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(54) **PRESSURE DISTRIBUTOR FOR PRESSING METALS AND DIE USING SAID PRESSURE DISTRIBUTOR**

DRUCKVERTEILER ZUM PRESSEN VON METALLEN UND MATRIZE MIT DIESEM
DRUCKVERTEILER

RÉPARTITEUR DE PRESSION POUR LE PRESSAGE DE MÉTAUX ET MATRICE UTILISANT LEDIT
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EP 3 283 242 B1

Description

[0001] The invention concerns a pressure distributor for metal forming, particularly suited to be used in dies for forming sheet metal and especially for deep-drawing according to the preamble of claim 1.

[0002] Forming processes, as is known, are used to make objects by deforming a material using pieces of equipment called "dies".

[0003] As regards in particular sheet metal forming, a die, in its basic configuration, comprises a punch that forces the metal sheet inside a matrix so as to obtain a concave configuration of the metal sheet reproducing the outline of the matrix in plan view.

[0004] The forming operation in this case is called "drawing", and if the depth of the item that is being formed exceeds its larger dimension in plan view, the drawing process is called "deep drawing".

[0005] During the drawing process, sheet metal is deformed as a consequence of the stresses to which it is subjected and which can be summed up as follows:

- radial tensile stress produced by the action exerted by the punch that moves into the matrix in order to form the object;
- circumferential compressive stress produced by the progressive adaptation of the external perimeter of the metal sheet to the shape of the matrix.

[0006] These stresses are exerted simultaneously with variable intensity in the different areas of the metal sheet which, at the level of its edge, tends to corrugate and thicken, and thus to become thicker in the areas with limited sliding movements.

[0007] In order to avoid these drawbacks, the edges of the metal sheet are maintained adherent to the matrix by means of a sheet pressing device that, applying pressure at right angles to the edge of the metal sheet and distributing said pressure on the surface of the edge itself, prevents the metal sheet from corrugating and controls its sliding movements.

[0008] From a practical point of view, the efforts to which the metal sheet is subjected during the forming process generate compressive stresses at the level of corners and curves and compressive stresses generated by the sheet pressing device, which tend to press the metal sheet against the matrix in such a way as to avoid the formation of wrinkles and thicker portions.

[0009] However, it is known to the experts in the art that, notwithstanding the presence of the sheet pressing device, in some areas of the die, between the matrix and the sheet pressing device, the metal sheet becomes thicker and this causes the localized deformation of the sheet pressing device.

[0010] As a consequence of the above, the sheet pressing device is raised in the areas surrounding the deformed area, where the metal sheet, being subjected to a reduced holding action, slides more.

[0011] All this means that, notwithstanding the presence of the sheet pressing device, it is not possible to achieve total control of the sliding movements of the metal sheet and this causes the appearance of distortions, cracks, streaks and wrinkles in the formed object, thus negatively affecting the quality of the product.

[0012] In the worst cases, the formed object may even break.

[0013] In the attempt to eliminate the drawbacks described above, mechanical and/or hydraulic thrusting units are used which apply to the dies compensation forces that tend to deform them in the areas where the sheet pressing device tends to be raised, in such a way as to maintain the metal sheet as uniformly pressed as possible at the level of the edge and to control its sliding movements during the forming process.

[0014] The use of said units, however, poses some recognized drawbacks.

[0015] A first drawback lies in that the above mentioned mechanical-hydraulic thrusting units involve purchase and installation costs that must be added to the already high costs borne by the user for the purchase and installation of the presses.

[0016] Another drawback is represented by the further additional cost to be borne for the operation of said mechanical-hydraulic thrusting units.

[0017] A further drawback is represented by the fact that said mechanical-hydraulic thrusting units are characterized by a recognized lack of flexibility of use, as the same thrusting unit can be used only for dies suited to produce formed objects having geometrically similar shapes.

[0018] This means that the user needs to replace the thrusting units if there are significant differences in the shape and outline of the formed objects to be produced.

[0019] Another drawback is represented by the fact that said mechanical-hydraulic thrusting units are difficult to adjust, because of the required adjusting time and also because the adjustments must be carried out by expert personnel and adapted to each single die.

[0020] Another, yet not the least important drawback lies in that often the use of said mechanical-hydraulic thrusting units does not allow the desired results to be achieved, meaning uniform control of the sliding movements of the metal sheet during the forming process.

[0021] The patent document EP 0 808 224 B1 is also known, which describes a drawing die provided with pressing devices that are fixed to the punch and made of an elastomeric material.

[0022] The pressure devices are arranged at the periphery of the punch, are spaced from one another and each one of them is provided with a braking pad suited to come into contact with the edge of the metal sheet to be drawn during the drawing process.

[0023] During the drawing process, the elastic thrust exerted by the pressing device against the edge of the metal sheet controls the deformation to which the metal sheet is subjected when the punch forces it inside the

matrix.

[0024] The patent document FR 884 771 A, on which the preamble of claim 1 is based, is also known, which describes a drawing process and a device suited to implement said process, wherein the edge of the metal sheet to be drawn is pressed against the surface of the matrix of the die by a sheet pressing device.

[0025] The latter is made elastic thanks to the presence of a yielding element that in the case described in the patent document is constituted by a rubber block included between the sheet pressing device and a holding plate which are both fixed by means of screws to a movable element of the press that is coaxial and external to the punch.

[0026] Even the devices described in the above mentioned patent documents pose the drawback that they do not ensure optimal control of the sliding movements of the metal sheet during the forming process.

[0027] In particular, none of the devices described above improves the absorption of the variable forces that develop in the areas where the thickness of the metal sheet is increased during the forming process.

[0028] The present invention intends to overcome all of the drawbacks described above.

[0029] In particular, it is one object of the invention to provide a pressure distributor that makes it possible to absorb the variable forces that during the forming process are exerted on the sheet pressing device at the level of the areas where the thickness of the metal sheet increases.

[0030] It is another object of the present invention to provide a pressure distributor that also allows said variable forces to be redistributed at the periphery of the areas where said increases in thickness take place.

[0031] It is another, yet not the least important object of the present invention to provide a pressure distributor that during the forming process allows better control of the sliding movements of the metal sheet compared to the sheet pressing devices known in the art.

[0032] The objects listed above are achieved by a pressure distributor having the features defined in independent claim 1, to which reference is made.

[0033] Preferred features are described in the dependent claims. Advantageously, compared to the known art, the use of the pressure distributor that is the subject of the invention improves the distribution of pressures on the metal sheet during the forming process and reduces the differences in thickness that are found on the formed product once the forming process has been completed.

[0034] To further advantage, the formation of wrinkles, cracks and streaks that affect the quality of the formed product is also reduced.

[0035] The objects and advantages listed above are highlighted in greater detail in the following description of the pressure distributor of the invention and of preferred construction variants of the same based on the same innovative concept that are illustrated by way of examples with reference to the attached drawings,

wherein:

- Figure 1 shows an axonometric view of the pressure distributor according to a preferred embodiment of the invention applied to a die arranged in open configuration;
- Figure 2 shows the die of Figure 1 arranged in closed configuration;
- Figure 3 shows a sectional view of the die with an exploded view of the pressure distributor of Figure 2;
- Figure 4 shows the die of Figure 3 arranged in closed configuration;
- Figure 5 shows the die of Figure 4 during the forming process;
- Figures from 6 to 11 show enlarged details of further preferred embodiments of the pressure distributor of the invention;
- Figure 12 shows an enlarged view of a detail of the die of Figure 5, where it is possible to observe in detail how the metal sheet and the pressure distributor of the invention are deformed during the forming process.

[0036] A preferred embodiment of the pressure distributor that is the subject of the present invention is represented in axonometric view in Figure 1, where it is indicated as a whole by **1** and is associated with a die indicated as a whole by **10** and represented in open configuration in Figure 1 and in closed configuration in Figure 2.

[0037] The pressure distributor **1**, in fact, is configured in such a way that it can be placed between the matrix **11** and the base **12** of the die **10** during the forming process carried out on a metal sheet **A** which, as can be observed in the Figures from 3 to 5, is interposed between the matrix **11** and the pressure distributor **1**.

