

(19)



(11) Publication number:

SG 185362 A1

(43) Publication date:

30.01.2013

(51) Int. Cl:

**B21C 37/02, B21K 23/00, A61K
6/04, B21H 8/00;**

(12)

Patent Application

(21) Application number: **2012075743**

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(22) Date of filing: **15.06.2011**

DE 10 2010 030 128.0 15.06.2010

(30) Priority:

DE 10 2010 044 199.6 20.11.2010

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(54) Title:

**BAR MADE OF NOBLE METAL, AND PRODUCTION
METHOD**

(57) Abstract:

Abstract A bar of noble metal or an alloy containing noble metal having a mass m_B is subdivided into $n \times m$ miniature bars 2, 3 each having a specified mass m_k , wherein n and m each denote an integer > 2 , there being an interconnection of solid material (8) between directly adjacent miniature bars (2, 3). Another bar is affixed to a backing (13), to which the miniature bars are releasably attached. A method for the production of the bar consists in dividing up the same while leaving an interconnection of solid material or producing an arrangement thereof on a backing.

Abstract

A bar of noble metal or an alloy containing noble metal having a mass m_B is subdivided into $n \times m$ miniature bars 2, 3 each having a specified mass m_k , wherein n and m each denote an integer ≥ 2 ,
5 there being an interconnection of solid material (8) between directly adjacent miniature bars (2, 3). Another bar is affixed to a backing (13), to which the miniature bars are releasably attached. A method for the production of the bar consists in dividing up the same while leaving an interconnection of solid material
10 or producing an arrangement thereof on a backing.

Description

Bar made of noble metal, and production method

The invention relates to a bar of noble metal, for example, gold, silver, platinum, palladium or alloys thereof and to a method for the production of such a bar.

Prior art

Proportionable dental gold materials are commercially available in the form of platelets, the platelets having been obtained by producing identical pieces from rolled sheet gold. The sheet gold is made by rolling an alloyed gold bar, as described in DE 10 2004 060 730 A1.

For the production of gold bars in small pieces, i.e. pieces weighing 1 g, 5 g, or 10 g it is known to stamp information concerning the weight, the manufacturer, the purity of the metal, and the type of metal onto each single bar. Bars of noble metal in small pieces are very popularly with investors but are individually expensive to produce in relation to the metal price.

Summary of the invention

Instead of making a large number of individual miniature bars each of a specified mass m_k , the fundamental idea of the invention consists in producing, in a single pass, a plaque or bar having a mass m_B and comprising a plurality of such miniature bars and subsequently dividing up this plaque or bar by complete or partial separation of material to form the miniature bars, whilst the miniature bars are disposed in an $n \times m$ arrangement in which each of $n, m \geq 2$. Thus the total mass m_B of the bar is given by $n \times m \times m_k$.

Due to the fact that there is first produced a bar in the form of a plaque of a nominal mass m_B , which is then divided up into a plurality of miniature bars, for example by embossing, which miniature bars may, if required, be separated from each other or

lifted from a backing without the use of tools, there is both a reduction in the manufacturing costs and an improvement in the handling of the miniature bars.

Thus the invention relates to a bar of noble metal or an alloy
5 containing a noble metal having a mass m_B , which bar is subdivided into $n \times m$ miniature bars each of a specified mass m_k , wherein n and m each denote an integer ≥ 2 . Between the directly adjacent miniature bars there is an interconnection of solid material such that the miniature bars are firmly attached to their
10 direct neighbors. The interconnecting material can, for example, be in the form of a bridge or a connecting land.

Advantageously, the interconnection of solid material can have a predetermined break point. The bending strength of the interconnection is preferably such that bending by the force of gravity
15 is not possible, whereas its upper limit is such that destruction of the interconnection of solid material is possible by manually bending or breaking the same.

In addition to the interconnection of solid material, or alternatively thereto, the underside of the bar may be provided with
20 a backing material such that when the miniature bars are produced from a bar or from a plaque, they can be completely separated without the provision of an interconnection of solid material with or without a predetermined break point.

The interconnection of solid material can advantageously form
25 part of a depression provided in the bar. A depression may be formed on the top surface and an opposing depression on the underside, and the interconnection of solid material can be set at a distance from the top surface and from the underside of the bar. The depression can be in the form of a groove.

