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(54) Title: PARTIAL CONTACT BETWEEN HEATER ASSEMBLY AND HOT-RUNNER MANIFOLD ASSEMBLY

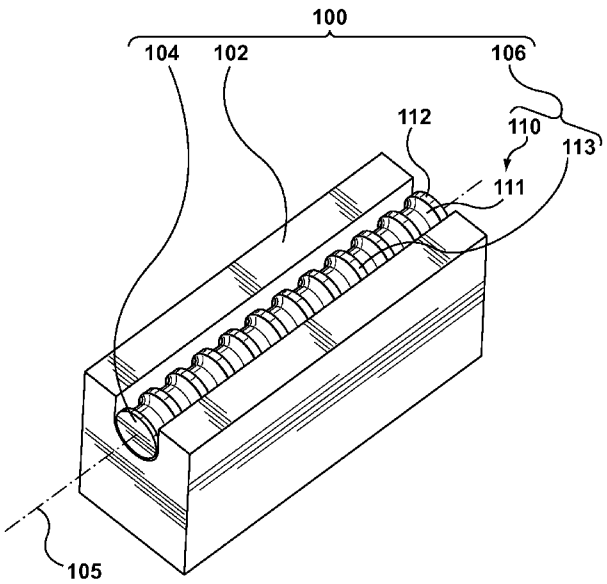


FIG. 1

(57) Abstract: The inventors have researched a problem associated with known molding systems that inadvertently manufacture bad-quality molded articles or parts. After much study, the inventors believe they have arrived at an understanding of the problem and its solution, which are stated below, and the inventors believe this understanding is not known to the public: a mold-tool system (100), comprising: a partial-contacting means (106) for partially contacting a heater assembly (104) with a hot-runner manifold assembly (102).

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PARTIAL CONTACT BETWEEN HEATER ASSEMBLY AND HOT-RUNNER MANIFOLD ASSEMBLY

TECHNICAL FIELD

An aspect generally relates to (but is not limited to) a mold-tool system and/or a molding system having the mold-tool system.

SUMMARY

The inventors have researched a problem associated with known molding systems that inadvertently manufacture bad-quality molded articles or parts. After much study, the inventors believe they have arrived at an understanding of the problem and its solution, which are stated below, and the inventors believe this understanding is not known to the public.

The current problem is that electrical resistive heater assemblies supply a fixed wattage per linear length of the heater assembly. Known installation method depends on installing the heater assembly to have good thermal conductance to a manifold of a runner assembly. This arrangement may improve heat transfer. However, heat transfer is a two way street, not only does the above arrangement improve heat going out to the manifold from the heater assembly, but the above arrangement may also improve cooling of the heater assembly at the location of heat losses. For an ideal case, the temperature of the electric heater is to be independent of the temperature of the manifold. However, the next best case may be to limit the effect of the manifold temperature on the temperature of the heater assembly. Instead of transferring a majority of the heat by conductance, the solution may reduce, at least in part, heat transfer by conduction and/or may improve heat transfer by radiation. Radiative heat transfer is a function of the fourth power of temperature difference between two bodies (using an absolute scale), and thus is much higher for larger differences in temperature. This then acts as a partially self-regulating heat transfer mode, as the amount of heat transferred increases dramatically as the temperature differential increases, and correspondingly decreases as the temperature differential decreases. This is in contrast to conductive and convective heat transfer modes, where the heat transfer typically has a linear relationship as a function of the temperature differential. The ideal resistive heater design combines conductive, convective and radiative heat transfer modes, with the contribution of each dependent upon numerous parameters, including but not limited to, materials, desired temperature profiles, environmental conditions, etc.

To resolve the above, at least in part, according to a first aspect, there is provided a mold-tool system (**100**), comprising: a partial-contacting means (**106**) for partially contacting a heater assembly (**104**) with a hot-runner manifold assembly (**102**).

To resolve the above, at least in part, according to a second aspect, there is provided a mold-tool system (**100**), comprising: a hot-runner manifold assembly (**102**); a heater assembly (**104**); and a partial-contacting means (**106**) for partially contacting the heater assembly (**104**) with the hot-runner manifold assembly (**102**).

To resolve the above, at least in part, according to a third aspect, there is provided a mold-tool system (**100**), comprising: a hot-runner manifold assembly (**102**); and a heater assembly (**104**), the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other.

To resolve the above, at least in part, according to a fourth aspect, there is provided a method, comprising: partially contacting a heater assembly (**104**) with a hot-runner manifold assembly (**102**).

The mold-tool system (100) may improve heat transfer and may decrease power draw, and may improve thermal uniformity.

Other aspects and features of the non-limiting embodiments will now become apparent to those skilled in the art upon review of the following detailed description of the non-limiting embodiments with the accompanying drawings.

DETAILED DESCRIPTION OF THE DRAWINGS

The non-limiting embodiments will be more fully appreciated by reference to the following detailed description of the non-limiting embodiments when taken in conjunction with the accompanying drawings, in which:

FIGS. 1 to 15 depict schematic representations of examples of a mold-tool system (**100**).

The drawings are not necessarily to scale and may be illustrated by phantom lines, diagrammatic representations and fragmentary views. In certain instances, details not

necessary for an understanding of the embodiments (and/or details that render other details difficult to perceive) may have been omitted.

DETAILED DESCRIPTION OF THE NON-LIMITING EMBODIMENT(S)

FIGS. 1 to 15 depict the schematic representations of the examples of the mold-tool system (**100**). The mold-tool system (**100**) may include components that are known to persons skilled in the art, and these known components will not be described here; these known components are described, at least in part, in the following reference books (for example): (i) "*Injection Molding Handbook*" authored by OSSWALD/TURNG/GRAMANN (ISBN: 3-446-21669-2), (ii) "*Injection Molding Handbook*" authored by ROSATO AND ROSATO (ISBN: 0-412-99381-3), (iii) "*Injection Molding Systems*" 3rd Edition authored by JOHANNABER (ISBN 3-446-17733-7) and/or (iv) "*Runner and Gating Design Handbook*" authored by BEAUMONT (ISBN 1-446-22672-9). It will be appreciated that for the purposes of this document, the phrase "includes (and is not limited to)" is equivalent to the word "comprising". The word "comprising" is a transitional phrase or word that links the preamble of a patent claim to the specific elements set forth in the claim that define what the invention itself actually is. The transitional phrase acts as a limitation on the claim, indicating whether a similar device, method, or composition infringes the patent if the accused device (etc) contains more or fewer elements than the claim in the patent. The word "comprising" is to be treated as an open transition, which is the broadest form of transition, as it does not limit the preamble to whatever elements are identified in the claim.

The definition of the mold-tool system (**100**) is as follows: a system that may be positioned and/or may be used in an envelope defined by a platen system of the molding system (known and not depicted), such as an injection-molding system for example. The platen system may include (and is not limited to) a stationary platen and a movable platen that is moveable relative to the stationary platen. A molding system may include (and is not limited to) the mold-tool system (**100**).

Referring generally to all of the FIGS., broadly speaking in accordance with a first example, the mold-tool system (**100**) includes (and is not limited to): a partial-contacting means (**106**) for partially contacting a heater assembly (**104**) with a hot-runner manifold assembly (**102**). Examples of the partial-contacting means (**106**) are described below and depicted in the FIGS.

Referring generally to all of the FIGS., broadly speaking in accordance with a second example, the mold-tool system (**100**) includes (and is not limited to): a hot-runner manifold assembly (**102**), a heater assembly (**104**), and a partial-contacting means (**106**) for partially contacting the heater assembly (**104**) with the hot-runner manifold assembly (**102**). Examples of the partial-contacting means (**106**) are described below and depicted in the FIGS.

More specifically (in accordance with an option), the partial-contacting means (**106**) may provide effective contact between the hot-runner manifold assembly (**102**) and the heater assembly (**104**) is reduced by at least **25**% as a result of the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other, in comparison to a case in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in normal contact with each other.

Referring generally to all of the FIGS., broadly speaking in accordance with a third example the mold-tool system (**100**) includes (and is not limited to): a hot-runner manifold assembly (**102**), and a heater assembly (**104**), in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in partial contact with each other. Examples of the manner in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in partial contact with each other are described below and depicted in the FIGS.

More specifically (in accordance with an option), effective contact between the hot-runner manifold assembly (**102**) and the heater assembly (**104**) may be reduced by at least **25**% as a result of the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other, in comparison to a case in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in normal contact with each other.

Referring generally to all of the FIGS., broadly speaking in accordance with a fourth example, A method includes (and is not limited to): partially contacting a heater assembly (**104**) with a hot-runner manifold assembly (**102**). In accordance with an option, the method may further

include (and is not limited to): reducing effective contact between the hot-runner manifold assembly (**102**) and the heater assembly (**104**) by at least **25**% as a result of the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other, in comparison to a case in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in normal contact with each other.

Referring specifically now to FIGS. 1, 2, 3, there is depicted a first variation of the mold-tool system (**100**), in which the heater assembly (**104**) includes (and is not limited to): (i) an outer surface (**112**), and (ii) outer-surface heater crests (**113**). The outer surface (**112**) defines heater slots (**110**). The heater slots (**110**) face, at least in part, the hot-runner manifold assembly (**102**). The outer-surface heater crests (**113**) extend from the heater assembly (**104**) toward the hot-runner manifold assembly (**102**). The outer-surface heater crests (**113**) are positioned between the heater slots (**110**). The outer-surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). It will be appreciated that meaning of the heater slots (**110**) may include one or more heater slots (**110**), and that the meaning of the outer-surface heater crests (**113**) may include one or more outer-surface heater crests (**113**).