[0038] According to the invention the pressure distributor, which can be observed in greater detail in Figure 6, comprises a composite laminar structure **2** provided with a shaped opening **3** for the passage of the punch **13** of the die **10**, wherein said composite laminar structure **2** comprises a sheet pressing plate **21** configured in such a way that it can be placed in contact with the metal sheet **A** and an elastically deformable plate **22** included between the sheet pressing plate **21** and the base **12** of the die **10**.

[0039] Variant embodiments of the pressure distributor **1** of the invention are possible, some of which are represented in the figures from 7 to 11.

[0040] A first variant embodiment of the pressure distributor, indicated as a whole by **1a**, is visible in Figure 7 and according to this embodiment the composite laminar structure **2a** comprises a sheet pressing plate **21** configured in such a way that it can be placed in contact with the metal sheet **A**, an elastically deformable plate **22** resting on the base **12** of the die **10** and a first intermediate plate **24** included between the sheet pressing plate **21** and the elastically deformable plate **22**.

[0041] Another variant embodiment of the pressure

distributor, indicated as a whole by **1b**, is visible in Figure 8 and according to this embodiment the composite laminar structure **2b** comprises a sheet pressing plate **21** configured in such a way that it can be placed in contact with the metal sheet **A**, an elastically deformable plate **22** facing and placed against the sheet pressing plate **21** and a second intermediate plate **25** included between the elastically deformable plate **22** and the base **12** of the die **10**.

[0042] Another variant embodiment of the pressure distributor, indicated as a whole by **1c**, is visible in Figure 9 and according to this embodiment the composite laminar structure **2c** comprises a sheet pressing plate **21** configured in such a way that it can be placed in contact with the metal sheet **A**, a first intermediate plate **24** included between the sheet pressing plate **21** and an elastically deformable plate **22** and a second intermediate plate **25** included between the elastically deformable plate **22** and the base **12** of the die **10**.

[0043] Another, yet not the least important variant embodiment of the pressure distributor of the invention, indicated as a whole by **1d**, is visible in Figure 10 and according to this embodiment the composite laminar structure **2d** comprises a sheet pressing plate **21** configured in such a way that it can be placed in contact with the sheet **A**, an underlying elastically deformable plate **22** placed against the sheet pressing plate **21** and two second intermediate plates **25** facing each other and included between the elastically deformable plate **22** and the base **12** of the die **10**.

[0044] Other variant embodiments of the invention are possible, which are neither described nor illustrated herein and in which a variable number of intermediate plates may be used, variously arranged between the sheet pressing plate **21** and the elastically deformable plate **22** and/or between the elastically deformable plate **22** and the base **12** of the die **10**.

[0045] Furthermore, said intermediate plates may be made of metallic or non-metallic materials.

[0046] In all of its variant embodiments described herein, the pressure distributor of the invention comprises also a frame **4** that delimits perimetrically the composite laminar structure, so that the pressure distributor of the invention constitutes an easily handled unit that can be rapidly and easily installed in and removed from the corresponding die.

[0047] For this purpose, as can be observed in the figures, in the base **12** of the die **10** there is a perimeter housing **15** that accommodates the frame **4** in order to stabilize the pressure distributor when it is installed in the die.

[0048] Regarding the elastically deformable plate **22**, this is preferably but not exclusively made of an elastomer or an equivalent material and therefore it is characterized by reduced hardness and increased elasticity compared to the overlying sheet pressing plate **21**, so that during the forming of the metal sheet **A** it serves the function of absorbing and distributing pressure, which is described

in greater detail below.

[0049] The elastically deformable plate in turn has a variant embodiment illustrated in Figure 11 and indicated as a whole by **23**, comprising a pair of parallel foils **23a**, **23b** spaced from each other through the interposition of two or more annular gaskets **23c**, **23d**, wherein the foils together with the gaskets define an annular chamber **23e** containing a fluid **23f** that can be a liquid or a gas.

[0050] In this way, the elasticity of the fluid **23f** and of the annular gaskets **23c**, **23d** allows the foils **23a**, **23b**, which from a functional point of view behave as an elastomer, to be mutually moved towards and away from each other.

[0051] From an operational point of view, in order to form the metal sheet **A**, for example to carry out a deep drawing process and obtain a container as shown in Figure 5, the pressure distributor **1** is arranged in the operating position with the frame **4** housed in the annular cavity **15** provided in the base **12** of the die **10**, after arranging the punch **13** so that it is completely recessed within the base **12** itself, as can be seen in Figure 4.

[0052] Then the metal sheet **A** is positioned on the pressure distributor **1** so that the metal sheet is included between the latter and the overlying matrix **11**.

[0053] Obviously, any pressure distributor made according to any of the variant embodiments described above may be used, but for the sake of simplicity here below reference is made to the pressure distributor indicated as a whole by **1** and comprising the sheet pressing plate **21** and the underlying elastically deformable plate **22** made of an elastomer.

[0054] In order to proceed with the forming operation, the punch **13** is lifted and this penetrates the matrix **11** as shown in Figure 5 and thus deforms the metal sheet **A**, creating in the same a cavity with variable shape and depth that depend on the shape of the punch **13** and the depth of penetration of the same in the matrix **11** itself.

[0055] For the reasons already explained above, during the forming process the metal sheet **A** is deformed and in some of its perimeter areas, in particular in proximity to the angular areas of the matrix **11**, during the bending operation it is subjected to a compression force that increases its thickness from value **A1** to value **A2**, which is schematically represented in Figure 12, in which the deformation states are represented in a marked way on purpose, in order to make them more evident.

[0056] The increase in the thickness of the metal sheet generates a thrusting action **F** that deforms the underlying sheet pressing plate **21**, which in turn deforms the underlying elastically deformable plate **22**.

[0057] At the same time, the areas adjacent to the area where the sheet pressing plate **21** is deformed tend to become spaced from the metal sheet **A** that, being less controlled in those areas, shows an increased tendency to slide. Said uncontrolled sliding movement of the metal sheet, however, is counteracted by the elastically deformable plate **22**, as the elastomer with which it is made substantially behaves as a fluid and transforms the lo-

calized deforming force **F** into a pressure **P** that acts on the sheet pressing plate **21** at the level of the areas around the deformation area, in the direction contrary to that of the force **F**, as schematically represented in Figure 12.

[0058] In substance, the elastomer with which the elastically deformable plate **22** is made absorbs the deforming force **F** and redistributes it on the overlying sheet pressing plate **21** in the form of a counter pressure **P¹** with value equal to that of the pressure **P** that is distributed based on the well-known Pascal's law. Therefore, in the areas around the area where the sheet pressing plate **21** has been deformed said counter pressure **P¹** tends to move the sheet pressing plate **21** back towards the metal sheet **A** that is thus held in a substantially uniform way along its entire perimeter edge for the whole duration of the forming process.

[0059] This leads to the advantage of obtaining an almost constant thickness of the metal sheet and eliminating the distortions, cracks, streaks and wrinkles that appear during the forming process carried out according to the known art and thus negatively affect the quality of the product once the forming process has been completed and that in the worst cases may even cause the metal sheet to break.

[0060] Experimental tests have made it possible to verify that by applying the pressure distributor of the invention to a die it is possible to reduce the thickness increases that take place on the metal sheet, and such increases are much smaller than those observed when the forming process is carried out using dies with sheet pressing devices of the known type.

[0061] The embodiment of the pressure distributor that, as explained above, is constituted by the composite laminar structure made up of a sheet pressing plate, an elastically deformable plate, intermediate plates in a variable number and the frame that delimits them, makes it possible to provide a unit that can be rapidly installed in and removed from a die with operations that can be carried out in a simple and safe manner also by inexperienced personnel.

[0062] Furthermore, the use of the pressure distributor of the present invention makes it possible to eliminate the need to use the costly hydraulic equipment that according to the known art is presently used to control the sliding movements of the metal sheet during the forming process.

[0063] During the production stage, the pressure distributor of the invention may be subjected to modifications and variants that are neither illustrated in the drawings nor described herein but that must all be considered protected by the present patent, provided that they fall within the scope of the claims expressed below.

