(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 637 353 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
08.01.1997 Bulletin 1997/02

(21) Application number: **93905228.8**

(22) Date of filing: **26.02.1993**

(51) Int Cl.[6]: **D21J 5/00**

(86) International application number:
PCT/DK93/00071

(87) International publication number:
WO 93/17183 (02.09.1993 Gazette 1993/21)

(54) EQUIPMENT FOR MAKING ARTICLES FROM PULP MATERIAL

EINRICHTUNG ZUR HERSTELLUNG VON FORMKÖRPERN AUS FASERBREI

EQUIPEMENT POUR LA FABRICATION D'ARTICLES A PARTIR D'UNE PATE FIBREUSE

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB IE IT LI NL PT SE

(30) Priority: **28.02.1992 DK 262/92**

(43) Date of publication of application:
08.02.1995 Bulletin 1995/06

(73) Proprietor: **BRODRENE HARTMANN A/S**
DK-2800 Lyngby (DK)

(72) Inventors:
- **JESSEN, Poul, Erik**
  DK-2830 Virum (DK)
- **KJELDSEN, Ib Jorgen**
  DK-2640 Flong (DK)
- **PIHL, René**
  DK-1728 Kobenhavn V (DK)
- **RASMUSSEN, Torben**
  DK-2800 Lyngby (DK)

(74) Representative: **Roerboel, Leif et al**
BUDDE, SCHOU & CO. A/S,
Vestergade 31
1456 Copenhagen K (DK)

(56) References cited:
GB-A- 627 841
GB-A- 708 393
SE-A- 6 605 138
US-A- 2 903 062

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 637 353 B1

Printed by Jouve, 75001 PARIS (FR)

Description

TECHNICAL FIELD

The present invention relates to equipment of the kind set forth in the preamble of claim 1.

BACKGROUND ART

Pulp moulding dies of this kind for the production of egg flats or fruit packaging trays are e.g. known from GB-A-708393 and US-A-2903062 which solved a problem inherent to earlier pulp moulding dies, namely the undue stretching or distortion of the wire mesh. The manufacture of such a die or mould necessitates, however, extensive machining for the shaping of both the base surface and the individual projections, and the die or mould is therefore costly to manufacture and may only be used profitably when producing extremely great numbers of articles such as the aforesaid egg flats or fruit packaging trays.

Recently, the need has arisen for also being able to make smaller series of articles, e.g. thin-walled papier--mâché products of pulp material with raised portions or projections to be used as shock-absorbing filling bodies instead of moulded filling bodies of rigid porous plastic material between an external packaging means, e.g. a corrugated-paper box, and an article packaged therein, such as an electronic apparatus, a kitchen machine etc., said projections or raised portions necessarily having various shapes and sizes and being located in a manner corresponding to the article to be packaged.

DISCLOSURE OF THE INVENTION

On the above background, it is the object of the present invention to provide equipment of the kind referred to initially, with which it is possible to fill the need mentioned above, and which can be produced at such low cost, that it makes it possible in a profitable manner to produce limited numbers of thin-walled or shell-shaped products of pulp material.

This object is achieved with equipment, according to the present invention being characterized by the features set forth in the characterizing clause of claim 1.

With this arrangement, it is possible to assemble a suction mould with the desired raised portions or projections from a small number of standardized and series-produced components, which may in certain cases be used again, and the base surface may be made from e.g. a sheet metal where all the machining needed is the provision of perforations and openings, so that the suction mould can be produced at substantially reduced cost.

A preferred embodiment for the equipment according to the invention is set forth in claim 2.

Another embodiment of the equipment according to the invention is set forth in claim 3. The use of stainless steel makes the components concerned easy to clean and protects them against electrolytic corrosion. The combination set forth in items b and c has proved suitable for achieving a homogenous deposition of pulp material on the shaping surface of the suction mould.

A further preferred embodiment is set forth in claim 4. Especially high-density polyethylene is cheap and easy to shape at low cost to the desired shapes, while its hydrophobic surface properties reduce the necessary cleaning of the suction mould.