Specifically, in accordance with FIGS. 1, 2, 3, the partial-contacting means (**106**) includes (and is not limited to): (i) the outer surface (**112**) of the heater assembly (**104**), and (ii) the outer-surface heater crests (**113**), in which the outer-surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

Referring now to FIG. **1**, there is depicted a variant of the heater slots (**110**) by way of an example. The heater slots (**110**) include (and are not limited to) radial-heater slots (**111**). The heater slots (**110**) are aligned, at least in part, radially relative to a longitudinal axis (**105**) extending, at least in part, through the heater assembly (**104**).

Referring now to FIG. **2**, there is depicted another variant of the heater slots (**110**) by way of another example. The heater slots (**110**) include (and are not limited to): axial-heater slots (**114**). The axial-heater slots (**114**) are aligned, at least in part, axially relative to a longitudinal axis (**105**) extending, at least in part, through the heater assembly (**104**).

Referring not to FIG. **3**, there is depicted another variant of the heater slots (**110**) by way of another example. The heater slots (**110**) include (and is not limited to): concave-heater dimples (**109**) that extend, at least in part, into the body of the heater assembly (104).

Many other variants (not depicted) of the heater slots (**110**) are contemplated by way of other examples. The non-depicted variants are easily understood by persons of skill in the art in view of FIGS **1** and **2**. For example: (i) the heater slots (**110**) include (and are not limited to): a combination (not depicted) of both the radial-heater slots (**111**) and the axial-heater slots (**114**), (ii) the heater slots (**110**) include (and are not limited to) non-radial heater slots (not depicted), (iii) the heater slots (**110**) include (and are not limited to) non-axial heater slots (not depicted), and (iv) the heater slots (**110**) include (and are not limited to) a combination (both not depicted) of non-radial heater slots and/or non-axial heater slots,

Referring specifically now to FIGS 4, 5, 6, 7, there is depicted a second variation of the mold-tool system (**100**), in which the hot-runner manifold assembly (**102**) includes (and is not limited to): (i) an outer-manifold surface (**120**), and (ii) outer-surface crests (**115**). The outer-manifold surface (**120**) defines a manifold-heater groove (**118**) and manifold slots (**116**) formed in the manifold-heater groove (**118**). The manifold slots (**116**) face, at least in part, the heater assembly (**104**). The outer-surface crests (**115**) extend from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**). The manifold slots (**116**) are positioned between outer-surface crests (**115**). The manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). It will be appreciated that meaning of the manifold slots (**116**) may include one or more manifold slots (**116**), and that the meaning of the outer-surface crests (**115**) may include one or more outer-surface crests (**115**).

Specifically, in accordance with FIGS. 4, 5, 6, 7, the partial-contacting means (**106**) includes (and is not limited to): (i) the outer-manifold surface (**120**), and (ii)the outer-surface crests (**115**), and the manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

Referring now to FIG. **4**, there is depicted a variant of the manifold slots (**116**) by way of example. The manifold slots (**116**) include (and is not limited to) radial-manifold slots (**117**).

The radial-manifold slots (**117**) are aligned, at least in part, radially relative to a longitudinal axis (**107**) of the manifold-heater groove (**118**) of the hot-runner manifold assembly (**102**).

Referring now to FIG. **5**, there is depicted a variant of the manifold slots (**116**) by way of example. The manifold slots (**116**) include (and is not limited to) axial-manifold slots (**122**). The axial-manifold slots (**122**) are aligned, at least in part, axially relative to a longitudinal axis (**107**) of the manifold-heater groove (**118**) of the hot-runner manifold assembly (**102**).

Referring now to FIG. **6**, there is depicted another variant of the manifold slots (**116**) by way of example. The manifold slots (**116**) include (and are not limited to): bosses (**128**) located in the manifold-heater groove (**118**). The bosses (**128**) are positioned between boss crests (**130**). The boss crests (**130**) face, at least in part, the heater assembly (**104**). The bosses (**128**) and the boss crests (**130**) are arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

Referring now to FIG. **7**, there is depicted another variant of the manifold slots (**116**) by way of example. The manifold slots (**116**) include (and are not limited to): concave-manifold dimples (**129**) located in the manifold-heater groove (**118**). The concave-manifold dimples (**129**) face the heater assembly (**104**).

Referring now to FIG. **8**, there is depicts another variant of the manifold slots (**116**) by way of example. The manifold slots (**116**) include (and are not limited to) a manifold-heater groove (**118**) defined by the hot-runner manifold assembly (**102**). The manifold-heater groove (**118**) is arranged (or shaped) to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

Many variants (not depicted) of the heater slots (**110**) are depicted by way of other examples. The non-depicted variants are easily understood by persons of skill in the art in view of FIGS **4** and **5**: (i) the manifold slots (**116**) include (and are not limited to): a combination (not depicted) of both the radial-manifold slots (**117**) and the axial-manifold slots (**122**), (ii) the manifold slots (**116**) include (and are not limited to): non-radial manifold slots (not depicted), (iii) the manifold slots (**116**) include (and are not limited to): non-axial manifold slots (not depicted), and (iv) the manifold slots (**116**) include (and are not limited to): a combination (not depicted) of non-radial manifold slots and/or non-axial manifold slots.

Referring specifically now to FIGS 9, 10, 11, 12, 13, 14, there is depicted a third variation of the mold-tool system (**100**), in which an intermediate assembly (**124**) is positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). The intermediate assembly (**124**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**). The intermediate assembly (**124**) is arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). It will be appreciated that meaning of the intermediate assembly (**124**) may include one or more of the intermediate assembly (**124**).

Specifically, in accordance with FIGS 9, 10, 11, 12, 13, 14, the partial-contacting means (**106**) includes (and is not limited to): the intermediate assembly (**124**)arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

Once again, many variants of the intermediate assembly (**124**) are contemplated.

Referring to FIG. **9**, there is depicted a variant of the intermediate assembly (**124**), by way of an example. The intermediate assembly (**124**) includes (and is not limited to) a wire assembly (**125**). The wire assembly (**125**) surrounds, at least in part, the heater assembly (**104**).

Referring to FIG. **10**, there is depicted another variant of the intermediate assembly (**124**), by way of an example. The intermediate assembly (**124**) includes (and is not limited to) a wire-mesh assembly (**126**). The wire-mesh assembly (**126**) surrounds, at least in part, the heater assembly (**104**).

Referring to FIG. **11**, there is depicted another variant of the intermediate assembly (**124**), by way of another example. The intermediate assembly (**124**) includes (and is not limited to) a spacer structure (**132**), such as a set of spacer rings for example. The spacer structure (**132**) is positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). The spacer structure (**132**) surrounds, at least in part, the heater assembly (**104**). The spacer structure (**132**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**). The spacer structure (**132**) reduce the effective contact between the hot-runner manifold assembly (**102**) and the heater assembly (**104**).

Referring to FIG. **12**, there is depicted another variant of the intermediate assembly (**124**), by way of another example. The intermediate assembly (**124**) includes (and is not limited to) convex-heater dimples (**134**). The convex-heater dimples (**134**) extend from an outer surface (**112**) of the heater assembly (**104**). The convex-heater dimples (**134**) face, at least in part, the hot-runner manifold assembly (**102**). The convex-heater dimples (**134**) contact, at least in part, the hot-runner manifold assembly (**102**).

Referring to FIG. **13**, there is depicted another variant of the intermediate assembly (**124**), by way of another example. The intermediate assembly (**124**) includes (and is not limited to) convex-manifold dimples (**136**). The convex-manifold dimples (**136**) extend from an outer-manifold surface (**120**) of the hot-runner manifold assembly (**102**). The convex-manifold dimples (**136**) are located in a manifold-heater groove (**118**) defined by the hot-runner manifold assembly (**102**). The convex-manifold dimples (**136**) extend from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**). The convex-manifold dimples (**136**) face, at least in part, the heater assembly (**104**). The convex-manifold dimples (**136**) contact, at least in part, the heater assembly (**104**).

Referring to FIG. **14**, there is depicted another variant of the intermediate assembly (**124**), by way of another example. The intermediate assembly (**124**) includes a spring-clip structure (**138**). The spring-clip structure (**138**) is configured to suspend the heater assembly (**104**) in a manifold-heater groove (**118**). The spring-clip structure (**138**) is positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). The spring-clip structure (**138**) is positioned, at least in part, in the manifold-heater groove (**118**) of the hot-runner manifold assembly (**102**). The spring-clip structure (**138**) surrounds, at least in part, the heater assembly (**104**). The spring-clip structure (**138**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

Other variants of the intermediate assembly (**124**) are contemplated but are not depicted, by way of an example: (i) the intermediate assembly (**124**) includes (and is not limited to) a combination (not depicted) of a wire assembly (**125**) and a wire-mesh assembly (**126**), (ii) the intermediate assembly (**124**) includes (and is not limited to) a non-wire assembly (not depicted), (iii) the intermediate assembly (**124**) includes (and is not limited to) a non wire-mesh assembly (not depicted), and (iv) the intermediate assembly (**124**) includes (and is not limited to) a combination (not depicted) of a non-wire assembly and a non wire-mesh

assembly.

