(19) DANMARK

(10) DK/EP 2674144 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: *A 61 J 3/07 (2006.01)* *B 65 B 1/36 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2016-11-07**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2016-08-10**

(86) Europæisk ansøgning nr.: **13002884.8**

(86) Europæisk indleveringsdag: **2013-06-05**

(87) Den europæiske ansøgnings publiceringsdag: **2013-12-18**

(30) Prioritet: **2012-06-16 DE 202012005898 U**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **Harro Höfliger Verpackungsmaschinen GmbH, Helmholtzstrasse 4, 71573 Allmersbach im Tal, Tyskland**

(72) Opfinder: **Gall, Steffen, Buocher Str. 6/1, D-71364 Winnenden, Tyskland**
Graf, Timo, Egkweg 1, D-73663 Berglen, Tyskland
Naseband, Frank, c/o Harro Höfliger Verpackungsmaschinen GmbH, Helmholtzstr. 4, D-71573 Allmersbach im Tal, Tyskland
Wurst, Reiner, Adlerstr. 11, D-71549 Auenwald, Tyskland

(74) Fuldmægtig i Danmark: **Budde Schou A/S, Hausergade 3, 1128 København K, Danmark**

(54) Benævnelse: **Doseringsskive og kapselpåfyldningsindretning med doseringsskive**

(56) Fremdragne publikationer:
DE-U1- 29 620 828
DE-U1-202011 108 334
GB-A- 1 027 780

Description

[0001] The invention relates to a metering disc of a capsule filling device of the species specified in the preamble of claim 1 and to a capsule filling device comprising such a metering disc.

[0002] Capsule filling devices such as known from DE 296 20 828 U1, for example, are used for filling capsules with powder products, for example powder, granulate, pellets or the like, in the form of drugs, food supplements or the like. A part of the capsule filling device described in this document is a metering disc comprising a disc base body and metering sleeves interchangeably installed into the disc main body. Metering orifices are formed in said metering sleeves. A powder bed is placed above the metering disc. Pressure pistons are lowered into the metering orifices of the metering sleeves for a volumetric metering of the powder product within the metering orifice and for then pushing the metered powder product down through the metering orifices into an open capsule provided there.

[0003] The above document hints at the possibility of making the metering disc suitable for a variety of different diameters or lengths of the capsules to be filled by exchanging the metering sleeves without having to exchange the metering disc itself.

[0004] If the diameter of the metering orifices has to be changed to suit the application, all metering sleeves and the pressure pistons matched thereto in their diameters have to be exchanged. An even bigger problem is an adaptation of the length of the metering orifices. Just exchanging the metering sleeves is not enough, because the height setting would no longer be correct, for example relative to a stuffing ring located below the metering disc. There is therefore a need for either a complex height adjustment or a complete exchange of the metering disc, which is cost-intensive in terms of the parts required and in terms of the conversion operations required, including the stoppage times involved, and which affects productivity.

[0005] The invention is based on the problem of further developing a generic metering disc in such a way that the metering volume can be adapted in a simplified way.

[0006] This problem is solved by a metering disc with the features of claim 1.

[0007] The invention is further based on the problem of specifying a capsule filling device for filling capsules which can be converted for different filling volumes in a simplified way.

[0008] This problem is solved by a capsule filling device with the features of claim 9.

[0009] According to the invention, it is provided that the metering disc comprises a disc base body and at least one thickness adjusting plate releasably connectable to the disc base body, wherein the metering orifice passes through the disc base body and the at least one thickness adjusting plate. A plurality of thickness adjusting plates, having different thicknesses in particular, is preferably provided. This offers the opportunity for combining the disc base body as required with one or more thickness adjusting plates in such a way that the desired total thickness and thus the desired total length of the metering orifice is obtained. The disc base body neither has to be exchanged nor adjusted in its height. On the contrary, the desired metering volume can be obtained simply by selecting or exchanging one or more thickness adjusting plates.

[0010] It can be expedient if the at least one thickness adjusting plate is located on the underside of the disc base body. Preferably, however, it is located on the top side, so that the interaction between the fixed disc base body and further elements located below, such as a stuffing ring or the like, is not affected.

[0011] It is possible to implement the thickness adjusting plates in the form of individual segments. The thickness adjusting plate is advantageously designed in the form of a flat, continuous annulus. The closed upper surface formed thereby prevents an undesirable ingress of the powder product into gaps or the like. In addition, a smooth, flat surface is formed on which the powder bed rests during the metering process and which, having no disruptive edges, can be handled easily.