30 Another object of the invention is a bar of noble metal or an alloy containing a noble metal and having a mass m_B , which bar is subdivided into $n \times m$ miniature bars each having a specified

mass m_k , wherein n and m each denote an integer ≥ 2 whilst a backing material is attached to the underside of the bar and the miniature bars are peripherally spaced all round from their adjacent miniature bars and are exclusively attached to said backing.
5 ing.

Advantageously, the miniature bars can be separated from each other via a depression that penetrates the bar down to the backing.

It is particularly advantageous when the depression is impressed, since by this means economical production is possible.
10

Another object of the invention is a method for the production of a bar having a mass m_B consisting of noble metal or an alloy containing noble metal, in which the bar is in one manufacturing step divided up into $n \times m$ miniature bars, each of a specified
15 mass m_k , wherein n and m each denote an integer ≥ 2 , whilst in between the directly adjacent miniature bars there remains an interconnection of solid material.

The interconnection of solid material can advantageously form part of a depression.

Yet another object of the invention is the provision of a method for the production of a bar having a mass m_B consisting of noble metal or an alloy containing noble metal, in which the bar is affixed, in one manufacturing step, to a backing material and, in another manufacturing step, is divided up into $n \times m$ miniature bars each of a specified mass m_k , wherein n and m each denote an integer ≥ 2 , and the miniature bars are peripherally
20 spaced all round from the adjacent miniature bars and are attached exclusively to the backing material.
25

Advantageously, the bar can be embossed to effect said division
30 into miniature bars.

Yet another object of the invention is the provision of a method for the production of a bar having a mass m_B consisting of noble metal or an alloy containing noble metal, in which a continuous band of noble metal of appropriate thickness is rolled and fed
5 stepwise to a shaping device and is advanced following shaping. The shaping consists in dividing up the continuous band into a row comprising $n \times 1$ miniature bars each having a specified mass m_k , wherein n denotes an integer ≥ 2 , while leaving an interconnection of solid material between directly adjacent miniature
10 bars and the continuous band. This makes it possible to form a continuous composite bar.

The desired bar is produced by severing the interconnection of solid material in the region between a row and the rest of the continuous band following on a specified number of rows.

15 The continuous band can have a width B which is greater than the width b of the bar to be fabricated, so that when the continuous band is shaped, it is augmented by a protruding edge.

If shaping includes automatic removal of said edge, it will be possible to carry out such severing of the continuous band fol-
20 lowing the production of a desired number of rows, to produce the finished bar.

Advantageously, the miniature bars formed during shaping can be simultaneously inscribed.

Brief description of the drawings

25 Exemplary embodiments of the invention are illustrated in the drawings, in which:

Fig. 1 illustrates a bar of noble metal in the form of a plaque containing 4×3 miniature bars;

Fig. 2 shows a detail of Fig. 1;

- Fig. 3 is a partial section taken along the line A-A of Fig. 2;
- 5 Figs. 4A - 4D show various forms of an interconnection of solid material between the miniature bars in a plaque;
- Figs. 5A - 5D show other forms of an interconnection of solid material between the miniature bars in a plaque;
- Fig. 6 shows miniature bars disposed on a backing and not interconnected by solid material.
- 10 Fig. 7 is a cross-section of the continuous band comprising miniature bars;
- Fig. 8 is a top view of the shaped continuous band shown in Fig. 7;
- Fig. 9 shows edges of a tool for the production of miniature bars.
- 15

Description of exemplary embodiments of the invention

Fig. 1 illustrates a bar 1 of noble metal in the form of a plaque comprising 4 x 3 miniature bars 2, 3. To this end, a bar (not shown) was first of all produced in the form of a plaque

20 having a nominal mass mB. Processing of the bar to provide a plurality of miniature bars 2, 3 can be effected, for example, by embossing. This can take place at the same time as an embossing operation by means of which the data 4 concerning the miniature bars 2, 3 are impressed, namely a manufacturer's logo, the

25 mass and the purity, such that production can take place in a single pass. In the exemplary embodiment shown, the parameter 4 indicating the mass is shown as "1", which denotes 1 g.

