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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: MOLDING SYSTEM INCLUDING STATIONARY PLATEN POSITIONED BETWEEN ACTUATION ASSEMBLY AND STEM-ACTUATION PLATE

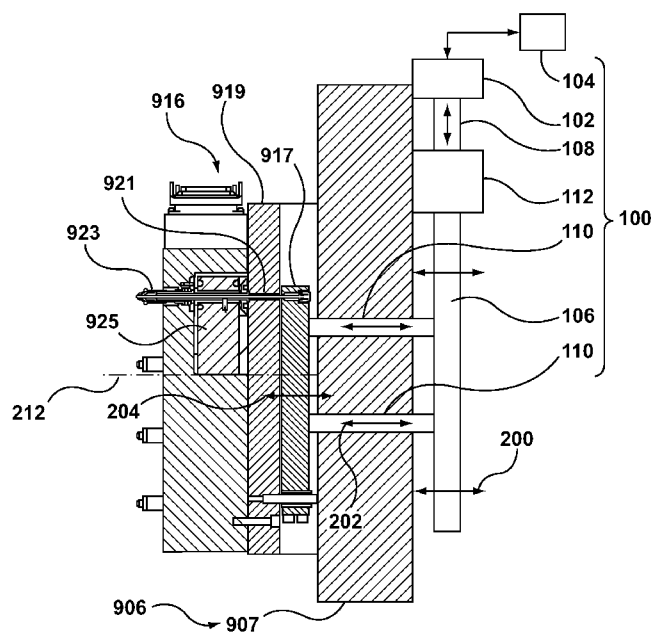


FIG. 4

(57) Abstract: A molding system (900), comprising: a stationary platen (906) having a body assembly (907); a runner system (916) having a stem-actuation plate (917), and having a backing plate (919) being configured to be supported, at least in part, by the stationary platen (906), the stem-actuation plate (917) being movable relative to the backing plate (919); and an actuation assembly (100) being configured to move the stem-actuation plate (917), the stationary platen (906) being positioned, at least in part, between the actuation assembly (100) and the stem-actuation plate (917).



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**MOLDING SYSTEM INCLUDING STATIONARY PLATEN POSITIONED BETWEEN
ACTUATION ASSEMBLY AND STEM-ACTUATION PLATE**

TECHNICAL FIELD

5 An aspect generally relates to (but is not limited to) molding systems including (but not limited to) runner systems, etc.

SUMMARY

10 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
15 known to the public.

According to one aspect, there is provided a molding system (900), comprising: a stationary platen (906) having a body assembly (907); a runner system (916) having a stem-actuation plate (917), and having a backing plate (919) being configured to
20 be supported, at least in part, by the stationary platen (906), the stem-actuation plate (917) being movable relative to the backing plate (919); and an actuation assembly (100) being configured to move the stem-actuation plate (917), the stationary platen (906) being positioned, at least in part, between the actuation assembly (100) and the stem-actuation plate (917).

25 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

30 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, 2, 3, 4, 5 depict schematic representations of a molding system (900).

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, 2, 3, 4, 5 depict schematic representations of the molding system (900). It will be appreciated that the examples depicted in FIGS. 1, 2, 3, 4, 5 may be combined in any suitable permutation and combination. The molding system (900) 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/TURNING/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 (but 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.

FIG. 1 depicts the schematic representation of the molding system (900) as viewed from an operator side. The molding system (900) may also be called an injection-molding system for example. According to the example depicted in FIG. 1, the molding system (900) includes (and is not limited to): (i) an extruder assembly (902), (ii) a clamp assembly (904), (iii) a runner system (916), and/or (iv) a mold assembly