[0012] The thickness adjusting plate can be releasably secured to the disc base body by clamping or other suitable means. Bolting is preferred for this purpose. This is in particular based on countersunk head screws, their heads being flush with an outer surface of the at least one thickness adjusting plate. Given a suitable number and distribution of the screws, an even surface pressure without any warping of the thickness adjusting plates is ensured. The countersunk heads of the countersunk head screws do not significantly interrupt the otherwise smooth outer surface. One or more thickness adjusting plates can be exchanged without any special tools and quite easily, simply by releasing and tightening the bolted connection.

[0013] In an advantageous further development, the disc base body is provided with an accommodation recess for a gap-free accommodation of the at least one thickness adjusting plate. The thickness adjusting plate or a package of several such thickness adjusting plates is installed into the accommodation recess without a gap, forming a gap-free joint surface of the disc base body and the top-most thickness adjusting plate. An unimpeded handling of the powder is ensured irrespective of the chosen thickness of the thickness adjusting plate or a package thereof.

[0014] An embodiment of the invention is described in greater detail below with reference to the drawing, of which:

Fig. 1 is a perspective view of a metering disc according to the invention, comprising a disc main body and a package of thickness adjusting plates embedded therein;

Fig. 2 is a radial section of a capsule filling device according to the invention with a metering disc according to Fig. 1;

Fig. 3 is an exploded view of the metering disc according to Fig. 1 with details of the design of a package of thickness adjusting plates with associated mounting screws: and

Fig. 4 shows a cross-section through the arrangement according to Fig. 3 with further details of the design of the disc base body with an accommodation recess for the package of thickness adjusting plates.

[0015] Fig. 1 is a perspective view of a metering disc 1 according to the invention as a part of a capsule filling device shown in Fig. 2 for filling capsules not shown in the drawing with powder products. The metering disc 1 comprises an annular disc base body 3 and at least one thickness adjusting plate 4 releasably connectable to the disc base body 3. The at least one thickness adjusting plate 4 is bolted to the disc base body 3, for which purpose a plurality of countersunk head screws 5 as shown in Figs. 2 to 4 is provided. In the assembled state as shown in Fig. 1, only the corresponding number of countersunk heads 6 of said countersunk head screws 5 is visible. The metering disc 1 is provided with a number of metering orifices 2. In the illustrated embodiment, six groups of twelve metering orifices 2 each are provided. Each group of metering orifices 2 is arranged in a straight line along a secant of the annular contour. The six groups are positioned along the circumference at equal angular distances of 60 degrees. A different number and arrangement of the metering orifices 2 can, however, also be expedient. In each case, the metering orifices 2 pass through the metering disc 1 completely, passing through the thickness adjusting plate 4 and the disc base body 3 parallel to the axis of rotation of the metering disc 1 from the top to the bottom.

[0016] Fig. 2 is a radial section of an embodiment of the capsule filling device according to the invention provided for filling capsules not shown in the drawing with powder products. The capsule filling device comprises the metering disc 1 according to Fig. 1, of which only the radially outer region is shown here. The metering disc 1 is non-rotatably and at a fixed height joined to a drive shaft not shown in the drawing and can be driven to rotate together therewith about a vertical axis of rotation perpendicular to the plane of the metering disc 1 in individual rotary steps by a stepper gear likewise not shown in the drawing. In addition to the disc base body 3 and the topmost thickness adjusting plate 4, the metering disc optionally comprises further thickness adjusting plates 4' 4", which are stacked on top of one another to form a package and bolted to the disc base body 3 by means of the mounting screws. For this purpose, countersunk head screws 5 with countersunk heads 6 are used, the

countersunk heads 6 lying flush with an outer top surface 7 of the topmost thickness adjusting plate 4.

[0017] The metering orifices 2, which extend from the top to the bottom through all of the thickness adjusting plates 4, 4', 4" and through the disc base body 3, have longitudinal axes which extend parallel to the axis of rotation of the metering disc 1 and perpendicular to the plane of the metering disc 1. Each of the metering orifices 2 of an individual group of metering orifices 2 described with reference to Fig. 1 is assigned a vertical pressure piston 12, with only one metering orifice 2 and an associated pressure piston 12 shown here. The cross-sectional contour of the pressure piston 12 precisely matches that of the respective metering orifice 2. In operation, the group of pressure pistons 12 is lowered in a cyclical motion from the top towards the bottom into the associated group of metering orifices 2 in accordance with an arrow 13 and then moved out again in an upward direction.

