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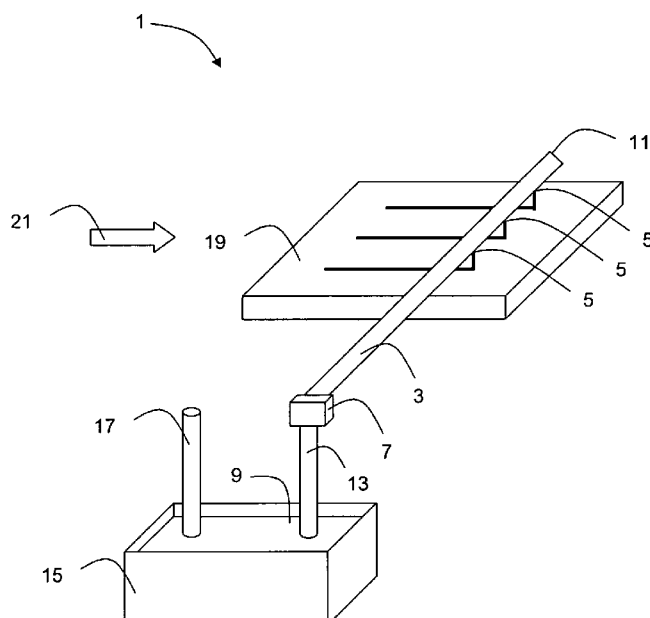


Fig. 1

(57) Abstract: A batter tube for depositing strips of batter from which wafer-based confectionary products are manufactured. The batter tube comprises an elongate tube for receiving a flow of batter under pressure. The elongate tube is provided with depositing means arranged to define an array of holes along the length of the elongate tube for depositing the batter. The depositing means is adjustable to provide the holes with different spacings, shapes and/or sizes. In one embodiment, the depositing means comprises at least one aperture formed along the length of the elongate tube and a plurality of rotatable sleeves sealingly arranged about the elongate tube and spaced along its length. The sleeves are arranged to at least partially cover the at least one aperture. Each sleeve may be provided with a variety of different holes spaced about the circumference of the sleeves. The dispensing holes of the batter tube can be easily changes, for either product modifications or process optimisation, with minimal manufacturing downtime.

Batter Tube

This invention relates to a batter tube for use in manufacturing food products, particularly wafer-based confectionary products. A batter tube, also known as a
5 batter arm, is typically used in a manufacturing process for wafer-based confectionary products to deposit strips of batter onto wafer baking plates.

A known batter tube is arranged to receive a supply of batter under a positive pressure from a batter reservoir. The batter tube is provided with a linear array of
10 holes along its length, and the viscous batter is forced through these holes under the positive pressure.

Typically, the known batter tube is arranged in a horizontal orientation and a first wafer baking plate is arranged under the batter tube and moved in a horizontal
15 direction perpendicular to the batter tube. In this way, an array of parallel, elongate strips of batter may be deposited on the first wafer baking plate. Once the first baking plate has passed the batter tube, a second wafer baking plate may be brought down over the first wafer baking plate to enclose the strips of batter for the baking process.

20 The known batter tube has a relatively simple structure and functions in a satisfactory manner. For this reason, the design of the batter tube has not changed significantly in recent years. Moreover, because of the simple structure of the batter tube, when it is desired to deposit different batters or to alter the
25 depositing pattern of the batter, it has become customary to maintain a set of several batter tubes having different hole arrangements, for example different hole diameters and linear spacings. Heretofore, this has been deemed an acceptable situation because the cost associated with fabrication of the several batter tubes is relatively low.

30 According to the invention, there is provided a batter tube for depositing strips of

batter from which food products are manufactured, particularly wafer-based confectionary products, the batter tube comprising an elongate tube for receiving a flow of batter under pressure, wherein the elongate tube is provided with depositing means arranged to define an array of holes along the length of the elongate tube for depositing the batter, and wherein the depositing means is adjustable to provide the holes with different spacings, shapes and/or sizes.

The inventors have realised that, although the structure of the known batter tube is simple, and its functional performance is satisfactory, there is a previously unrecognised need for a batter tube in which the sizes, shapes and spacings of the dispensing holes can be varied. Such a batter tube not only provides the advantage that changes to the food products being manufactured can be made with minimal downtime, but also allows for manufacturing process optimisation, since small changes to the batter tube can be made quickly and the effects of these changes on the manufacturing process can be verified quickly.

