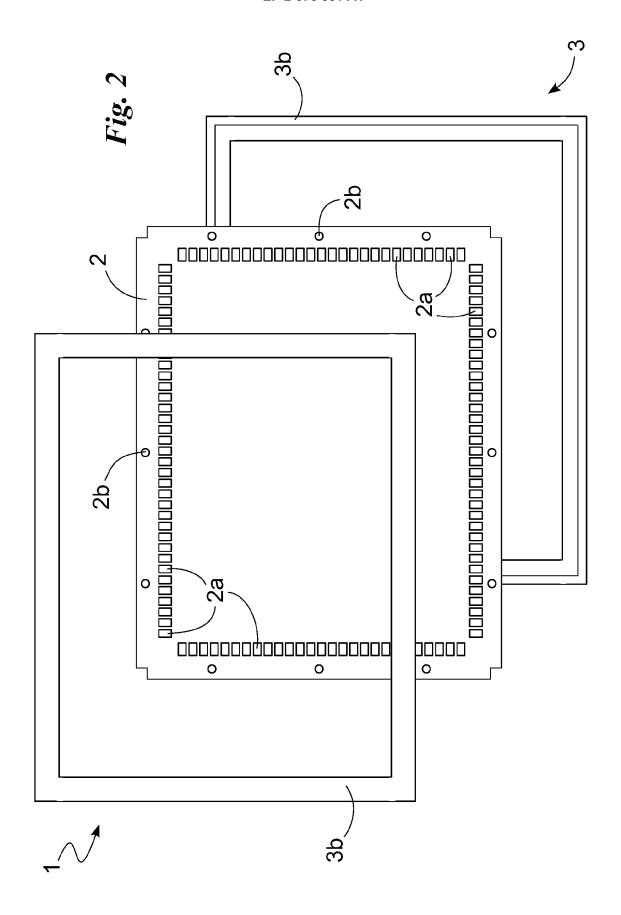
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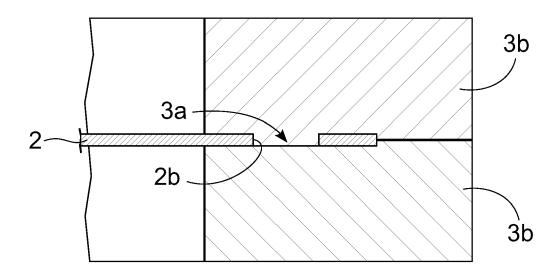
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*Fig. 3* 





## **EUROPEAN SEARCH REPORT**

Application Number

EP 13 15 5527

	DOCUMENTS CONSID							
Category	Citation of document with in of relevant pass		appropriate,		evant laim	CLASSIFICATION OF THE APPLICATION (IPC)		
A	WO 01/38094 A1 (NEW 31 May 2001 (2001-6 * page 13, line 15 figure 1 *	)5-31)		1-1	0	INV. B41N1/24		
A	WO 2004/105452 A1 ( [ES]; ABRIL-PRIESSN 2 December 2004 (20 * abstract; figures	NITZ YOLANI 004-12-02)	Z WALTER JUN DA [ES])	1-1	0	TECHNICAL FIELDS SEARCHED (IPC) B41N		
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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 13 15 5527

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