Yet another preferred embodiment is set forth in claim 5. A wire-gauze covering made in the manner indicated has proved to serve its purpose excellently, and the resistance welding of the wire gauze has proved not to reduce its permeability.

With a view to easy separation of papier-mâche products made with a suction mould according to the invention and having them stacked on top of each other, the suction mould may also exhibit the features set forth in claim 6. With this arrangement, a protruding rib will be formed between the ribs referred to on the side of the papier-mâché product facing the suction mould, while on the opposite side of the product a projection with a relatively plane surface will be formed, said projection, when dried papier-mâché products are stacked on top of each other and nested within each other, will abut against the protruding rib on the papier-mâché product lying immediately above, thus producing a certain spacing from the latter.

When the suction mould has been separated from the shell of pulp material having been aspirated onto it and this shell has been placed in the drying section of the equipment and dried so as to form a papier-mâché product, in which process a certain drying shrinkage occurs depending on the production parameters, it is often preferred to hot-press the papier-mâché product, giving the latter a more dense consistency and a more smooth and an esthetically pleasing surface.

For this reason, the present invention also relates to equipment of the kind set forth in the preamble of claim 7, and according to the invention, this equipment is characterized by the features set forth in the characterizing clause of said claim 7. With this arrangement it is possible to exploit the benefits of the modular-system arrangement set forth in claim 1 and used for making the suction mould.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following detailed portion of the present specification, the present invention will be explained in more detail with reference to the drawings, in which

Figure 1 is a partial plan view of the corner of a suction mould according to the invention,

Figure 2 is a sectional view along the line A-A in Figure 1,

Figure 3 is a sectional view along the line B-B in

Figure 1, and

Figure 4 is a partial sectional view through a region of a pressing mould according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figures 1-3 show a corner of a suction mould generally designated 1. The suction mould 1 comprises a plane metal plate 2, along the periphery of which a so-called flushing edge 3 is secured by means of screws 4. The metal plate 2 is perforated by a number of through-going bores 5, preferably with a diameter of 2 mm and having their centres spaced from each other by appr. 8 mm, the moulding surface of said metal sheet 2 being covered by metal wire gauze 6 having 20 apertures per linear centimeter (50-mesh gauze). Both the metal plate 2 and the metal wire gauze 6 are made of stainless steel. Projections generally designated 8 are secured to the metal plate 2 above suitable openings 7, each of said projections consisting of a hollow member 9 of high-density polyethylene, the external surface of which is covered with metal-wire gauze 10. The hollow members 9 are perforated by bores 11, like the bores 5 in the plate 2 having a diameter of 2 mm and preferably having their centres spaced approximately 8 mm apart. Like the metal-wire gauze 6 in the plate 2, the metal-wire gauze 10 is made from stainless steel and has 20 apertures per linear centimeter (50-mesh gauze). As shown in Figure 3, the projections 8 are secured to the metal plate 2 by means of screws 12.

The projections 8 shown in the drawing all have the same dimensions and the same shape, as they are shaped somewhat like truncated cones with square base and rounded corners. It is, however, to be understood that according to the present invention, the projections 8 may have various dimensions and shapes, such as similar to a truncated cone with a rectangular base and rounded corners, and they may have been selected among a modular system comprising pre-fabricated projections of a relatively small number of types with different dimensions and shapes.

In the corner of suction mould 1 shown in Figure 1, a pair of ribs 13 are placed close side-by-side between two of the projections 8. The purpose of these ribs 13 is to produce a recess with a downwardly protruding rib on the surface shaped by the suction mould 1 on the papier-mâché product made on this mould, and to produce a substantially plane raised portion on the opposite surface of the product, said rib and a corresponding raised portion on the next product lying below in a stack of nested papier-mâché products having as their purpose to make it easier to separate stacked products from each other.

Figure 4 is a partial sectional view of a region of a pressing mould according to the present invention, adapted for hot-pressing of a dried papier-mâché product made with a suction mould according to the invention.

