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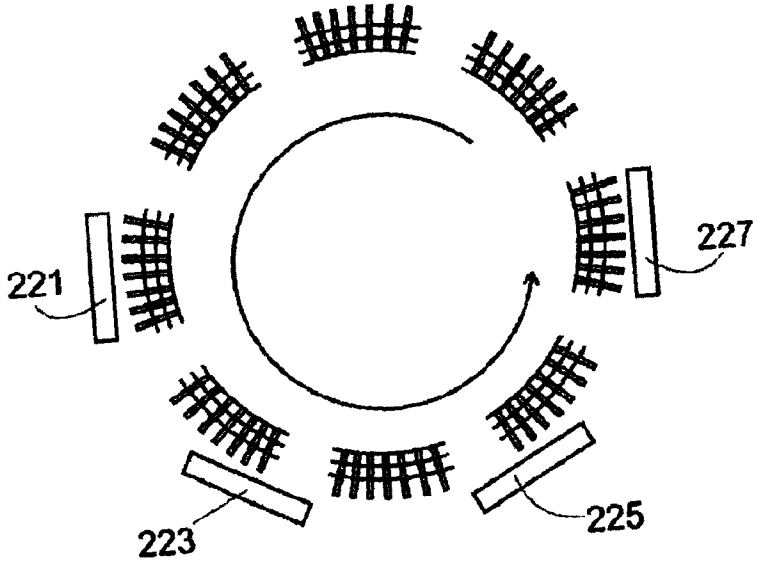
(54) Title: HOLDER FOR BORING-HEAD COATING



(57) Abrégé/Abstract:
The present invention relates to a holder for a number of borers, which can advantageously be used for coating borer tips. The holders according to the invention make it possible to arrange the borers in the coating unit in such a way that their tips rest on a cylindrical wall and these can be rotated past a coating source at the same minimum distance. The holder comprises a first curved wall with holes, a second curved wall with holes or slits and a third wall which serves as stop for borers inserted in the holes of the first and second wall.

Abstract
(prepared by WIPO / international publication)

The present invention relates to a holder for a number of borers, which can advantageously be used for coating borer tips. The holders according to the invention make it possible to arrange the borers in the coating unit in such a way that their tips rest on a cylindrical wall and these can be rotated past a coating source at the same minimum distance. The holder comprises a first curved wall with holes, a second curved wall with holes or slits and a third wall which serves as stop for borers inserted in the holes of the first and second wall.

HOLDER FOR BORING-HEAD COATING

The present invention relates to the coating of borers and to the holders that can be used for this purpose.

In order to improve the wear and tear behavior of borers, it is known to coat their tips and chip flutes with layers of a hard material such as for example titanium nitride or aluminum chromium nitride. Usually, to apply the layers, PVD processes such as for example arc evaporation, electron beam evaporation or sputtering, are used in a batch process. A batch process means in this connection that holders with the borers to be coated are loaded and these holders are arranged on a kind of turntable, which by rotating ensures that the borers are presented several times to the coating source. In doing so, the attempt is made to construct the holders in such a way that only the borer heads and the area directly behind the tip are coated.

From DE 600 02 579 T2 it is known to use a holder that has at least a perforated outer wall provided with an array of openings in which the borers can be inserted. Within the inner cavity of the holder, a supporting wall parallel to the outer wall and having corresponding openings is provided, so that the borers with their shafts can be arranged essentially in parallel. Furthermore, a stop at a distance inwards from the support wall is provided in the cavity of the holder in order to ensure that the borers protrude essentially to the same extent from the outer wall. The holder in this case is constructed as a hollow holder to shield the portion of a borer within the outer wall from the external environment yet to expose them to the atmosphere in the inside of the holder.

The holder as disclosed in DE 600 02 579 T2 has however the disadvantage that it is designed in the shape of a polygon and the borers protrude during the coating from the outer surface of the polygonal shape. If therefore the borer tips rotate past the coating source, those borers that are placed close to the corners of the polygon have a reduced minimal distance to the coating source compared with those borers that lie at the center of the polygon surface. This results in an undesirable variation of the thickness of the borers'

coating. Additionally, the borers that are placed close to the corners of the polygons, when they have the smallest distance to the coating source, do not stand perpendicular to the surface of the coating source. One side of the chip flute is therefore shielded, whilst the other side of the chip flute is more directly exposed to the source. Since it is at this point in time that most material is deposited onto the borer surface, it results in an undesirably asymmetric coating of these borers. A further disadvantage is that since the holder must be hollow, the flexibility of loading is considerably reduced.

