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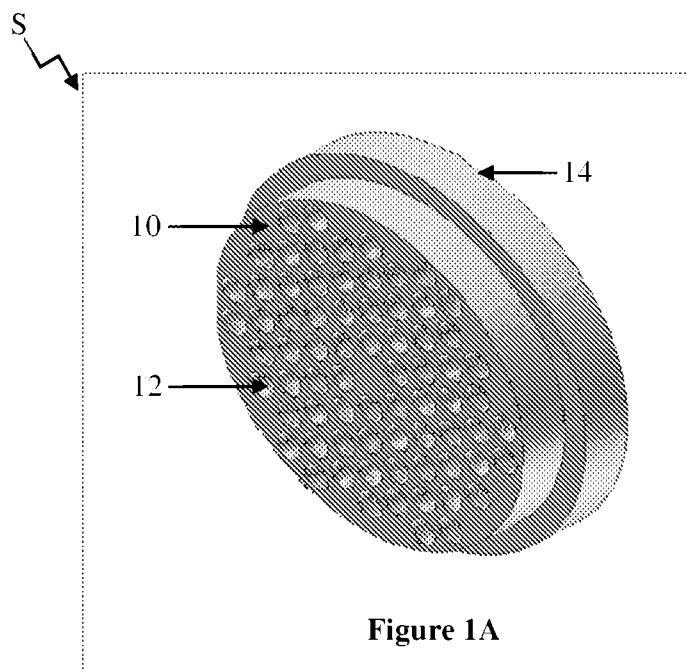


Figure 1A

(57) **Abstract:** The present disclosure relates to a spinneret plate comprising a plurality of threaded apertures. Each of the plurality of threaded apertures is adapted to receive one of a capillary stud and a blinding stud. The capillary stud has threads configured on its outer circumference, 5 and a capillary configured there within for extruding fibers therefrom. The blinding stud is adapted for blocking at least one of the plurality of threaded apertures.

A SPINNERET PLATE

FIELD

The present disclosure relates to the field of textile engineering. Particularly, the present disclosure relates to a spinneret plate.

5 BACKGROUND

Polymeric fibers are obtained by using melt spinning, solution spinning or wet spinning process. During the spinning process, a polymeric material is melted, dissolved or solubilized, to obtain a polymer that is ready to be spun. The polymer is then passed through a spinneret plate having a plurality of apertures of a specific dimension configured thereon, to
10 obtain fibers. These fibers are washed, dried, and cooled or conditioned to obtain polymeric fibers. The properties of the polymeric fibers are directly proportional to the dimensions of the plurality of apertures.

Conventionally, the spinneret plate is required to be changed with the change in dimensions or properties of the polymeric fibers. The following drawbacks are associated with the change
15 in spinneret plate:

- capital expenditure (CAPEX) is increased; and
- extra time is required for procuring and installing a desired spinneret plate, thereby delaying the processing of a polymeric material to obtain polymeric fibers.

There is, therefore, felt a need for an alternative spinneret plate to extrude fibers, and obviate
20 the above mentioned drawbacks.

OBJECTS

Some of the objects of the present disclosure, which at least one embodiment herein satisfies, are as follows.

It is an object of the present disclosure to ameliorate one or more problems of the prior art or
25 to at least provide a useful alternative.

An object of the present disclosure is to provide a spinneret plate for extrusion of fibers.

Other objects and advantages of the present disclosure will be more apparent from the following description, which is not intended to limit the scope of the present disclosure.

SUMMARY

5 The present disclosure envisages a spinneret plate. The spinneret plate comprises a plurality of threaded apertures. The plurality of threaded apertures are configured on the spinneret plate. Each of the plurality of threaded apertures is adapted to receive one of a capillary stud and a blinding stud. The capillary stud has threads configured on its outer circumference, and a capillary configured therewithin for extruding fibers from the capillary.

10 The capillary stud includes an operative top surface, an operative intermediate surface, and an operative bottom surface.

The capillary forms an opening, of a pre-determined cross-section, on the operative bottom surface of the capillary stud.

The blinding stud is adapted for blocking at least one of the plurality of threaded apertures.

The blinding stud can be shaped in the form of a spinning top.

15 Threads are configured on the outer circumference of the operative intermediate surface of the capillary stud.

The operative bottom surface of the capillary stud can be circular.