Referring specifically now to FIG. **15**, the mold-tool system (**100**) of any example, option or variation described above may further include (and is not limited to) a component (**140**). The component (**140**) is configured to reduce radiative heat transfer, from the heater assembly (**104**), to objects other than the hot-runner manifold assembly (**102**). More specifically, the partial-contacting means (**106**) may further include: the component (**140**).

By way of an example, the component (**140**) may include (and is not limited to): a cover (**142**) positioned over a manifold-heater groove (**118**) defined by the hot-runner manifold assembly (**102**).

ADDITIONAL DESCRIPTION

The following clauses are offered as further description of the examples of the mold-tool system (**100**): Clause (**1**): a mold-tool system (**100**), comprising: a partial-contacting means (**106**) for partially contacting a heater assembly (**104**) with a hot-runner manifold assembly (**102**). Clause (**2**): a mold-tool system (**100**), comprising: a hot-runner manifold assembly (**102**); a heater assembly (**104**); and a partial-contacting means (**106**) for partially contacting the heater assembly (**104**) with the hot-runner manifold assembly (**102**). Clause (**3**): a mold-tool system (**100**), comprising: a hot-runner manifold assembly (**102**); and a heater assembly (**104**), the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other. Clause (**4**): the mold-tool system (**100**) of any clause mentioned in this paragraph wherein: effective contact between the hot-runner manifold assembly (**102**) and the heater assembly (**104**) is reduced by at least **25**% as a result of the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other, in comparison to a case in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in normal contact with each other. Clause (**5**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: the heater assembly (**104**) includes: an outer surface (**112**) defining heater slots (**110**), the heater slots (**110**) facing, at least in part, the hot-runner manifold assembly (**102**); and outer-surface heater crests (**113**) extending from the heater assembly (**104**) toward the hot-runner manifold assembly (**102**), the outer-surface heater crests (**113**) being positioned between the heater slots (**110**), wherein the outer-surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). Clause

(**6**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: the partial-contacting means (**106**) includes: an outer surface (**112**) of the heater assembly (**104**) defining heater slots (**110**), the heater slots (**110**) facing, at least in part, the hot-runner manifold assembly (**102**); and outer-surface heater crests (**113**) extending from the heater assembly (**104**) toward the hot-runner manifold assembly (**102**), the outer-surface heater crests (**113**) being positioned between the heater slots (**110**), and the outer-surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). Clause (**7**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: the hot-runner manifold assembly (**102**) includes: an outer-manifold surface (**120**), the outer-manifold surface (**120**) defining a manifold-heater groove (**118**) and manifold slots (**116**) being formed in the manifold-heater groove (**118**), the manifold slots (**116**) facing, at least in part, the heater assembly (**104**); and outer-surface crests (**115**) extending from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**), the manifold slots (**116**) being positioned between outer-surface crests (**115**), and the manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). Clause (**8**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: the partial-contacting means (**106**) includes: an outer-manifold surface (**120**) of the hot-runner manifold assembly (**102**), the outer-manifold surface (**120**) defining a manifold-heater groove (**118**) and manifold slots (**116**) being formed in the manifold-heater groove (**118**), the manifold slots (**116**) facing, at least in part, the heater assembly (**104**); and outer-surface crests (**115**) extending from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**), the manifold slots (**116**) being positioned between outer-surface crests (**115**), and the manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**) Clause (**9**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: an intermediate assembly (**124**) is positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**), the intermediate assembly (**124**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and the intermediate assembly (**124**) is arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). Clause (**10**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: the partial-contacting means (**106**) includes: an intermediate assembly (**124**)

positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**), the intermediate assembly (**124**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and the intermediate assembly (**124**) is arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**). Clause (**11**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: a component (**140**) is configured to reduce radiative heat transfer, from the heater assembly (**104**), to objects other than the hot-runner manifold assembly (**102**). Clause (**12**): the mold-tool system (**100**) of any clause mentioned in this paragraph, wherein: the partial-contacting means (**106**) further includes: a component (**140**) configured to reduce radiative heat transfer, from the heater assembly (**104**), to objects other than the hot-runner manifold assembly (**102**).

FIGS. **1**-**15** depict examples of the mold-tool system (**100**). It will be appreciated that the examples depicted in FIGS. **1**-**15** may be combined in any suitable permutation and combination. It will be appreciated that the assemblies and modules described above may be connected with each other as may be required to perform desired functions and tasks that are within the scope of persons of skill in the art to make such combinations and permutations without having to describe each and every one of them in explicit terms. There is no particular assembly, components, or software code that is superior to any of the equivalents available to the art. There is no particular mode of practicing the inventions and/or examples of the invention that is superior to others, so long as the functions may be performed. It is believed that all the crucial aspects of the invention have been provided in this document. It is understood that the scope of the present invention is limited to the scope provided by the independent claim(s), and it is also understood that the scope of the present invention is not limited to: (i) the dependent claims, (ii) the detailed description of the non-limiting embodiments, (iii) the summary, (iv) the abstract, and/or (v) description provided outside of this document (that is, outside of the instant application as filed, as prosecuted, and/or as granted). It is understood, for the purposes of this document, the phrase "includes (and is not limited to)" is equivalent to the word "comprising." It is noted that the foregoing has outlined the non-limiting embodiments (examples). The description is made for particular non-limiting embodiments (examples). It is understood that the non-limiting embodiments are merely illustrative as examples.

It will be appreciated that the assemblies and modules described above may be connected with each other as may be required to perform desired functions and tasks that are within

the scope of persons of skill in the art to make such combinations and permutations without having to describe each and every one of them in explicit terms. There is no particular assembly, components, or software code that is superior to any of the equivalents available to the art. There is no particular mode of practicing the inventions and/or examples of the invention that is superior to others, so long as the functions may be performed. It is believed that all the crucial aspects of the invention have been provided in this document. It is understood that the scope of the present invention is limited to the scope provided by the independent claim(s), and it is also understood that the scope of the present invention is not limited to: (i) the dependent claims, (ii) the detailed description of the non-limiting embodiments, (iii) the summary, (iv) the abstract, and/or (v) description provided outside of this document (that is, outside of the instant application as filed, as prosecuted, and/or as granted). It is understood, for the purposes of this document, the phrase "includes (and is not limited to)" is equivalent to the word "comprising". It is noted that the foregoing has outlined the non-limiting embodiments (examples). The description is made for particular non-limiting embodiments (examples). It is understood that the non-limiting embodiments are merely illustrative as examples.

CLAIMS

WHAT IS CLAIMED IS:

1. A mold-tool system (**100**), comprising:

a partial-contacting means (**106**) for partially contacting a heater assembly (**104**) with a hot-runner manifold assembly (**102**).

2. A mold-tool system (**100**), comprising:

a hot-runner manifold assembly (**102**);

a heater assembly (**104**); and

a partial-contacting means (**106**) for partially contacting the heater assembly (**104**) with the hot-runner manifold assembly (**102**).

3. The mold-tool system (**100**) of any one of claims **2** and **3**, wherein:

effective contact between the hot-runner manifold assembly (**102**) and the heater assembly (**104**) is reduced by at least **25**% as a result of the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other, in comparison to a case in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in normal contact with each other.

4. The mold-tool system (**100**) of **1** and **2**, wherein:

the partial-contacting means (**106**) includes:

an outer surface (**112**) of the heater assembly (**104**) defining heater slots (**110**), the heater slots (**110**) facing, at least in part, the hot-runner manifold assembly (**102**); and

outer-surface heater crests (**113**) extending from the heater assembly (**104**) toward the hot-runner manifold assembly (**102**), the outer-surface heater crests (**113**) being positioned between the heater slots (**110**), and the outer-surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

5. The mold-tool system (**100**) of claims **1** and **2**, wherein:

the partial-contacting means (**106**) includes:

an outer-manifold surface (**120**) of the hot-runner manifold assembly (**102**), the outer-manifold surface (**120**) defining a manifold-heater groove (**118**) and manifold slots (**116**) being formed in the manifold-heater groove (**118**), the manifold slots (**116**) facing, at least in part, the heater assembly (**104**); and

outer-surface crests (**115**) extending from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**), the manifold slots (**116**) being positioned between outer-surface crests (**115**), and the manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

6. The mold-tool system (**100**) of any one of claims **1** and **2**, wherein:

the partial-contacting means (**106**) includes:

an intermediate assembly (**124**) positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**),

the intermediate assembly (**124**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and

the intermediate assembly (**124**) is arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

7. The mold-tool system (**100**) of any one of claims **1** and **2**, wherein:

the partial-contacting means (**106**) further includes:

a component (**140**) configured to reduce radiative heat transfer, from the heater assembly (**104**), to objects other than the hot-runner manifold assembly (**102**).