The batter tube of the invention may avoid the need for a set of several batter tubes having different hole arrangements to be maintained.

The depositing means may comprise at least one aperture formed along the length of the elongate tube and a plurality of rotatable sleeves arranged about the elongate tube and distributed along its length. The sleeves may be arranged to at least partially cover the at least one aperture. Preferably, the sleeves may be arranged to completely cover the at least one aperture. The sleeves may be rotated to vary the size, shape and/or spacing of the dispensing holes.

The at least one aperture formed along the length of the elongate tube may comprise an elongate, narrow slot formed along the length of the elongate tube, for example extending substantially along the full length of the elongate tube. In alternative embodiments, the at least one aperture may comprise a plurality of discrete openings spaced along the elongate tube.

Each sleeve may be provided with a plurality of holes spaced at intervals about its circumference, such that only one hole of the sleeve can be aligned with the at least one aperture in the elongate tube at any one time. The sleeves may be arranged about the elongate tube such that the batter can only flow out of the dispensing means through the holes in the sleeves.

The holes of each sleeve may have different shapes and/or different sizes. Furthermore, a portion of the circumference of each sleeve may be provided with no hole, so that the sleeve can be arranged about the elongate tube to completely cover the at least one aperture in the elongate tube, to thereby alter the spacing of the holes.

The edges of each sleeve may be provided with resilient seals to seal between the sleeve and the elongate tube and/or between the sleeve and adjacent sleeves. Other suitable forms of seal will be apparent to those of ordinary skill in the art. For example, for very viscous batters deposited through relatively large dispensing holes, the seals may simply take the form of close fitting components, i.e. the elongate tube and the sleeves.

The dispensing means may further comprises a locking mechanism, such as grub screws for each sleeve, for locking the rotational position of each of the sleeves. In this way, once a dispensing hole from each sleeve has been selected, the batter tube can be prepared for long term production of the confectionary products by fixing the position of the sleeve.

The elongate tube and the sleeves are preferably formed from food grade stainless steel, although embodiments having one or more components moulded from food grade plastics materials are also envisaged.

The invention also provides a batter arm comprising the batter tube described

above. In this case, an end of the tube is sealed, so that the supply of batter is fed from one end only.

The invention also provides a food product manufacturing apparatus comprising
5 the batter tube or the batter arm described above.

The invention also provides a wafer-based confectionary product manufacturing apparatus comprising:

the batter tube or the batter arm described above, the batter tube or batter
10 arm being arranged in a horizontal orientation such that the dispensing mean is downwardly pointing; and

a wafer baking plate arranged under the batter tube or batter arm, wherein
the wafer baking plate is movable in a perpendicular direction relative to the
length direction of the batter tube, such that a plurality of parallel strips of batter
15 can be deposited by the batter tube or batter arm on the wafer baking plate.

According to another aspect of the invention, there is provided a method of using
a batter tube for depositing strips of batter from which food products are
manufactured, the batter tube comprising an elongate tube for receiving a flow of
20 batter under pressure, wherein the elongate tube is provided with depositing
means arranged to define an array of holes along the length of the elongate tube
for depositing the batter, the method comprising adjusting the depositing means
to provide the holes with different spacings, shapes and/or sizes.

25 The method aspect of the invention corresponds to use of the batter tube
described above.

Specific embodiments of the invention will now be described, by way of example
only, with reference to the accompanying drawings in which:

30 Figure 1 is an illustration of a known manufacturing apparatus comprising
a batter tube;

Figure 2 is a schematic perspective view of a batter tube according to the invention; and

Figure 3 is a front view of the batter tube shown in Figure 2.

5 The invention provides a batter tube for depositing strips of batter from which wafer-based confectionary products are manufactured. The batter tube comprises an elongate tube for receiving a flow of batter under pressure, which elongate tube is provided with depositing means arranged to define an array of holes along the length of the elongate tube for depositing the batter. According
10 to the invention, the depositing means is adjustable to provide the holes with different spacings, shapes and/or sizes.

Figure 1 is an illustration of a known manufacturing apparatus 1 comprising a batter tube. The apparatus is suitable for use in manufacturing wafer-based
15 confectionary products.