[0018] The capsule filling device further comprises a closure element for the bottom ends of the metering orifices 2. Like the metering disc 1, the closure element is held at a fixed height in the capsule filling device, without, however, performing a rotation of its own in operation. In the illustrated embodiment, the closure element is designed as a stuffing ring 9 in the form of a C-shaped annular segment, which partially circles the axis of rotation and on which the metering disc 1 lies at least approximately without a gap with the major part of its metering orifices 2 in the region of their lower ends. In this way, the respective metering orifices 2 are closed in the vertical direction towards the bottom.

[0019] In operation, a powder bed 11, which lies on the top side of the metering disc 1 with its weight and is radially bounded on the outside by a continuous border 10, is placed above the metering disc 1. The powder bed 11 consists of a powder, granulate or the like to be filled, for example in the form of powdered medication, food supplement or a comparable powder. For volumetric metering, the powder is pushed by the pressure pistons 12 from the powder bed 11 into the metering orifices 2, the stuffing ring 9 preventing it from being pushed through. As a result of the volume of the metering orifices 2, the lowering pressure and distance of the pressure pistons 12 and the consistency of the powder, a powder product which is precisely defined in

volume and mass is made available in the metering orifices 2. This powder product, volumetrically metered in the above manner, is moved along the closed part of the fixed C-shaped stuffing ring 9 by the rotation of the metering disc 1 about its axis of rotation, until it reaches the open point of the C-shaped stuffing ring 9. There is provided a transfer station not shown in the drawing, which, like the stuffing ring 9, is fixed in position. In the said transfer station, open capsule halves are available, into which the previously metered powder product is pushed from the metering orifices 2 by means of the pressure pistons 12.

[0020] As mentioned above, the metering quantity of the powder product is, among other factors, determined by the volume of the metering orifices 2, i.e. by their cross-section and axial length. According to the invention, the metering quantity can be adjusted by the exchange and combination of thickness adjusting plates 4, 4', 4", whereby a defined axial length of the metering orifices 2 is set from the chosen total thickness of the disc base body 3 and the at least one thickness adjusting plate 4, 4', 4". The cross-section of the metering orifices 2 does not change, so that the pressure pistons 12 with their matching cross-sections do not have to be exchanged either. The volume is exclusively adapted by choosing a suitable axial length of the metering orifices 2 as determined by the chosen combination of the disc base body 3 with at least one thickness adjusting plate 4, 4', 4". Fig. 2 further shows that here, by way of example, several thickness adjusting plates 4, 4', 4" of different thickness are used, which facilitates a finely graduated adjustment of the total thickness and thus of the metering volume. It may, however, also be expedient to use only one type of thickness adjusting plates 4, 4', 4" of a specific thickness.

[0021] Fig. 3 is an exploded view of the metering disc 1 according to Fig. 1 with the disc base body 3, an example for a selection of thickness adjusting plates 4, 4', 4" and countersunk head screws 5 for releasably joining the above parts. It can be seen that all thickness adjusting plates 4, 4', 4" are provided with a number of bores 15, 15', 15", with a corresponding number of bores 16 in the disc base body 3. All bores 15, 15', 15" and 16 are in alignment with one another and have identical calibrated cross-sections or diameters, so that they form the aligned continuous metering orifices (Fig. 2) in the assembled state of the metering disc 1 (Fig. 1).

[0022] In addition, the thickness adjusting plates 4, 4', 4" have bores for the countersunk head screws 5, with a corresponding number of threaded holes (Fig. 2) being provided in the disc base body 3 for tightening the countersunk head screws 5. In the region of the latter bores, the thickness adjusting plate 4, which is in the topmost position on the stack, is provided with countersinks 14. As shown in Fig. 2, these receive the countersunk heads 6 of the countersunk head screws 5 in such a way that the upper end faces of the countersunk heads 6 are flush with the outer surface 7 of the topmost thickness adjusting plate 4. Finally, Fig. 3 shows that each of the thickness adjusting plates 4, 4', 4" is designed as a flat, continuous annulus.