The pressing mould consists of a first mould part generally designated 14 and a second mould part generally designated 15. The first mould part 14 comprises projections 16 of a shape complementary to the shape of the recesses produced in the dried papier-mâché product by the shaping surface of the suction mould, while the second mould part 15 comprises recesses 17 of a shape complementary to the shape of the projections 16 on the first mould part, but having dimensions greater than the projections 16 on the first mould part enlarged by the wall thickness of the hot-pressed papier-mâché product. Both the projections 16 and the recesses 17 may be produced by suitably machining metallic work pieces.

The projection 16 shown in Figure 4 is pre-fabricated and chosen from second modular system comprising a relatively small number of types with different dimensions and shapes corresponding to the dimensions and shapes after shrinkage of the recesses produced in the papier-mâché product using projections according to the first-mentioned modular system described in connection with the suction mould related to with reference to Figures 1-3.

In the exemplary embodiment shown, the projections 16 on the first mould part 14 are secured to a substantially plane metal plate 18 by means of screws 19.

LIST OF PARTS

1. Suction mould
2. Plane metal plate
3. Flushing edge
4. Screw
5. Bore
6. Metal-wire gauze
7. Opening
8. Projection
9. Hollow member
10. Metal-wire gauze
11. Bore
12. Screw
13. Rib
14. First mould part
15. Second mould part
16. Projection
17. Recess
18. Plane metal plate
19. Screw

Claims

1. Equipment for making a thin-walled papier-mâché product from pulp material and comprising a suction mould (1) with flushing edges (3) and a shaping surface having projections (8) and covered with wire gauze (6,10), said projections having a suitable taper permitting problem-free liberation of the mould-

ed product from the suction mould, wherein

a) the suction mould (1) comprises a base surface (2) provided with perforations (5) and covered by wire gauze, and wherein
b) the projections (8) are releasably secured (12) to the plate (2) above suitable openings (7) in the latter and in the wire gauze (6) and consist of perforated hollow members (9) covered on the outside with wire gauze (10), **characterized in** that said base surface is a plane plate (2) and that said projections (8) are selected from a first building-set system comprising a relatively small number of types of pre-fabricated projections (8) with different dimensions and shapes.

2. Equipment according to claim 1, **characterized in** that the projections (8) have shapes resembling those of truncated cones with a substantially square or rectangular base with rounded corners, their oblique peripheral walls forming a taper angle with the normal on the surface of the plate (2) in the order of magnitude 8-20°, preferably approximately 15°.

3. Equipment according to claim 2, **characterized in** that

a) the plate (2) and the wire gauze (6,10) consist of stainless steel,
b) the perforations (5,11) in the plate (2) and the hollow members (9) are holes with a diameter of approximately 2 mm and a spacing between centres of preferably approximately 8 mm, and that
c) the wire gauze (6,10) has about 20 apertures per linear centimeter (a mesh size at about 50).

4. Equipment according to claim 2 or 3, **characterized in that** the hollow members (9) used in the projections (8) are produced by moulding and/or material-removing processing of a plastic material, such as nylon, polycarbonate, polyester etc., preferably high-density polyethylene.

5. Equipment according to claim 4, **characterized in that** a metal-wire-gauze covering (10) on the projections (8) has been produced by a method comprising the following steps:

a) creating a suitably developed surface,
b) cutting a pre-form of metal-wire gauze of a shape corresponding to said developed surface,
c) folding the pre-form to the desired shape and resistance-welding of its edges to each other to retain the shape, and
d) securing the shaped and welded wire-gauze shape to the surface of the hollow member of plastic (9) by heating.

6. Equipment according to any one or any of the claims 2-5, **characterized by** at least one pair of short ribs (13) with suitable taper placed close side-by-side on top of the wire-gauze covering (6) in at least one location on the plate (2), said ribs (13) either being made of metal-wire gauze and secured to a metal-wire gauze on the plate by spot welding or made of e.g. polyethylene and removably secured to the metal plate by means of at least one screw.