Claims

1. Pressure distributor (1; 1a; 1b; 1c; 1d) configured in

such away that it can be arranged between the matrix (11) and the base (12) of a die (10) during the forming of a metal sheet (A) interposed between said matrix (11) and said pressure distributor (1), said pressure distributor (1) comprising a composite laminar structure (2; 2a; 2b; 2c; 2d) provided with a shaped opening (3) for the passage of the punch (13) of said die (10), said composite laminar structure (2; 2a; 2b; 2c; 2d) comprising a sheet pressing plate (21) configured in such a way that it can be placed in contact with said metal sheet (A) and at least one elastically deformable plate (22, 23) included between said sheet pressing plate (21) and said base (12) of said die (10), **characterized in that** said composite laminar structure (2a) comprises also at least one first intermediate plate (24) included between said sheet pressing plate (21) and said elastically deformable plate (22, 23).

2. Pressure distributor (1b; 1d) according to claim 1, **characterized in that** said composite laminar structure (2b; 2d) comprises also at least one second intermediate plate (25) included between said elastically deformable plate (22, 23) and said base (12) of said die (10).

3. Pressure distributor (1b) according to claim 2, **characterized in that** said composite laminar structure (2b) comprises a single second intermediate plate (25) included between said elastically deformable plate (22, 23) and said base (12) of said die (10).

4. Pressure distributor (1d) according to claim 2, **characterized in that** said composite laminar structure (2d) comprises two second intermediate plates (25) facing and in contact with each other, included between said elastically deformable plate (22, 23) and said base (12) of said die (10).

5. Pressure distributor (1c) according to claim 1, **characterized in that** said composite laminar structure (2c) comprises also at least one first intermediate plate (24) included between said sheet pressing plate (21) and said elastically deformable plate (22, 23) and at least one second intermediate plate (25) included between said elastically deformable plate (22, 23) and said base (12) of said die (10).

6. Pressure distributor (1; 1a; 1b; 1c; 1d) according to any of the preceding claims, **characterized in that** said elastically deformable plate (22) is made of elastomer.

7. Pressure distributor (1; 1a; 1b; 1c; 1d) according to any of the preceding claims from 1 to 5, **characterized in that** said elastically deformable plate (23) is defined by a pair of parallel foils (23a, 23b) spaced from each other through the interposition of two or

more annular gaskets (23c, 23d), said foils (23a, 23b) and said gaskets (23c, 23d) being suited to define together at least one annular chamber (23e) containing a fluid (23f).

8. Pressure distributor (1; 1a; 1b; 1c; 1d) according to claim 7, **characterized in that** said fluid (23f) is a liquid.
9. Pressure distributor (1; 1a; 1b; 1c; 1d) according to claim 7, **characterized in that** said fluid (23f) is a gas.
10. Pressure distributor (1; 1a; 1b; 1c; 1d) according to any of the preceding claims, **characterized in that** it comprises a frame (4) that delimits said composite laminar structure (2; 2a; 2b; 2c; 2d) perimetrically.
11. Die (10) comprising a matrix (11) facing a base (12) in which a punch (13) is slidably associated, said punch being configured so that it cooperates with said matrix (11) in order to draw a metal sheet (A) arranged between said matrix (11) and said base (12), **characterized in that** it comprises a pressure distributor (1; 1a; 1b; 1c; 1d) according to any of the preceding claims and included between said metal sheet (A) and said base (12).

Patentansprüche

1. Druckverteiler (1; 1a; 1b; 1c; 1d), so konfiguriert, dass er zwischen der Matrice (11) und der Basis (12) eines Formwerkzeugs (10) angeordnet werden kann, während ein zwischen der besagten Matrice (11) und dem besagten Druckverteiler (1) selbst eingefügtes Metallblech (A) geformt wird, wobei der besagte Druckverteiler (1) eine blätterförmige Verbundstruktur (2; 2a; 2b; 2c; 2d) mit einer geformten Öffnung (3) für den Durchgang des Stempels (13) des besagten Formwerkzeugs (10) umfasst, wobei die besagte blätterförmige Verbundstruktur (2; 2a; 2b; 2c; 2d) eine Blechpressplatte (21) umfasst, die so konfiguriert ist, dass sie in Kontakt mit dem besagten Metallblech (A) positioniert werden kann, sowie wenigstens eine elastisch verformbare Platte (22, 23), welche zwischen der besagten Blechpressplatte (21) und der besagten Basis (12) des besagten Formwerkzeugs (10) eingeschlossen ist, **dadurch gekennzeichnet, dass** die besagte blätterförmige Verbundstruktur (2a) auch wenigstens eine erste Zwischenplatte (24) umfasst, die zwischen der besagten Blechpressplatte (21) und der besagten, elastisch verformbaren Platte (22, 23) eingeschlossen ist.
2. Druckverteiler (1b; 1d) nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die besagte blätter-

förmige Verbundstruktur (2b; 2d) auch wenigstens eine zweite Zwischenplatte (25) umfasst, die zwischen der besagten, elastisch verformbaren Platte (22, 23) und der besagten Basis (12) des besagten Formwerkzeugs (10) eingeschlossen ist.

3. Druckverteiler (1b) nach Patentanspruch 2, **dadurch gekennzeichnet, dass** die besagte blätterförmige Verbundstruktur (2b) eine einzelne zweite Zwischenplatte (25) umfasst, die zwischen der besagten, elastisch verformbaren Platte (22, 23) und der besagten Basis (12) des besagten Formwerkzeugs (10) eingeschlossen ist.
4. Druckverteiler (1d) nach Patentanspruch 2, **dadurch gekennzeichnet, dass** die besagte blätterförmige Verbundstruktur (2d) zwei zweite Zwischenplatten (25) umfasst, die zueinander gerichtet und in Kontakt miteinander sowie zwischen der besagten, elastisch verformbaren Platte (22, 23) und der besagten Basis (12) des besagten Formwerkzeugs (10) eingeschlossen sind.
5. Druckverteiler (1c) nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die besagte blätterförmige Verbundstruktur (2c) auch wenigstens eine erste Zwischenplatte (24) umfasst, die zwischen der besagten Blechpressplatte (21) und der besagten, elastisch verformbaren Platte (22, 23) eingeschlossen ist, und wenigstens eine zweite Zwischenplatte (25), die zwischen der besagten, elastisch verformbaren Platte (22, 23) und der besagten Basis (12) des besagten Formwerkzeugs (10) eingeschlossen ist.
6. Druckverteiler (1; 1a; 1b; 1c; 1d) nach einem jeden der vorstehenden Patentansprüche, **dadurch gekennzeichnet, dass** die besagte elastisch verformbare Platte (22) aus Elastomer besteht.
7. Druckverteiler (1; 1a; 1b; 1c; 1d) nach einem jeden der vorstehenden Patentansprüche von 1 bis 5, **dadurch gekennzeichnet, dass** die besagte elastisch verformbare Platte (23) durch ein Paar paralleler Folien (23a, 23b) definiert ist, die durch Zwischenfügung von zwei oder mehreren ringförmigen Dichtungen (23c, 23d) voneinander distanziert sind, wobei die besagten Folien (23a, 23b) und die besagten Dichtungen (23c, 23d) dazu geeignet sind, gemeinsam wenigstens eine ringförmige, ein Fluid (23f) enthaltende Kammer (23e) zu definieren.
8. Druckverteiler (1; 1a; 1b; 1c; 1d) nach Patentanspruch 7, **dadurch gekennzeichnet, dass** das besagte Fluid (23f) eine Flüssigkeit ist.
9. Druckverteiler (1; 1a; 1b; 1c; 1d) nach Patentanspruch 7, **dadurch gekennzeichnet, dass** das be-