It is one aim of the present invention to solve at least partly the problems described above.

According to the invention, this aim is solved in that the holder is not executed as a hollow holder but as a sandwich of at least three walls at a distance to one another, wherein the walls are curved in such a way that when arranging the holder onto the turntable, the curve is substantially adapted to the contour of the turntable. In this manner, the polygon form known from the state of the art is avoided.

According to some embodiments of the invention, there is provided a holder for carrying borers in a coating facility, having a first wall perforated with first holes and a second wall at a distance from the first wall and perforated with second holes or slits that are adjusted to the first holes in such a manner that borers are insertable each into the first holes and the same borers simultaneously into the second holes or slits, wherein the holder comprises at least a third wall at a distance from the second wall and which serves as a stop for the borers inserted into the first and second holes or slits, wherein at least the first wall and the third wall are curved to segments of circles and thus have curves, wherein the curves of the walls are chosen in such a manner that, if the walls were completed to circles, the centers of the circles would substantially lie superimposed above one another in such a manner that, when the borers are inserted into the first and second holes up to the respective stop, the borers are oriented substantially radially and protrude as a whole with the borer tip from the holder, following the segment of circle of the third wall.

According to some embodiments of the invention, there is provided a coating facility with holders as described above, wherein the holders are arranged in the coating facility in

such a manner that during coating the borers are presented to a coating source in a circular path with substantially the same minimum distance from the coating source.

According to some embodiments of the invention, there is provided a method for coating a series of borers, the method comprising inserting the borers for coating in at least one holder as described above, the at least one holder rotating in a circular path, wherein the coating method is carried out in the coating facility as described above, wherein the tips of the borers protruding from each holder are arranged in a substantially circular arc, wherein the axes of the borers are not parallel to the rotation axis of the at least one holder.

The invention will now be explained in detail by way of example and on the basis of the figures.

Figure 1a shows diagrammatically a cross section of an individual inventive holder according to a first embodiment.

Figure 1b shows diagrammatically the exploded view of an individual inventive holder according to the first embodiment.

Figure 1c shows, for the first embodiment, the inventive holders as they would have to be arranged in a coating facility. The figure shows the view from above on the turntable.

Figure 2a shows diagrammatically a cross section of an individual inventive holder according to a second embodiment.

Figure 2b shows diagrammatically the exploded view of an individual inventive holder according to the second embodiment.

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Figure 2c shows the cross section of an individual inventive holder according to the second embodiment with variable stopper means.

Figure 2d shows a second embodiment of the inventive holders as they would have to be arranged in a coating facility. The figure shows the view from above on the turntable.

Figure 3a shows a cross section of an individual inventive holder according to a third embodiment.

Figure 3b shows the exploded view of an individual inventive holder according to the third embodiment.

The holder according to a first embodiment comprises a first wall 103 curved along a segment of circle and perforated with an array of holes 105, into which the borers 107 can be inserted. It furthermore includes a second curved and perforated wall 109 with holes 111, whose curve corresponds essentially to the curve of the first wall 103 and whose holders 111 have been placed essentially to correspond with the holes 105 of the first wall 103. The second wall 109 is placed at a distance from the first wall 103 on its concave side. The holder includes a third curved wall 113 again arranged at a distance from the second wall 109 on its concave side but which has no holes corresponding to the holes of the first and second walls. A corresponding holder is illustrated diagrammatically in figure 1a in cross section and diagrammatically in figure 1b in an exploded view.

Figure 1c shows how corresponding holders can be placed in the coating facility. The figure shows the inventive holders placed in a circle and surrounded for example by four coating sources 121, 123, 125 and 127, past which they rotate. This clearly shows that the curves of the holders must be adapted to the size of the coating facility. The curve radius of the holders therefore lies between 0.2m for small coating facilities and 3m for large coating facilities. Figure 1c also clearly shows that each of the borers rotates past the coating source at the same minimum distance. It also becomes clear that with this first embodiment of the present invention, the problem of the asymmetrical coating of the chip flutes has not yet been solved.