[0023] Fig. 4 shows a cross-section through the arrangement according to Fig. 3, with identical parts being identified by the same reference numbers. The cross-sectional view shows that the disc base body 3 is provided with an accommodation recess 8 for the thickness adjusting plates 4, 4', 4". In combination, Figs 2, 3 and 4 show that the contour of the accommodation recess 8 precisely matches the contour of the thickness adjusting plates 4, 4', 4", likewise having the form of a continuous annulus. For this purpose, the accommodation recess 8 is bounded towards the bottom by the disc base body 3 itself, radially outwards by an outer ring wall 17 and radially inwards by an inner ring wall 18. Towards the top, the accommodation recess 8 is open, so that the package of thickness adjusting plates 4, 4', 4" can be lowered into the accommodation recess 8 from the top in any suitable combination and number and secured there by means of the screws 5. In the assembled state, the outer ring wall 17 and the inner ring wall 18 are in gap-free contact with the outer and inner edges of the thickness adjusting plates 4, 4', 4", as shown in Fig. 2. The overall result is that, in the assembled state shown in Fig. 2, the disc base body 3 and the thickness adjusting plates 4, 4', 4" located on its top form a common smooth, flat, annular and gap-free continuous surface 7 on which the powder bed 11 rests.

PATENTKRAV

1. Doseringsskive (1) til en kapselpåfyldningsindretning til påfyldning af kapsler med pulverprodukter, hvor doseringsskiven (1) omfatter et antal doseringsåbninger (2), **kendetegnet ved, at** doseringsskiven (1) omfatter et skivegrundlegeme (3) og i det mindste én tykkelsestilpasningsplade (4, 4', 4"), som udløseligt kan forbindes med skivegrundlegemet (3), idet den i det mindste ene tykkelsestilpasningsplade (4, 4', 4") er forsynet med boringer (15, 15, 15"), til hvilke der svarer et tilsvarende antal boringer (16) i skivegrundlegemet (3), idet samtlige boringer (15, 15', 15", 16) er indbyrdes flugtende og har det samme, kalibrerede tværsnit hhv. den samme, kalibrerede diameter, således at i monteret tilstand for doseringsskiven (1) danner disse de flugtende gennemgående doseringsåbninger (2), og hvor doseringsåbningerne (2) forløber igennem skivegrundlegemet (3) og den i det mindste ene tykkelsestilpasningsplade (4, 4', 4").

2. Doseringsskive ifølge krav 1, **kendetegnet ved, at** flere tykkelsestilpasningsplader (4, 4', 4") med indbyrdes flugtende boringer (15, 15', 15") er stablede over hinanden til en pakke.

3. Doseringsskrive ifølge krav 2, **kendetegnet ved, at** adskillige tykkelsestilpasningsplader (4, 4', 4") med forskellig tykkelse er tilvejebragt.

4. Doseringsskive ifølge ethvert af kravene 1 til 3, **kendetegnet ved, at** den i det mindste ene tykkelsestilpasningsplade (4, 4', 4") er anbragt på oversiden af skivegrundlegemet (3).

5. Doseringsskive ifølge ethvert af kravene 1 til 4, **kendetegnet ved, at** tykkelsestilpasningsplade (4, 4', 4") er udformet i form af en plan, lukket rundgående cirkelring.

6. Doseringsskive ifølge ethvert af kravene 1 til 5, **kendetegnet ved, at** tykkelsestilpasningsplade (4, 4', 4") er sammenskruet med skivegrundlegemet (3).

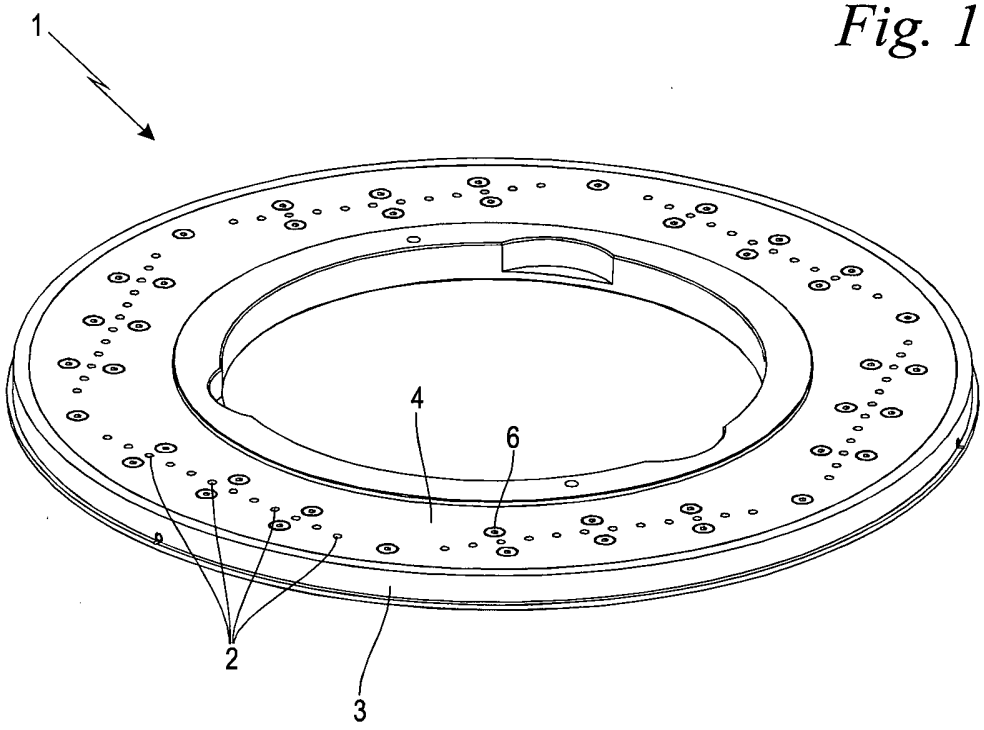
7. Doseringsskive ifølge krav 6, **kendetegnet ved, at** sammenskruningen er udført ved hjælp af skruer (5) med undersænkede hoveder (6), idet de undersænkede hoveder (6) ligger i plan med en udvendig overflade (7) på den i det mindste ene tykkelsestilpasningsplade (4, 4', 4").