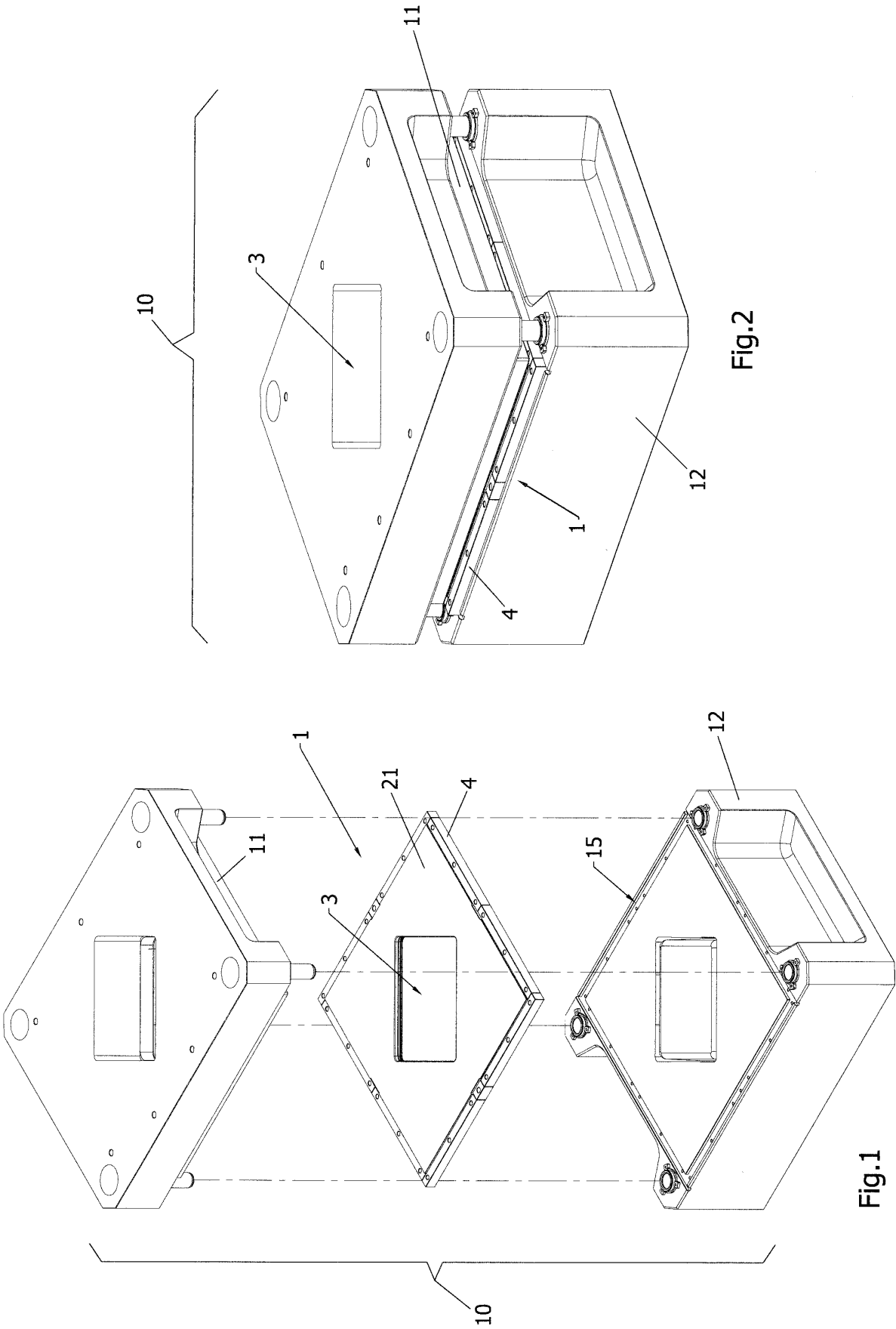
sagte Fluid (23f) ein Gas ist.

10. Druckverteiler (1; 1a; 1b; 1c; 1d) nach einem jeden der vorstehenden Patentansprüche, **dadurch gekennzeichnet, dass** er einen Rahmen (4) umfasst, der den Umfang der besagten blätterförmige Verbundstruktur (2; 2a; 2b; 2c; 2d) begrenzt.
11. Formwerkzeug (10), eine Matrice (11) umfassend, die zu einer Basis (12) gerichtet ist, in der ein Stempel (13) gleitend verbunden ist, wobei der besagte Stempel so konfiguriert ist, dass er mit der besagten Matrice (11) zusammenarbeitet, um ein zwischen der besagten Matrice (11) und der besagten Basis (12) positioniertes Metallblech (A) tiefzuziehen, **dadurch gekennzeichnet, dass** es einen Druckverteiler (1; 1a; 1b; 1c; 1d) nach einem jeden der vorstehenden Patentansprüche umfasst, der zwischen dem besagten Metallblech (A) und der besagten Basis (12) eingeschlossen ist.

Revendications

1. Distributeur de pression (1; 1a; 1b; 1c; 1d) configuré de manière à ce qu'il peut être disposé entre la matrice (11) et la base (12) d'un moule (10) durant le moulage d'une tôle (A) interposée entre ladite matrice (11) et ledit distributeur de pression (1), ledit distributeur de pression (1) comprenant une structure laminaire composée (2; 2a; 2b; 2c; 2d) dotée d'une ouverture galbée (3) pour le passage d'un poinçon (13) dudit moule (10), ladite structure laminaire composée (2; 2a; 2b; 2c; 2d) comprenant une plaque de compression de tôle (21) configurée de manière à ce qu'elle peut être mise en contact avec ladite tôle (A) et au moins une plaque élastiquement déformable (22, 23) comprise entre ladite plaque de compression de tôle (21) et ladite base (12) dudit moule (10), **caractérisé en ce que** ladite structure laminaire composée (2a) comprend également au moins une première plaque intermédiaire (24) comprise entre ladite plaque de compression de tôle (21) et ladite plaque élastiquement déformable (22, 23).
2. Distributeur de pression (1b; 1d) selon la revendication 1, **caractérisé en ce que** ladite structure laminaire composée (2b; 2d) comprend également au moins une deuxième plaque intermédiaire (25) comprise entre ladite plaque élastiquement déformable (22, 23) et ladite base (12) dudit moule (10).
3. Distributeur de pression (1b) selon la revendication 2, **caractérisé en ce que** ladite structure laminaire composée (2b) comprend une deuxième plaque intermédiaire unique (25) comprise entre ladite plaque élastiquement déformable (22, 23) et ladite base (12) dudit moule (10).

4. Distributeur de pression (1d) selon la revendication 2, **caractérisé en ce que** ladite structure laminaire composée (2d) comprend deux deuxième plaques intermédiaires (25) tournées l'une vers l'autre et en contact entre elles, comprises entre ladite plaque élastiquement déformable (22, 23) et ladite base (12) dudit moule (10).
5. Distributeur de pression (1c) selon la revendication 1, **caractérisé en ce que** ladite structure laminaire composée (2c) comprend également au moins une première plaque intermédiaire (24) comprise entre ladite plaque de compression de tôle (21) et ladite plaque élastiquement déformable (22, 23) et au moins une deuxième plaque intermédiaire (25) comprise entre ladite plaque élastiquement déformable (22, 23) et ladite base (12) dudit moule (10).
6. Distributeur de pression (1; 1a; 1b; 1c; 1d) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite plaque élastiquement déformable (22) est réalisée en élastomère.
7. Distributeur de pression (1; 1a; 1b; 1c; 1d) selon l'une quelconque des revendications précédentes de 1 à 5, **caractérisé en ce que** ladite plaque élastiquement déformable (23) est définie par une paire de feuilles parallèles (23a, 23b) et espacées entre elles par l'interposition de deux ou plusieurs joints annulaires (23c, 23d), lesdites feuilles (23a, 23b) et lesdits joints (23c, 23d) étant aptes à définir entre elles au moins une chambre annulaire (23e) dans laquelle un fluide (23f) est contenu.
8. Distributeur de pression (1; 1a; 1b; 1c; 1d) selon la revendication 7, **caractérisé en ce que** ledit fluide (23f) est un liquide.
9. Distributeur de pression (1; 1a; 1b; 1c; 1d) selon la revendication 7, **caractérisé en ce que** ledit fluide (23f) est un gaz.
10. Distributeur de pression (1; 1a; 1b; 1c; 1d) selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend un cadre (4) qui délimite ladite structure de laminaire composée de manière périmétrale (2; 2a; 2b; 2c; 2d).
11. Moule (10) comprenant une matrice (11) tournée vers une base (12) dans laquelle est associé de manière coulissante un poinçon (13), ledit poinçon étant configuré pour coopérer avec ladite matrice (11) pour emboutir une tôle (A) disposée entre ladite matrice (11) et ladite base (12), **caractérisé en ce qu'il** comprend un distributeur de pression (1; 1a; 1b; 1c; 1d) selon l'une quelconque des revendications précédentes et compris entre ladite tôle (A) et ladite base (12).



