



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
06.09.2023 Bulletin 2023/36

(51) International Patent Classification (IPC):
E21B 10/38^(2006.01)

(21) Application number: **22160150.3**

(52) Cooperative Patent Classification (CPC):
E21B 10/38

(22) Date of filing: **04.03.2022**

(84) Designated Contracting States:
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
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **CENTRAL FLUSHING CHANNEL COMPRISING ID MARKER**

(57) A rock drill bit for percussive drilling comprising a central flushing channel wherein the central flushing channel has an endmost surface; wherein the endmost surface of the flushing channel has an angle α measured between a first surface and a second surface on a longitudinal cross section of the bit; there is at least one identification marker positioned on the end most surface of the central flushing channel.

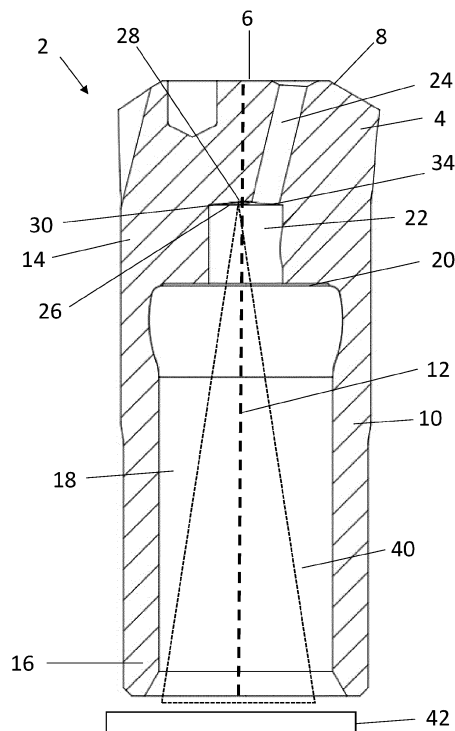


Fig 1

Description

Field of invention

[0001] The present invention relates to a rock drill for percussive drilling, although not exclusively, especially to rock drill for top hammer drilling having a central flushing channel comprising an identification marker.

Background art

[0002] Percussion drill bits are widely used both for drilling relatively shallow bores in hard rock and for creating deep boreholes wherein a drill string is employed. In 'top hammer drilling' a terrestrial machine is operative to transfer a combined impact and rotary drive motion to an upper end of the drill string. Whilst a drill bit which has a plurality of inserts or buttons, made from a hard material, mounted on its front face is positioned at the lower end is operative to crush the rock and form the boreholes. The cuttings resulting from the rock breaking action need to be removed so that the next impact will hit solid rock again and therefore break the new rock more efficiently than if the cuttings were still present. Therefore, a flushing media, such as water, is supplied from the drill string to the front face of the drill bit through flushing holes via a central flushing channel and returned through an annular space formed between the drill string and the hole. An example of a drill bit having a standard central flushing channel can for example be seen in figure 5 of EP2369127. In down-the-hole (DTH) drilling the impact device is in the drill hole.

[0003] It is desirable to be able to identify rock drill bits, in terms of serial number, to be able to be able to retrieve information and properties from the production process of the bit. From the serial number software can then be used to obtain further information about the part, for example the batch number and raw material sources. It is further desirable to be able to track drilling parameters from specific drill bits for process improvement purposes. The current method of identifying drill bits is to attach a label to the bit with the product information on. The problem with this is that it easily comes detached during the drilling operation.

[0004] Identification (ID) tagging is well known from other industries but has never been applied on a drill bit due to steel wash that occurs rock drilling which would damage the ID tag. Therefore, the problem to be solved is how to modify the drill bit design in order for the ID tag to be able to be positioned where it is protected from steel wash and abrasive wear during the drilling operation whilst still being located in a position that is readable.

Summary of the Invention

[0005] It is an objective of the present invention to provide a rock drill bit for percussive drilling comprising: a bit head having a front face; a shank that projects rear-

wardly from the bit head centred on an elongate bit central axis having a top end that is proximal the bit head and bottom end that is distal the bit head; an internal cavity extending through the shank; a central flushing channel extending from the top end of the cavity wherein the central flushing channel has an endmost surface; at least one flushing port extending from the endmost surface of the central flushing channel through the bit head for delivering flushing media to the front face; wherein the endmost surface of the flushing channel has an angle α measured between a first surface and a second surface on a longitudinal cross section of the bit; characterized in that there is at least one identification marker positioned on the end most surface of the central flushing channel.

