



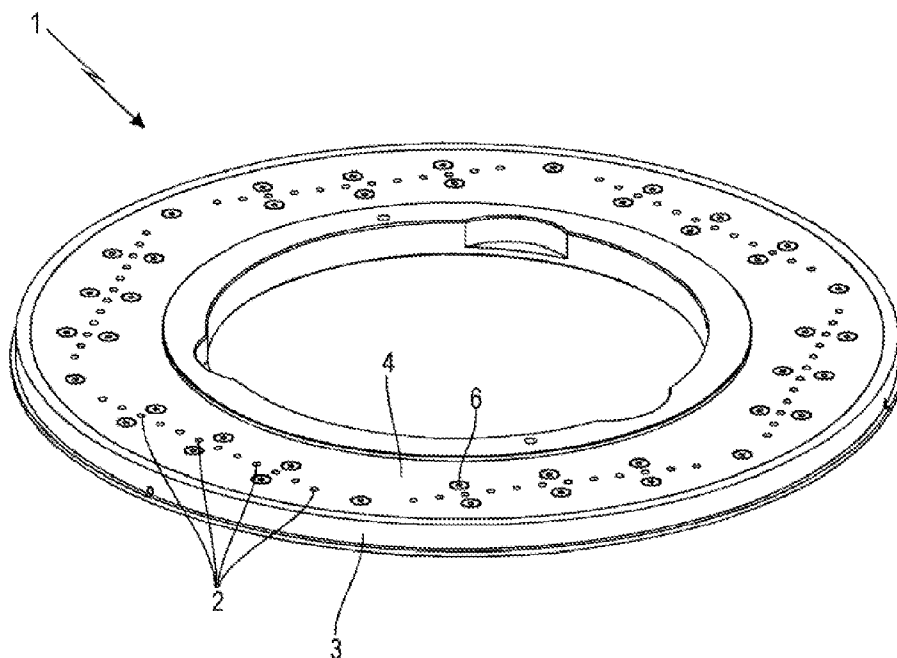
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(19) **United States**(12) **Patent Application Publication**
Gall et al.(10) **Pub. No.: US 2013/0333801 A1**(43) **Pub. Date: Dec. 19, 2013**(54) **METERING DISK AND CAPSULE FILLING
DEVICE WITH METERING DISK****Publication Classification**(71) Applicant: **Harro Hofliger**
Verpackungsmaschinen GmbH,
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B65B 1/36 (2006.01)(72) Inventors: **Steffen Gall**, Winnenden (DE); **Timo**
Graf, Berglen (DE); **Frank Naseband**,
Allmersbach im Tal (DE); **Reiner**
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(57) **ABSTRACT**

A metering disk of a capsule filling device for filling capsules with powder products as has a plurality of metering openings. The metering disk has a disk base member and at least one thickness adaptation sheet connectable detachably with the disk base member. The metering opening penetrates the disk base member and the at least one thickness adaptation sheet. In a corresponding capsule filling device, the metering disk and in particular a tamping ring arranged below the metering disk are mounted in a fixed vertical position.