This problem is solved with the second embodiment of the present invention, which is thus a preferred embodiment. The holder according to the second embodiment comprises a first wall 203 curved along a segment of circle and perforated with an array of holes 205, into which the borers 107 can be inserted. It furthermore includes a second wall 209 curved along a segment of circle and perforated with holes 211. The second wall 209 is placed at a distance from the first wall 203 on the concave side. The holder includes a third wall 213 curved along a segment of circle. The third wall 213 is placed at a distance from the second wall 209 on its concave side. It has no holes corresponding to the holes of the first or second wall. The curves of the three walls are chosen in such a way that, if they were to be completed, the centers of the circles would lie superimposed above one another. The holes 211 of the second wall 209 are aligned with the holes 205 of the first wall 203 in such a manner that the borers 207 are oriented essentially radially when they are loaded in the holder through the first wall 203 and the second wall 209 and finally stop against the third wall 213.

Figure 2c shows how the three walls can be connected to one another by means of braces 251, 253. In this respect, the first wall 203 is firmly connected with the second wall 209 so that the respective holes for the borers remain aligned one with another. In contrast thereto, the distance of the third wall 213 to the second wall 209 can be modified in order to be able to coat borer lengths that may vary from one batch to the next. This can be achieved for example by means of elongated holes 255. Figure 2c illustrates a second position of the third wall 213 in a dotted line.

Figure 2d shows diagrammatically a view from above of a coating facility in which the holders according to the just described second embodiment are placed in a ring shape and surrounded by four coating sources 221, 223, 225 and 227, past which they rotate. As can be seen from the figure, all borers protrude radially outwards and are presented to the coating sources with the same minimum distance.

According to a third embodiment of the present invention, as illustrated in figures 3a and 3b, the holder comprises four walls. The two outer walls 303, 313 correspond to the first wall and to the third wall of the first two embodiments. Between these two outer walls 303, 313 are placed two additional walls 309, 315. The wall 309, which is placed in the vicinity of

the outer wall 303, comprises slits 317 which run perpendicular to the curve of the wall 309. The wall 315, which is placed in the vicinity of the wall 313, comprises slits 319 running longitudinally along the curve of the wall. With such an arrangement, it is possible by radially sliding the wall 309 relative to the wall 303 to adjust the radial orientation of the borers. This is advantageous for example if the same holder is to be used for coating facilities with different chamber diameters.

In the described embodiments, the borer tips come to rest on a cylindrical wall when they are loaded into the holders up to the stopper means. This affords the possibility of stacking several cylinders, i.e. several holders, one on top of the other.

A holder for carrying borers in a coating facility has been disclosed, having a first wall perforated with first holes and a second wall at a distance from the first wall and perforated with second holes or slits that are aligned with the first holes in such a way that borers can be inserted each into the first holes and the same borers simultaneously into the second holes or slits, wherein the holder comprises at least a third wall at a distance from the second wall and which is suitable for serving as a stop for the borers inserted in the first and second holes or slits and wherein at least the first wall and the third wall are curved along segments of circle and thus have curves designed in such a way that after inserting the borers up to the respective stop, they protrude as a whole with the borer tip from the holder following the segment of circle of the third wall.

The second wall itself can be curved along a segment of circle. The second wall can be placed at a distance from the first wall on its concave side and the third wall can be placed at a distance from the second wall on the concave side of the first wall, wherein the second wall is placed between the first and third walls.

It is advantageous if the first, second and third wall are placed relative to one another and curved to segments of circle in such a manner that when completing the circles, the centers of the circles would essentially lie superimposed above one another.

The invention discloses a coating facility with holders as described above, wherein the holders are placed in the coating facility in such a manner that during coating, the borers can be presented to a coating source in a circular path with essentially the same minimum distance from the coating source.

A method for coating a series of borers has been disclosed, wherein the borers for coating are inserted in at least one holder rotating in a circular path and having a first wall perforated with first holes and a second wall perforated with second holes or slits, characterized in that the tips of the borers protruding from the holder essentially rest on a cylindrical wall, wherein the axes of the borers are not parallel to the rotation axis of the at least one holder and are preferably perpendicular to the cylindrical wall.