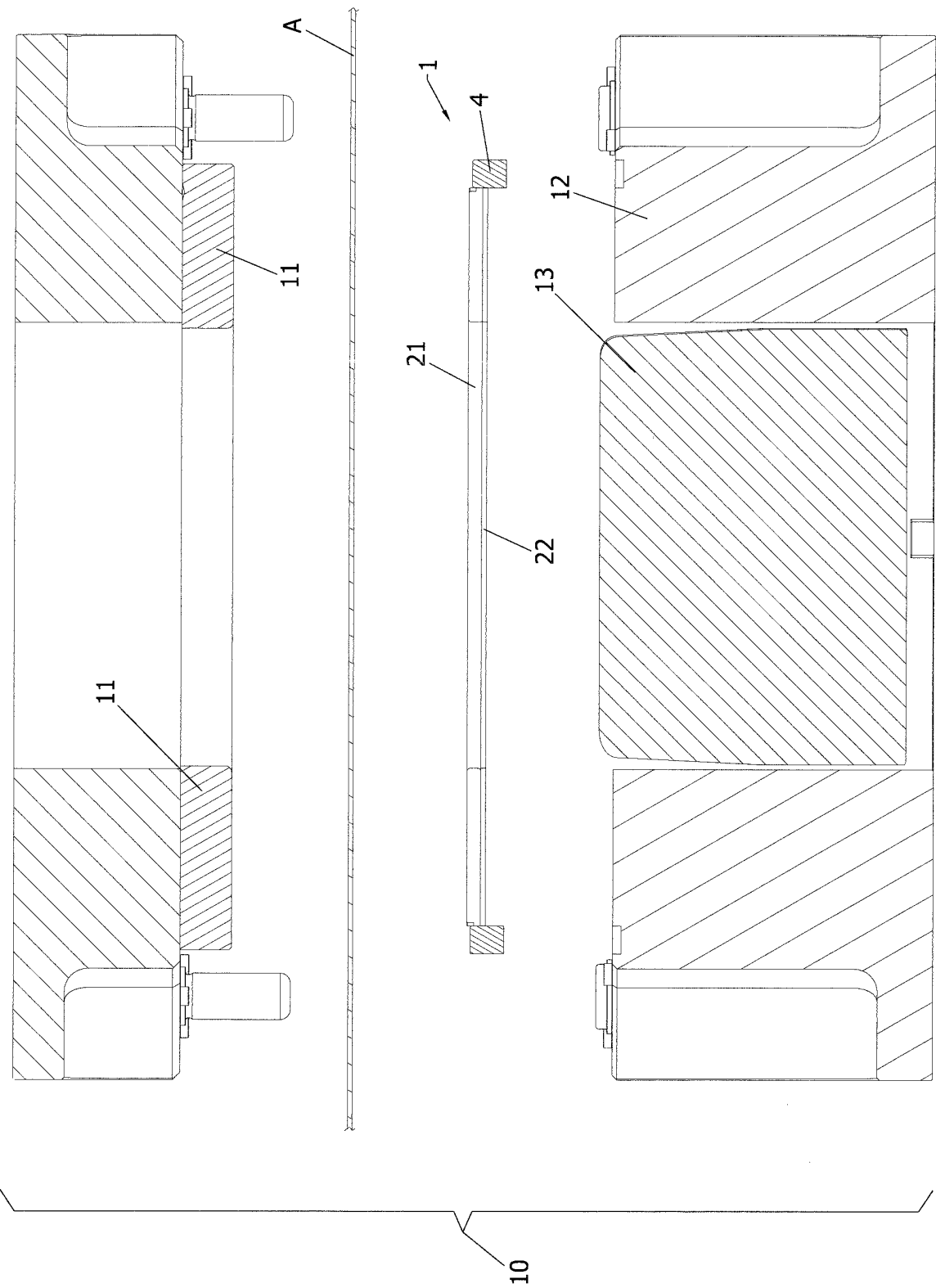


Fig.3

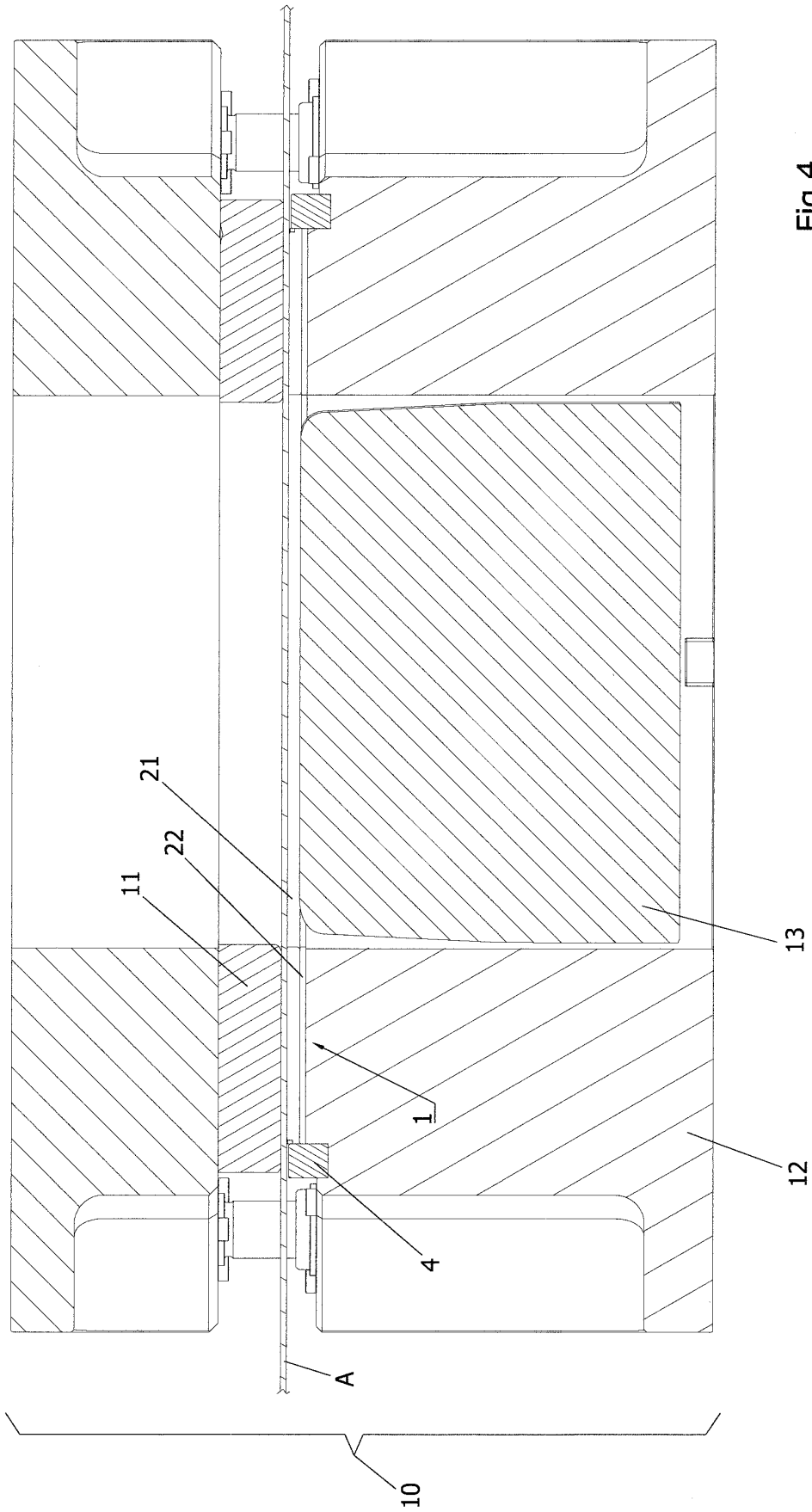


Fig.4

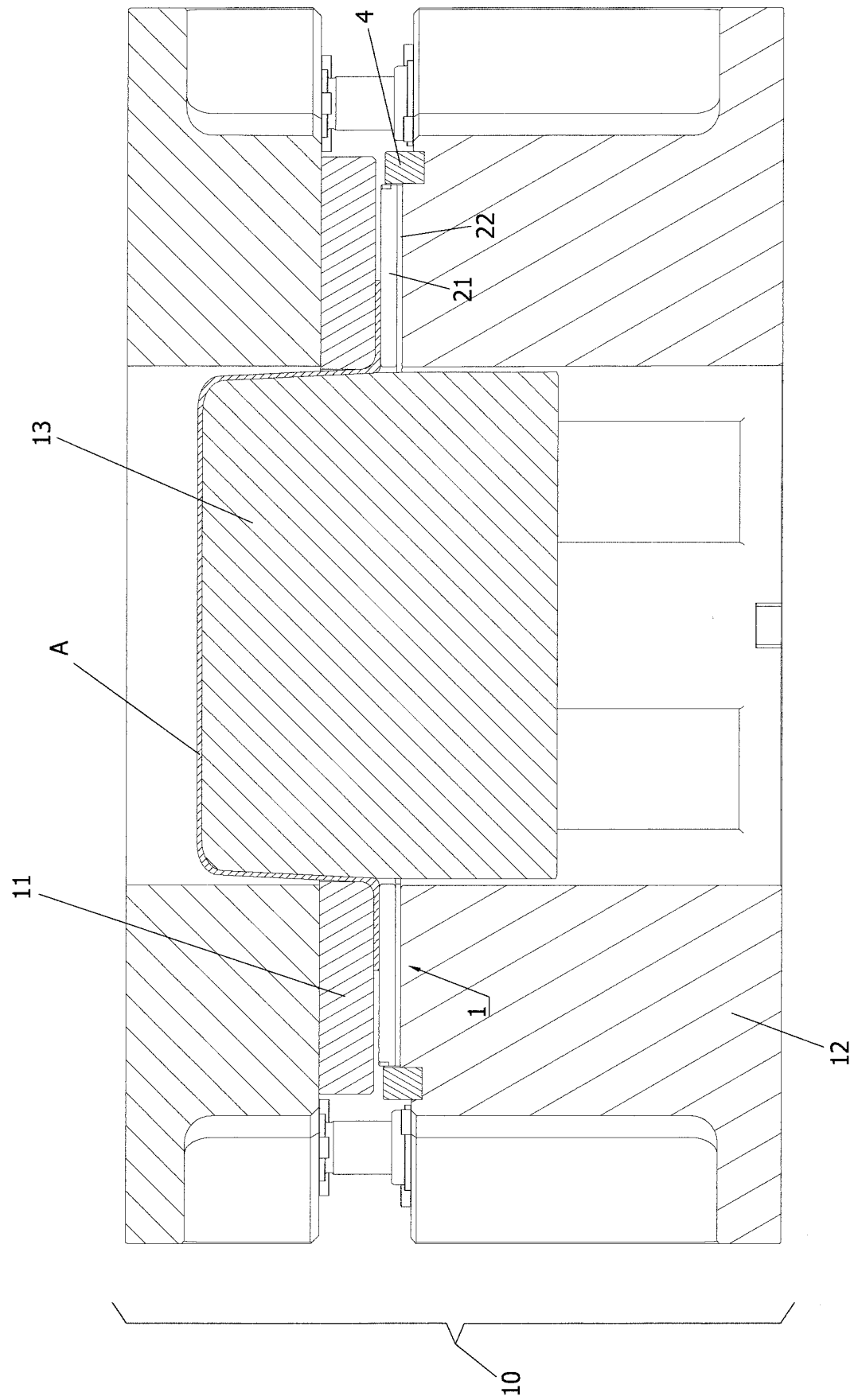