(918). By way of example, the extruder assembly (902) is configured, to prepare, in use, a heated, flowable resin, and is also configured to inject or to move the resin from the extruder assembly (902) toward the runner system (916). Other names for the extruder assembly (902) may include injection unit, melt-preparation assembly, etc. By way of example, the clamp assembly (904) includes (and is not limited to): (i) a stationary platen (906), (ii) a movable platen (908), (iii) a rod assembly (910), (iv) a clamping assembly (912), and/or (v) a lock assembly (914). The stationary platen (906) does not move; that is, the stationary platen (906) may be fixedly positioned relative to the ground or floor. The movable platen (908) is configured to be movable relative to the stationary platen (906). A platen-moving mechanism (not depicted but known) is connected to the movable platen (908), and the platen-moving mechanism is configured to move, in use, the movable platen (908). The rod assembly (910) extends between the movable platen (908) and the stationary platen (906). The rod assembly (910) may have, by way of example, four rod structures positioned at the corners of the respective stationary platen (906) and the movable platen (908). The rod assembly (910) is configured to guide movement of the movable platen (908) relative to the stationary platen (906). A clamping assembly (912) is connected to the rod assembly (910). The stationary platen (906) supports, at least in part, the position of the clamping assembly (912). The lock assembly (914) is connected to the rod assembly (910), or may alternatively be connected to the movable platen (908). The lock assembly (914) is configured to selectively lock and unlock the rod assembly (910) relative to the movable platen (908). By way of example, the runner system (916) is attached to, or is supported by, the stationary platen (906). The runner system (916) is configured to receive the resin from the extruder assembly (902). By way of example, the mold assembly (918) includes (and is not limited to): (i) a mold-cavity assembly (920), and (ii) a mold-core assembly (922) that is movable relative to the mold-cavity assembly (920). The mold-core assembly (922) is attached to or supported by the movable platen (908). The mold-cavity assembly (920) is attached to or supported by the runner system (916), so that the mold-core assembly (922) faces the mold-cavity assembly (920). The runner system (916) is configured to distribute the resin from the extruder assembly (902) to the mold assembly (918).

In operation, the movable platen (908) is moved toward the stationary platen (906) so that the mold-cavity assembly (920) is closed against the mold-core assembly (922), so that the mold assembly (918) may define a mold cavity configured to

receive the resin from the runner system (916). The lock assembly (914) is engaged so as to lock the position of the movable platen (908) so that the movable platen (908) no longer moves relative to the stationary platen (906). The clamping assembly (912) is then engaged to apply a clamping pressure, in use, to the rod assembly (910), so that the clamping pressure then may be transferred to the mold assembly (918). The extruder assembly (902) pushes or injects, in use, the resin to the runner system (916), which then the runner system (916) distributes the resin to the mold cavity structure defined by the mold assembly (918). Once the resin in the mold assembly (918) is solidified, the clamping assembly (912) is deactivated so as to remove the clamping force from the mold assembly (918), and then the lock assembly (914) is deactivated to permit movement of the movable platen (908) away from the stationary platen (906), and then a molded article may be removed from the mold assembly (918).

Generally speaking, with reference to FIGS. 2, 3, 4, 5, the molding system (900) includes (and is not limited to): (i) the stationary platen (906), the runner system (916), and an actuation assembly (100), in accordance with a minimal configuration of the molding system (900). The stationary platen (906) has a body assembly (907). The runner system (916) has: (i) a stem-actuation plate (917), and (ii) a backing plate (919). The backing plate (919) is configured to be supported, at least in part, by the stationary platen (906). The stem-actuation plate (917) is movable relative to the backing plate (919). The actuation assembly (100) is configured to move the stem-actuation plate (917). The stationary platen (906) is positioned, at least in part, between the actuation assembly (100) and the stem-actuation plate (917). It will be appreciated that the molding system (900), the runner system (916) and the stationary platen (906) may be provided separately or together in combination.

Referring now to FIG. 2, there is depicted a top view of a schematic representation of the molding system (900) according to a first variation of the molding system (900).

The actuation assembly (100) includes (and is not limited to): (i) a motor assembly (102), (ii) a controller (104), (iii) an actuation plate (106), (iv) a connection assembly (108), and (v) a connector assembly (110). The motor assembly (102) is configured to move the actuation plate (106). An example of the motor assembly (102) may be a servo motor. The controller (104) is configured to control the motor assembly (102). The controller (104) may include a Human Machine Interface (HMI) of a molding