8. The mold-tool system (**100**) of **1** and **2**, wherein:

the partial-contacting means (**106**) includes:

an outer surface (**112**) of the heater assembly (**104**) defining heater slots (**110**), the heater slots (**110**) facing, at least in part, the hot-runner manifold assembly (**102**); and

outer-surface heater crests (**113**) extending from the heater assembly (**104**) toward the hot-runner manifold assembly (**102**), the outer-surface heater crests (**113**) being positioned between the heater slots (**110**), and the outer-

surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**),

the partial-contacting means (**106**) further includes:

an outer-manifold surface (**120**) of the hot-runner manifold assembly (**102**), the outer-manifold surface (**120**) defining a manifold-heater groove (**118**) and manifold slots (**116**) being formed in the manifold-heater groove (**118**), the manifold slots (**116**) facing, at least in part, the heater assembly (**104**); and

outer-surface crests (**115**) extending from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**), the manifold slots (**116**) being positioned between outer-surface crests (**115**), and the manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and

the partial-contacting means (**106**) further includes:

an intermediate assembly (**124**) positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**),

the intermediate assembly (**124**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and

the intermediate assembly (**124**) is arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

9. A mold-tool system (**100**), comprising:

a hot-runner manifold assembly (**102**); and

a heater assembly (**104**), the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other.

10. The mold-tool system (**100**) of claim **9**, wherein:

effective contact between the hot-runner manifold assembly (**102**) and the heater assembly (**104**) is reduced by at least **25**% as a result of the hot-runner manifold assembly (**102**) and the heater assembly (**104**) being in partial contact with each other, in comparison to a case in which the hot-runner manifold assembly (**102**) and the heater assembly (**104**) are in normal contact with each other.

11. The mold-tool system (**100**) of claim **9**, wherein:

the heater assembly (**104**) includes:

an outer surface (**112**) defining heater slots (**110**), the heater slots (**110**) facing, at least in part, the hot-runner manifold assembly (**102**); and

outer-surface heater crests (**113**) extending from the heater assembly (**104**) toward the hot-runner manifold assembly (**102**), the outer-surface heater crests (**113**) being positioned between the heater slots (**110**), wherein the outer-surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

12. The mold-tool system (**100**) of claim **9**, wherein:

the hot-runner manifold assembly (**102**) includes:

an outer-manifold surface (**120**), the outer-manifold surface (**120**) defining a manifold-heater groove (**118**) and manifold slots (**116**) being formed in the manifold-heater groove (**118**), the manifold slots (**116**) facing, at least in part, the heater assembly (**104**); and

outer-surface crests (**115**) extending from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**), the manifold slots (**116**) being positioned between outer-surface crests (**115**), and the manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

13. The mold-tool system (**100**) of claim **9**, wherein:

an intermediate assembly (**124**) is positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**),

the intermediate assembly (**124**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and

the intermediate assembly (**124**) is arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

14. The mold-tool system (**100**) of claim **9**, wherein:

a component (**140**) configured to reduce radiative heat transfer, from the heater

assembly (**104**), to objects other than the hot-runner manifold assembly (**102**).

15. The mold-tool system (**100**) of claim **9**, wherein:

the heater assembly (**104**) includes:

an outer surface (**112**) defining heater slots (**110**), the heater slots (**110**) facing, at least in part, the hot-runner manifold assembly (**102**); and

outer-surface heater crests (**113**) extending from the heater assembly (**104**) toward the hot-runner manifold assembly (**102**), the outer-surface heater crests (**113**) being positioned between the heater slots (**110**), wherein the outer-surface heater crests (**113**) and the heater slots (**110**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**),

the hot-runner manifold assembly (**102**) includes:

an outer-manifold surface (**120**), the outer-manifold surface (**120**) defining a manifold-heater groove (**118**) and manifold slots (**116**) being formed in the manifold-heater groove (**118**), the manifold slots (**116**) facing, at least in part, the heater assembly (**104**); and

outer-surface crests (**115**) extending from the hot-runner manifold assembly (**102**) toward the heater assembly (**104**), the manifold slots (**116**) being positioned between outer-surface crests (**115**), and the manifold slots (**116**) and the outer-surface crests (**115**) are arranged relative to each other so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and

wherein:

an intermediate assembly (**124**) is positioned, at least in part, between the heater assembly (**104**) and the hot-runner manifold assembly (**102**), the intermediate assembly (**124**) contacts, at least in part, the heater assembly (**104**) and the hot-runner manifold assembly (**102**), and the intermediate assembly (**124**) is arranged so as to reduce the effective contact between the heater assembly (**104**) and the hot-runner manifold assembly (**102**).

16. A method, comprising:

partially contacting a heater assembly (**104**) with a hot-runner manifold assembly (**102**).