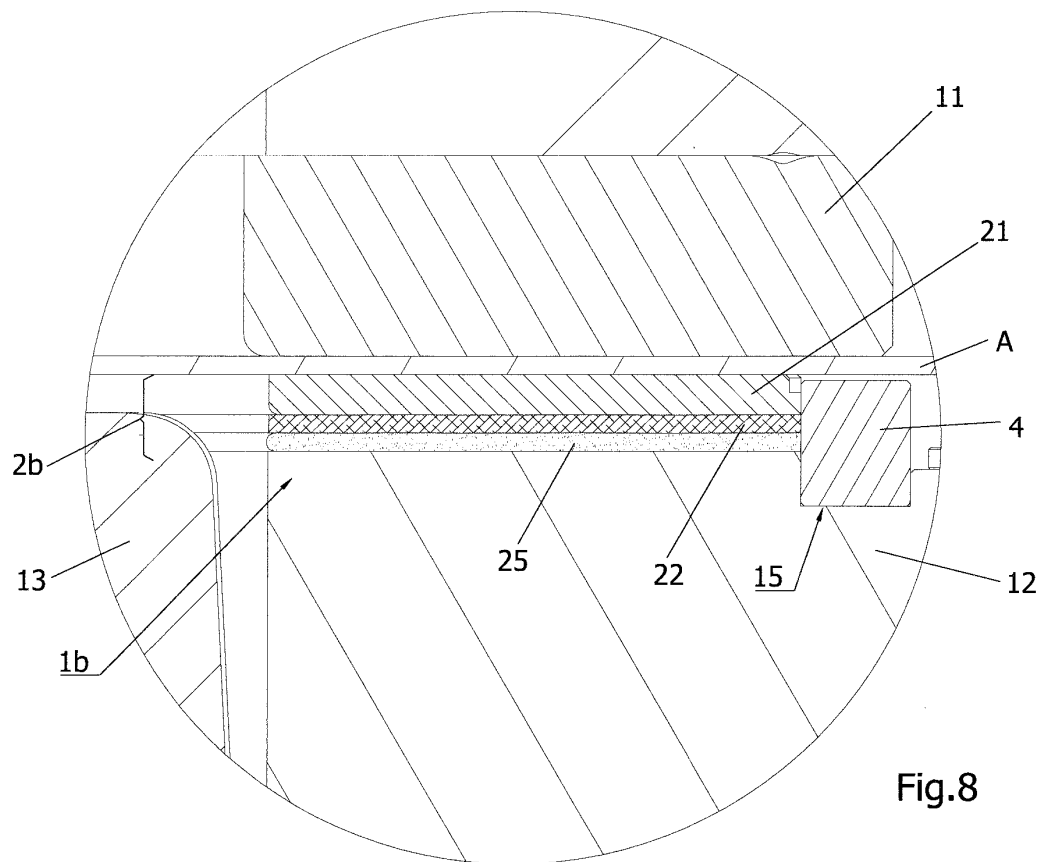
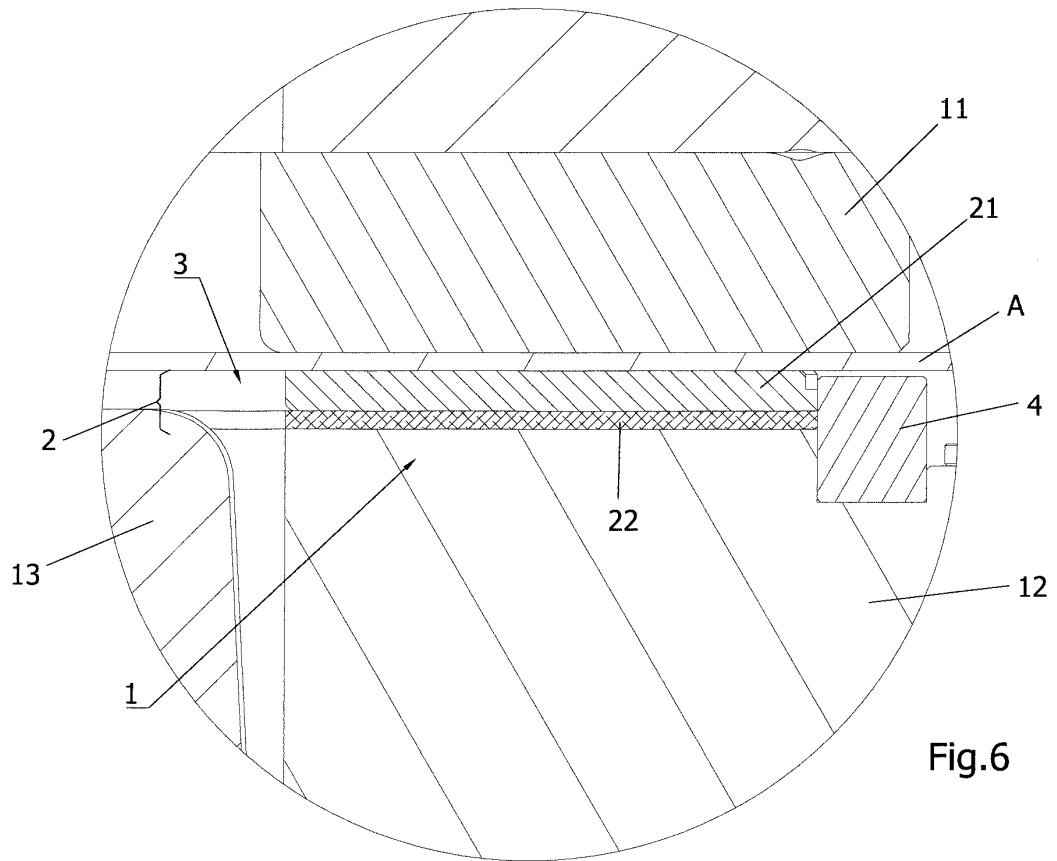
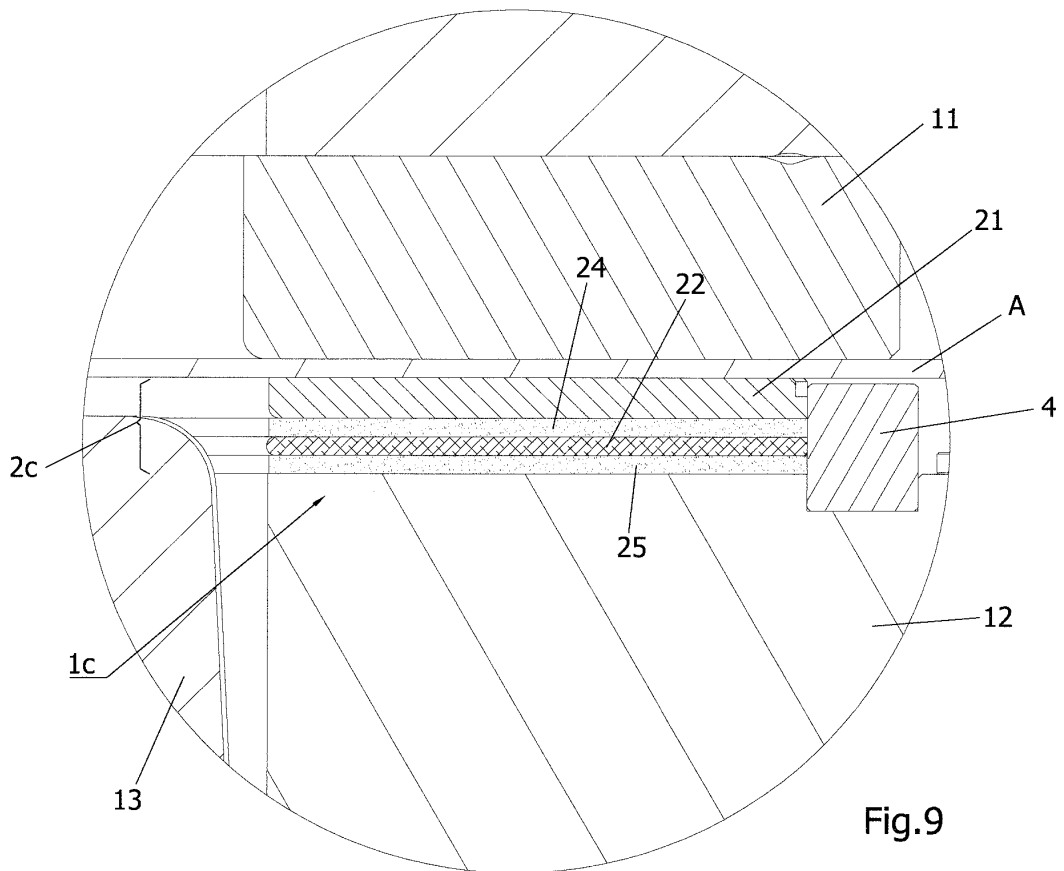