7. Equipment according to anyone of the claims 1-6 and comprising a pressing mould for hot-pressing the dried papier-mâché product made with a suction mould as set forth in any of the claims 1-6, said pressing mould comprising a first mould part (14) with projections (16) complementary to the recesses in the dried papier-mâché product produced by the shaping surface of the suction mould and having the same shape and dimensions as said recesses, and a second mould part (15) with recesses (17) complementary to the projections (6) on the first mould part (14) and having the same shape as the latter, the dimensions of the recesses (17), however, being increased by the wall thickness (t) of the hot-pressed papier-mâché product relative to the dimensions of the projections (16) on the first mould part (14), and in which the projections (16) on and the recesses (17) in the mould parts are produced by material-removing machining metal workpieces, **characterized in** that the first mould part (14) has been assembled with separate, pre-fabricated projections (16) selected from a second building-set system comprising a relatively small number of types with different dimensions and shapes, corresponding to the dimensions and shapes after shrinkage of the recesses produced in the papier-mâché product using projections according to the first building-set system set forth in claim 1, said first projections (16) being releasably secured to a substantially plane metal base (8).

Patentansprüche

1. Anlage zur Herstellung dünnwandiger Papmaché-Gegenstände aus Pulpmaterial, bestehend aus einer mit Spülkanten (3) versehenen Saugform (1) und einer formgebenden, mit Vorsprüngen (8) versehenen und mit einem Drahtgewebe (6,10) bekleideten Oberfläche, wobei die Vorsprünge einen passenden Schlupfwinkel aufweisen, der eine problemfreie Befreiung des geformten Gegenstandes von der Saugform ermöglicht, indem

a) die Saugform (1) eine Grundfläche (2) aufweist, die mit Durchbrechungen (5) versehen und mit einem Drahtgewebe bekleidet ist, und b) die Vorsprünge (8) lösbar (12) an der Fläche (2) über in letzterer und in dem Drahtgewebe (6) vorgesehenen passenden Öffnungen (7) befestigt sind und aus durchbrochenen, auf ihrer Aussenseite mit einem Drahtgewebe bekleideten Hohlkörpern (9) bestehen, dadurch **gekennzeichnet**, dass die Grundfläche eine ebene Platte (2) ist, und dass die genannten Vorsprünge (8) aus einem ersten Bausatz-System ausgewählt sind, welches eine verhältnismässig geringe Anzahl von vorgefertigten Typen von Vorsprüngen (8) mit verschiedenen Abmessungen und Formen aufweist.

2. Anlage gemäss Anspruch 1, dadurch **gekennzeichnet**, dass die Vorsprünge (8) Formen aufweisen, die der von Kegelstumpfen gleichen, mit einer im Wesentlichen quadratischen oder rechtwinkligen Grundfläche mit abgerundeten Ecken, und dass ihre schrägen Periferiewände einen Schlupfwinkel mit der auf die Oberfläche der Platte (2) bezogenen Senkrechten bilden in einer Grössenordnung von 8-200, vorzugsweise etwa 15°.

3. Anlage gemäss Anspruch 2, dadurch **gekennzeichnet**, dass

a) die Platte (2) und das Drahtgewebe (6,10) aus nichtrostendem Stahl bestehen,
b) die Durchbrechungen (5,11) in der Platte (2) und den Hohlkörpern (9) Löcher mit einem Durchmesser von etwa 2 mm und einem Mittenabstand von vorzugsweise etwa 8 mm sind, sowie dass
c) das Drahtgewebe (6,10) etwa 20 Öffnungen per linearem Zentimeter (eine Maschengrösse von etwa 50) aufweist.

4. Anlage gemäss Anspruch 2 oder 3, dadurch **gekennzeichnet**, dass die in den Vorsprüngen (8) angewandten Hohlkörper (9) durch Giessen und/oder materialentfernende Bearbeitung eines Plastmaterials wie Nylon, Polykarbonat, Polyester etc., vorzugsweise Polyethylen hoher Dichte hergestellt sind.