20 A plurality of slots can be configured on one of the operative bottom surface and the operative top surface, to facilitate at least one of tightening, and opening of said capillary stud, with an instrument.

A seat can be configured on the operative top surface of the capillary stud to accommodate a seal.

The diameter of the plurality of threaded apertures can be in the range of 1.5 mm to 7 mm.

25 The height of the capillary stud can be in the range of 5 mm to 30 mm, and at least a portion of the total height of the capillary stud can be covered with the threads.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWING

A spinneret plate will now be described with the help of the accompanying drawing, in which:

Figures 1A and **1B** illustrate a schematic view of a spinneret plate in accordance with the present disclosure, wherein the spinneret plate receives capillary studs from an operative front surface of the spinneret plate;

Figures 2A and **2B** illustrate a schematic view of a capillary stud for bottom insert in accordance with the present disclosure;

Figures 2C and **2D** illustrate a schematic view of a capillary stud for top insert in accordance with the present disclosure;

Figure 2E illustrates line drawing of the capillary stud of **Figures 2A** to **2D**;

Figures 3A and **3B** illustrate an assembled view of the spinneret plate of **Figure 1A** and **1B**;

Figure 4 illustrates a schematic view of a blinding stud in accordance with the present disclosure; and

Figures 5A and **5B** illustrate a schematic view of the spinneret plate for top insert mechanism.

DETAILED DESCRIPTION

Conventionally, with the change in dimensions of polymeric fibers, there is a need to change a spinneret plate, thereby increasing the CAPEX, and the time required for procuring and installing a desired spinneret plate, which in turn delays processing of a polymeric material to obtain polymeric fibers.

The present disclosure, therefore, provides a spinneret plate to obviate the above mentioned drawbacks.

The spinneret plate (S) of the present disclosure is described with reference to **Figures 1A** and **1B**. The spinneret plate (S) comprises a plurality of threaded apertures (12). The plurality of threaded apertures (12) are configured on the spinneret plate (S). The spinneret plate (S), typically, consists of two surfaces, viz., an operative front surface (10), and an operative rear surface (14). Each of the plurality of threaded apertures (12) configured on the spinneret plate (S) is a through aperture. Due to this, the plurality of threaded apertures (12) form a plurality

of openings on the operative front surface (10), and the operative rear surface (14) of the spinneret plate (S) (as shown in **Figures 1A and 1B**).

Each of the plurality of threaded apertures (12) can be a counterbore.

5 The diameter of the plurality of threaded apertures (12) can be in the range of 1.5 mm to 7 mm.

Each of the plurality of threaded apertures (12) is adapted to receive one of a capillary stud (C and C') and a blinding stud. The capillary stud (C and C') is described with reference to **Figures 2A to 2E**. The capillary stud (C and C') has threads (16) configured on its outer circumference, and a capillary (18) configured within the capillary stud (C and C'), for
10 extruding fibers from the capillary (18).

A conventional spinneret plate has a plurality of apertures of a fixed dimension configured thereon, i.e. the capillaries are drilled in the body of spinneret block. Due to this, the conventional spinneret cannot be used to extrude polymeric fibers of different dimensions or diameter therefrom. For instance, if polymeric fibers having 20 micron diameter are extruded
15 from a spinneret plate, and suddenly there is a need to extrude polymeric fibers having 40 micron diameter from the spinneret plate, then, it is not possible to extrude the polymeric fibers having 40 micron diameter from the same spinneret plate used for extruding the polymeric fibers having 20 micron. In order to extrude the polymeric fibers having 40 micron diameter, it is necessary to change the spinneret plate.

20 However, this is not the case with the spinneret plate (S) of the present disclosure.

In accordance with the present disclosure, the diameter of the capillary (18) is selected depending upon the required dimensions of the polymeric fibers to be extruded therefrom. The capillary stud (C and C') can be easily changed without changing the spinneret plate (S), to obtain the required dimensions of the polymeric fibers.

25 The plurality of threaded apertures (12) facilitate in securing and removing the capillary stud (C and C') therefrom.

The capillary stud (C and C') comprises an operative top surface (20), an operative intermediate surface (22), and an operative bottom surface (24).

Threads (16) are configured on the outer circumference of the operative intermediate surface (22) of the capillary stud (C and C').