system controller, by way of example. The connection assembly (108) connects the motor assembly (102) to the actuation plate (106). The actuation plate (106) is connected with the connector assembly (110). The connector assembly (110) is coupled to the stem-actuation plate (917). The body assembly (907) of the stationary platen (906) is configured to accommodate the connector assembly (110). Specifically, the body assembly (907) defines pass through holes that permit sliding movement of the connector assembly (110). The controller (104) includes programmed instructions configured to control operation of the motor assembly (102). In operation, the controller (104) causes the motor assembly (102) to become actuated so that the actuation plate (106) is moved along a plate-movement direction (200). When the actuation plate (106) is moved, the connector assembly (110) is also moved along a connector movement direction (202). As well, in similar fashion, the stem-actuation plate (917) is also moved along a plate movement direction (204). A centre line (210) of the stem-actuation plate (917) is in-line with a centre line (212) of the extruder assembly (902). The motor assembly (102) is positioned offset from the centre line (210). FIG. 2 depicts a top view so that it only appears that the motor assembly (102) is not positioned offset from the centre line (210), but this is understood that the motor assembly (102) is positioned offset from the centre line (210). By way of example (and not limited to the depiction of FIG. 2), the runner system (916) includes (and is not limited to): a stem assembly (921) that is configured to slide, a nozzle assembly (923) that is configured to slidably receive the stem assembly (921), a manifold assembly (925) configured to distribute resin from the extruder assembly (902) to the nozzle assembly (923).

Referring now to FIG. 3, there is depicted a top view of a schematic representation of the molding system (900) according to a second variation of the molding system (900). The extruder assembly (902) is positioned at a location that is a top or side injection position relative to the edge of the stationary platen (906). The motor assembly (102) is positioned at a centre point of the actuation plate (106), in sharp contrast to the variant depicted in FIG. 2.

Referring now to FIG. 4, there is depicted a top view of a schematic representation of the molding system (900) according to a third variation of the molding system (900). The connection assembly (108) includes (and is not limited to): a converter assembly (112). The converter assembly (112) is connected to the connection assembly (108)

and is connected to the actuation plate (106). The converter assembly (112) is configured to convert side to side movement of the connection assembly (108) to front to back movement of the actuation plate (106). The converter assembly (112) is a mechanical force-redirection device. An outer surface of the stationary platen (906) supports the actuation assembly (100).

Referring now to FIG. 5, there is depicted a top view of a schematic representation of the molding system (900) according to a fourth variation of the molding system (900). The stationary platen (906) defines a platen pocket (909). The platen pocket (909) is configured to accommodate the actuation plate (106), the connection assembly (108), the connector assembly (110) and the converter assembly (112).

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:

- 5 **1.** A molding system (**900**), comprising:
 a stationary platen (**906**) having a body assembly (**907**);
 a runner system (**916**) having a stem-actuation plate (**917**), and having a
backing plate (**919**) being configured to be supported, at least in part, by the stationary
platen (**906**), the stem-actuation plate (**917**) being movable relative to the backing
10 plate (**919**); and
 an actuation assembly (**100**) being configured to move the stem-actuation plate
(**917**),
 the stationary platen (**906**) being positioned, at least in part, between the
actuation assembly (**100**) and the stem-actuation plate (**917**).
- 15 **2.** The molding system (**900**) of claim **1**, wherein:
 the actuation assembly (**100**) includes:
 a motor assembly (**102**),
 a controller (**104**), the controller (**104**) is configured to control the motor
20 assembly (**102**),
 an actuation plate (**106**), the motor assembly (**102**) is configured to move the
actuation plate (**106**),
 a connection assembly (**108**), the connection assembly (**108**) connects the
motor assembly (**102**) to the actuation plate (**106**), and
25 a connector assembly (**110**), the actuation plate (**106**) is connected with the
connector assembly (**110**), the connector assembly (**110**) is coupled to the stem-
actuation plate (**917**), and the body assembly (**907**) of the stationary platen (**906**) is
configured to accommodate the connector assembly (**110**).
- 30 **3.** The molding system (**900**) of claim **2**, wherein:
 the motor assembly (**102**) is positioned offset from a centre line (**210**) of an
extruder assembly (**902**) of the molding system (**900**).
- 4.** The molding system (**900**) of claim **2**, wherein:

an extruder assembly (902) of the molding system (900) is positioned at a location that is a side injection position relative to an edge of the stationary platen (906), and

the motor assembly (102) is positioned at a centre point of the actuation plate (106).

5 5. The molding system (900) of claim 2, wherein:

the connection assembly (108) includes:

10 a converter assembly (112) connected to the connection assembly (108) and connected to the actuation plate (106),

the converter assembly (112) is configured to convert side to side movement of the connection assembly (108) to front to back movement of the actuation plate (106).

15 6. The molding system (900) of claim 2, wherein:

an outer surface of the stationary platen (906) supports the actuation assembly (100).