[0006] Advantageously, if the identification marker is positioned in this location it is protected from steel wash, abrasive wear, and the harsh environment surroundings during the drilling operation, therefore reducing the risk that the identification marker is damaged and is therefore still readable after the drilling operation, whilst also being able to be positioned in a location that is readable, for example by using a smartphone app.

[0007] In one embodiment the end most surface of the central flushing channel comprises at least one radio frequency identification (RFID) tag. Advantageously, when an RFID tag is located in this position it enables product and drilling information to be stored in a reliable way as it is protected from steel wash but is still able to be read.

[0008] In another embodiment, the end most surface of the central flushing channel comprises at least one identification marker encoded with one-dimensional or two-dimensional optical machine-readable code. Advantageously, by arranging identification marker on the end most surface of the central flushing channel this enables product and drilling information to be stored in a reliable way. When the identification marker is located in this position it is protected from steel wash but still readable.

[0009] Preferably, the identification marker is laser engraved on. Advantageously, the location can be reached most easily using a laser.

[0010] Preferably, the identification marker is a DataMatrix code. A data matrix code is a two-dimensional bar code which may be in the form of a square or rectangular symbol made up of individual modules of predetermined size in the form of dots or squares. The individual modules form an ordered grid of contrasting (e.g. dark or light) modules, bordered by a finder pattern used to specify the orientation and structure of the symbol. The identification tag can in this case be used to store information about a very large amount of individual sintered bodies, depending on the size of the data matrix code. The size may typically be 12x12 modules, or larger depending on needs. In an error correction algorithm, several damaged or blurred modules can be corrected for. Advantageously if a data matrix code is used more information can be stored in a smaller area. Further, only approximately 32-72% of the data matrix code needs to be

intact in order for the information to be read, therefore even if the data matrix code is slightly damaged the information can still be read. It may be preferable that the ID tag used has an industry standard associated with it.

[0011] Preferably, α is between 120° - 180° , more preferably between 140° - 180° , even more preferably between 165° - 180° . Advantageously, this angle range provides at optimal balance between readability of the identification tag and ease of manufacturing.

[0012] In one embodiment, there is a line of sight between the endmost surface and a reader located external to the cavity and wherein the identification marker is located within the line of sight. Advantageously, this enables easy readability of the information on the identification marker.

[0013] Preferably, the angle of flushing port relative to the longitudinal axis is $>0^\circ$. Advantageously, this provides an increased area on the endmost surface of the central flushing channel for the identification marker to be positioned.

Brief description of drawings

[0014] A specific implementation of the present invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

Figure 1 is a longitudinal cross section of a rock drill bit having a modified central flushing channel.

Figure 2 shows an enlargement of the longitudinal cross section of the rock drill bit in the region of the central flushing channel.

Figure 3 is a radial cross section of the rock drill bit showing the end most surface of the central flushing channel.

Detailed description

[0015] Figure 1 shows a longitudinal cross section of the rock drill bit 2 for top hammer drilling having a bit head 4 configured to be attached at one end of a drilling assembly (not shown). The bit head 4 has a front face 6, with a plurality of buttons (not shown), otherwise referred to as inserts or cutters, mounted on. The buttons are made of a hard material, such as cemented carbide or diamond and are usually uniformly distributed across the front face 6. The buttons engage with the material, such as rock, to be crushed during the drilling operation. The bit head 4 is centred on an elongate bit central axis 12.

[0016] The rock drill 2 also has a shank 10 that projects rearwardly from the bit head 4. The shank 10 is also centred on the elongate bit central axis 12 and has a top end 14 that is proximal to the bit head 4 and a bottom end 16 that is distal to the bit head 4, the shank 10 is hollowed out such that a cavity 18 (or bore) is formed inside. The cavity 18 extends from the bottom end 16 of the shank

to a longitudinal internal surface 20 at the top end 14 of the shank 14. Flushing fluid, which is normally water for top hammer drilling, but could be air or any other fluid suitable for flushing, is transported from the bottom end 16 to the top end 14 of the cavity 18. Both the bit head 4 and the shank 10 are typically made from steel.