As shown in Fig. 2 in detail, the shaping operation has involved the creation of depressions in the bar 1 at specific intervals,

30 such depressions being in the form of grooves 5, which dis-

tinctly delimit the individual miniature bars 2 with respect to the adjacent miniature bars 3. The position of the grooves 5 in the bar 1 is selected such that the miniature bars 2, 3 delimited by the grooves 5 have the desired mass.

- 5 Preferably, the bar can have a specified uniform thickness prior to the shaping operation, so that shaping of the bar can be carried out by means of a single embossing punch, while the mass of the miniature bars 2, 3 will be sufficiently correct, that is, within permissible tolerances.
- 10 An example of how a bar can be produced in the form of a plaque is illustrated by a fine gold bar having a mass of 100 g being subdivided into 100 miniature bars each weighing 1 g. For this purpose, a continuous metal band of 99.99 % fine gold is previously rolled to a calculated thickness. Plaques weighing 100 g
- 15 are punched out of this band.

These plaques are embossed in an embossing machine known per se for embossing coins, in a similar manner thereto and in a single pass such that depressions in the form of grooves 5 are formed between the individual miniature bars, and that the manufacturer's logo, the weight and the purity are inscribed on each individual 1 g miniature bar.

20

The depressions 5, 5' in the form of grooves can be so thin that the displaced material forms only a comparatively small lateral bead, which can, however, be flattened immediately on the surfaces, if desired, by the embossing operation. In this context, "thin" means that the width of the depression is smaller than its depth and is preferably not more than 50 % of its depth.

25

Fig. 3 is a partial cross-section taken along the line A-A of Fig. 2, and it can be seen that the depressions 5 do not penetrate the entire plaque but that a groove 5 is formed that extends from the top surface 6 toward the underside 7, the interconnection of solid material 8 being in the form of a connecting

30

land (see the description of Figs. 4A-4D below), or of a bridge (see the description of Figs. 5A-5D below).

5 The interconnection of solid material 8 in the depression 5 can take various shapes, as shown in Figs. 4A-4D and 5A-5D, for example.

10 In Fig. 4A, the side walls 9, 10 of the depression 5 formed only from the top surface of the plaque are substantially parallel to each other and perpendicular to the top surface 6 and the underside 7 of the plaque, the base 11 of the depression 5 being flat and parallel to the underside 7. The base 11 is part of the connecting land of the interconnection of solid material 8 between adjacent miniature bars 2, 3.

15 Fig. 4B differs from Fig. 4A in that the base 11 of the depression is tapered toward the underside such that a predetermined break point 12 is formed at the point of greatest depth of the base 11 on account of the smallest cross-section of the connecting land at said point.

20 With the presence of a predetermined break point 12, the interconnection of solid material 8 in the depression 5 can, if required, be broken without the use of a tool to allow the miniature bars to be separated from each other. By reason of the known position of the predetermined break point, a planned weight distribution is ensured.

25 In Fig. 4C, the side walls of the depression 5, which is created only from the top surface 6 of the plaque, are tapered toward the base, the base 11 of the depression 5 being steeply tapered as in Fig. 4B. This produces a predetermined break point 12. In cross-section, the depression shows two different angles of spread, the angle of spread of the base 11 being larger than
30 that of the side walls 9, 10.

In Fig. 4D, the side walls are as in Fig. 4C, whereas the base 11 is rounded, somewhat like a gutter. Here again, the predeter-

mined break point 12 is in the region of the smallest cross-section of the connecting land 8.

Figs. 5A-5D illustrate other forms of an interconnection of solid material 8 having, in some cases, a predetermined break point 12 between the miniature bars 2, 3 in a plaque, differing from Figs. 4A-4D in that the interconnection of solid material is disposed in a depression 5,5' that is created both from the top surface 6 and from the underside 7. In this case, the material is displaced both at the top surface 6 and at the underside 7 and can, if desired, be flattened during the embossing operation.

In Fig. 6, the plaque 1 is disposed with its underside 7 resting on a backing 13, to which it is attached by, say, adhesive means such that even when the miniature bars are completely separated, that is to say, are not interconnected by solid material, a certain degree of coherence is still given. The material can be intercepted by creating a depression 5 in the form of a groove, said depression being impressed from the top surface 6, that is, from the surface of the plaque opposite the backing 13.