20 7. The molding system (900) of claim 2, wherein:

the stationary platen (906) defines a platen pocket (909), the platen pocket (909) is configured to accommodate the actuation plate (106), the connection assembly (108), the connector assembly (110) and a converter assembly (112).

25 8. A runner system (916), comprising

a backing plate (919) being configured to be supported by a stationary platen (906) of a molding system (900), the stationary platen (906) having a body assembly (907); and

30 a stem-actuation plate (917) being configured to move relative to the backing plate (919), the stem-actuation plate (917) being configured to be moved by an actuation assembly (100), the stationary platen (906) being positioned, at least in part, between the actuation assembly (100) and the stem-actuation plate (917).

35 9. A stationary platen (906) of a molding system (900), comprising:

a body assembly (907) being configured to support:

(i) a runner system (916) having a stem-actuation plate (917), and having a

backing plate (919) being configured for support by the stationary platen (906), the stem-actuation plate (917) being movable relative to the backing plate (919); and

- (ii) an actuation assembly (100) being configured to move the stem-actuation plate (917), the actuation assembly (100) being configured for support by the stationary platen (906), the stationary platen (906) being positioned, at least in part, between the actuation assembly (100) and the stem-actuation plate (917).

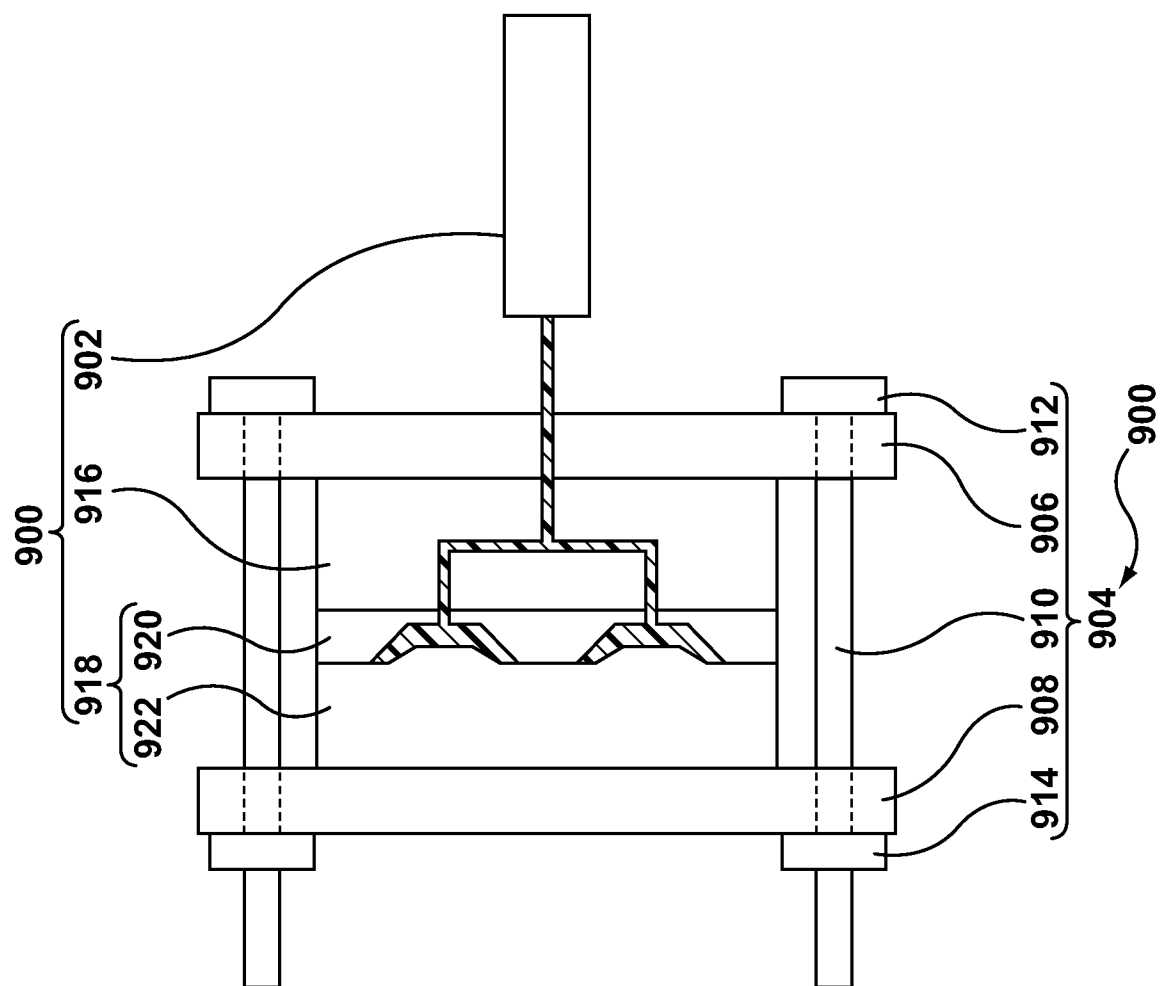


FIG. 1

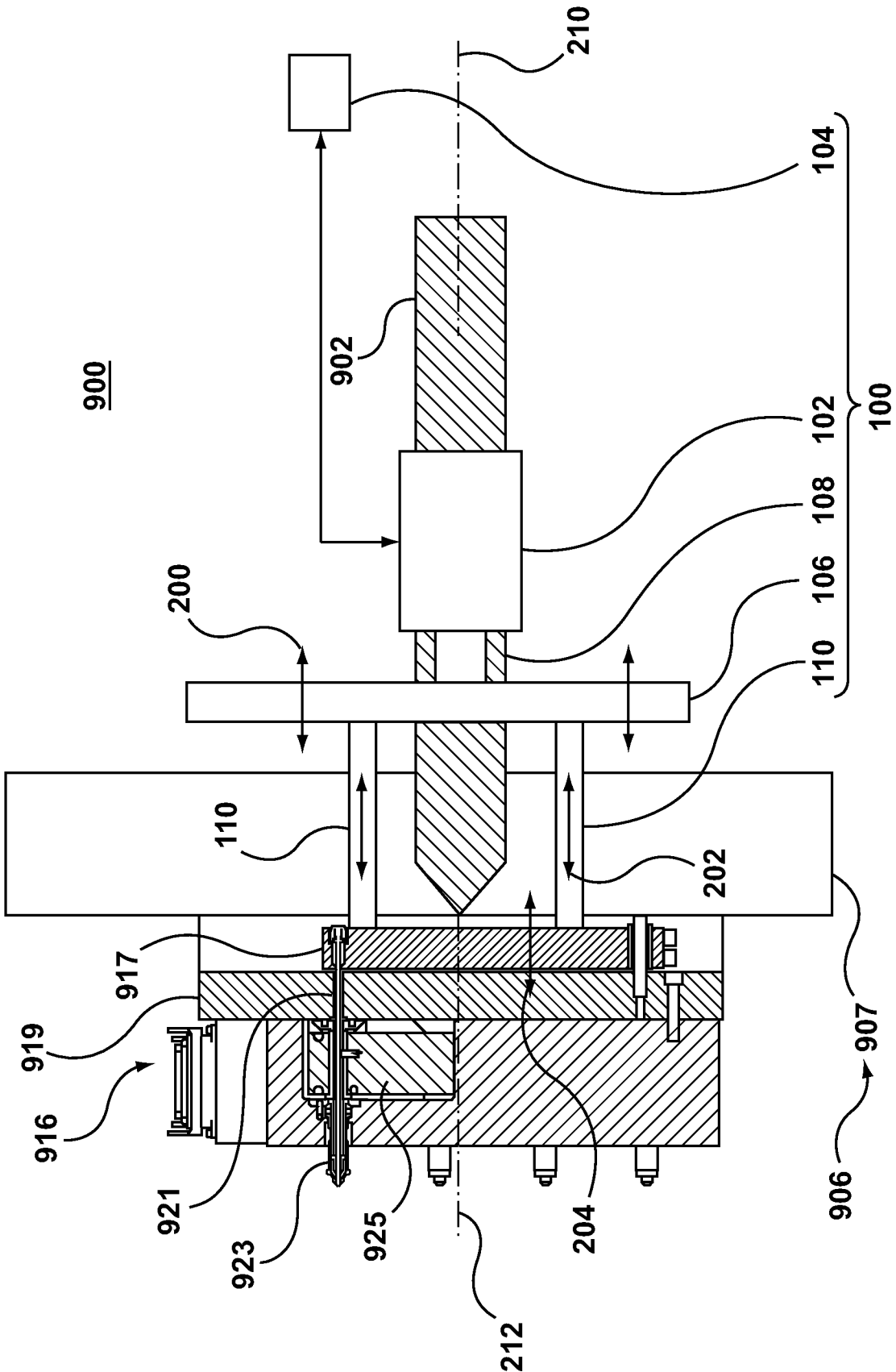


FIG. 2

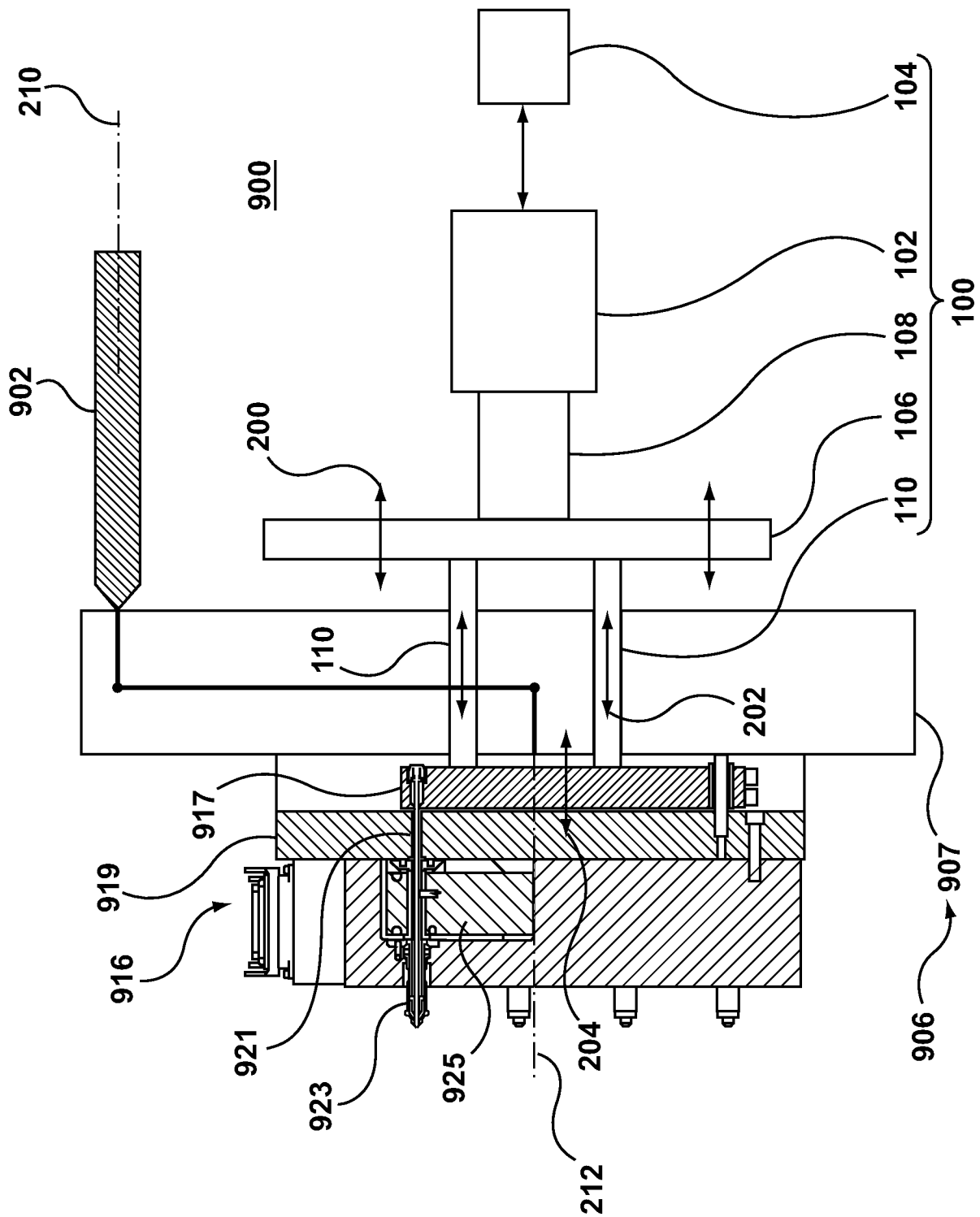
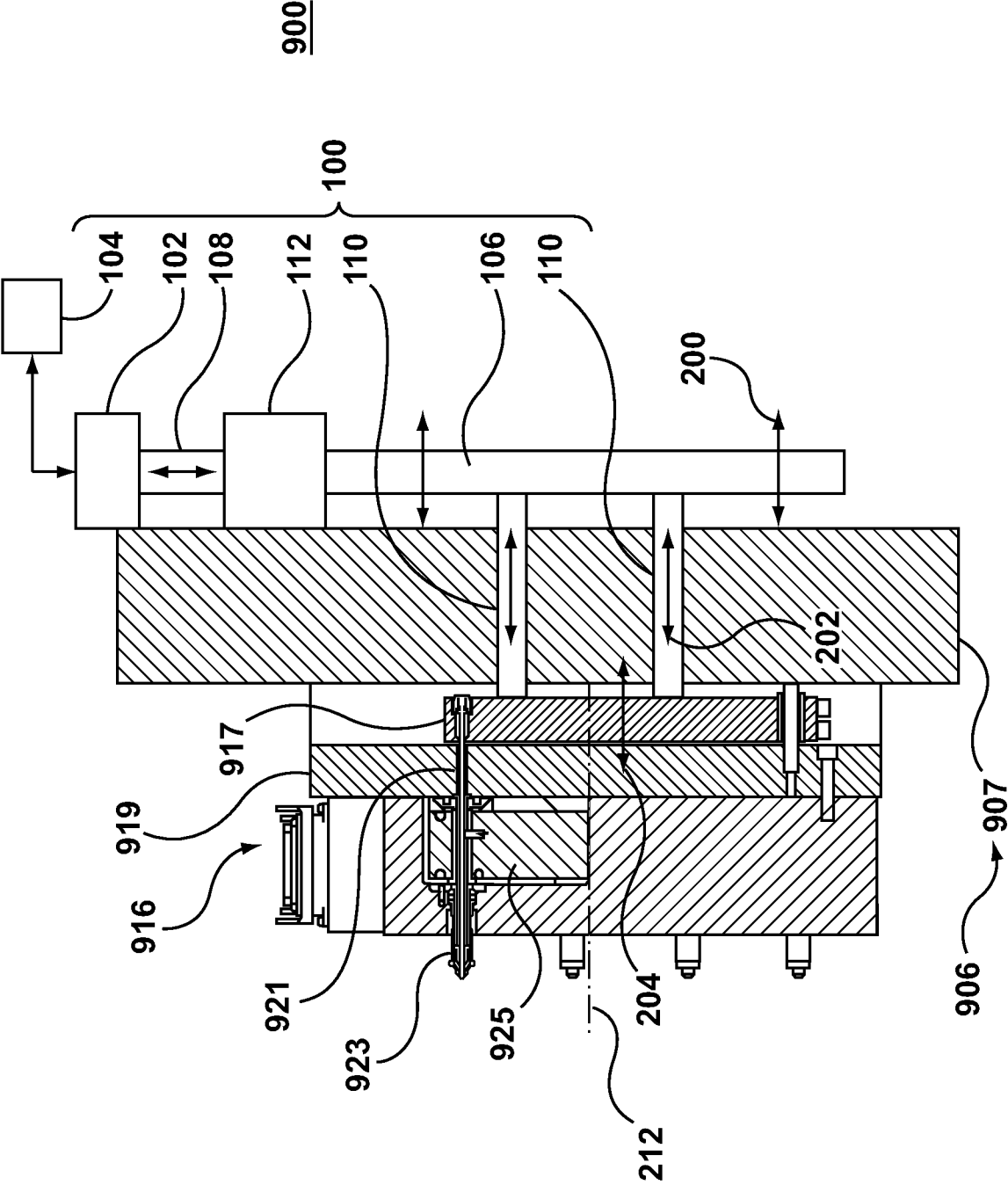