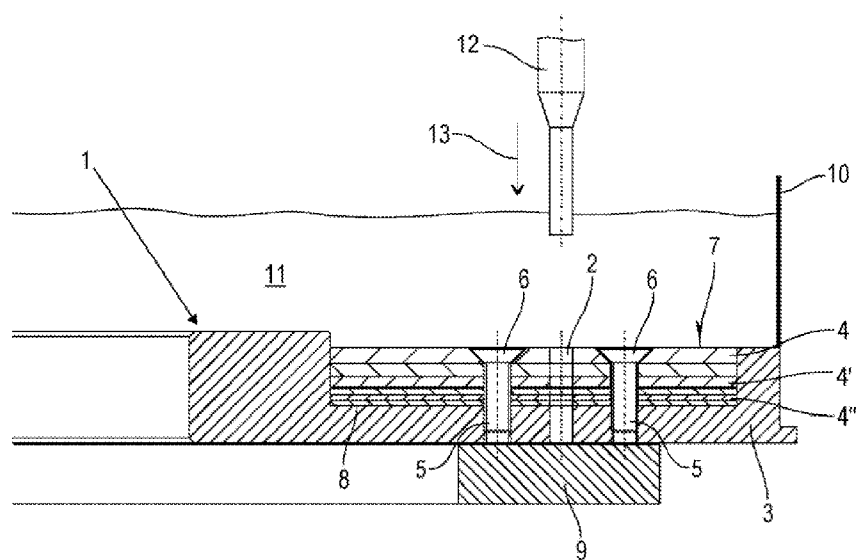
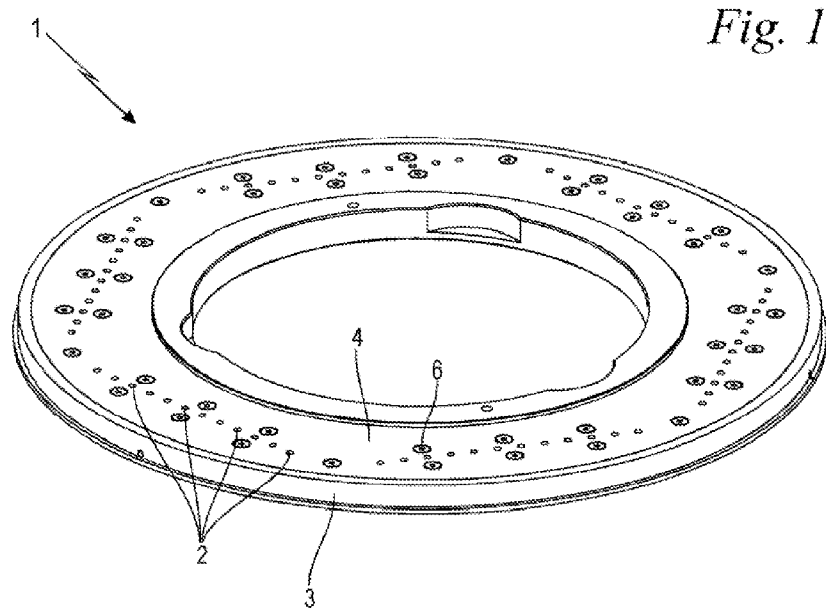