A suitable backing 13 is, for example, a backing board provided with a gum coating 14 which is similar to that coated on self-adhesive labels and from which the individual miniature bars 2, 3 can be readily removed without any traces of adhesive remaining on the miniature bars 2, 3. The backing board can consist either of comparatively thick paper, of paperboard, or of plastics material.

Thus one or more of the miniature bars 2, 3 can be removed from the backing, while the remaining miniature bars stay on the backing 13 and can again be handled collectively.

In another embodiment, illustrated in Figs. 7 to 9, the bar 1 is produced by starting from a continuous band 21 as illustrated in cross-section in Fig. 7 and rolled to a precalculated thickness

t and having a fine gold content of 99.99 %, and shaping the continuous band 21 stepwise to form the miniature bars. To this end, the continuous metal band 21 resting on a table 20 is caused to approach a shaping station 22, and in a shaping step
5 there are produced miniature bars 2 which comprise an interconnection of solid material 8 with a miniature bar 3 produced in the previous shaping step and in addition with the unshaped continuous band 21, in each case at the base of a depression 5 that takes the form of a groove. The depression 5 in the form of a
10 groove is produced with a sharp edge 22.1, and another sharp edge 22.2 is shown in the direction of advance 24 for other grooves (not shown).

As may be seen from the top view shown in Fig. 8, the miniature bars 2, 3 are each disposed in a row 23, 23.1 at right angles to
15 the direction of advance 24 of the continuous band 21 and are separated from each other by the groove-shaped depression 5.

On completion of shaping a row 23, the continuous metal band 21 is forwarded in relation to the shaping device (not shown) by one step and the shaping operation is repeated in order to produce the next row of miniature bars 2, 3. The bar itself can
20 then be severed at a suitable point so as to give a bar having the desired number of rows 23 of miniature bars 2, 3.

When the continuous metal band 21 has a width B greater than the width b of the bar to be fabricated, each miniature bar 2, 3
25 is subjected to the same shaping operation during fabrication thereof. However, the lateral excess of material on the continuous metal band 21 beyond the width of the bar 1 produces a lateral edge 26 of width r separated by a depression 25 in the form of a groove extending in the direction of advance 25 but is
30 still connected by solid material. The edge 26 can be removed during shaping or it can be removed after shaping.

This method of shaping can include the production of depressions 5 impressed both from the top surface of the continuous band 21

and from its underside. The additional provision of a groove produced from the underside is basically advantageously when the thickness of the bar is too great for shaping from one side only to be sufficient.

- 5 The predetermined break points produced by the formation of depressions 5 in the bar in the region of the interconnection of solid material 8 can have an angle of spread of from approximately 10 degrees to 60 degrees and the interconnection of solid material 8 can have a thickness of from 0.05 mm to 0.4 mm,
10 although other thicknesses may be adequate for effecting manual separation.

Fig. 9 illustrates edges 31, 32 of a tool for the production of miniature bars. One edge 31 extends at right angles to the direction of feed 24 and produces the depression 5 in the form of a groove, another edge 32 in the direction of feed 24 produces,
15 for example, the depression 25 in the form of a groove situated in the marginal region 26 of a miniature bar 2, 3 shown in Fig. 8. The edges 231, 32 are pressed into the continuous band and displace the material such that a depression is formed, whilst
20 at the same time an interconnection of solid material remains, which is in this case not shown.

The embodiment illustrated in Figs. 7 to 9 also includes the possibility of using backing material instead of an interconnection of solid material, said backing material being attached to
25 the continuous band.

The bars are fabricated, for example, in the following sizes:
For gold 100 x 1g: 74 mm x 105 mm x 0.667 mm or
85 mm x 150 mm x 0.406 mm; for silver: 100 x 1g:
74 mm x 105 mm x 1.226 mm; for platinum: 100 x 1g:
30 74 mm x 105 mm x 0.602 mm, and for palladium: 100 x 1g :
74 mm x 105 mm x 1.073 mm.

Thus it is possible to differentiate between two fabrication variants, although other manufacturing processes, such as casting, are not unfeasible. In the first variant, a noble metal sheet is cut to the final dimensions of the finished product. The cut
5 sheet then passes to a normal embossing machine, such as is used for embossing coins or standard noble metal bars, where it is embossed to produce the final shape using appropriately shaped embossing punches under high pressure.