5. Anlage gemäss Anspruch 4, dadurch **gekennzeichnet**, dass eine Metalldrahtgewebe-Bekleidung (10) auf den Vorsprüngen (8) hergestellt worden ist durch ein die folgenden Schritte enthaltendes Verfahren:

a) Herstellung einer passend entfalteten Oberfläche,
b) Zuschneiden einer Vorform aus Metalldrahtgewebe mit einer der entfalteten Oberfläche entsprechenden Form,
c) Falten dieser Vorform in die gewünschte Form, und Widerstands-verschweissen von deren Kanten aneinander zwecks Bewahrung der Form, und
d) Befestigung des geformten und verschweissten Draht-Formgewebes an die Oberfläche des hohlen Plastkörpers (9) durch Erwärmung.

6. Anlage gemäss einem jeden, oder jede der Ansprüche 2-5, dadurch **gekennzeichnet**, dass zumindest ein Paar kurzer Rippen (13) mit passenden Schlupf dicht Seite an Seite auf der Spitze der Drahtgewebe-Bekleidung (6) auf mindestens einer Stelle der Platte (2) angebracht ist, welche Rippen (13) entweder aus Metalldrahtgewebe hergestellt und an einem Metalldrahtgewebe auf der Platte durch Punktschweissen befestigt sind, oder beispielsweise aus Polyethylen hergestellt und entfernbar auf der Metallplatte mittels mindestens einer Schraube befestigt sind.

7. Anlage gemäss einem jeden der Ansprüche 1-6, bestehend aus einer Press-Form zum Warm-Pressen des mittels einer Saugform hergestellten, getrockneten Papmaché-Gegenstandes wie in einem jeden der Ansprüche 1-6 angegeben, wobei die Pressform einen ersten Formteil (14) mit Vorsprüngen (16) entsprechend den Vertiefungen in dem getrockneten, mittels der formgebenden Oberfläche der Saugform hergestellten Papmaché-Gegenstand enthält und die gleiche Form und die gleichen Abmessungen wie die Vertiefungen aufweist, sowie einen zweiten Formteil (15) mit entsprechend den Vorsprüngen (16) auf dem ersten Formteil (14) enthält sowie die gleiche Form wie letztere aufweist, wobei indessen die Dimensionen der Vertiefungen (17) um die Wanddicke (t) des warm-gepressten Papmaché-Gegenstandes entsprechend den Abmessungen der Vorsprünge (16) auf dem ersten Formteil (14) vergrössert sind, und wo die Vorsprünge (16) auf, und die Vertiefungen (17) in den Formteilen durch materialentfernende Bearbeitung von Metallwerkstücken hergestellt sind, dadurch **gekennzeichnet**, dass der erste Formteil (14) mittels separater, vorgefertigter Vorsprünge (16) aufgebaut ist, die aus einem zweiten Bausatz-System ausgewählt sind, das eine verhältnismässig kleine Anzahl von Typen unterschiedlicher Abmessungen und Formen umfasst, die den Abmessungen und Formen nach Schrumpfen der in dem Papmaché-Gegenstand hergestellten Vertiefungen unter Anwendung von Vorsprüngen gemäss dem ersten Bausatz-System wie in Anspruch 1 angegeben entspricht, und dass die genannten ersten Vorsprünge (16) lösbar an einer im Wesentlichen ebenen Metallunterlage (8) befestigt sind.

Revendications

1. Appareil pour la fabrication d'un produit à paroi mince en papier mâché à partir d'un matériau sous forme de pâte et comprenant un moule à aspiration (1), avec des bords d'égalisation (3) et une surface de moulage présentant des parties en saillie (8) et recouvert d'un tissu métallique (6, 10), lesdites parties en saillie présentant une dépouille adéquate permettant une libération aisée du produit moulé du moule à aspiration, dans lequel:

   a) le moule à aspiration (1) comprend une surface de base (2) munie de perforations (5) et recouverte d'un tissu métallique et dans lequel
   b) les parties en saillie (8) sont fixées de façon amovible (12) à la plaque (2) au-dessus d'ouvertures adéquates (7) pratiquées dans la plaque et dans le tissu métallique (6) et sont constituées d'organes creux perforés (9) recouverts extérieurement d'un tissu métallique (10), caractérisé en ce que ladite surface de base est une plaque plane (2) et en ce que lesdites parties en saillie (8) sont choisies parmi un premier système de composants d'assemblage comprenant un nombre relativement faible de types de parties en saillie pré-fabriquées (8) présentant différentes dimensions et formes.

