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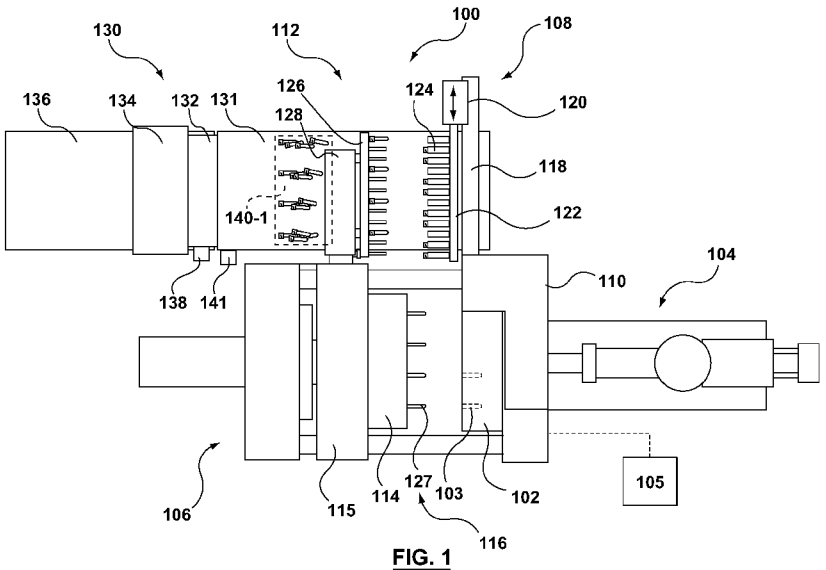

FIG. 1

(57) Abstract: Disclosed herein, amongst other things, is a molded article conveyance device for use with an injection molding machine that includes a conveyor for receiving shots of molded articles that are molded in the injection molding machine, a sample device, and a director that is configurable to selectively direct a selected shot of molded articles, at least in part, into the sample device.

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MOLDED ARTICLE CONVEYANCE DEVICE

TECHNICAL FIELD

Non-Limiting embodiments disclosed herein generally relate to a molded article conveyance device for a molding machine, and a related method of molding.

SUMMARY

In accordance with an aspect disclosed herein, there is provided a molded article conveyance device for use with an injection molding machine that includes a conveyor for receiving shots of molded articles that are molded in the injection molding machine, a sample device, and a director that is configurable to selectively direct a selected shot of molded articles, at least in part, into the sample device.

In accordance with a further aspect disclosed herein, there is related method of molding using an injection molding machine having the molded article conveyance device. The method broadly includes successively molding shots of molded articles in the injection molding machine and depositing them onto a conveyor of the molded article conveyance device. Next, the method includes conveying the shots of molded articles towards a downstream structure. Furthermore, the method includes selectively sampling a selected shot of molded articles, at least in part, with selective reconfiguring of a director to direct the selected shot of molded articles into a sample device.

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

DESCRIPTION OF THE DRAWINGS

The non-limiting embodiments will be more fully appreciated by reference to the accompanying drawings, in which:

FIGS. 1-4 depict a conceptual representation of a non-limiting operational sequence of an injection molding system that includes a molded article conveyance device;

FIGS. 5-7 depict a more detailed view of the construction and operation of the molded article conveyance device shown in FIGS. 1-4;

FIG. 8 depicts a flow chart of operational steps of a non-limiting embodiment of method of molding;

FIGS. 9-11 depict a conceptual representation of a non-limiting operational sequence of an injection molding system that includes various alternate non-limiting embodiments of the molded article conveyance device.

FIG. 12A depicts a schematic representation of an arrangement of cavities in a mold;

FIG. 12B depicts a schematic representation of an arrangement of holders on a retrieval tool.

The drawings are not necessarily to scale and may be illustrated by phantom lines, diagrammatic representations and fragmentary views. In certain instances, details that are not necessary for an understanding of the embodiments or that render other details difficult to perceive may have been omitted.