The capillary (18) forms an opening (O) of a pre-determined cross-section on the operative bottom surface (24) of the capillary stud (C and C').

- 5 The capillary (18) can be circular or non-circular in cross-section. In case of circular cross-section, the diameter of the capillary (18) can be in the range of 0.1 mm to 2 mm.

The capillary (18) can be divided into four portions, viz., a funnel shaped first portion (18a), a rectangular shaped second portion (18b) extending from the funnel shaped first portion (18a), a funnel shaped third portion (18c) extending from the rectangular shaped second portion
10 (18b), and a rectangular shaped fourth portion (18d) extending from the funnel shaped third portion (18c). The rectangular shaped fourth portion (18d) forms the opening (O) on the operative bottom surface (24) of the capillary stud (C and C').

The operative bottom surface (24) of the capillary stud (C and C') is circular, thereby facilitating cleaning of the operative bottom surface (24), so as to obviate blocking of the
15 opening (O).

A plurality of slots (26) can be configured on one of the operative bottom surface (24) of the capillary stud (C) and the operative top surface (20) of the capillary stud (C'), thereby facilitating at least one of tightening, and opening of the capillary stud (C and C'), with an instrument.

- 20 The instrument can be a screw-driver, or a screw driving machine.

A seat (not shown in **Figures 2A to 2E**) can be configured on the operative top surface (20) of the capillary stud (C and C') to accommodate a seal (A and A') thereon.

Preferably, the seal (A and A') is an aluminum seal, because typically aluminum has a high thermal expansion coefficient as compared to steel, thereby providing a leak proof joint when
25 inserted in the spinneret plate (S).

The capillary stud (C and C') can be screwed in each of the plurality of threaded apertures (12) with moderate pre-tension. Moderate pre-tension refers to a pre-tension developed in the capillary stud (C and C') while tightening the capillary stud (C) in each of the plurality of threaded apertures (12). This is because, during tightening of the capillary stud (C and C'),

the seal (A and A') is compressed in the threaded aperture (12). The compression of the seal (A and A') is transferred to the capillary stud (C and C'), thereby developing moderate pre-tension or pre-tension in the capillary stud (C and C'), and ensuring leak proof joint in the spinneret plate (S).

- 5 The height of the capillary stud (C and C') is chosen such that at least 8 threads (16) are received or screwed in the plurality of threaded apertures (12) on tightening. Due to this, the threads (16) have an ability to overcome the compressive or crushing stresses developed in the capillary stud (C and C') due to heating; tightening; and the pressure of a polymeric material.

- 10 The diameter of the capillary stud (C and C') can be in the range of 4 mm to 10 mm.

The height of the capillary stud (C and C') can be in the range of 5 mm to 30 mm.

The capillary stud (C and C') can be received in each of the plurality of threaded apertures (12) from one of the operative front surface (10) and the operative rear surface (14) of the spinneret plate (S).

- 15 **Figure 3A** illustrates an assembled view of the spinneret plate (S), wherein the capillary stud (C) is received in the plurality of threaded apertures (12) from the operative front surface (10) of the spinneret plate (S), thereby facilitating extrusion of polymeric fibers therefrom. The number of polymeric fibers extruded depends upon the number of capillary studs received in the threaded apertures. If there is a need to reduce the number of extruded polymeric fibers,
20 then the required number of the plurality of apertures (12) may be blocked by inserting the blinding stud (B) in at least one of the plurality of apertures (12) (as shown in **Figure 3B**).

The blinding stud (B) can be shaped in the form of a spinning top (as shown in **Figure 4**).

- The spinning top comprises a cone-shaped surface (28) merging into a convex-shaped surface (30), and a shank (32) extending from the convex-shaped surface (30) (as shown in **Figure**
25 **4**).

The blinding stud (B) is inserted into the apertures from the operative rear surface (14) of the spinneret plate (S), in such a way that the cone-shaped surface (28) is exposed to a polymeric material.

Moreover, the blinding stud (B) facilitates in avoiding dead space for the polymeric material; and improving the flow of the polymeric material over the capillary stud (S).

Before inserting the blinding stud (B) in the apertures, the spinneret plate (S) is heated to a temperature in the range of 280°C to 300°C, so as to expand the apertures configured on the spinneret plate (S). After expansion, the diameter of the apertures is increased, thereby enabling easy insertion of the blinding stud (B) in the apertures. The spinneret plate (S) is further allowed to cool, thereby allowing self-tightening of the blinding stud (B) in the apertures.