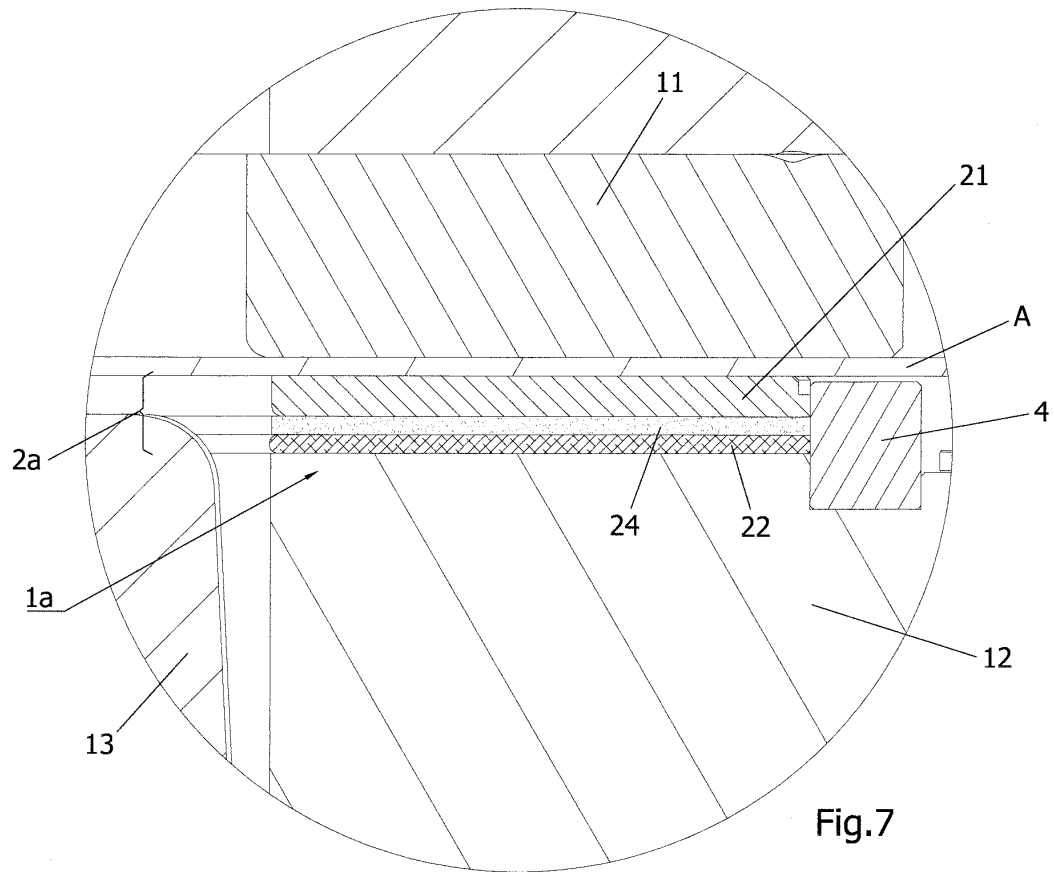
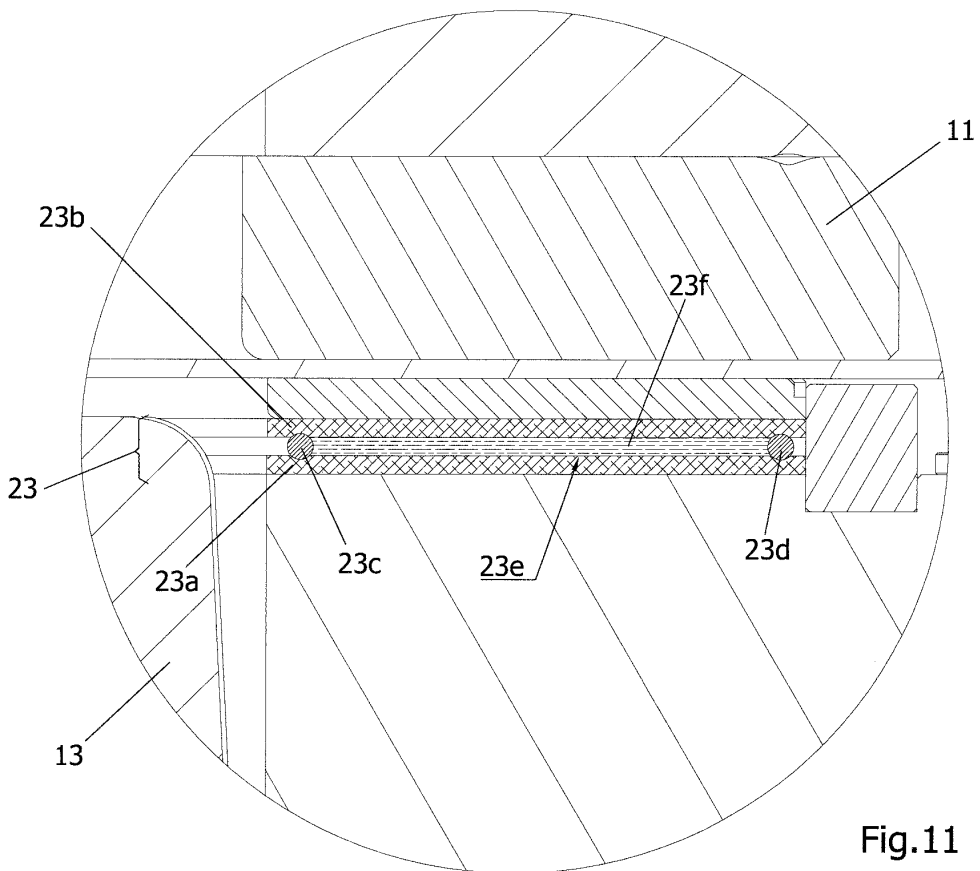
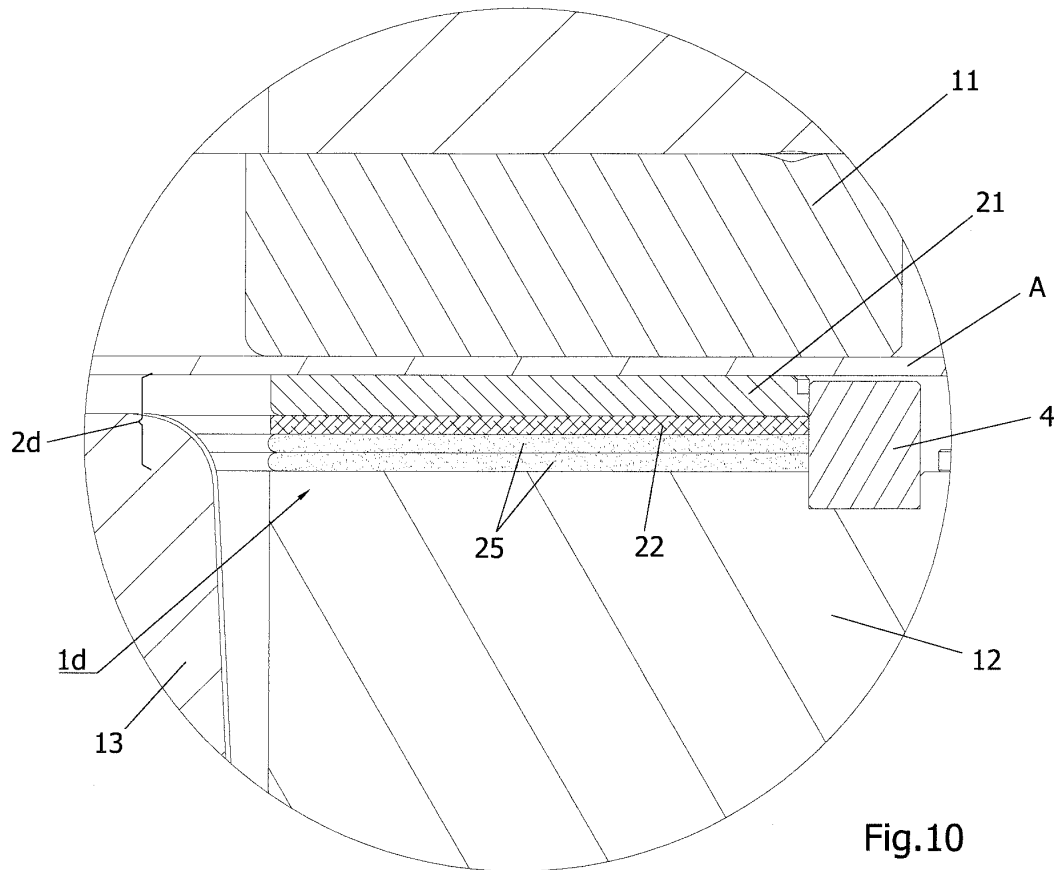