CLAIMS:

1. Holder for carrying borers in a coating facility, having a first wall perforated with first holes and a second wall at a distance from the first wall and perforated with second holes or slits that are adjusted to the first holes in such a manner that borers are insertable each into the first holes and the same borers simultaneously into the second holes or slits, wherein the holder comprises at least a third wall at a distance from the second wall and which serves as a stop for the borers inserted into the first and second holes or slits, wherein at least the first wall and the third wall are curved to segments of circles and thus have curves, wherein the curves of the walls are chosen in such a manner that, if the walls were completed to circles, the centers of the circles would substantially lie superimposed above one another in such a manner that, when the borers are inserted into the first and second holes up to the respective stop, the borers are oriented substantially radially and protrude as a whole with the borer tip from the holder, following the segment of circle of the third wall.

2. Holder according to claim 1, wherein also the second wall is curved to a segment of a circle.

3. Holder according to claim 2, wherein the second wall is arranged at the distance from the first wall on a concave side of the first wall and the third wall is arranged at the distance from the second wall on the concave side of the first wall, wherein the second wall is arranged between the first and third walls, wherein the first, second and third walls are arranged relative to one another and curved to segments of circles in such a manner that, if the walls were completed to circles, the centers of the circles would substantially lie superimposed above one another.

4. Coating facility with holders according to any one of claims 1 to 3, wherein the holders are arranged in the coating facility in such a manner that during coating the borers are presented to a coating source in a circular path with substantially the same minimum distance from the coating source.

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5. Method for coating a series of borers, the method comprising inserting the borers for coating in at least one holder according to any one of claims 1 to 3, the at least one holder rotating in a circular path, wherein the coating method is carried out in the coating facility according to claim 4, wherein the tips of the borers protruding from each holder are arranged in a substantially circular arc, wherein the axes of the borers are not parallel to the rotation axis of the at least one holder.