The capillary stud (C and C') and the blinding stud (B) can be made up of one of aluminum and steel.

In an embodiment, the capillary stud (C') is received in the plurality of threaded apertures (12) from the operative rear surface (14) of the spinneret plate (S) (as shown in Figures 5A and 5B).

The seal (A') is used while introducing or tightening the capillary stud (C') from the operative rear surface (14) of the spinneret plate (S) to provide a leak proof joint (as shown in Figures 5B and 5C).

The polymeric fibers extruded from the capillary (18) are intertwined to produce yarns.

TECHNICAL ADVANCES AND ECONOMICAL SIGNIFICANCE

The present disclosure described herein above has several technical advantages including, but not limited to, the realization of a spinneret plate that:

- facilitates in extruding polymeric fibers of different dimensions without replacing or changing the spinneret plate, thereby reducing the CAPEX;
- eliminates delay in processing of a polymeric material to obtain polymeric fibers.

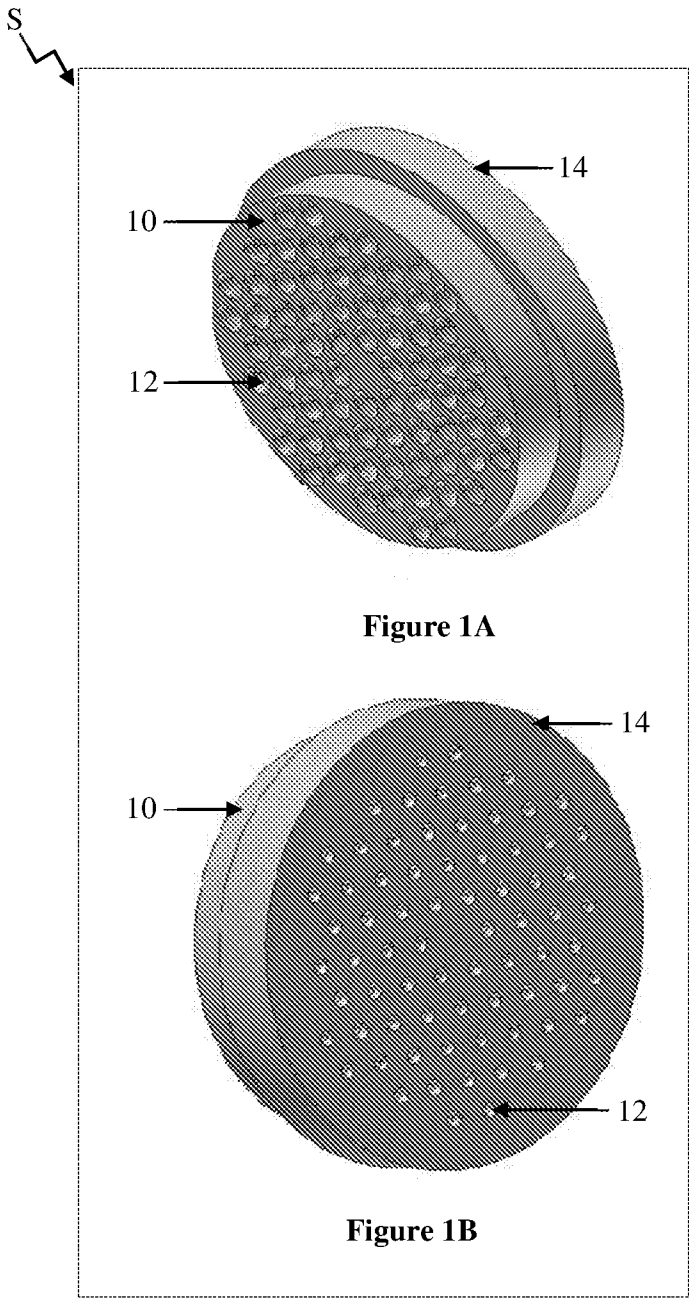
The disclosure has been described with reference to the accompanying embodiments which do not limit the scope and ambit of the disclosure. The description provided is purely by way of example and illustration.