FIG. 3



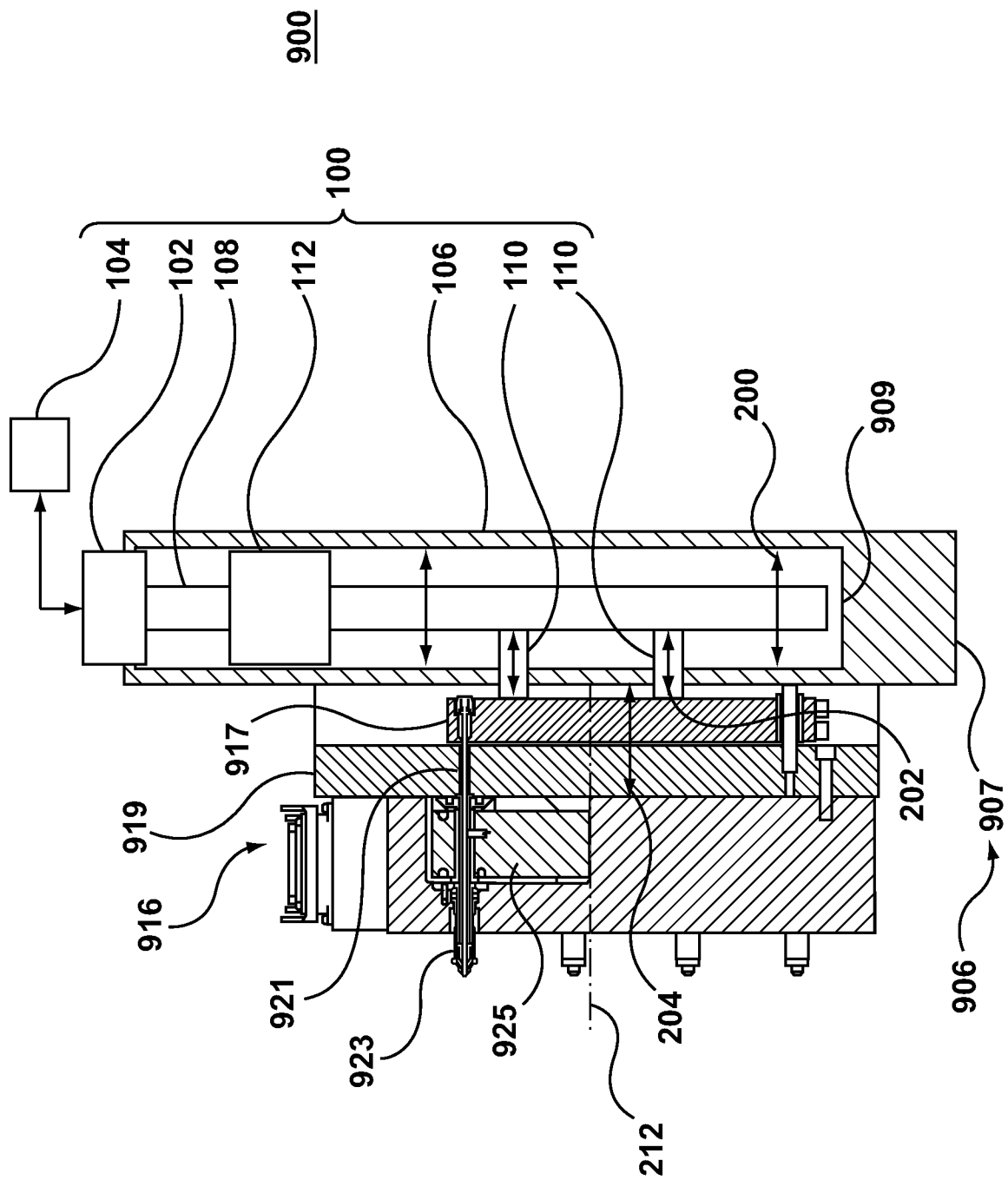


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/041991

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B29C 45/00 (2012.01)

USPC - 264/328.1

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 45/00, 45/03, 45/17, 45/18, 45/66 (2012.01)

USPC - 264/219, 255, 328.1, 328.8; 425/3, 149, 150, 171, 468, 572, 574, 575, 595

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
ECLA - B29C 45/02, 45/16B

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

PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010/121350 A1 (HONTHEIM et al) 28 October 2010 (28.10.2010) entire document	1, 8, 9
A	US 4,386,903 A (WYBENGA) 07 June 1983 (07.06.1983) entire document	1-9
A	US 7,401,639 B2 (MANDA) 22 July 2008 (22.07.2008) entire document	1-9
A	US 7,824,596 B2 (SICILIA) 02 November 2010 (02.11.2010) entire document	1-9

☐ 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

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