2. Appareil selon la revendication 1, caractérisé en ce que les parties en saillie (8) présentent des formes similaires à celles de troncs de cône munis d'une base de forme sensiblement carrée ou rectangulaire à angles arrondis, leurs parois périphériques en biais formant un angle de dépouille par rapport à la normale sur la surface de la plaque (2) de l'ordre de 8 à 20°, de préférence d'environ 15°.

3. Appareil selon la revendication 2, caractérisé en ce que

   a) la plaque (2) et le tissu métallique (6, 10) sont réalisés en acier inoxydable,
   b) les perforations (5, 11) de la plaque (2) et des organes creux (9) sont des trous présentant un diamètre d'environ 2 mm et un entraxe d'environ 8 mm, et en ce que,
   c) le tissu métallique (6, 10) présente environ 20 ouvertures par centimètre linéaire (une maille d'environ 50 mesh).

4. Appareil selon la revendication 2 ou 3, caractérisé en ce que les organes creux (9) utilisés dans les parties en saillie (8) sont fabriqués par moulage et/ou traitement d'usinage d'un matériau synthétique, tel que nylon, polycarbonate, polyester, etc., de préférence un polyéthylène haute densité.

5. Appareil selon la revendication 4, caractérisé en ce qu'un recouvrement en tissu métallique (10) sur les parties en saillie (8) est obtenu par un procédé comprenant les étapes consistant :

   a) à créer une surface développée adéquate,
   b) à découper une préforme en tissu métallique d'une forme qui correspond à celle de ladite surface développée;
   c) à plier la préforme pour obtenir la forme recherchée avec soudage électrique par résistance des arêtes, entre elles, afin de maintenir la forme, et
   d) à fixer le profil en tissu métallique, conformé et soudé, à la surface de l'organe creux en matière synthétique (9) par chauffage.

6. Appareil selon l'une quelconque des revendications 2 à 5, caractérisé par au moins une paire de nervures courtes (13) présentant une dépouille adéquate situées à proximité et l'une à côté de l'autre au-dessus du recouvrement en tissu métallique (6) à au moins un emplacement de la plaque (2), lesdites nervures (13) étant réalisées soit en tissu métallique et fixées au tissu métallique sur la plaque par soudage par points, soit en, par exemple polyéthylène et fixées de façon amovible à la plaque métallique au moyen d'au moins une vis.

7. Appareil selon l'une quelconque des revendications 1 à 6, et comprenant un moule de compression pour moulage à chaud d'un produit séché en papier mâché réalisé au moyen d'un moule à aspiration selon l'une quelconque des revendications 1 à 6, ledit moule de compression comprenant une première partie de moule (14) muni de pièces en saillie (16) qui sont complémentaires des évidements du produit séché en papier mâché formés par la surface de moulage du moule à aspiration et présentant la même forme et les mêmes dimensions que lesdits évidements, et une deuxième partie de moule (15) munie d'évidements (17) qui sont complémentaires des parties en saillie (6) prévus sur la première partie de moule (14) et présentent la même forme que ces dernières, les dimensions des évidements (17) étant néanmoins augmentées d'une valeur égale à l'épaisseur de paroi (t) du produit en papier mâché moulé à chaud par rapport aux dimensions des parties en saillie (16) prévues sur la première partie de moule (14), et dans lequel les parties en saillie (16) des parties de moule ainsi que les évidements (17) de ces dernières sont obtenues par usinage de pièces métalliques, caractérisé en ce que la première partie de moule (14) a été assemblée avec des parties en saillie indépendantes et préfabriquées (16) choisies dans un deuxième système de composants d'assemblage comprenant un nombre relativement faible de types présentant des dimensions

et des formes différentes, correspondant aux dimensions et aux formes, après rétrécissement, des évidements fabriqués dans le produit en papier mâché par l'utilisation des parties en saillie selon le premier système de composants d'assemblage tel que mentionné dans la revendication 1, lesdites premières parties en saillie (16) étant fixées de façon amovible à une base métallique sensiblement plane (8).