Fig. 2

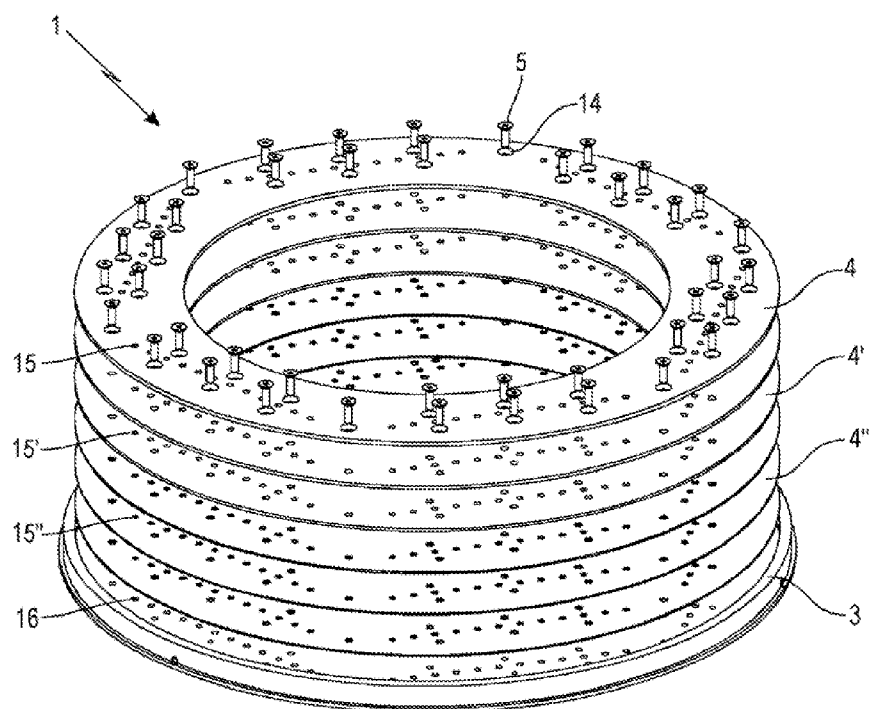


Fig. 3

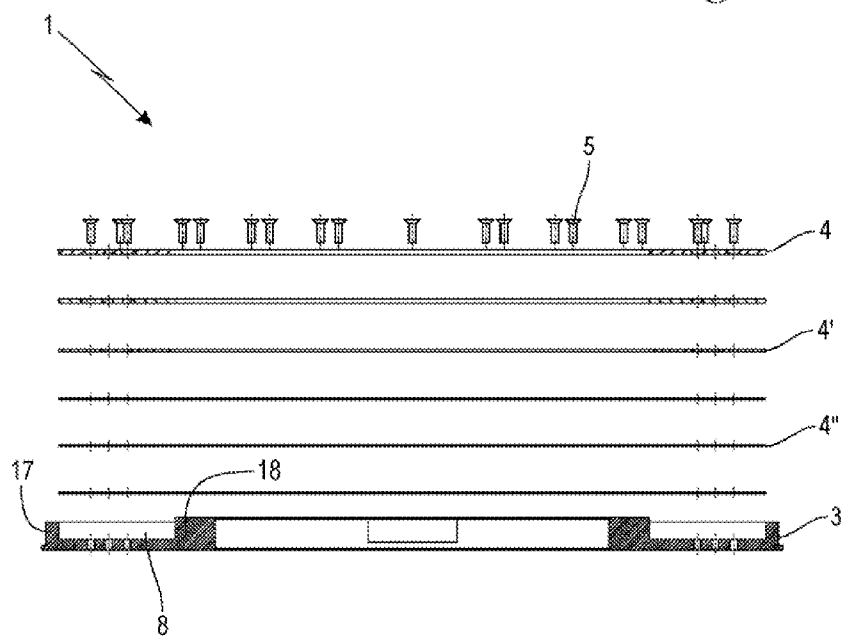


Fig. 4

METERING DISK AND CAPSULE FILLING DEVICE WITH METERING DISK

BACKGROUND OF THE INVENTION

[0001] The invention concerns a metering disk of a capsule filling device of a capsule filling device for filling capsules with powder products, wherein the metering disk has a number of metering openings; the invention also concerns a capsule filling device with such a metering disk.

[0002] For filling capsules with powder products, that is, for example, powder, granular material, pellets, or the like in the form of medicaments, food supplements or the like, capsule filling devices are used as they are disclosed, for example, in the document DE 296 20 828 U1. Part of the capsule filling device described therein is a metering disk that has a disk base member as well as metering sleeves exchangeably inserted into the disk base member. In said metering sleeves so-called metering openings are formed. Above the metering disk there is a powder bed. Rams are lowered into the metering openings of the metering sleeves in order to provide within the metering opening a volumetric metering of the powder product and in order to subsequently push the metered powder product in downward direction through the metering openings into the provided open capsule.

[0003] In the aforementioned document, the possibility is mentioned that the metering disk by exchange of the metering sleeves can be made suitable for a plurality of different diameters and/or lengths of capsules to be filled, without the metering disk itself having to be exchanged.

[0004] In case the diameter of the metering openings is to be changed as result of the task at hand, all metering sleeves and also the rams, matched in diameter thereto, must be exchanged. Even more problematic is a length adaptation of the metering openings. In this context, it is not sufficient to exchange the metering sleeves because then the vertical adjustment, for example, relative to a tamping ring which is arranged below the metering disk would no longer be correct. Therefore, either a complex vertical adjustment or a complete exchange of the metering disk must be carried out; with respect to the required parts and also with regard to the required retooling expenditure, including the entailed downtime, this is costly and impairs productivity.

[0005] The invention has the object to further develop a metering disk of the aforementioned kind such that a simple adaptation of the metering volume is possible.

SUMMARY OF THE INVENTION

[0006] This object is solved by a metering disk having a disk base member and at least one thickness adaptation sheet that is detachably connectable with the disk base member, wherein the metering opening penetrates through the disk base member and the at least one thickness adaptation sheet.

[0007] The invention has furthermore the object to provide a capsule filling device for filling capsules which can be retooled for different filling volumes in a simplified way.

[0008] This object is solved by a capsule filling device wherein the metering disk is fixedly mounted with regard to the vertical position in the capsule filling device.

[0009] According to the invention, it is provided that the metering disk has a disk base member and at least one thickness adaptation sheet connectable to the disk base member wherein the metering opening extends through the disk base member and the at least one thickness adaptation sheet. Preferably, several thickness adaptation sheets, in particular with different thicknesses, are provided. In this way, it is made possible to combine the disk base member, as needed, with one or several thickness adaptation sheets in such a way that the desired total thickness and thus the desired total length of the metering opening is adjusted. In this connection, the disk base member must neither be exchanged nor vertically adjusted. Instead, it is sufficient to provide the metering volume solely by selection or exchange of one or several thickness adaptation sheets.