[0017] The top end 14 of the cavity 18 connects to a central flushing channel 22, which is centred around the bit central axis 12 of the shank 10, into which the flushing media is directed. The central flushing channel 22 has an endmost surface 26 at its top end 14 from which one or more flushing port(s) 24 (otherwise known as flushing passages) extend from through bit head 4 to the front face 6. Typically, there are 3 flushing ports 24, but in the cross section shown in figure 1 only one the flushing ports 24 is visible, other numbers of flushing ports 24 are also possible. The endmost surface 26 has a central point 28 located on the longitudinal axis 12. In one embodiment there is a line of sight 40 between the endmost surface 26 and a reader 42 located external to the cavity 18 and the identification marker 38 is located within the line of sight 40.

[0018] Figure 2 shows an enlargement of the longitudinal cross section of the rock drill bit in the region of the central flushing channel 22. The longitudinal cross section of the endmost surface 26 has a first surface 30 and a second surface 34, having angle α between the first surface 30 and the second surface 34, wherein α is between 120° - 180° , preferably between 130° - 180° , more preferably between 140° - 180° , most preferably between 165° - 180° .

[0019] The angle of flushing port 24 relative to the longitudinal axis 12 is $>0^\circ$. The angle of the flushing port 24 relative to the first surface 30 or the second surface 34 is between 60° - 180° , preferably between 90° - 165° .

[0020] Figure 3 shows that the end most surface 26 of the central flushing channel 22 comprises at least one identification marker 38. The identification marker 38 could be for example a radio frequency identification (RFID) tag or identification marker encoded in a one-dimensional or two-dimensional optical machine-readable code. The term "one-dimensional or two-dimensional optical machine-readable code" represents a passive identification marker that can be read by an optical reading device, e.g., a camera. The "one-dimensional or two-dimensional optical machine-readable code" can for example be a Quick Response (QR) code, a High-Capacity Colored Two-Dimensional Code, a European Article Number code, a DataMatrix code, or a MaxiCode. By reading the identification marker 38 by use of a reading device, information regarding the unique rock drill bit 2 be easily achieved via e.g., a smartphone app with access to a tool database. Said information can include e.g., geometrical data and/or data regarding the material composition of the rock drill bit 2. Further information could be related to the material composition of the buttons, and the steel in the drill bit or the drilling parameters measured from the drilling operation and / or the internal

production process.

[0021] Typically, only one identification marker 38 is used however it would also be possible to include more than identification marker in any combination of RFID tag(s), identification marker(s) encoded in a one-dimensional or two-dimensional optical machine-readable code and / or any other suitable identification marker(s) 38.

[0022] According to one embodiment, the identification marker 38 is etched, engraved, impressed, imprinted or painted on the endmost surface 26 of the central flushing channel 22. A particularly suitable way of arranging the identification marker 38 is by using laser engraving.

EXAMPLE 1

[0023] Drill bit 77385348A-R48 with a diameter of 48 mm having an identification marker positioned on the end most surface of the central flushing channel, was drilled in a mine in Tampere to end of bit life, 392 drill meters, the identification marker positioned on the end most surface of the central flushing channel was readable with a Datalogic220 reader and lens after drilling.

Example 2

[0024] Drill bit 77385348A-R48 with diameter of 48 mm and drill bit 77385348A-S48 with a diameter of 48 mm both having an identification marker positioned on the end most surface of the central flushing channel, were tested in a mine in Tampere and were drilled to 213 and 148 m respectively. The identification markers were readable with Datalogic220 reader and lens after drilling.