8. Doseringsskive ifølge ethvert af kravene 1 til 7, **kendetegnet ved, at** skive-grundlegemet (3) er forsynet med en optagelsesfordybning (8) til en spaltefri optagelse af den i det mindste ene tykkelsestilpasningsplade (4, 4', 4").

9. Kapselpåfyldningsindretning til påfyldning af kapsler med pulverprodukter, omfattende en doseringsskive (1) ifølge et af kravene 1 til 8, **kendetegnet ved, at** doseringsskiven (1) er monteret højdepositionsfast i kapselpåfyldningsindretningen.

10. Kapselpåfyldningsindretning ifølge krav 9, **kendetegnet ved, at** en under doseringsskiven (1) anbragt stoppering (9) er monteret højdepositionsfast i kapsel-påfyldningsindretningen.

Fig. 1



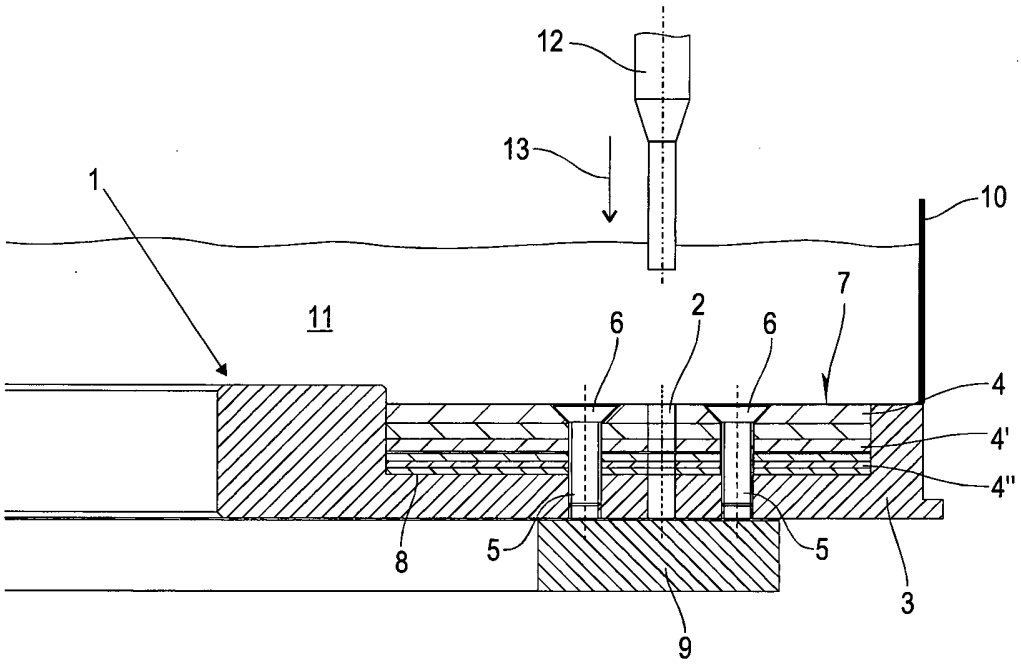


Fig. 2

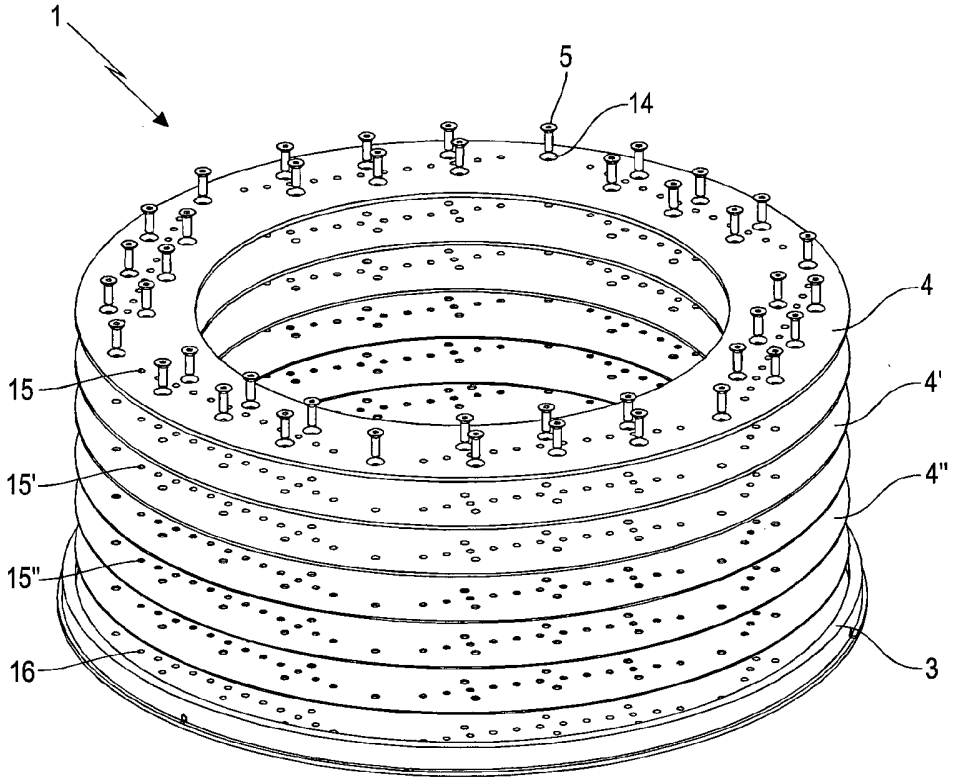


Fig. 3

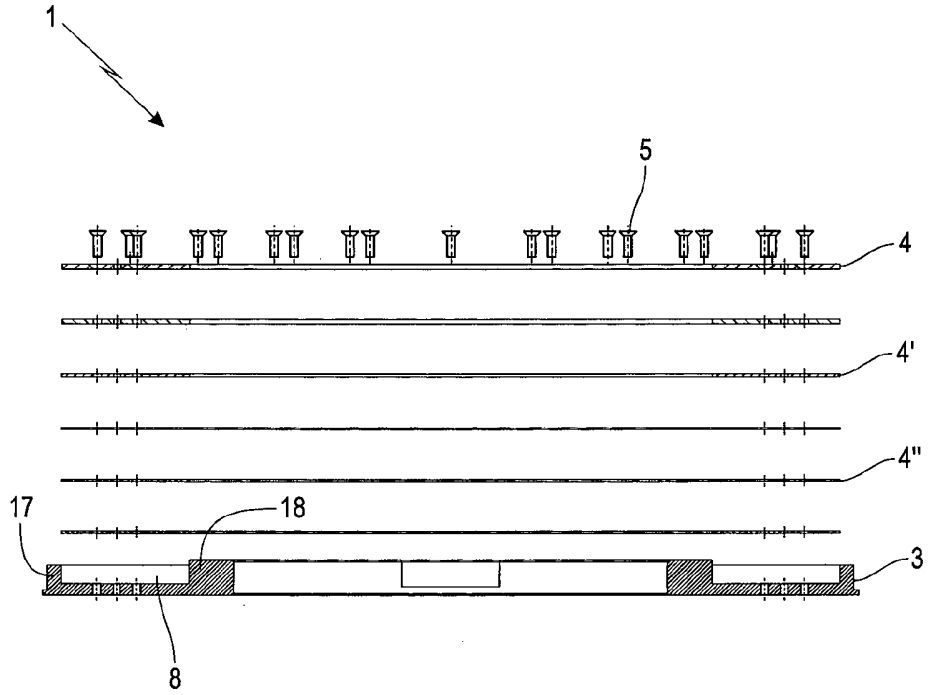


Fig. 4