In the second variant, a continuous band of noble metal of a desired thickness is rolled and forwarded to a punching machine,
10 in which a complete row, for example comprising 10 miniature bars weighing 1 g each, is simultaneously notched and inscribed. The band is then advanced such that a continuous composite is produced, which is severed after every tenth row to give a com-
15 posite bar containing pieces weighing 10 x 10 x 1g.

Both variants are suitable for achieving high-gloss surfaces.

Claims

1. A bar of noble metal or an alloy containing noble metal having a mass m_B , **characterized in that** the bar (1) is subdivided into $n \times m$ miniature bars (2, 3) each having a specified mass m_k , wherein n and m each denote an integer ≥ 2 and that there is an interconnection of solid material (8) between the directly adjacent miniature bars (2, 3).
2. The bar as defined in claim 2, characterized in that the interconnection of solid material (8) has a predetermined break point (12).
3. The bar as defined in any one of claims 1 to 2, characterized in that a backing (13) is attached to the underside (7) of the bar.
4. The bar as defined in any one of claims 1 to 3, characterized in that the interconnection of solid material (8) is part of a depression (5,5') formed in the bar (1).
5. The bar as defined in claim 4, characterized in that there is a depression (5') on the top surface (6) and a depression (5) opposite thereto on the underside (7) and that the interconnection of solid material (8) is set at a distance from the top surface (6) and from the underside (7) of said bar.
6. A bar of noble metal or an alloy containing noble metal having a mass m_B , **characterized in that** the bar is subdivided into $n \times m$ miniature bars (2, 3) each having a specified mass m_k , where n , m each denote an integer ≥ 2 and that a backing (13) is attached to the underside (7) of said bar and that the miniature bars (2, 3) are peripherally spaced all round from the adjacent miniature bars and are attached exclusively to said backing (13).

7. The bar as defined in claim 6, characterized in that said miniature bars (2, 3) are separated from each other by means of a depression (5) penetrating the bar down to said backing (13).
- 5 8. The bar as defined in any one of claims 4 to 5 or 7 characterized in that the depression is impressed.
9. A method for the production a bar having a mass m_B consisting of noble metal or an alloy containing noble metal, **characterized in that**, in one manufacturing step, the bar (1)
10 is divided up into $n \times m$ miniature bars (2, 3) each having a specified mass m_k , wherein n and m each denote an integer ≥ 2 , while an interconnection of solid material (8) remains between directly adjacent miniature bars (2, 3).
10. A method for the production of a bar having a mass m_B consisting of noble metal or an alloy containing noble metal,
15 **characterized in that** the bar is attached, in one manufacturing step, to a backing (13) and, in another manufacturing step, is divided up into $n \times m$ miniature bars (2, 3) each having a specified mass m_k , wherein n and m each denote an integer ≥ 2 , the miniature bars (2, 3) being peripherally spaced all round from the adjacent miniature bars
20 (2, 3) and are attached exclusively to said backing (13).
11. A method for the production of a bar having a mass m_B of noble metal or an alloy containing noble metal in which a
25 continuous band of noble metal is rolled to a desired thickness and is fed stepwise to a shaping device and moved away therefrom following shaping, **characterized in that** during the shaping the continuous band is divided up into a row (23, 23.1) of $n \times 1$ miniature bars (2, 3) each having a
30 specified mass m_k , where n denotes an integer ≥ 2 , an interconnection of solid material (8) being left between directly adjacent miniature bars (2, 3) and the continuous band (21).

12. The method as defined in claim 11, characterized in the shaped continuous web is severed in the region of the interconnection of solid material (8) between a row (23) and the continuous band (21) following the creation of a specified number of rows (23, 23.1), for the production of the bar.
13. The method as defined in claim 11 or claim 12, characterized in that the continuous band (21) has a width B which is greater than the width b of said bar (1) to be fabricated such that shaping produces, in addition to the bar (1), a protruding edge (26).
14. The method as defined in any one of claims 9 to 11 characterized in that the miniature bar is inscribed during production thereof.