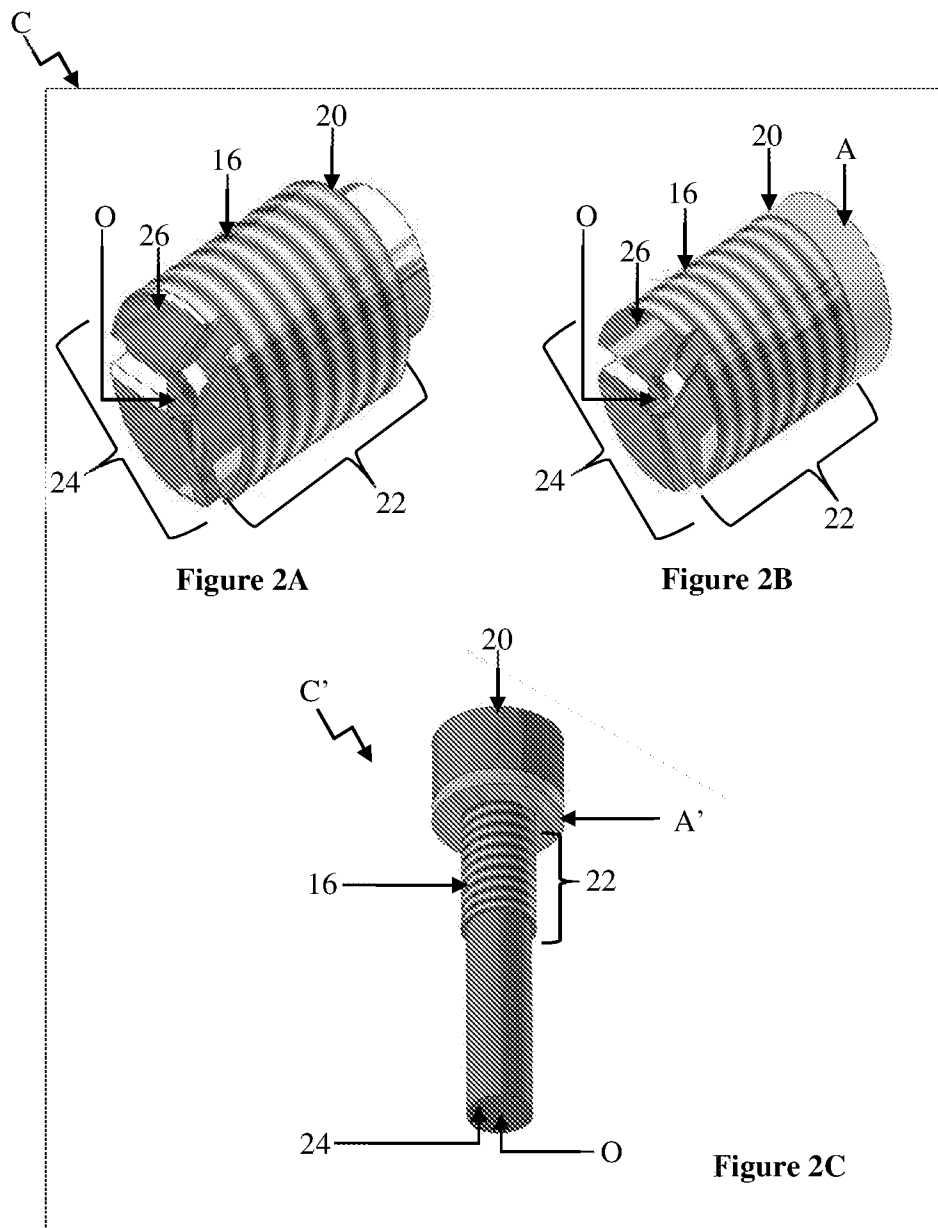
The embodiments herein and the various features and advantageous details thereof are explained with reference to the non-limiting embodiments in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein.

- 5 The foregoing description of the specific embodiments so fully revealed the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed
- 10 embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the embodiments as described herein.