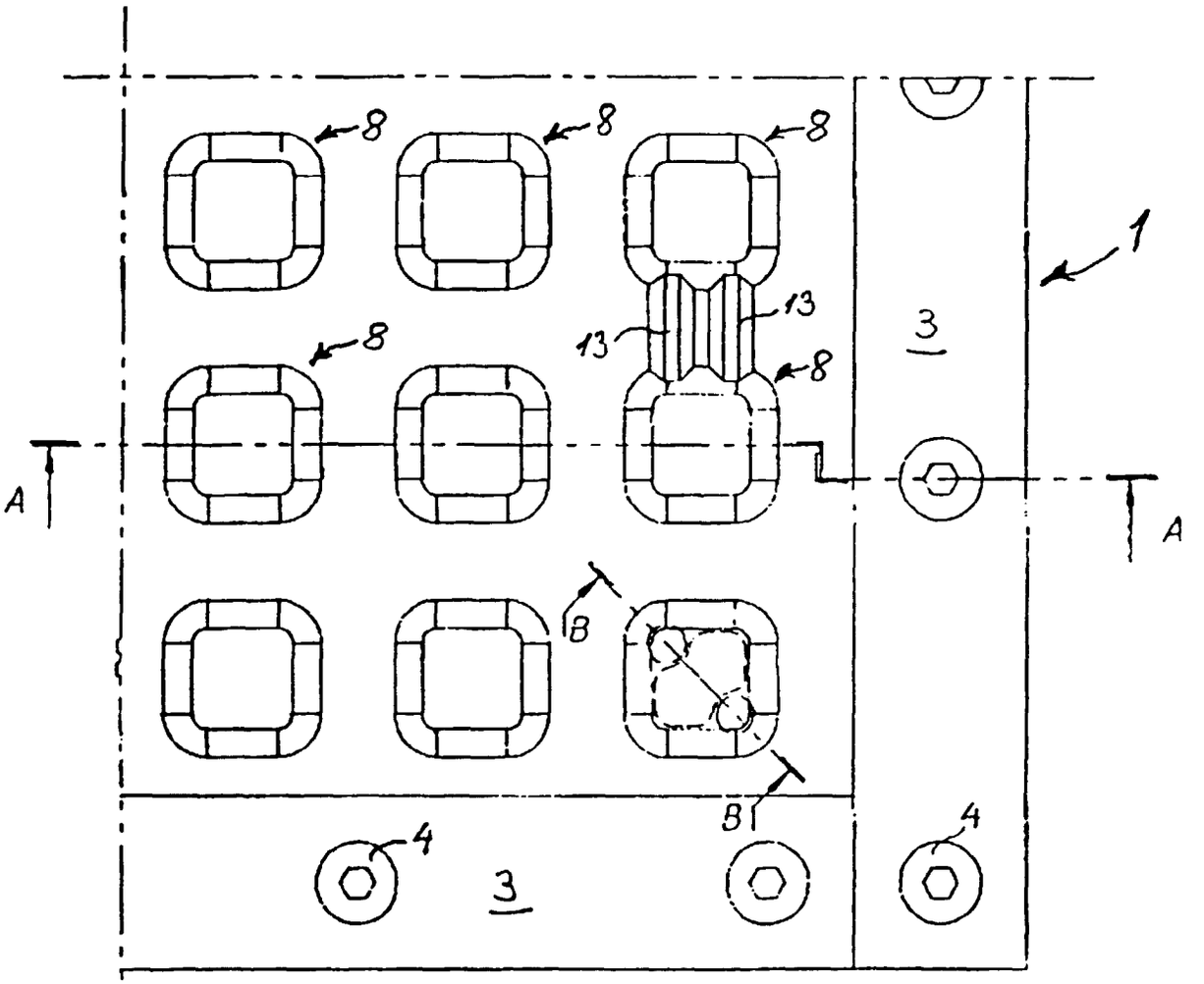


Fig. 1

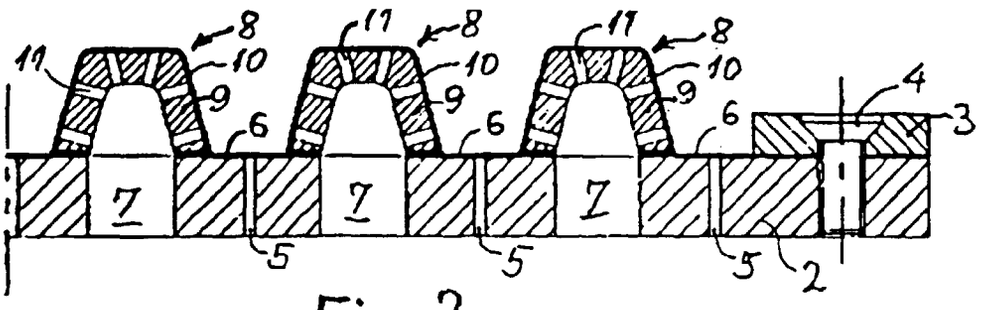


Fig. 2