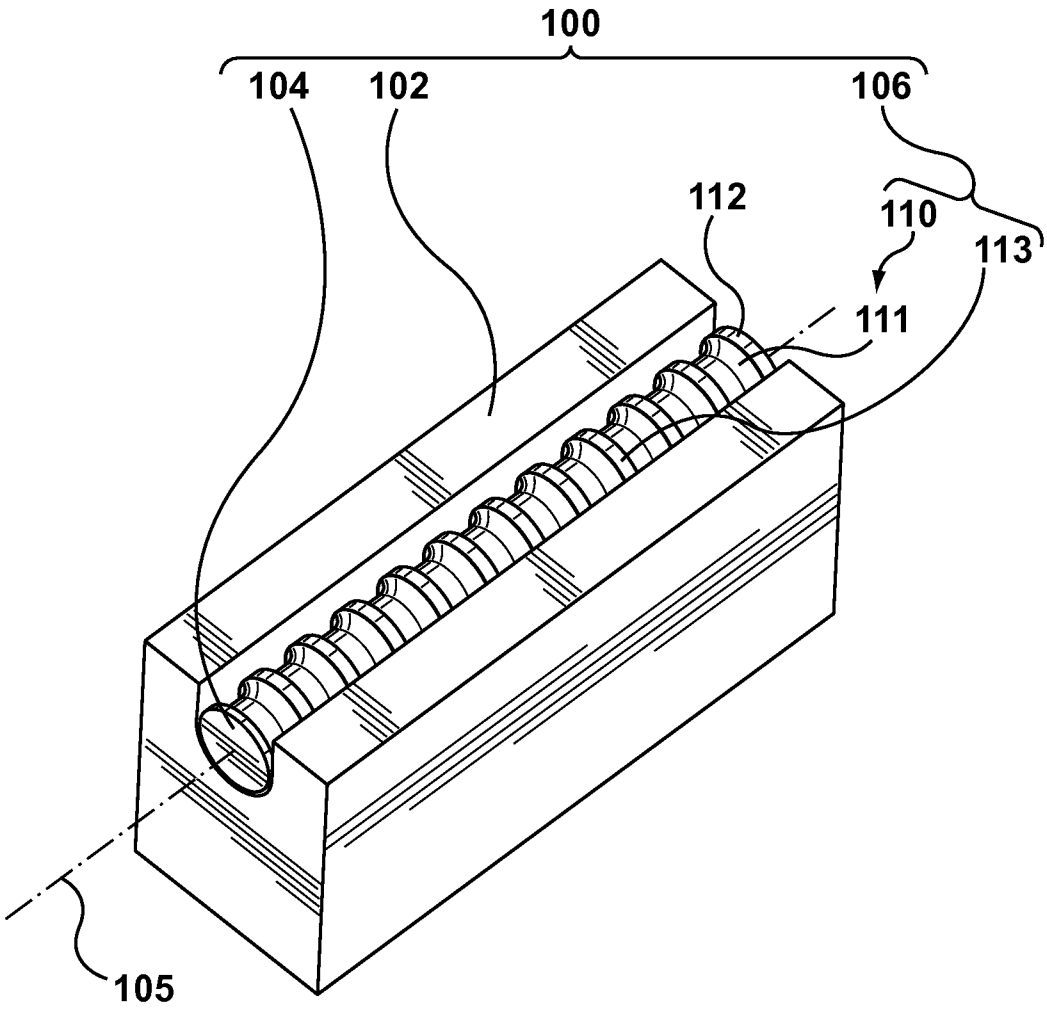


FIG. 1

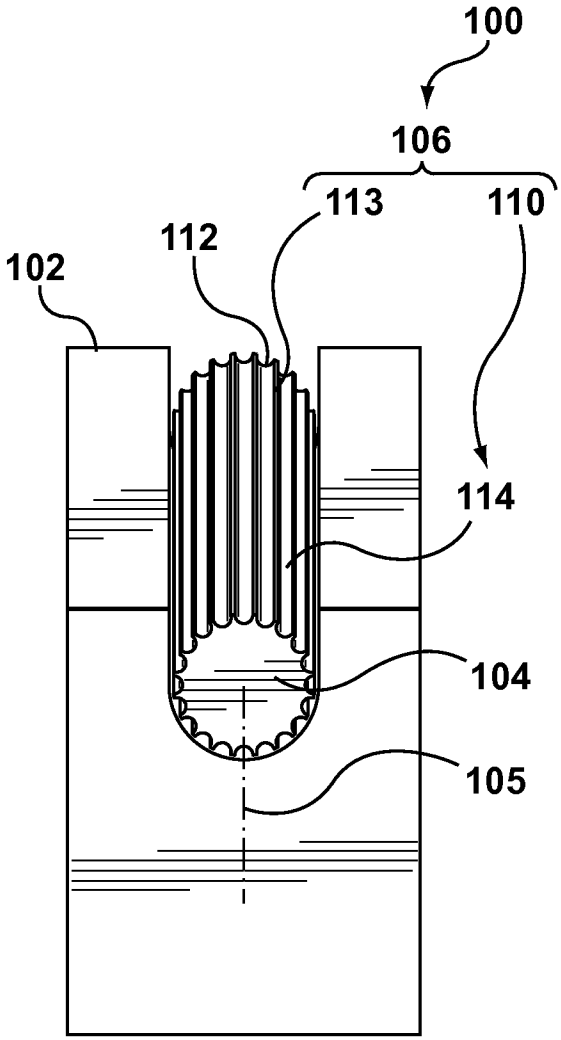


FIG. 2

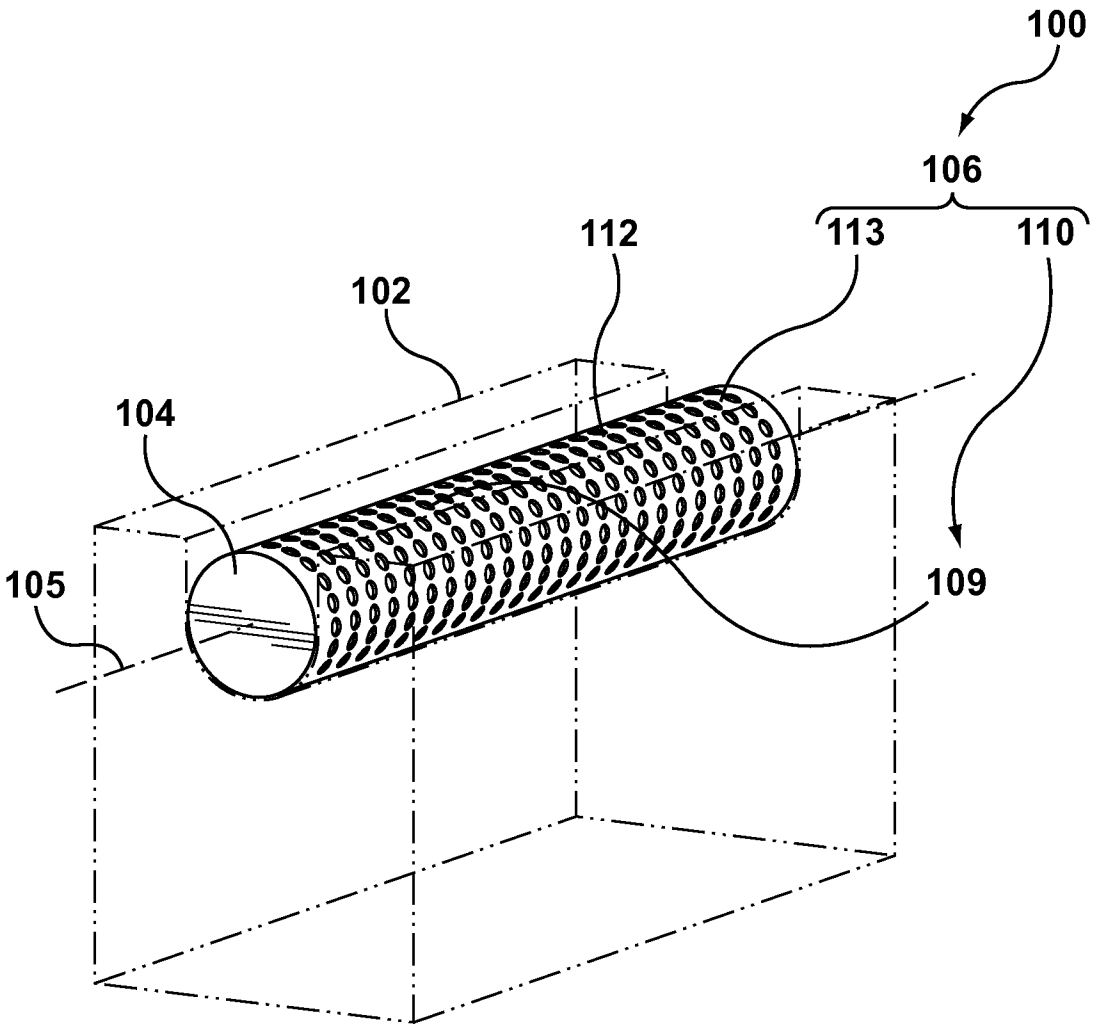


FIG. 3

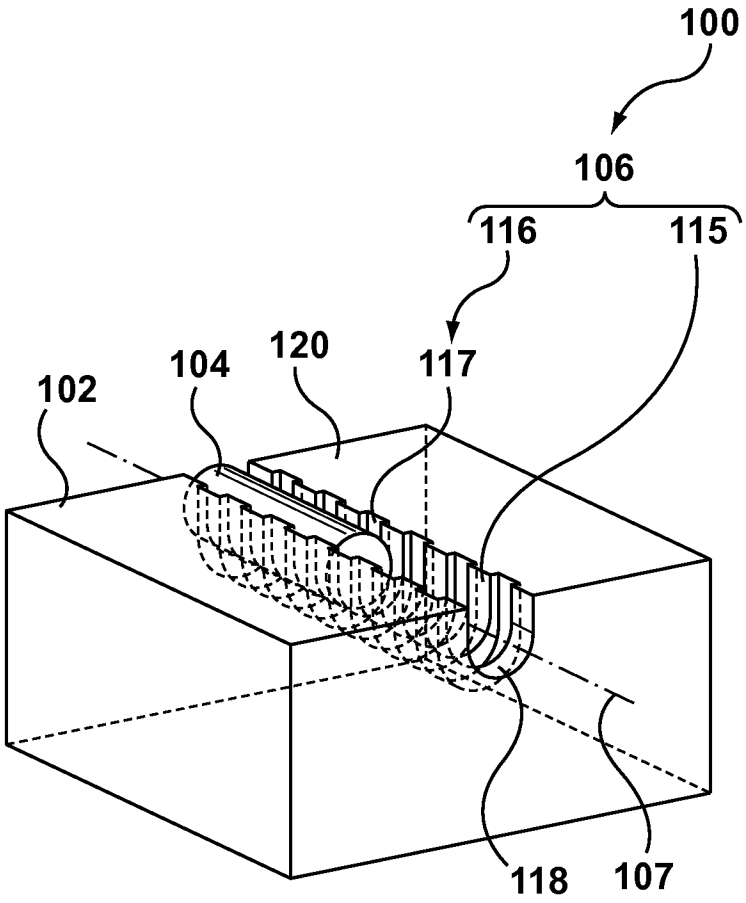


FIG. 4

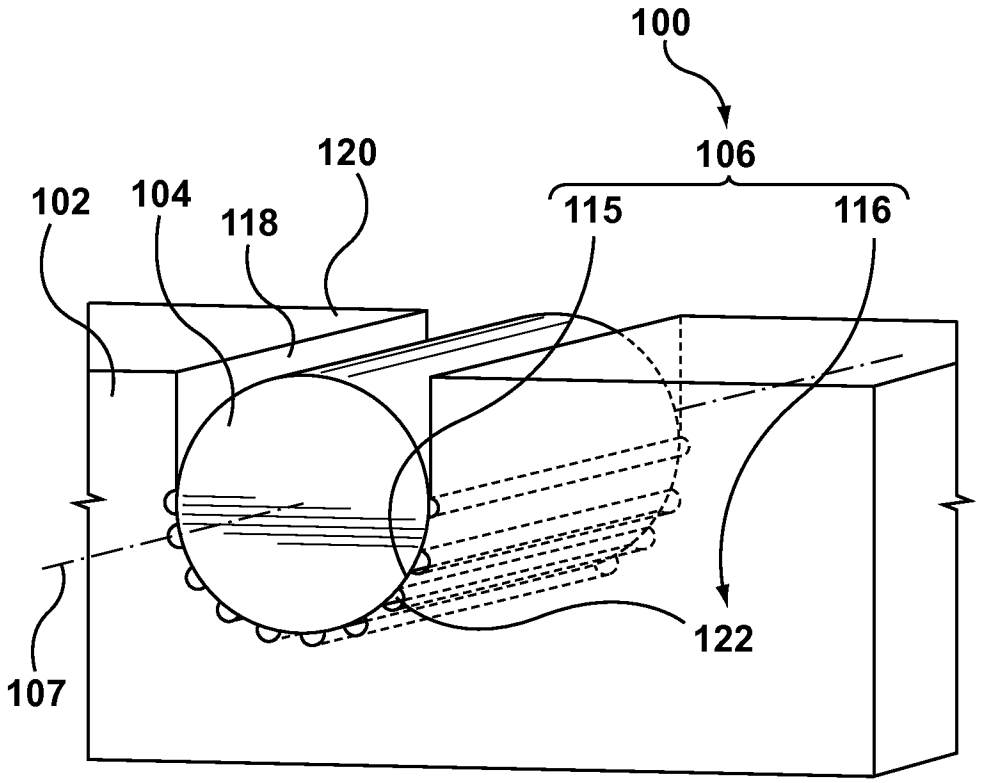


FIG. 5

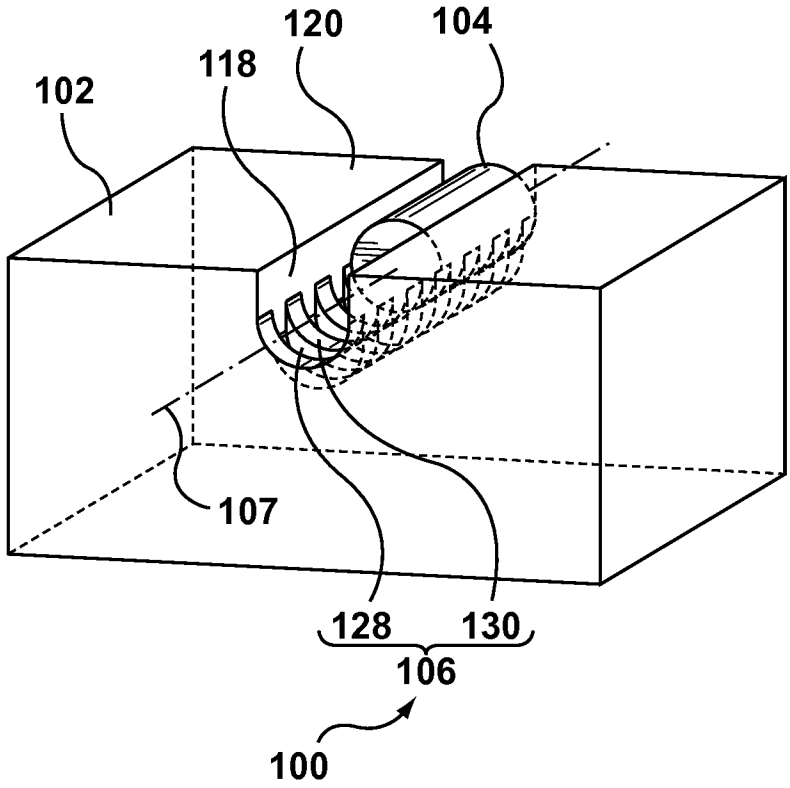


FIG. 6

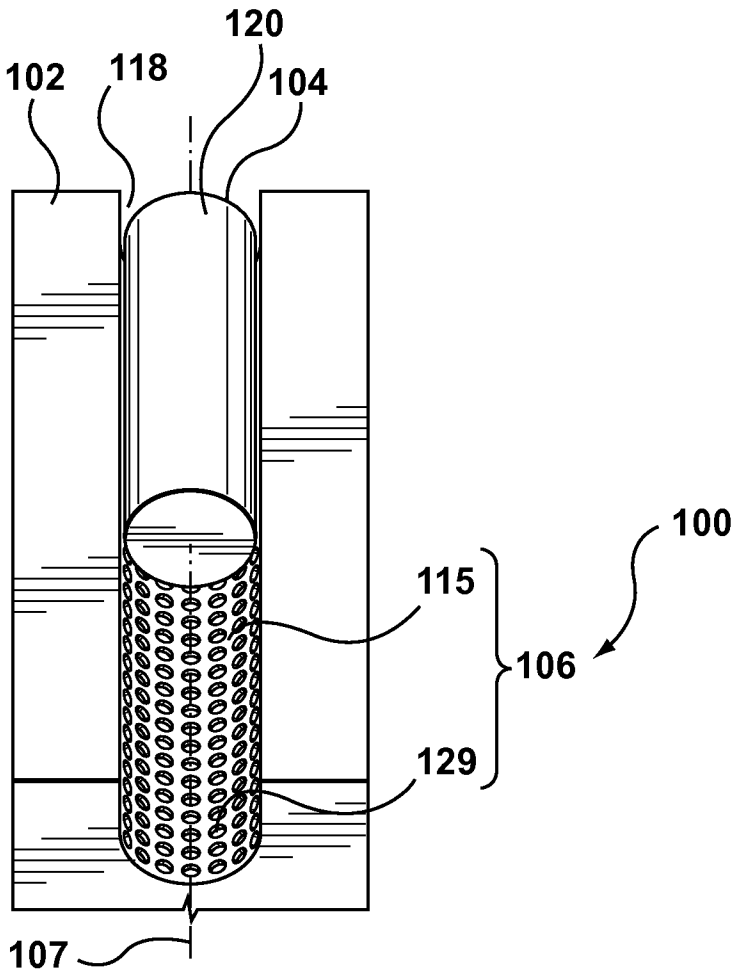


FIG. 7

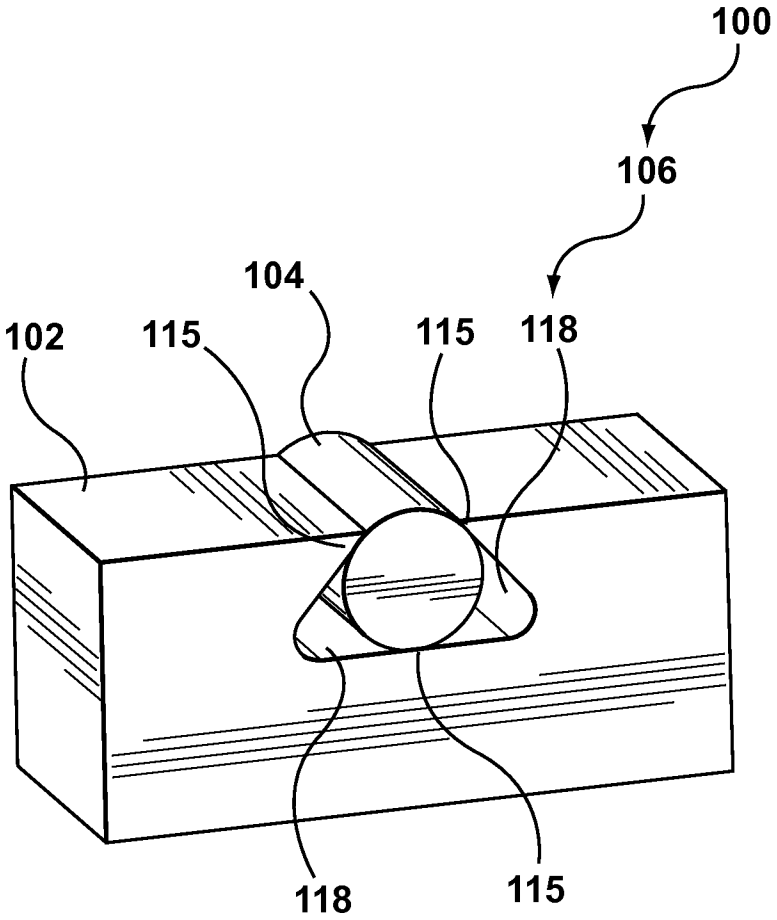


FIG. 8

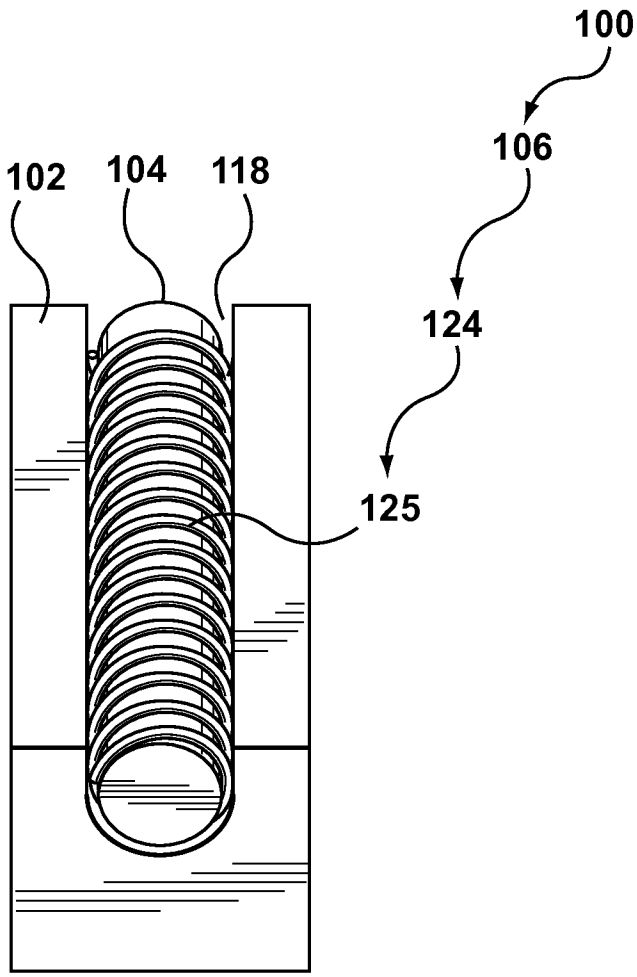