Claims:

1. A spinneret plate comprising a plurality of threaded apertures configured on said spinneret plate, wherein each of said plurality of threaded apertures is adapted to receive one of:
 - 5 • a capillary stud, said capillary stud has threads configured on its outer circumference, and a capillary configured therewithin for extruding fibers therefrom; and
 - a blinding stud for blocking at least one of said plurality of threaded apertures.
- 10 2. The spinneret plate as claimed in claim 1, wherein each of said plurality of threaded apertures is a counterbore.
3. The spinneret plate as claimed in claim 1, wherein said blinding stud is shaped in the form of a spinning top, wherein said spinning top comprises:
 - a cone-shaped surface merging into a convex-shaped surface; and
 - 15 • a shank extending from said convex-shaped surface.
4. The spinneret plate as claimed in claim 1, wherein said capillary stud comprises an operative top surface, an operative intermediate surface, and an operative bottom surface.
5. The spinneret plate as claimed in claim 1 or claim 4, wherein said threads on said capillary stud are configured on the outer circumference of said operative intermediate surface.
- 20 6. The spinneret plate as claimed in claim 4, wherein a plurality of slots are configured on one of said operative bottom surface and said operative top surface, to facilitate at least one of tightening, and opening of said capillary stud, with an instrument.
- 25 7. The spinneret plate as claimed in claim 4, wherein a seat is configured on said operative top surface to accommodate a seal, wherein said seal is an aluminum seal.
8. The spinneret plate as claimed in claim 1, wherein said capillary forms an opening, of a pre-determined cross-section, on said operative bottom surface.
- 30 9. The spinneret plate as claimed in claim 1, wherein said capillary is divided into at least one portion.