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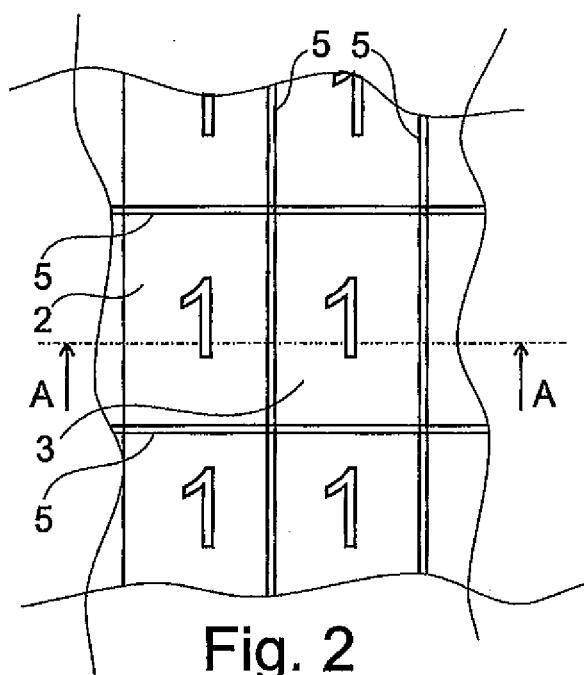