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[0010] It can be expedient to arrange the at least one thickness adaptation sheet on the bottom side of the disk base member. Preferably, however, it is arranged on the top side so that the interaction of the fixedly mounted disk base member with further elements arranged underneath thereof, such as tamping rings or the like, is not impaired.

[0011] One possibility resides in that the thickness adaptation sheets are embodied in the form of individual segments. Advantageously, the thickness adaptation sheet is in the form of flat, circumferentially closed circular ring. The thus formed closed upper surface prevents an undesirable penetration of the powder product into gaps or the like. Moreover, a smooth flat surface is formed on which the powder bed is resting during the metering process and can be handled easily without disturbing edges.

[0012] The thickness adaptation sheet can be detachably connected with the disk base member by a clamping action or in any other suitable way. Preferably, for this purpose, a screw connection is provided. In particular, the screw connection is embodied by means of countersunk head screws wherein their countersunk heads are flush with an outer surface of the at least one thickness adaptation sheet. With an appropriate number and distribution of the screws, a uniform contact pressure without bulging of the thickness adaptation sheet is ensured. The countersunk heads of the set-in countersunk head screws cause no significant interruption of the otherwise smooth outer surface. An exchange of one or several thickness adaptation sheets can be done without a special tool with minimal expenditure simply by releasing and tightening the aforementioned screw connection.

[0013] In an advantageous further embodiment, the disk base member is provided with a recessed receptacle for receiving gap-free the at least one thickness adaptation sheet. The thickness adaptation sheet or a packet of several such thickness adaptation sheets is recessed without gap into the recessed receptacle so that a gap-free common surface is formed on the disk base member and on the uppermost thickness adaptation sheet. Independent of the selected thickness of the thickness adaptation sheet or of a packet thereof a disturbance-free handling of the powder is ensured.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] One embodiment of the invention will be explained in the following with the aid of the drawing in more detail.

[0015] FIG. 1 shows in a perspective view a metering disk embodied in accordance with the invention with a disk base member and a packet of thickness adaptation sheets recessed therein.

[0016] FIG. 2 shows in a radial section a capsule filling device according to the invention with a metering disk according to FIG. 1.

[0017] FIG. 3 shows in an exploded view the metering disk according to FIG. 1 with details of the configuration of a packet of thickness adaptation sheets with correlated fastening screws.

[0018] FIG. 4 is a cross-sectional illustration of the arrangement according to FIG. 3 with further details of the configuration of the disk base member with a recessed receptacle for the packet of the thickness adaptation sheets.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0019] FIG. 1 shows in a perspective view a metering disk 1 according to the invention as a part of a capsule filling device shown in FIG. 2 for filling capsules, not illustrated, with a powder product. The metering disk 1 comprises a circular ring-shaped disk base member 3 and at least one thickness adaptation sheet 4 detachably connected to the disk base member 3. The at least one thickness adaptation sheet 4 is screw-connected to the disk base member 3 for which purpose a plurality of countersunk head screws 5, illustrated in FIGS. 2 to 4, are provided. In the mounted state according to FIG. 1, only the corresponding number of countersunk head screws 5 can be seen of the aforementioned countersunk head screws 5. The metering disk 1 is provided with several metering openings 2. In the illustrated embodiment, six groups of 12 metering openings 2 each are provided. Each group of metering openings 2 is arranged in a straight row along a secant of the circular ring contour. The aforementioned six groups are positioned at a uniform angular spacing of 60 degrees about the circumference. However, it may also be expedient to provide a different number and arrangement of metering openings 2. In any case, the metering openings 2 penetrate the metering disk 1 completely, i.e., extend thus through the thickness adaptation sheet 4 and the disk base member 3 parallel to the axis of rotation of the metering disk 1 from top to bottom.