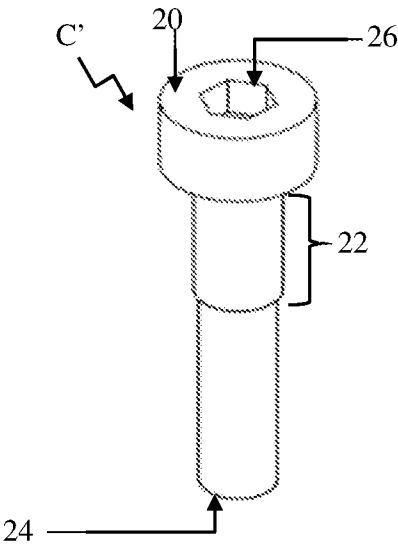


Figure 2D

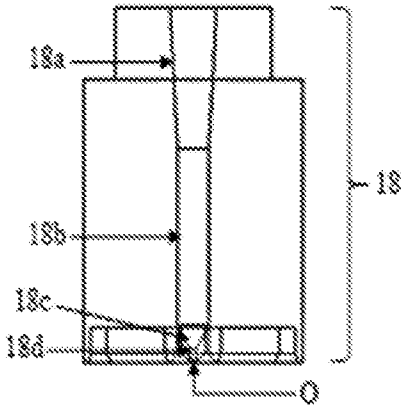


Figure 2E

S

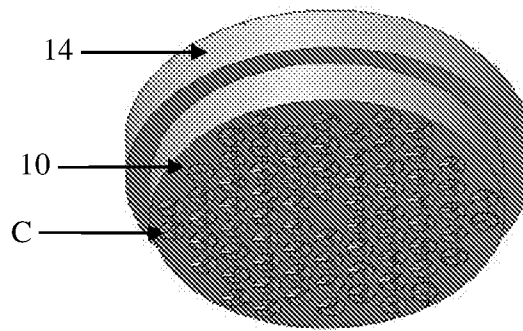


Figure 3A

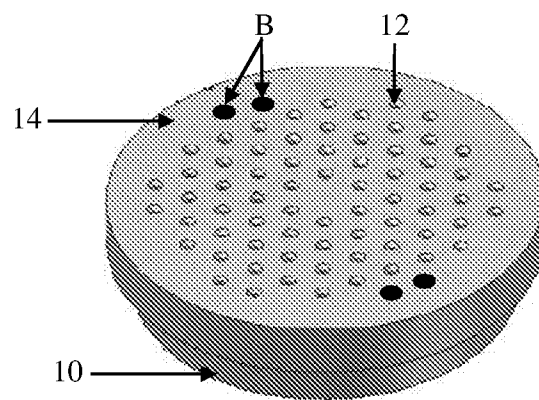


Figure 3B

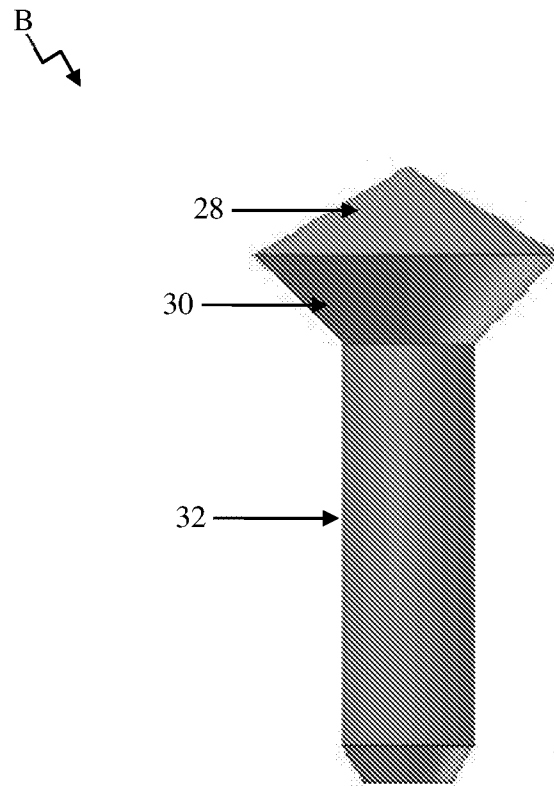
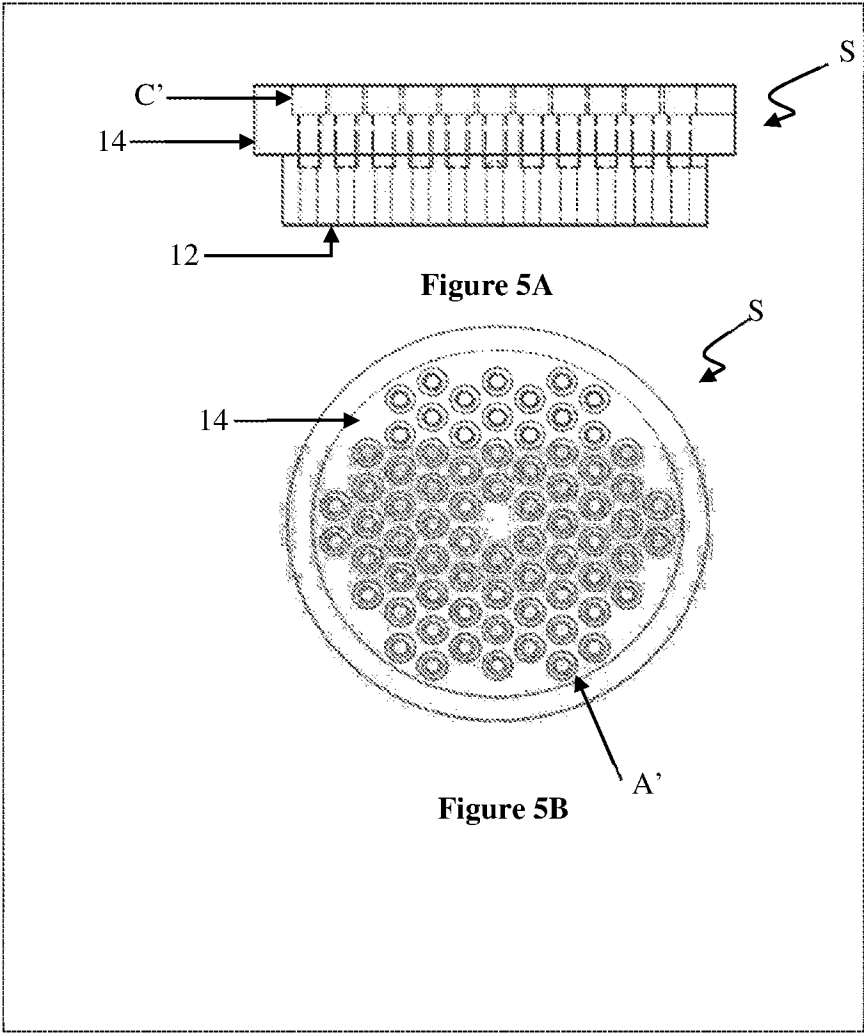


Figure 4



INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER
D01D4/02 Version=2016.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Patseer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN204151470U (SHAOTAN CHEMICAL FIBRE CORP), February 11, 2015. Abstract; Claim 1-6, Figure-6.	1-9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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