In the known apparatus, a batter tube 3 in the form of an arm comprises an elongate section of tubing formed of food grade stainless steel. The batter tube 3 has a length of approximately 500 mm and a diameter of approximately 50 mm.
20 The batter tube 3 is supported such that it is arranged in a horizontal orientation. The tubular wall of the batter tube 3 is provided with three downwardly pointing holes 5 for dispensing batter. The holes 5 have a diameter of 3 mm and an inter-hole spacing of 20 mm.

25 A proximal end of the batter tube 3 is releasably attached to a boss 7 for supporting the batter tube 3 in its horizontal orientation and for connecting the batter tube 3 to a supply of batter 9 (suitable for making wafers). The mechanism for releasably attaching the batter tube 3 to the boss 7 allows for the batter tube 3 to be exchanged for different batter tubes (not shown) having different dispensing
30 hole shapes, sizes and/or spacings.

A distal end of the batter tube 3 is sealed with a sealing plate 11, so that batter 9 flowing into the batter tube 3 from the proximal end can only flow out of the batter tube 3 through the dispensing holes 5.

- 5 The boss 7 to which the batter tube 3 is connected is also connected to a batter supply pipe 13. The supply pipe 13 has a vertical orientation and its end which is not connected to the boss 7 is connected to a batter pump (not shown). The batter pump is submerged in a volume of batter 9 contained in a batter reservoir 15. A main batter supply pipe 17 is also submerged in the batter reservoir 15, and serves to periodically top-up the level of batter 9 as it is dispensed by the batter tube 3.

The known manufacturing apparatus 1 also comprises a pair of wafer baking plates, only one of which is shown. A first wafer baking plate 19 is provided in a horizontal orientation underneath the dispensing holes 5 of the batter tube 3. The first wafer baking plate 19 is movable in a horizontal direction 21, which direction is perpendicular to the length direction of the batter tube 3. A second wafer baking plate (not shown) is hingedly connected to the first wafer baking plate 19 to provide an open configuration in which the wafer baking plates are separated and a closed configuration in which the wafer baking plates are closed for baking wafers.

In use of the know apparatus, the batter pump (not shown) pumps batter 9 from the batter reservoir 15 under a positive pressure. The positive pressure forces the batter up the supply pipe 13, through the boss 7, along the batter tube 3, and through the dispensing holes 5. At the same time, the first wafer baking plate 19 is moved under the batter tube 3 so that elongate strips of batter are deposited on the first wafer baking plate 19.

- 30 Once strips of batter 9 of the desired length have been deposited on the first wafer baking plate 19, the pump is stopped. The second wafer baking plate (not

shown) is then brought down over the first wafer baking plate so that the strips of batter 9 can be baked to provide wafers.

As mentioned above, the batter tube 3 of the known apparatus 1 has a relatively simple structure and functions in an satisfactory manner. For this reason, the design of the batter tube 3 has not changed significantly in recent years. Moreover, because of the simple structure of the batter tube 3, when it is desired to deposit different batters or to alter the depositing pattern of the batter, it has become customary to maintain a set of several batter tubes having different hole arrangements, for example different hole diameters and linear spacings. Heretofore, this has been deemed an acceptable situation because the cost associated with fabrication of the several batter tubes is relatively low.

Figures 2 is a schematic perspective view and Figure 3 is a schematic front views, respectively, of a batter tube 101 according to the invention. The batter tube 101 of the invention is suitable for use with the apparatus 1 illustrated in Figure 1, although it is not essential that the batter tube 101 is releasably attached to the boss 7, since changes to the dispensing holes of the batter tube 101 can be made without having to exchange the batter tube 101.

The batter tube 101 according to the invention comprises an elongate section of tubing 103 formed of food grade stainless steel. The tubing 103 has a length of approximately 500 mm and a diameter of approximately 50 mm. The tubing 103 is supported such that it is arranged in a horizontal orientation. The tubular wall of the tubing 103 is provided with a downwardly pointing elongate slot 105 running the entire length of the batter tube 101. The elongate slot 105 has a width of 5 mm.

A distal end of the tubing 103 is sealed with a sealing plate (not shown), so that batter flowing into the tubing 103 from a proximal end can only flow out of the tubing 103 through the elongate slot 105.