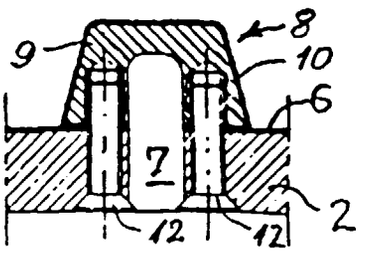


Fig. 3

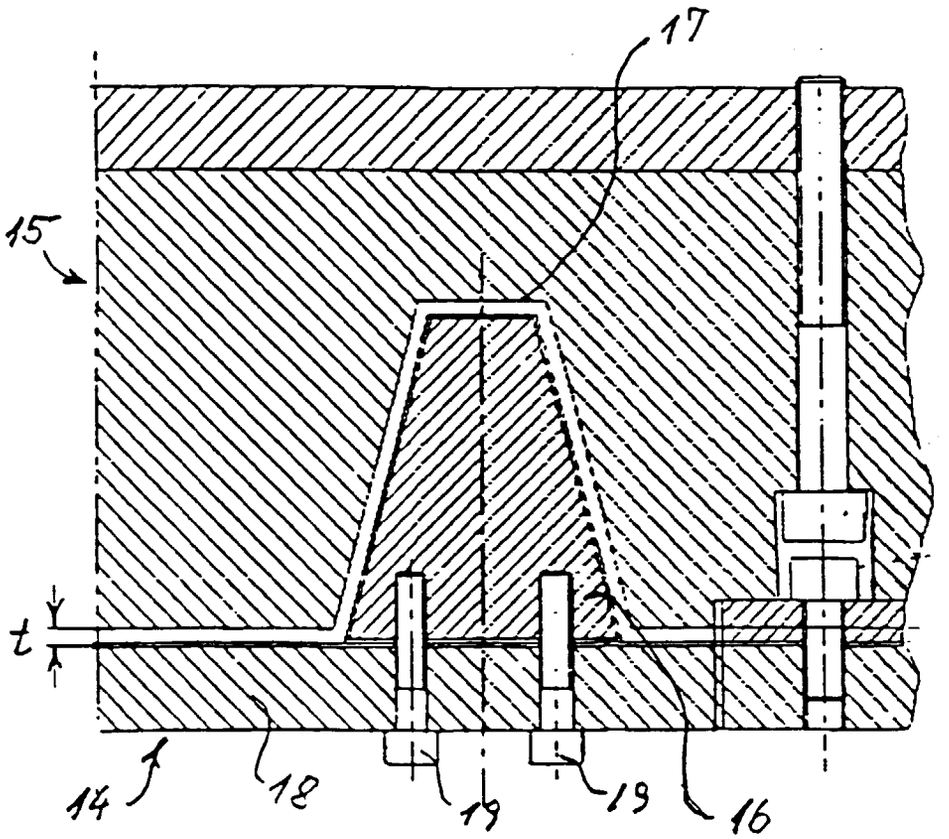


Fig. 4