Claims

1. A rock drill bit (2) for percussive drilling comprising:

a bit head (4) having a front face (6);
a shank (10) that projects rearwardly from the bit head (4) centred on an elongate bit central axis (12) having a top end (14) that is proximal the bit head (4) and bottom end (16) that is distal the bit head (4);
an internal cavity (18) extending through the shank (10);
a central flushing channel (22) extending from the top end (14) of the cavity (18) wherein the central flushing channel (22) has an endmost surface (26);
at least one flushing port (24) extending from the endmost surface (26) of the central flushing channel (22) through the bit head (4) for delivering flushing media to the front face (6);
wherein the endmost surface (26) of the flushing channel (22) has an angle α measured between a first surface (30) and a second surface (34) on

a longitudinal cross section of the bit (2);

characterized in that:

there is at least one identification marker (12) positioned on the end most surface (26) of the central flushing channel (22).

2. The rock drill bit (2) according to claim 1 wherein the identification marker (38) is a radio frequency identification (RFID) tag.
3. The rock drill bit (2) according to claim 1 wherein the identification marker (38) is an identification marker encoded with one-dimensional or two-dimensional optical machine-readable code.
4. The rock drill bit (2) according to claim 3 wherein the identification marker (38) is laser engraved on.
5. The rock drill bit (2) according to claim 3 or 4 wherein the identification marker (38) is a DataMatrix code.
6. The rock drill bit (2) according to any of the previous claims wherein α is between 120 - 180°.
7. A rock drill bit (2) according to claim 6 wherein α is between 140-180°.
8. A rock drill bit (2) according to claim 7 wherein α is between 165-180°.
9. The rock drill bit (2) according to any of the previous claims wherein there is a line of sight (40) between the endmost surface (26) and a reader (42) located external to the cavity (18) and wherein the identification marker (38) is located within the line of sight (40).
10. The rock drill bit according to any of the previous claims wherein the angle of flushing port (24) relative to the longitudinal axis (12) is $>0^\circ$.