The outer surface of the tubing 103 is provided with a linear array of eighteen rotatable sleeves 107. The sleeves 107 are arranged about the tubing 103 in close contact with the tubing 103. Edges of the sleeves 107 are provided with resilient seals (not shown) which bear against the seals of adjacent sleeves 107 to prevent the leakage of batter between the sleeves 107. Seals are also provided for preventing leakage of batter between the tubing 103 and the sleeves 107.

10 The sleeves 107 are each provided about their circumference with an series of differently sized holes 109 for depositing batter. In the example shown, the sleeves 107 have three differently sized holes 109 ranging in diameter from 1 mm to 5mm. The holes 109 are sufficiently spaced apart so that only one hole 109 of each sleeve 107 can be aligned with the elongate slot 105 of the tubing 103 at any one time. The sleeves 107 also have a portion of their circumference with no holes 109, so that the elongate slot 105 can be completely covered by the sleeve 105.

20 The sleeves 107 can be independently rotated by different amounts to provide dispensing hole configurations having different shapes, sizes and/or spacings. Dispensing hole spacings, in particular, can be varied by altering the number of sleeves 107 which are arranged to completely cover the elongate slot 105 of the tubing 103.

25 Once a desired dispensing hole configuration has been obtained, the rotational positions of the sleeves 107 can be fixed by a locking mechanism in the form of grub screws (not shown) which pass through each of the sleeves 107 and bear against the underlying surface of the tubing 103.

30 According to the invention, the dispensing hole configuration of the batter tube 103 can be altered without the need for a set of various different batter tubes to

be maintained, or for the batter tube to be removed from the manufacturing apparatus. Thus, the dispensing hole configuration of the batter tube can be altered with minimal manufacturing down time. In this way, a more flexible manufacturing apparatus is provided, since product changeovers can be
5 achieved more quickly and more easily.

The invention also allows for optimisation of the batter dispensing process. For example, different batter viscosities require different dispensing hole diameters. A more viscous batter requires dispensing holes having a larger diameter to
10 ensure sufficient flow, whereas a less viscous batter requires smaller dispensing holes to prevent leakage of the batter through the dispensing holes when the batter pump is not operating. Furthermore, the operating pressure of the batter pump influences the optimal dispensing hole configuration.

15 A specific example of the invention has been described above. Various changes within the scope of the claims will be readily apparent to those of ordinary skill in the art.

For example, the tubing may be provided with discrete holes instead of the
20 elongate slot, which may allow for reduced batter leakage between the sleeves.

The batter tube described above is suitable for use in manufacturing wafer-based confectionary products. The invention may, however, be used in manufacturing other products where flows of batter are required.
25

Claims

1. A batter tube for depositing strips of batter from which food products are manufactured, the batter tube comprising an elongate tube for receiving a flow of batter under pressure, wherein the elongate tube is provided with depositing means arranged to define an array of holes along the length of the elongate tube for depositing the batter, and wherein the depositing means is adjustable to provide the holes with different spacings, shapes and/or sizes.
2. A batter tube according to claim 1, wherein the depositing means comprises at least one aperture formed along the length of the elongate tube, wherein the depositing means further comprises a plurality of rotatable sleeves sealingly arranged about the elongate tube and distributed along its length, and wherein the sleeves are arranged to at least partially cover the at least one aperture.
3. A batter tube according to claim 2, wherein the sleeves are arranged to completely cover the at least one aperture.
4. A batter tube according to claim 2 or 3, wherein the at least one aperture formed along the length of the elongate tube comprises an elongate slot formed along the length of the elongate tube.
5. A batter tube according to any of claims 2 to 4, wherein each sleeve is provided with a plurality of holes spaced about its circumference, such that only one hole of the sleeve can be aligned with the at least one aperture in the elongate tube at any one time, and wherein the sleeves are arranged about the elongate tube such that the batter can only flow out of the dispensing means through the holes in the sleeves.
6. A batter tube according to claim 5, wherein the holes of each sleeve have

different shapes.

7. A batter tube according to claim 5 or 6, wherein the holes of each sleeve have different sizes.

5

8. A batter tube according to any of claims 5 to 7, wherein at least one of the sleeves can be arranged about the elongate tube so that no hole is aligned with the at least one aperture in the elongate tube, to thereby alter the spacing of the holes.