FIG. 9

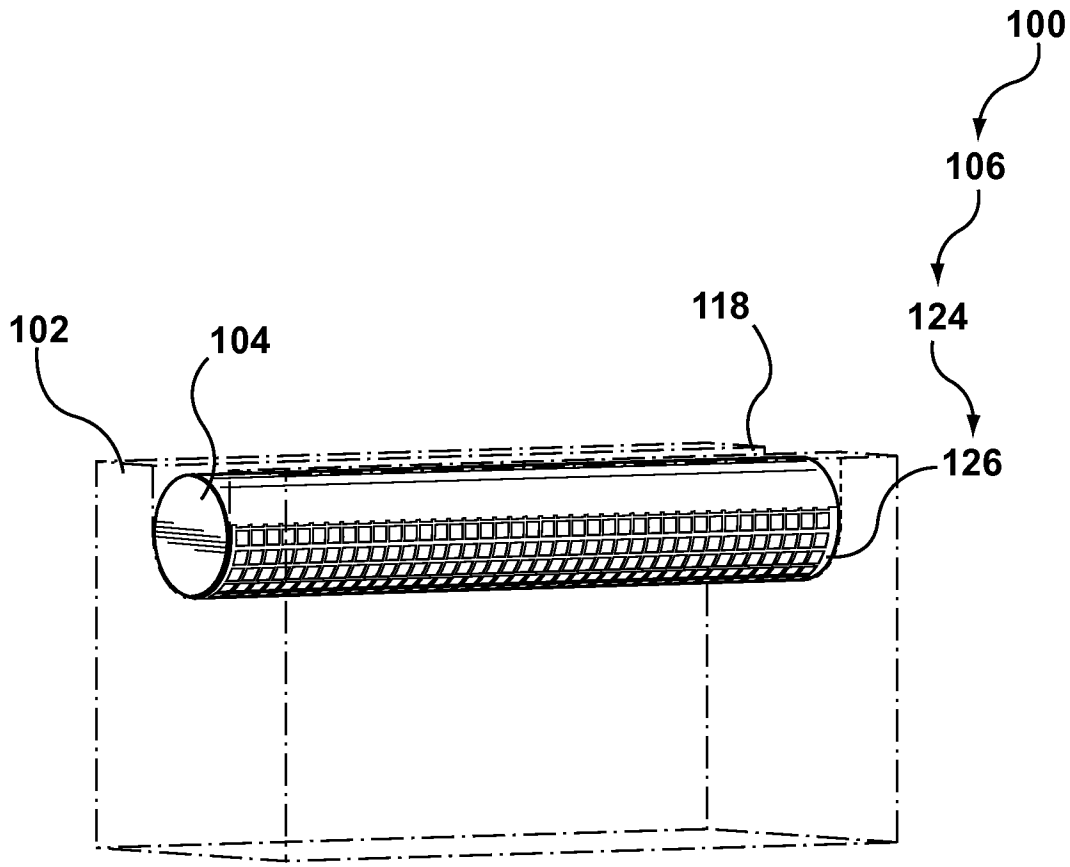


FIG. 10

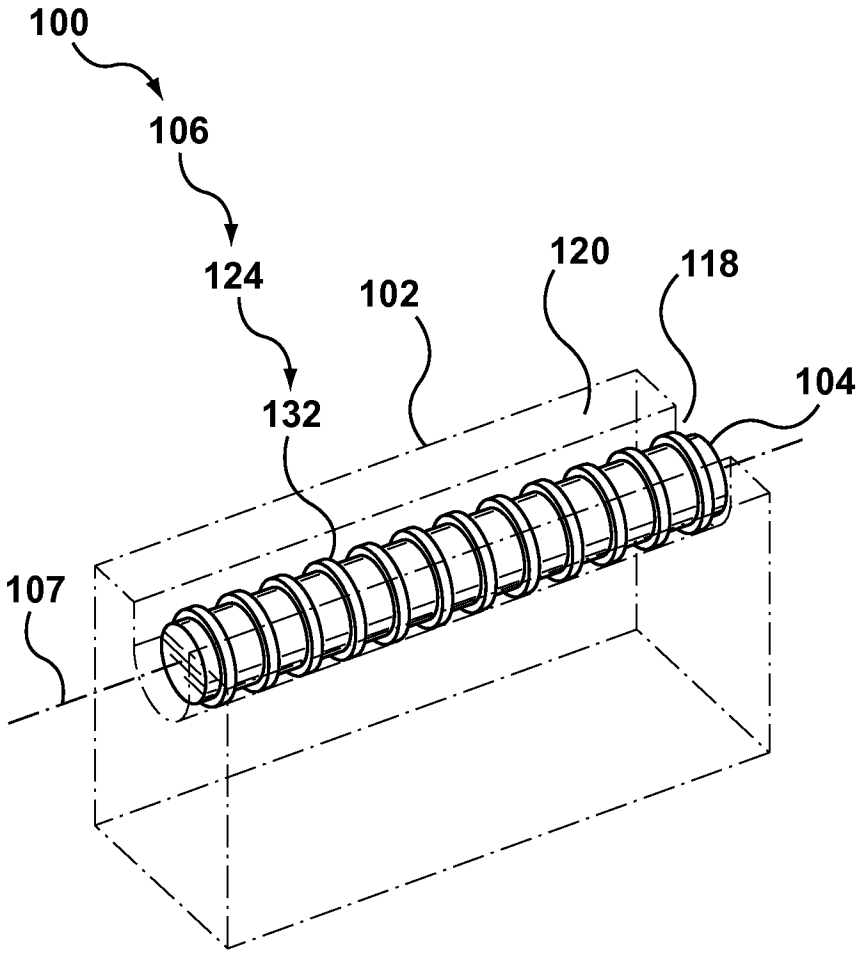


FIG. 11

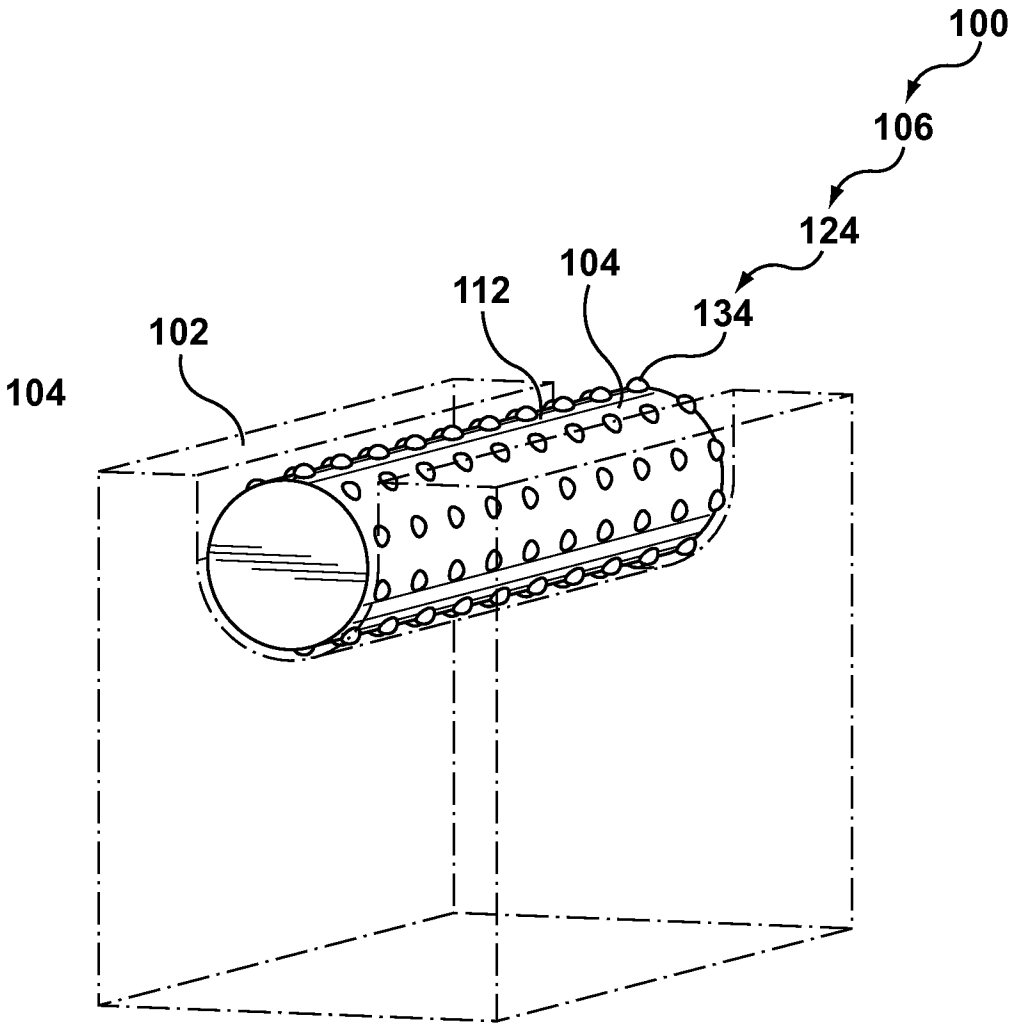


FIG. 12

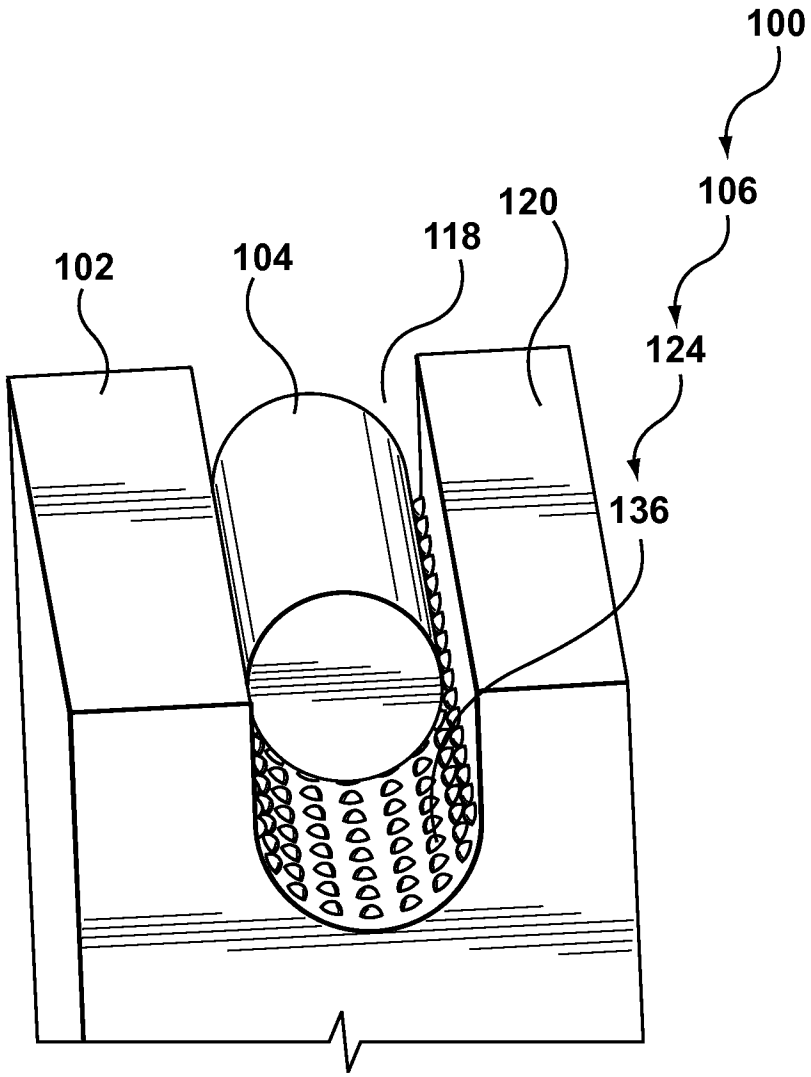


FIG. 13

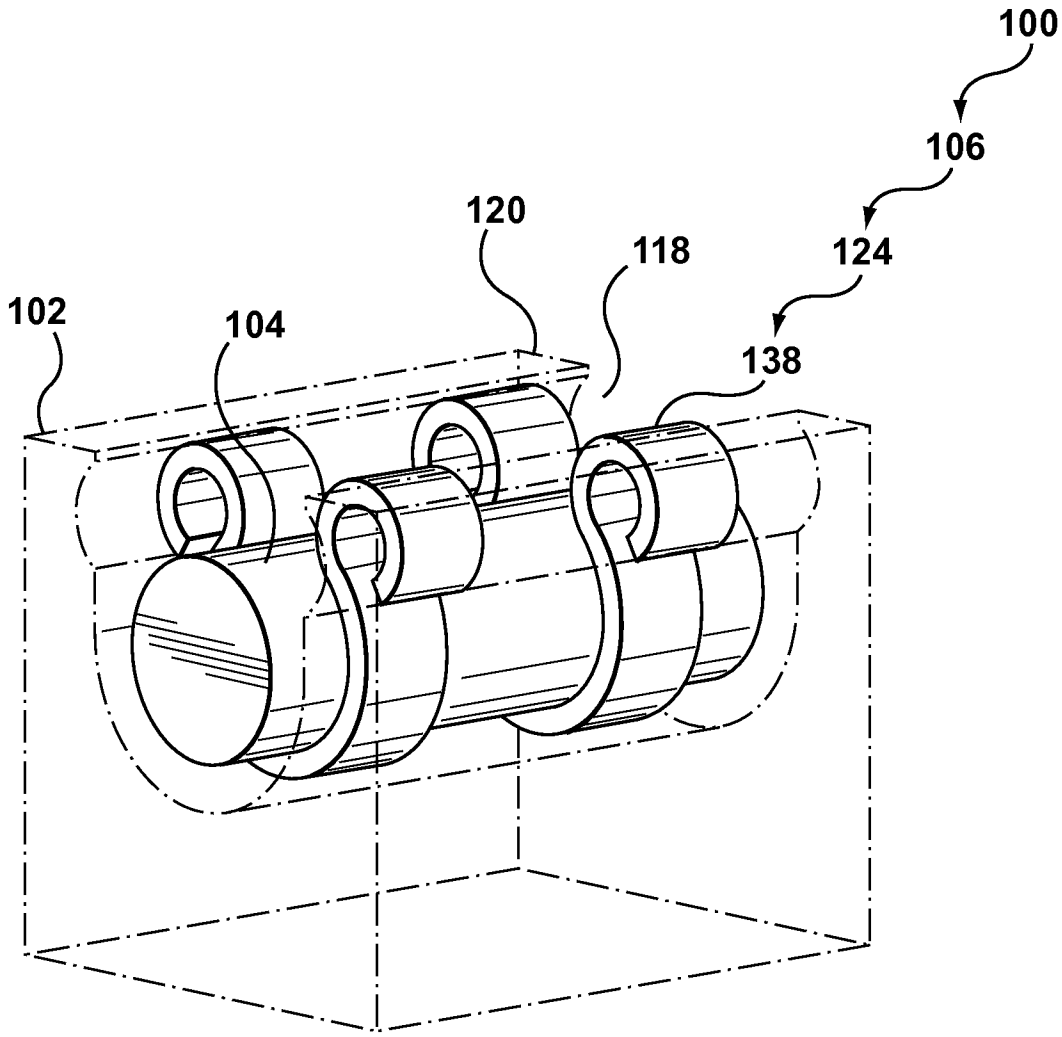


FIG. 14

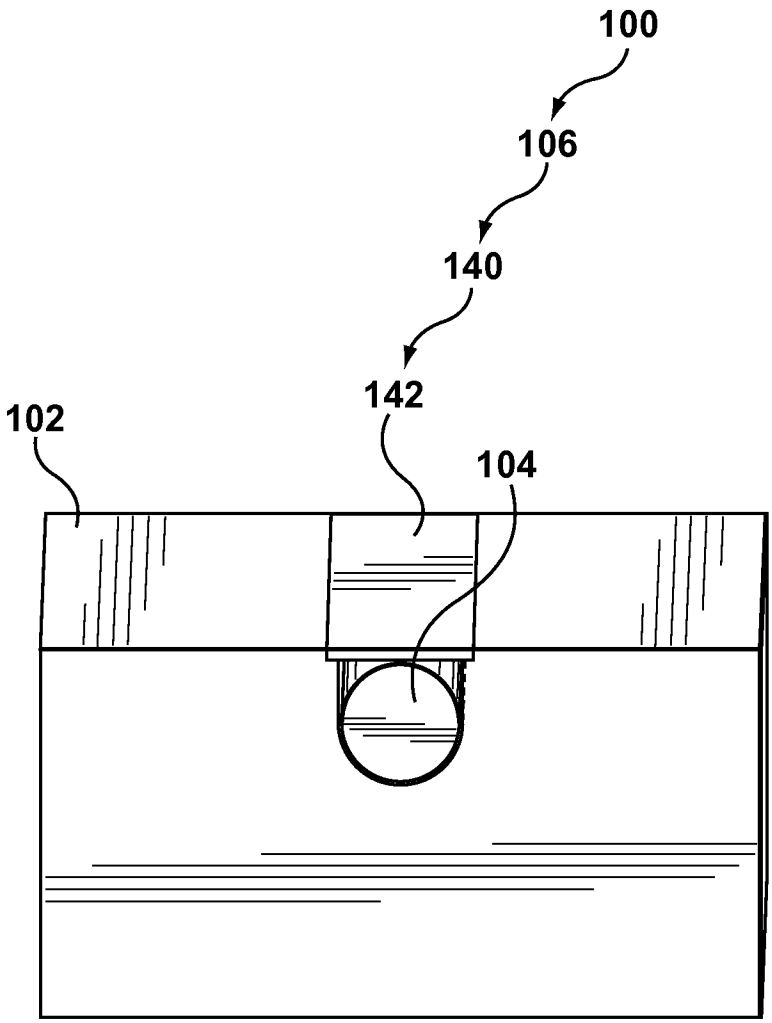


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/037867

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B29C 45/27 (2012.01)
USPC - 425/547
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)
IPC(8) - B29C 45/27, 45/73; H05B 3/42 (2012.01)
USPC - 425/547, 572

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)
PatBase, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/0011495 A1 (FISCHERS et al) 22 January 2004 (22.01.2004) entire document	1-3, 6, 7, 9, 10, 13, 14, 16
Y		4, 5, 8, 11, 12, 15
Y	US 2004/0056385 A1 (NETER et al) 25 March 2004 (25.03.2004) entire document	4, 5, 8, 11, 12, 15
A	US 5,225,662 A (SCHMIDT) 06 July 1993 (06.07.1993) entire document	1-16
A	US 3,387,653 A (COE) 11 June 1968 (11.06.1968) entire document	1-16
A	US 2,987,300 A (GREENE) 06 June 1961 (06.06.1961) entire document	1-16

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 July 2012	19 JUL 2012
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774