DETAILED DESCRIPTION OF THE NON-LIMITING EMBODIMENT(S)

Reference will now be made in detail to various non-limiting embodiment(s) of a molded article conveyance device for a molding machine, and a related method of molding involving the use thereof.

It should be understood that other non-limiting embodiment(s), modifications and equivalents will be evident to one of ordinary skill in the art in view of the non-limiting embodiment(s) disclosed herein and that these variants should be considered to be within scope of the appended claims.

Furthermore, it will be recognized by one of ordinary skill in the art that certain structural and operational details of the non-limiting embodiment(s) discussed hereafter may be modified or omitted (i.e. non-essential) altogether. In other instances, well known methods, procedures, and components have not been described in detail.

Injection mold machines can be used to form various molded articles using an injection molding process. One example of a molded article that can be formed, for example, from Polyethylene Teraphalate (PET) molding material is a preform that is capable of being subsequently blown into a

container, such as a beverage bottle or the like. Injection molding of molding material involves heating the molding material (e.g.. PET pellets, etc.) to a homogeneous molten state and injecting, under pressure, the melted PET material into mold cavities of a closed mold to form a group of molded articles, commonly referred to as a shot of molded articles, such as a plurality of PET performs.

The foregoing may be appreciated with reference to the operational sequence of an injection molding machine 100 (schematic representation) shown in FIGS. 1 through 4. The injection molding machine 100 broadly includes an injection unit 104, a clamping unit 106, a retrieval device 108, a treatment unit 112 and a molded article conveyance device 130. The operation of injection molding machine 100 and its components may be controlled by a controller 105 such as, for example, a programmable logic controller (PLC) or industrial computer. Communication links between various components of the injection molding machine 100 and controller 105 may be provided and such links may be wired and/or wireless.

The injection molding machine 100 also includes a mold 116 that is arranged in the clamping unit 106 that comprises a cavity mold half 102 and an opposite core mold half 114. The cavity mold half 102 is shown to be attached to a stationary platen 110 of the clamping unit 106 and the core mold half 114 is attached to a moving platen 115 of the clamping unit 106. The cavity mold half 102 defines or otherwise includes a plurality of cavities 103, and the core mold half 114 similarly defines or otherwise includes a corresponding plurality of cores 127 that cooperate together, when the mold is closed, to define a plurality of molding cavities (not numbered) within which to mold a plurality (i.e. shot) of molded articles, which in this example are preforms of the type mentioned previously.

The construction and operation of the injection molding system 100 is generally consistent with the HyPET™ (trademark of Husky Injection Molding Systems Ltd, of Bolton Ontario Canada) perform molding system from Husky Injection Molding Systems Ltd.. By way of reference, a detailed description of the structure and operation of the molding machine 100 is disclosed in commonly assigned US patent number 7,104,780 issued September 12, 2006, the entire contents of which is hereby incorporated herein by reference. A brief overview of the molding machine 100 and its operation follows.

With the mold 116 arranged in a mold closed configuration, as shown with reference to FIGS. 2 and 4, a charge of molding material that has been prepared in the injection unit 104 is injected into the mold 116 to define a shot of molded articles therein. At a suitable time, with sufficient cooling of the newly formed molded articles in the mold 116, the mold 116 is then opened, as shown with reference

to FIGS. 1 and 3, thereby providing space therebetween permitting entry of a retrieval tool 122, commonly referred to as an end-of-arm tool (EOAT), that is moveable by a moving apparatus 118 (e.g. robot) of the retrieval device 108, in between the mold halves of the mold 116 to an inbound position, not shown. Thereafter, the shot of molded articles is ejected from the mold 116 and transferred into holders 124 on the retrieval tool 122. Once the shot of molded articles are transferred to the retrieval tool 122, it is moved again by the moving apparatus 118 to an outbound position to allow the mold 116 to be closed again and then commence molding the next shot of molded articles in the mold. When the retrieval tool 122 is in an outbound position, a conditioning tool 126 of the treatment device 112 may subject the molded articles that are being held in the retrieval tool 122 to a treatment (e.g. convective cooling, thermoforming, etc.). Furthermore, at a suitable time (e.g. once the molded articles have been thoroughly cooled to a dimensionally stable temperature), the conditioning tool 126 may remove the shot of molded articles from the retrieval tool 122 for further processing such as, for example, transfer onto the molded article conveyance device 130 for conveyance away from the molding machine and towards a storage container or a blow molding machine.