10

9. A batter tube according to any of claims 2 to 8, wherein the edges of each sleeve are provided with resilient seals to seal between the sleeve and the elongate tube and/or between the sleeve and/or adjacent sleeves.

15 10. A batter tube according to any of claims 2 to 8, wherein the dispensing means further comprises a locking mechanism for locking the rotational position of each of the sleeves.

20 11. A batter tube according to any preceding claim, wherein the elongate tube and the sleeves are formed from food grade stainless steel.

12. A batter arm comprising a batter tube according to any proceeding claim, wherein an end of the tube is sealed.

25 13. A food product manufacturing apparatus comprising a batter tube according to any of claims 1 to 11 or a batter arm according to claim 12.

30 14. A wafer-based confectionary product manufacturing apparatus comprising:
a batter tube according to any of claims 1 to 11 or a batter arm according to claim 12, the batter tube or batter arm being arranged in a horizontal orientation such that the dispensing mean is downwardly pointing; and

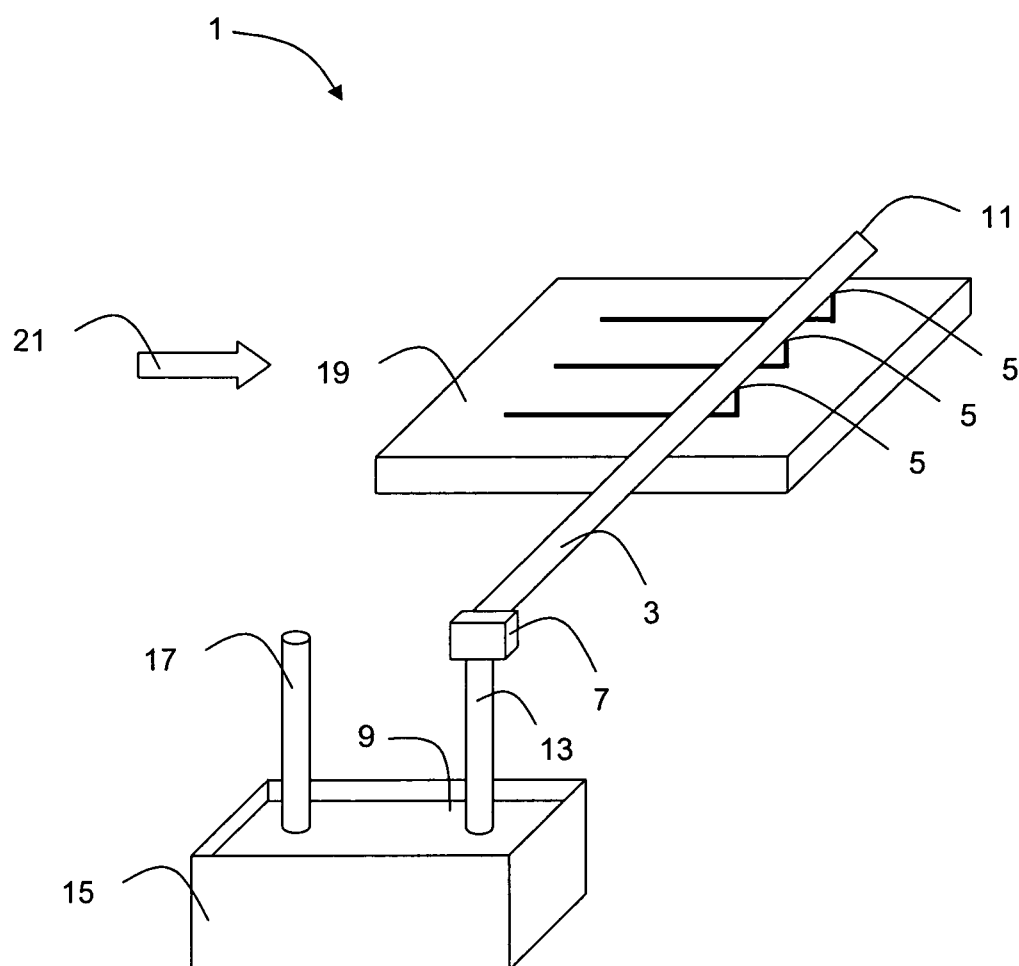
a wafer baking plate arranged under the batter tube or batter arm, wherein the wafer baking plate is movable in a perpendicular direction relative to the length direction of the batter tube, such that a plurality of parallel strips of batter can be deposited by the batter tube or batter arm on the wafer baking plate.