[0020] FIG. 2 shows in radial section an embodiment of the capsule filling device according to the invention which is provided for filling capsules, not illustrated, with powder products. The capsule filling device comprises the metering disk 1 according to FIG. 1 wherein only the radial outer area is illustrated herein. The metering disk 1 is connected fixedly with respect to rotation and to vertical position to a drive shaft, not illustrated, and is rotatably drivable together with the latter about an axis of rotation, positioned vertically and perpendicular to the plane of the metering disk 1, by means of an indexing unit, also not illustrated, by individual rotary steps. In addition to the disk base member 3 and the uppermost thickness adaptation sheet 4 illustrated in FIG. 1, the metering disk 1 comprises optionally further thickness adaptation sheets 4', 4'' that are stacked on top of each other to a packet and are screwed by means of the fastenings screws to the disk base member 3. The screw connection is embodied by means of countersunk head screws 5 with countersunk heads 6 wherein the countersunk heads 6 are flush with an outer top surface 7 of the uppermost thickness adaptation sheet 4.

[0021] The metering openings 2 that extend from top to bottom through all of the thickness adaptation sheets 4, 4', 4'' and the disk base member 3 have longitudinal axes that extend parallel to the axis of rotation of the metering disk 1 or perpendicular to the plane of the metering disk 1. Each one of the metering openings 1 of an individual group of metering openings 2 described in connection with FIG. 1 has correlated

therewith a vertical ram 12 wherein only one metering opening 2 and one correlated ram 12 are illustrated herein. The cross-sectional contour of the rams 12 corresponds precisely to the cross-sectional contour of the respective metering opening 2. In operation, the group of rams 12 is lowered cyclically from top to bottom into the correlated group of metering openings 2 in accordance with arrow 13 and is retracted in upward direction.

[0022] The capsule filling device comprises moreover a closure element for the lower ends of the metering openings 2. Like the metering disk 1, the closure element is secured fixedly with regard to vertical position in the capsule filling device without it however carrying out a rotation in operation. In the illustrated embodiment, the closure element is in the form of a tamping ring 9 which extends partially about the axis of rotation in the form of a C-shaped ring segment on which the metering disk 1 is resting at least approximately gap-free with the major portion of its metering openings 2 with the area of the correlated lower ends. In this way, the corresponding metering openings 2 in vertical direction are closed off in downward direction.

[0023] In operation, above the metering disk 1 a powder bed 11 is provided which, as a result of its weight, is resting on the top side of the metering disk 1 and is secured radially in outward direction by a circumferential frame 10. The powder bed 11 is comprised of powder, granular material or the like to be filled in, for example, in the form of a medicament, food supplement in powder form or a comparable powder. For the volumetric metering of the powder, it is pressed from the powder bed 11 by means of the rams 12 into the metering openings 2 wherein the tamping ring 9 prevents it from being pushed through. As a result of the volume of the metering openings 2, the downward pressure and downward travel of the rams 12 and also as a result of the properties of the powder, a powder product, precisely measured with respect to volume and mass, is provided in the metering openings 2 in this way. This powder product which is metered volumetrically in the afore described way is moved by rotation of the metering disk 1 about its axis of rotation along the closed part of the stationary C-shaped tamping ring 9 until the open area of the C-shaped tamping ring is reached. Here, a transfer station, not illustrated, is arranged which is secured, like the tamping ring 9, in its spatial position. At the aforementioned transfer station open capsules are provided into which the previously metered powder product is forced out of the metering openings 2 by means of the rams 12.

[0024] As already mentioned above, the metering quantity of the powder product is determined inter alia by the volume of the metering openings 2, i.e., by their cross-section and their axial length. An adaptation of the metering quantity according to the invention can be realized by exchange and any combination of thickness adaptation sheets 4, 4', 4'' so that the selected total thickness of the disk base member 3 and the at least one thickness adaptation sheet 4, 4', 4'' adjusts a certain axial length of the metering openings 2. The cross-section of the metering openings 2 does not change so that the cross-sectionally matched rams 12 must not be exchanged. The volume adaptation is realized solely by selection of a suitable axial length of the metering openings 2 as the result of the selected combination of the disk base members 3 with at least one thickness adaptation sheet 4, 4', 4''. The illustration according to FIG. 2 also shows that, for example, several thickness adaptation sheets 4, 4', 4'' of different thickness are used here which enables a fine-adjusted adaptation of the total

thickness and thus of the metering volume. However, it may also be expedient to use only one kind of thickness adaptation sheets 4, 4', 4'' with a certain thickness.