Fig. 2

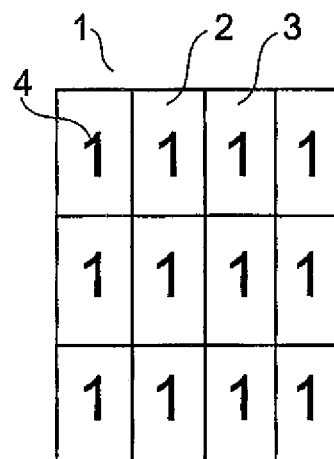


Fig. 1

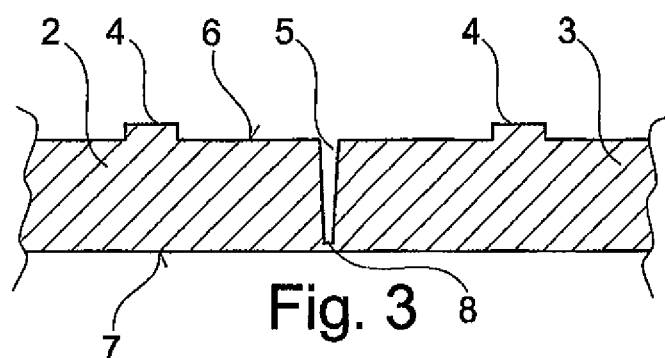


Fig. 3

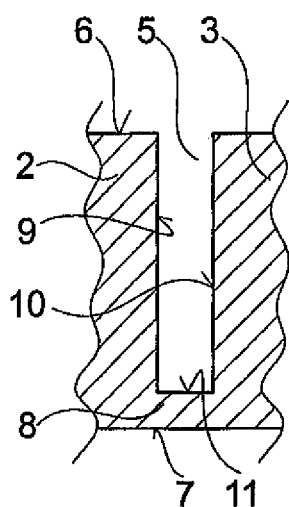


Fig. 4A

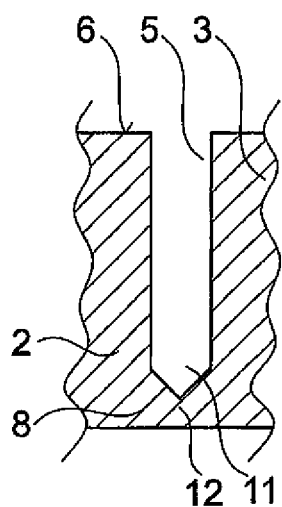


Fig. 4B

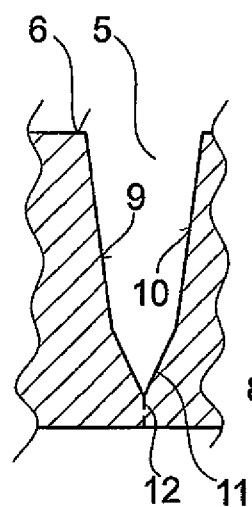


Fig. 4C

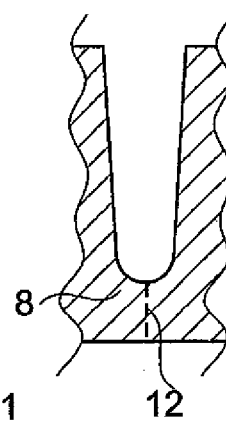