Fig.5







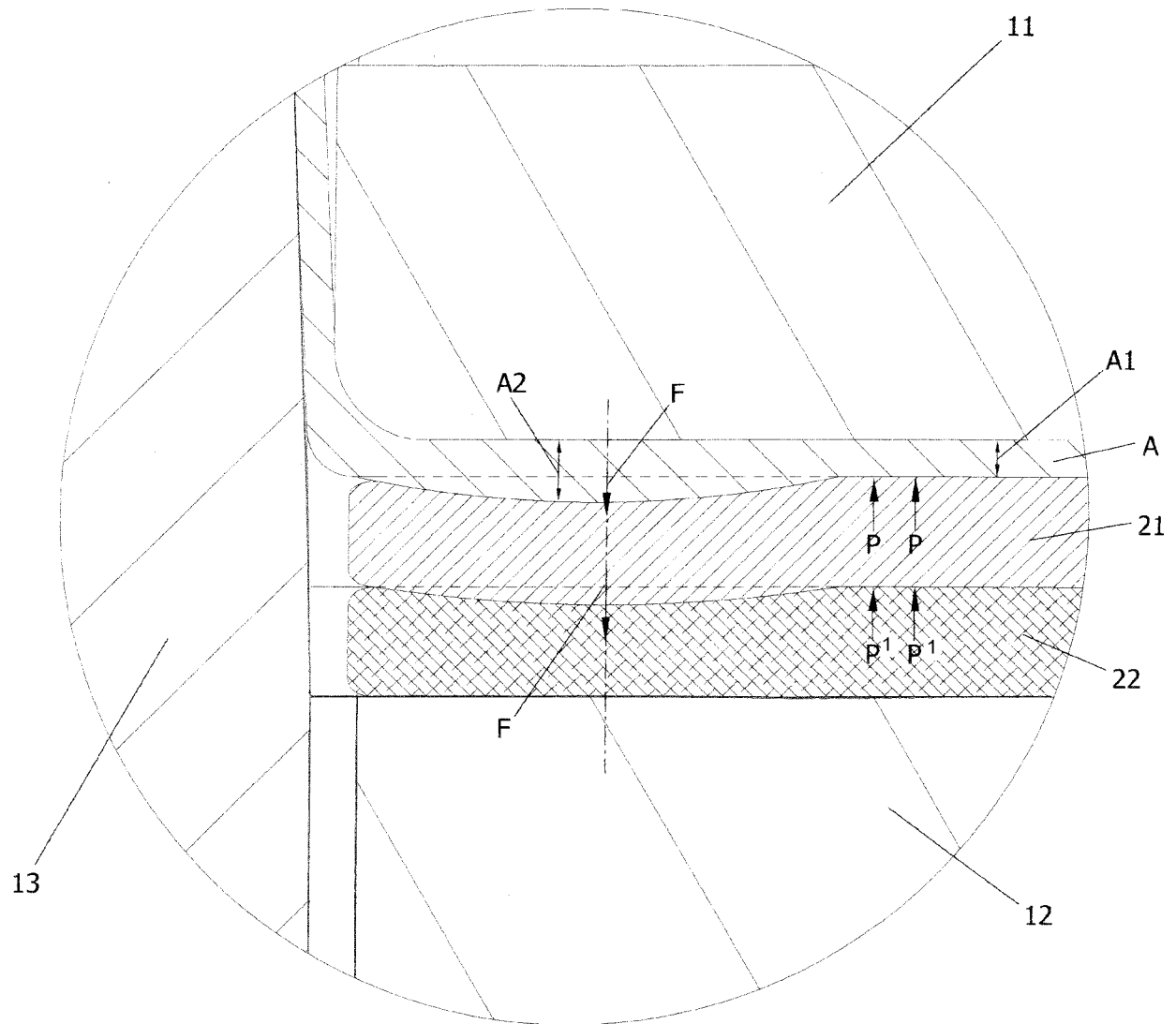


Fig.12

REFERENCES CITED IN THE DESCRIPTION

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