[0025] FIG. 3 shows in a perspective exploded illustration the metering disk 1 according to FIG. 1 with the disk base member 3, an exemplary selection of thickness adaptation sheets 4, 4', 4'' as well as countersunk head screws 5 for detachable connection of the aforementioned parts. It can be seen that all thickness adaptation sheets 4, 4', 4'' are provided with a number of bores 15, 15', 15'' corresponding with an appropriate number of bores 16 in the disk base member 3. All bores 15, 15', 15'', 16 are aligned with each other and have the same calibrated cross-section or diameter so that in the mounted state of the metering disk (FIG. 1) they form the aligned continuous metering openings 2 (FIG. 2).

[0026] Moreover, the thickness adaptation sheets 4, 4', 4'' have also bores for passing through the countersunk head screws 5 and, corresponding therewith, an appropriate number of threaded bores (FIG. 2) for screwing in the countersunk head screws 5 are provided in the disk base member 3. In the area of the latter bores the uppermost thickness adaptation sheet 4 in the stacked sequence is provided with counterbores 14. They receive, in accordance with the illustration of FIG. 2, the countersunk heads 6 of the countersunk head screws 5 in a way that the upper end faces of the countersunk heads 6 are flush with the outer surface 7 of the uppermost thickness adaptation sheet 4. Finally, FIG. 3 also shows that all of the thickness adaptation sheets 4, 4', 4'' each are in the form of a flat circumferentially closed circular ring.

[0027] FIG. 4 shows in a cross-sectional illustration the arrangement according to FIG. 3 wherein same parts are identified with same reference characters. It is apparent from the shown cross-sectional illustration that the disk base member 3 is provided with a recessed receptacle 8 for the thickness adaptation sheets 4, 4', 4''. When looking at FIGS. 2, 3, and 4, it is apparent that the recessed receptacle 8 in its contour is precisely matched to the contour of the thickness adaptation sheets 4, 4', 4'', i.e., has also the shape of a circumferentially closed circular ring. For this purpose, the recessed receptacle 8 is delimited in downward direction by the disk base member 3 itself, in radial outward direction by an outer ring wall 17 and in radial inward direction by an inner ring wall 18. In upward direction the recessed receptacle 8 is open so that the packet of thickness adaptation sheets 4, 4', 4'' can be lowered in any suitable combination and number from above into the recessed receptacle 8 and can be fastened therein by means of the fastening screws 5. The outer ring wall 17 and the inner ring wall 18 are positioned in the mounted state without a gap at the outer and inner edges of the thickness adaptation sheets 4, 4', 4'', as illustrated in FIG. 2. As a whole, in the mounted state illustrated in FIG. 2, the result is that by means of the disk base member 3 and the thickness adaptation sheets 4, 4', 4'' arranged at its topside a common smooth, flat, circular

ring-shaped, gap-free circumferentially extending surface 7 is formed on which the powder bed 11 is resting.

[0028] The specification incorporates by reference the entire disclosure of German priority document 20 2012 005 898.3 having a filing date of Jun. 16, 2012.

[0029] While specific embodiments of the invention have been shown and described in detail to illustrate the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A metering disk of a capsule filling device for filling capsules with powder products, the metering disk comprising:

a disk base member with metering openings;
at least one thickness adaptation sheet that is detachably connectable with the disk base member;
wherein the metering openings penetrate through the disk base member and the at least one thickness adaptation sheet.

2. The metering disk according to claim 1, wherein several of said at least one thickness adaptation sheet are provided.

3. The metering disk according to claim 2, wherein said several thickness adaptation sheets have different thicknesses.

4. The metering disk according to claim 1, wherein the at least one thickness adaptation sheet is arranged on a topside of the disk base member.

5. The metering disk according to claim 1, wherein the at least one thickness adaptation sheet is a flat, circumferentially closed circular ring.

6. The metering disk according to claim 1, wherein the at least one thickness adaptation sheet is connected by a screw connection to the disk base member.

7. The metering disk according to claim 6, wherein the screw-connection is realized by countersunk head screws with countersunk heads, wherein the countersunk heads are positioned flush with an outer surface of the at least one thickness adaptation sheet.

8. The metering device according to claim 1, wherein the disk base member is provided with a recessed receptacle for a gap-free reception of the at least one thickness adaptation sheet.

9. A capsule filling device for filling capsules with powder products, the capsule filling device comprising a metering disk according to claim 1, wherein the metering disk is fixedly mounted with regard to a vertical position thereof in the capsule filling device.

10. The capsule filling device according to claim 9, wherein a tamping ring is arranged below the metering disk and is fixedly mounted with regard to a vertical position thereof in the capsule filling device.

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