6. Method according to claim 5, wherein the axes of the borers are perpendicular to the circular arc.

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Figuren

Fig. 1a

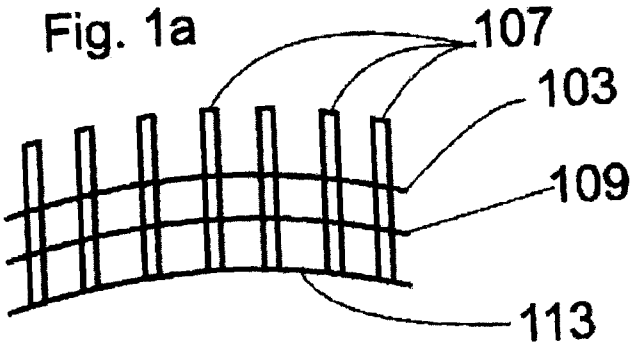


Fig. 1b

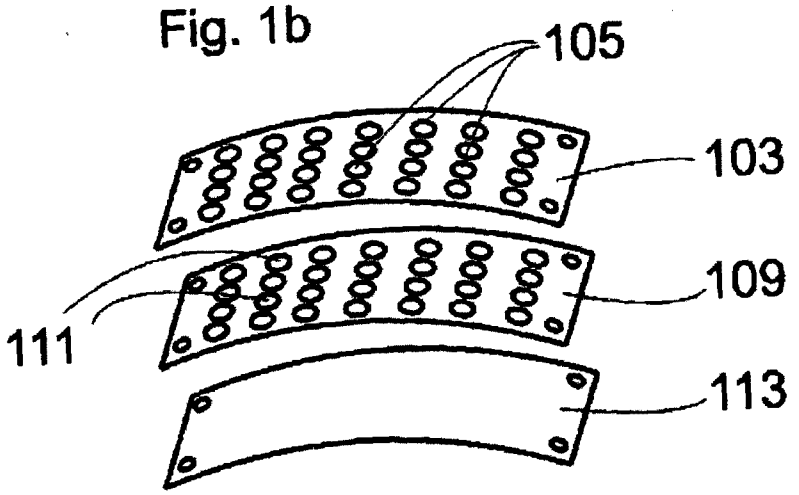


Fig. 1c

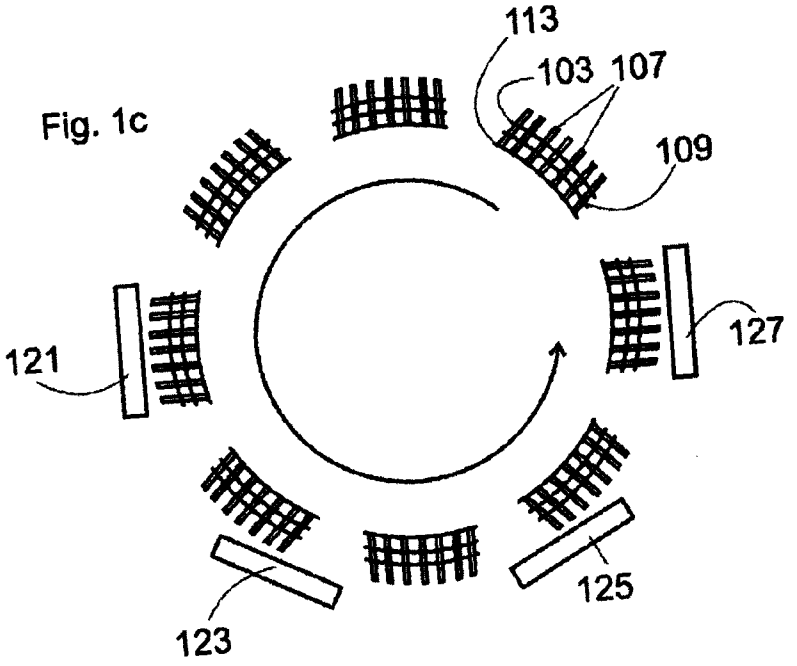


Fig. 2d

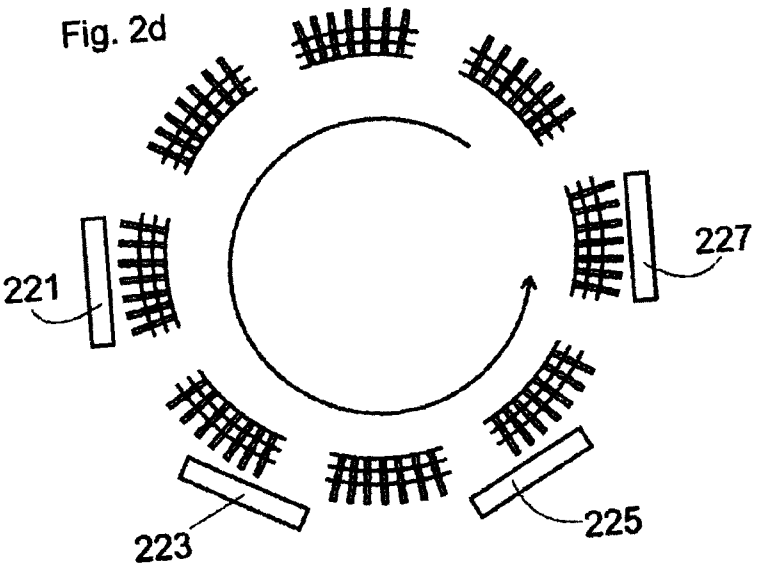


Fig. 2a

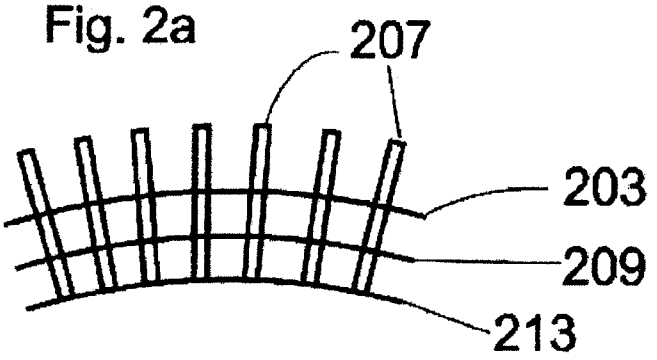


Fig. 2b

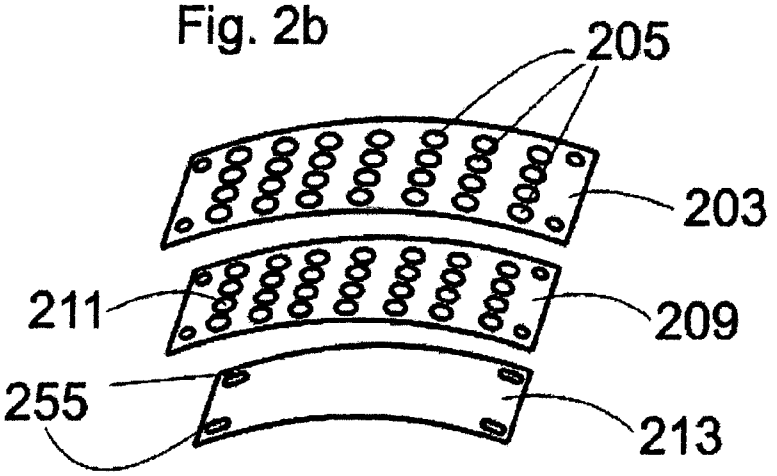


Fig. 2c