As shown, the retrieval tool 122 may be configured to carry and hold more than one shot of molded articles that were molded at different times (i.e. cycles) by the injection mold machine 100. In this regard, the retrieval tool 122 can be cycled, by the moving apparatus 118, between incremental inbound and outbound positions and may retrieve and hold more than one shot of molded articles at any one time.

It is typical for customers to take samples of molded articles being molded, such as during machine start-up, periodically during production runs, or while qualifying new preforms for production. Presently, the molded articles are sampled downstream from the injection molding machine 100. Currently available molding systems do not provide for a convenient or readily accessible sampling location nor is there a convenient process to sequester a defined shot of molded articles, at least in part, from those of other shots that may be in the conveyance device at the same time.

What follows then is a description of a non-limiting embodiment of the molded article conveyance device and a related method of operation that includes structure and steps that provide for convenient sampling of a selected shot of molded articles, at least in part, therefrom.

Broadly speaking, the molded article conveyance device for use with the injection molding machine 100 may include a conveyor for receiving shots of molded articles that are molded in the injection

molding machine 100, a sample device and a director that is configurable to selectively direct a selected shot of molded articles, at least in part, into the sample device.

The director is configurable to selectively direct one of the selected shot of molded articles or a selected portion thereof into the sample device. The selected portion of the shot of molded articles may correspond, for example, to one or more molded articles that were molded in specified cavities in the mold 116 or that were conditioned in one or more specified holders 124 on a retrieval tool 122. More specifically, the one or more specified cavities in the mold 116 may include, for example, a specified row 107-X (FIG. 12A), column 107-Y (FIG. 12A), or quadrant 107-Q FIG. 12A) of cavities in the mold 116. The one or more specified holders in the retrieval tool 122 may include, for example, a selected cooling stage (124-1, 124-2, 124-3, 124-4) therein.

The director may be operated either manually or automatically, to selectively direct one or more selected shots of molded articles into the sample device. The automated sampling may be conducted, for example, upon demand or at a specified frequency or interval (e.g. elapsed time, molding cycle count, etc).

The device may also include an inspector that is configured to inspect the molded articles in the sample device. The inspector may be configured to provide an indication of an out-of-boundary dimension to at least one of the controller 105 of the injection molding machine 100 and/or a plant monitoring system 109 (FIG. 11) to prompt remedial action.

A non-limiting embodiment of the molded article conveyance device 130 broadly includes a conveyor 131 (e.g. belt conveyor), a director 132 and a sample device 134. An upstream part of the conveyor 131 is positioned beneath the treatment device 112 for receiving, in a typical manner, shots of molded articles being deposited thereon by the treatment device 112. The conveyance of a shot of molded articles 140-1 through the handling device 130 may be appreciated with reference to FIGS. 1-4 in sequence, wherein the shot of molded articles 140-1 is conveyed away from the treatment device 112 and eventually through the director 132 that selectively directs the molded articles onto, or into, a downstream structure 136 such as, for example, a storage container or a further conveyor for further conveyance of the molded articles to a further device (e.g. conditioning oven, blow molding machine, etc.). Alternatively, the upstream part of the conveyor 131 may instead be positioned directly beneath the mold 116 for receiving the shot of molded articles being deposited (i.e. free-dropped) therefrom.