Fig. 4D

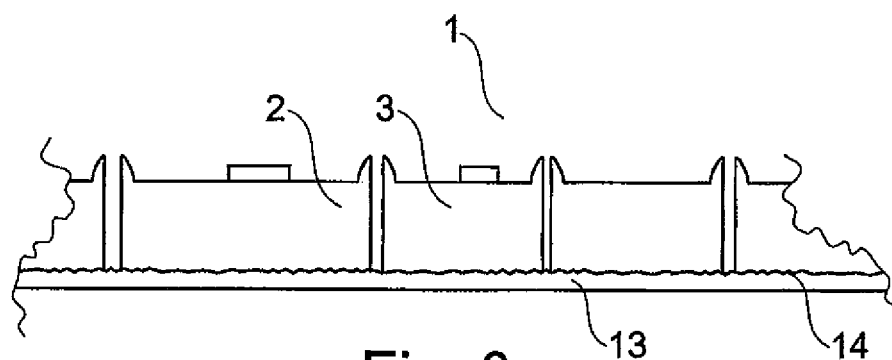


Fig. 6

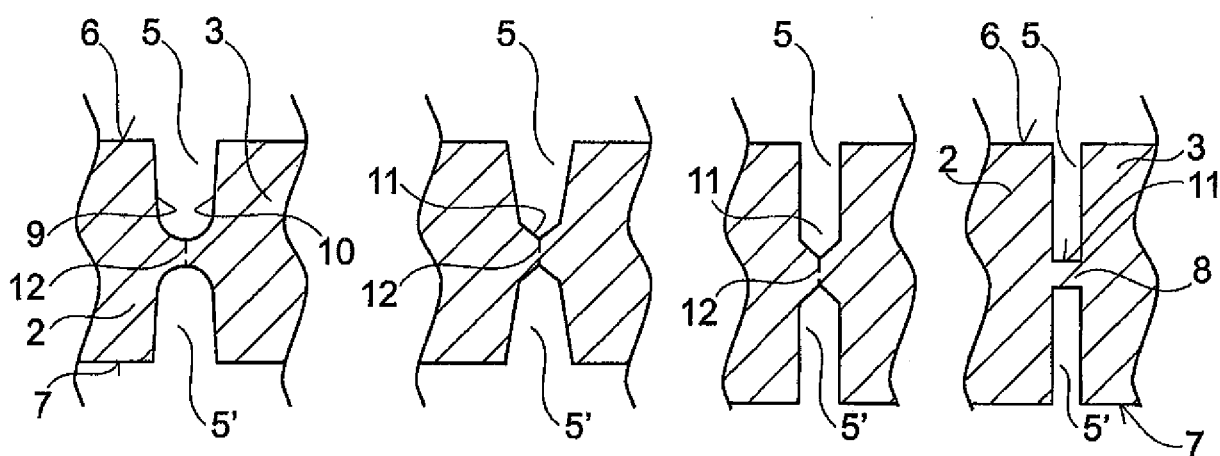


Fig. 5D

Fig. 5C

Fig. 5B

Fig. 5A

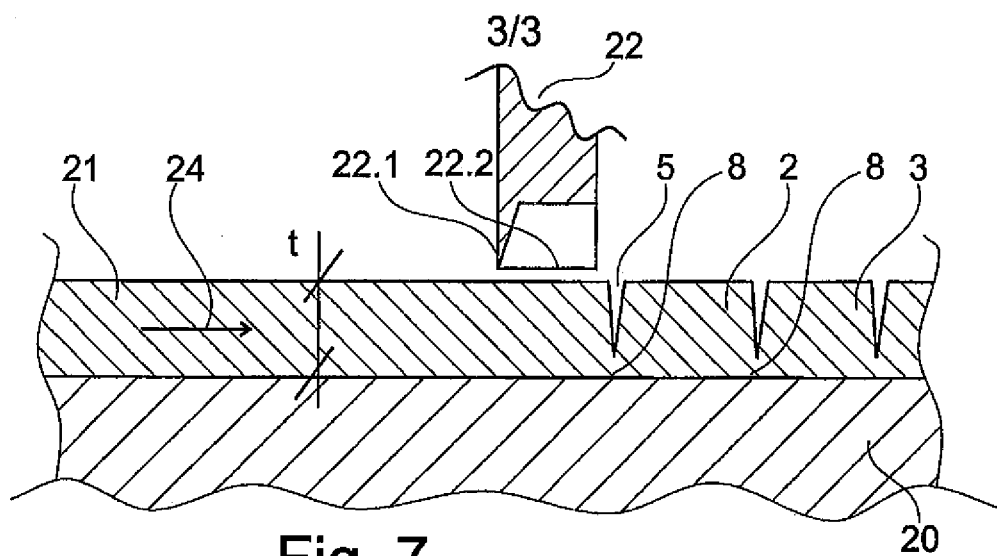


Fig. 7

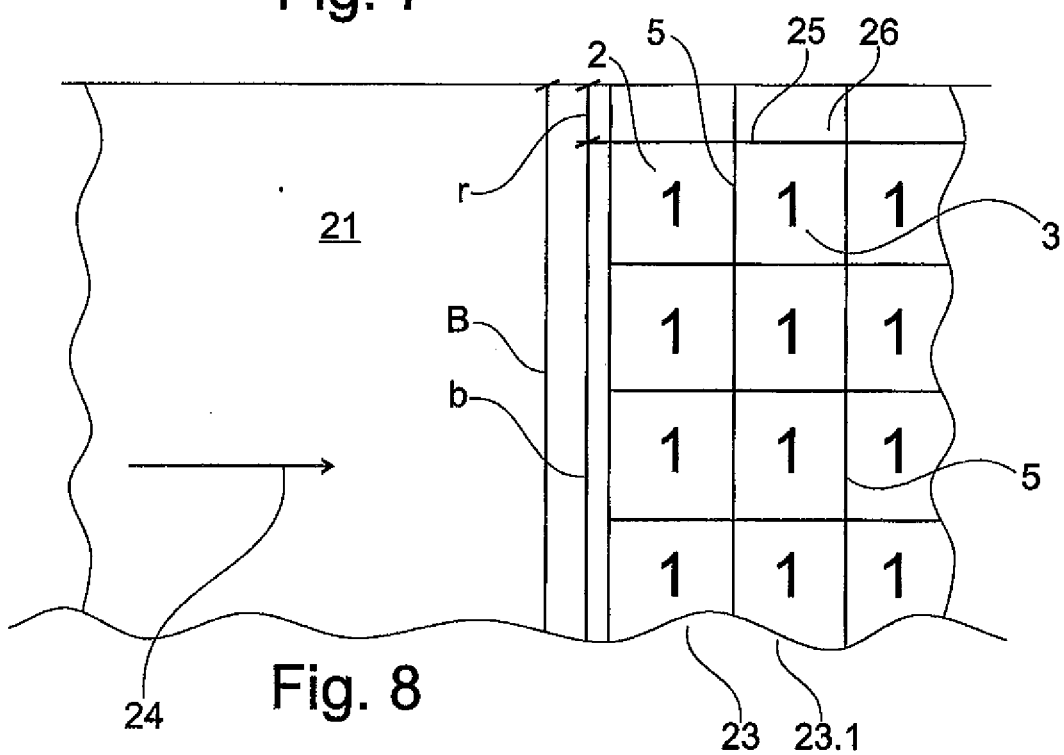


Fig. 8

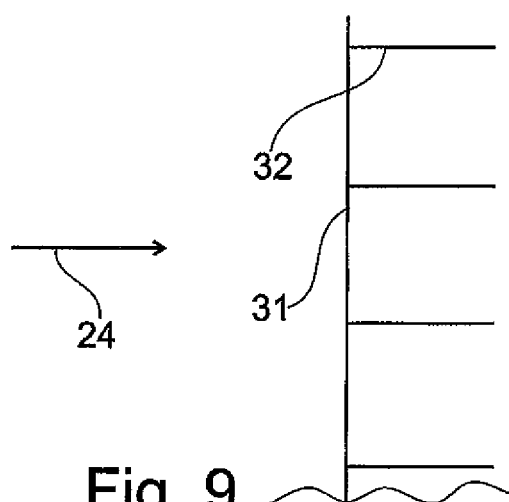


Fig. 9