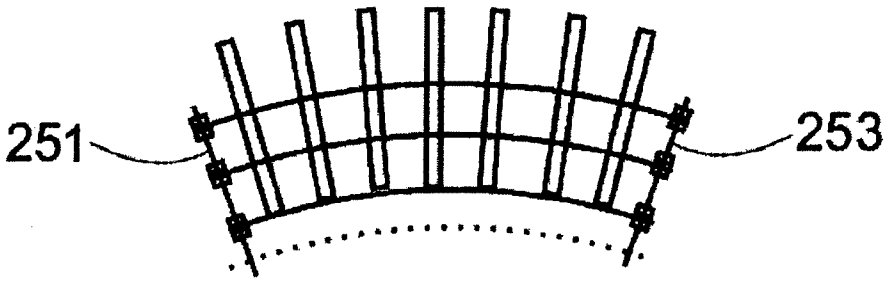


Fig 3a

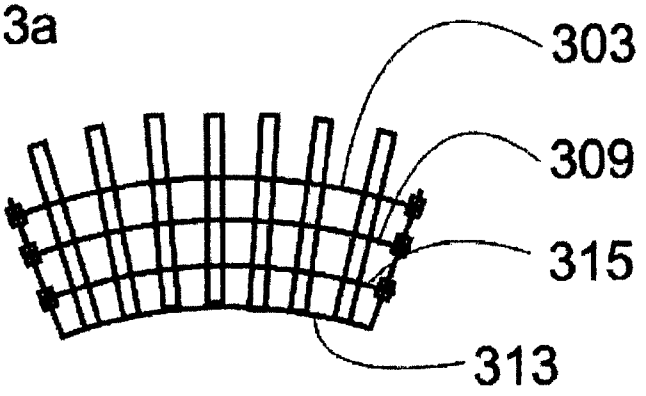
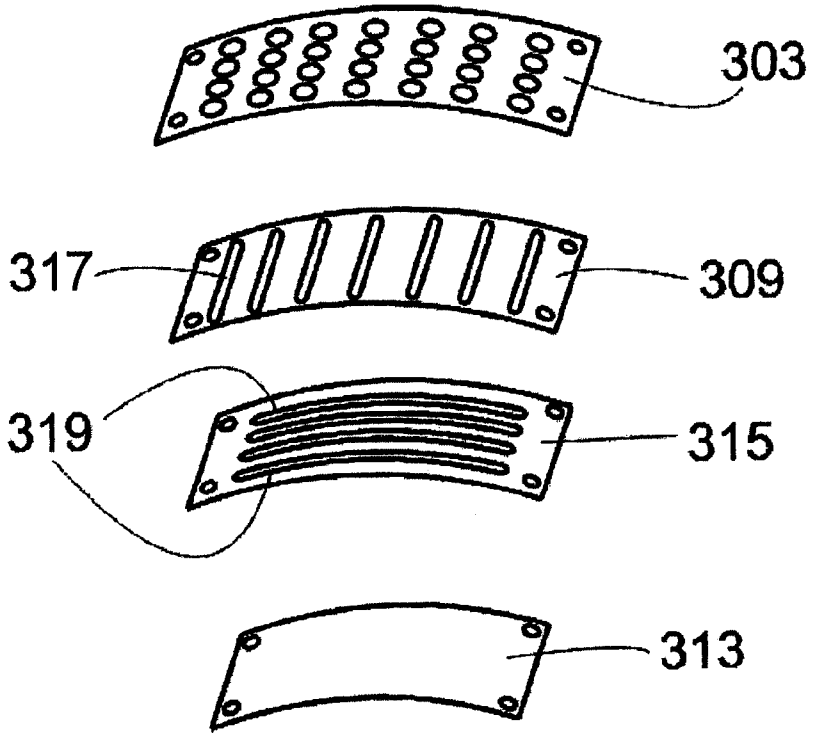
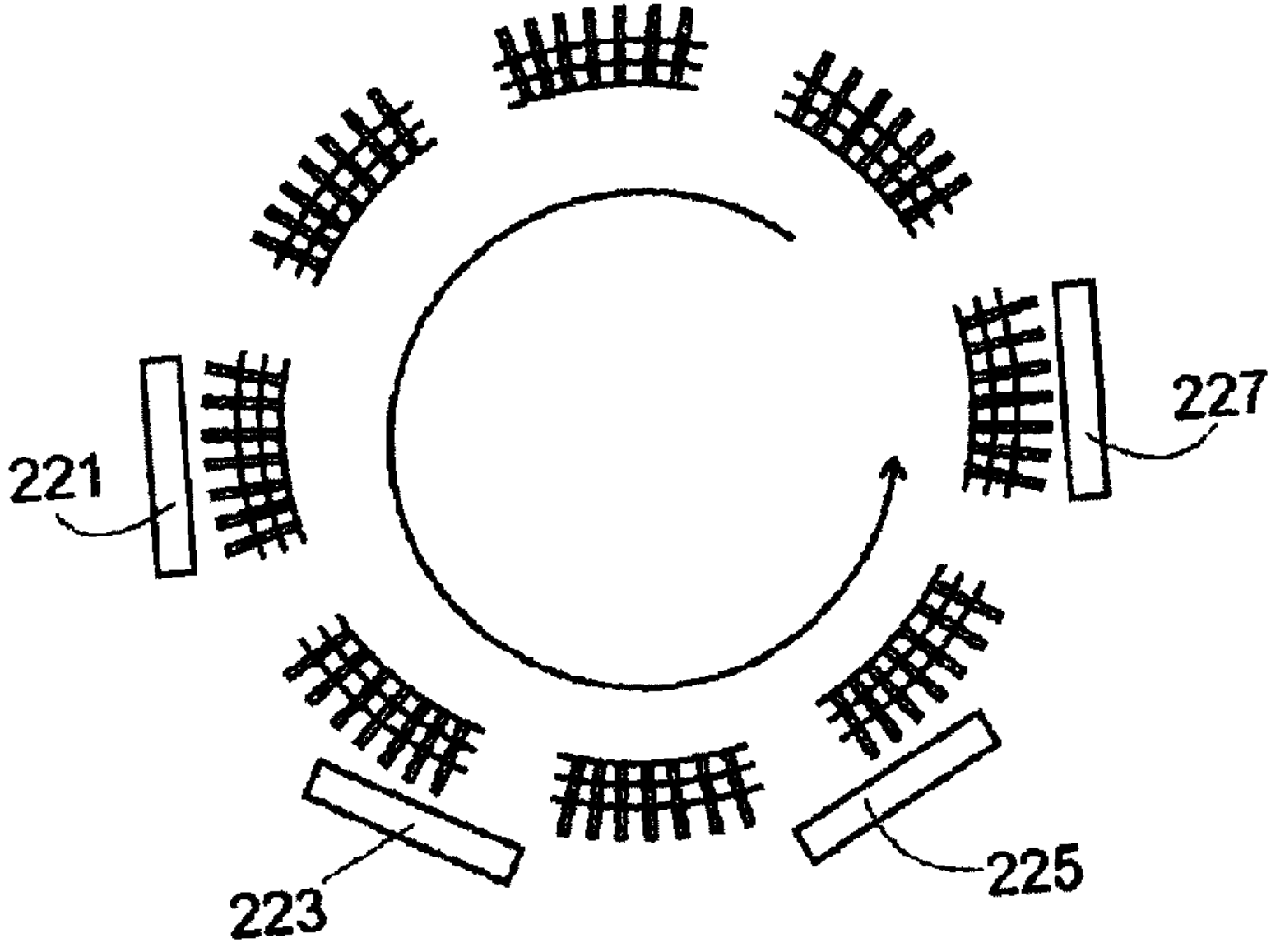


Fig 3b

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