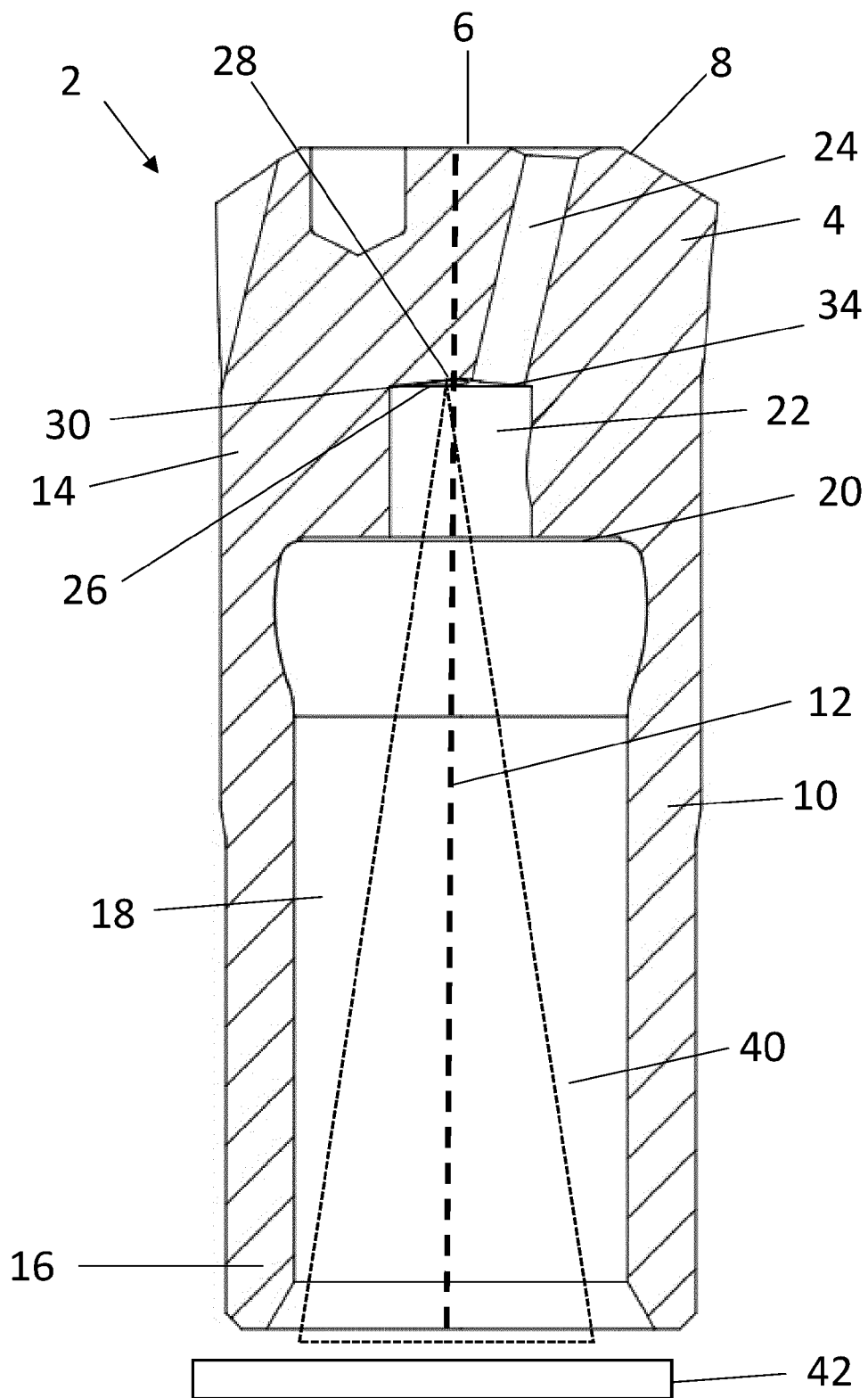


Fig 1

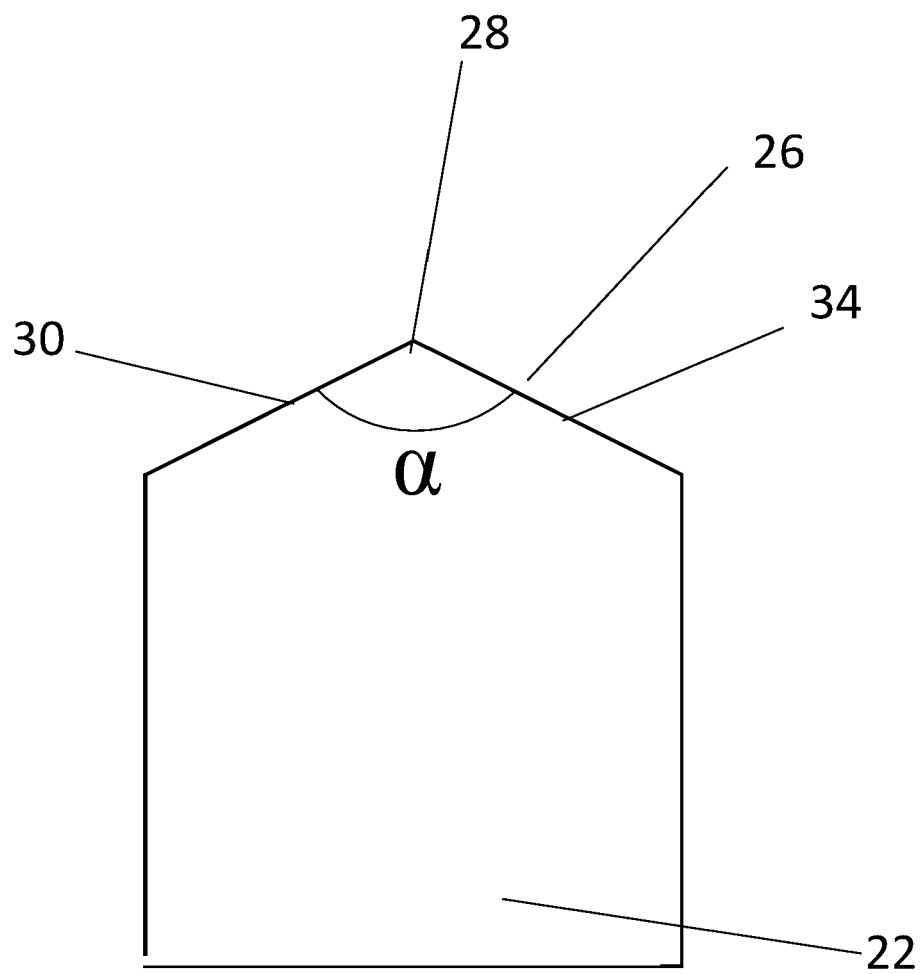


Fig 2

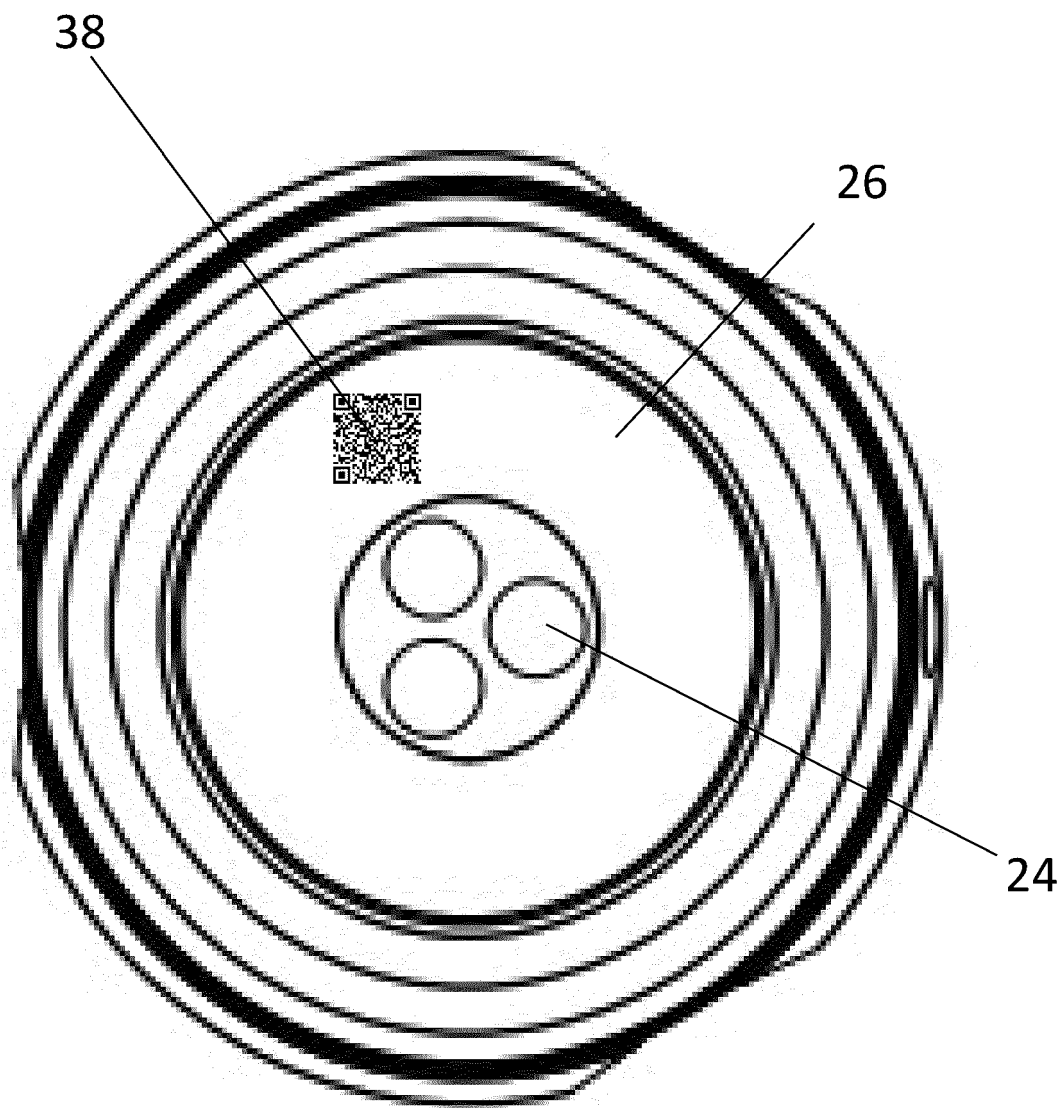


Fig 3



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Application Number

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