5

15. A method of using a batter tube for depositing strips of batter from which food products are manufactured, the batter tube comprising an elongate tube for receiving a flow of batter under pressure, wherein the elongate tube is provided with depositing means arranged to define an array of holes along the length of the elongate tube for depositing the batter, the method comprising adjusting the depositing means to provide the holes with different spacings, shapes and/or sizes.

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**Fig. 1**

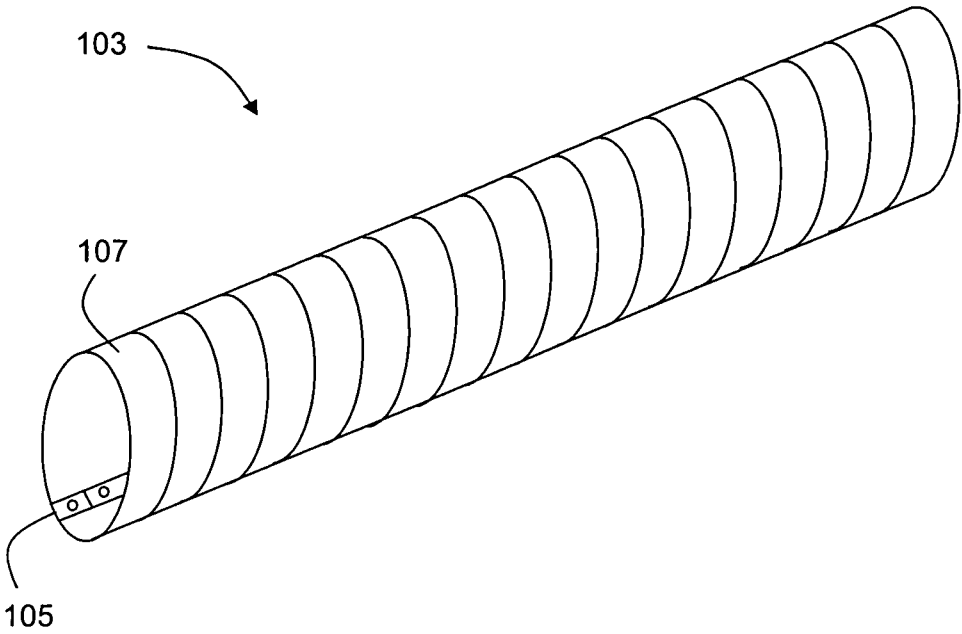


Fig. 2

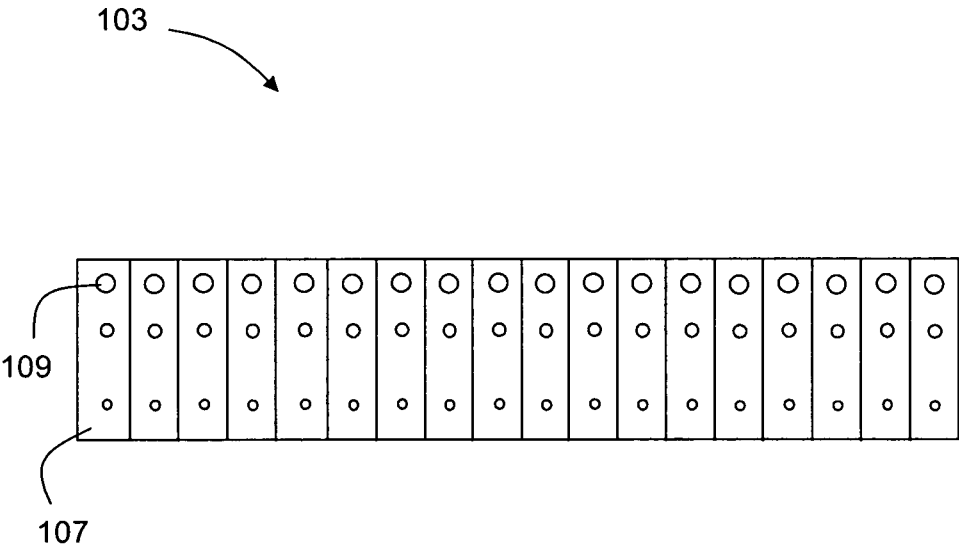


Fig. 3