Furthermore, the director 132 is configurable (e.g. moveable), either manually or automatically, to selectively direct one or more selected shots of molded articles into the sample device 134. The

foregoing may be appreciated by contrasting FIGS. 2 and 4, wherein the director 132 is configured, or otherwise positioned, to direct a selected shot of molded articles 140-2, at least in part, into the sample device 134. The sample device 134 may be, for example, a sample container (e.g. tray or box) for sequestering the selected molded articles 140-2 or it may be yet another conveyor. Thereafter, the selected shot of molded articles 140-2 may be conveniently inspected (manually or automatically).

A more detailed view of the molded article conveyance device 130 may be appreciated with reference to FIGS. 5, 6 and 7. Specifically, it may be appreciated that the director 132 may be a simple chute that is hinged near to a downstream end of the conveyor 131, and wherein the chute may be selectively inclined, contrasting FIGS. 6 and 7, to selectively direct the selected shot of molded articles towards the sample device 134 that is provided as a sample container that is supported on a gate wall 144 of the molding machine. The director 132 further includes a lever 142 to manually tilt the chute of the conveyor. Alternatively, the lever 142 may be supplemented or substituted by an actuator (e.g. a pneumatic or electro-mechanical actuator – not shown in these views) to provide for semi-autonomous or completely autonomous operation.

With further reference to FIG. 8, a flow chart is depicted that generalizes the specific operational steps introduced above and otherwise described hereafter in regards to various other alternate non-limiting embodiments.

Specifically, the flow chart depicts a method of molding 200 using the injection molding machine 100 including the molded article conveyance device 130 and/or the molded article conveyance device 230, 330 that will be described hereafter. The method begins with successively molding, step 210, shots of molded articles 140-1, 140-2, 140-3 in the injection molding machine 100 and depositing them onto a conveyor 131 of the molded article conveyance device 130, 230, 330. Next, the method 200 includes conveying, step 220, the shots of molded articles 140-1, 140-2, 140-3 towards a downstream structure 136. Finally, the method includes selectively sampling, step 230, a selected shot of molded articles 140-2 from the conveyor 131 with selective reconfiguring of a director 132, 232, 332 to direct the selected shot of molded articles 140-2 into a sample device 134, 234, 334.

With reference to back to FIGS. 1-4, it may be appreciated that the molded article conveyance device 130 may further include an actuator 138 for automated configuring or movement of the director 132 under the control of the controller 105.

Furthermore, the molded article conveyance device 130 may include a detector 141 such as, for example, a photo-eye, vision system or other such device that is configured to detect or otherwise

delineate separation between adjacent shots of molded articles on the conveyor 131. As such, the method 200 further include using the information from the detector 141 in the controller 105 to assist with automatic sampling of the selected shot of molded articles. More specifically, the controller 105 will use the information to time the reconfiguration of the director 132 to direct the selected shot of molded articles 140-2 into the sample device 134 and thereafter once again reconfigure the director 132 to direct the following shots of molded articles along the normal production path towards the downstream structure 136.

In addition, the method 200 may further include temporarily changing a speed profile of the conveyor 131, under control of the controller 105, during sampling to increase a gap between adjacent shots of molded articles thereon. Specifically, the speed of the conveyor 131 may be momentarily increased before and after deposit thereof thereon to provide for a larger gap between the selected shot of molded articles for sampling and those shots of molded articles from a preceding and following molding cycle.

With further reference to FIG. 9 it may be appreciated that the molded article conveyance device 130 may also include a barrier 146 that is selectively positionable to block conveyance of a following shot molded articles 140-3 on the conveyor 131 that follows the selected shot of molded articles 140-2 being sampled. As such, the method 200 may further include controlling the barrier 146, with the controller 105, to selectively position the barrier 146 into the detected gap between the selected shot of molded articles 140-2 and the following shot of molded articles 140-3. Furthermore, the barrier 146 may be configured to include an air blowing device 148 to slow or stop the following shot of molded articles 140-3 from moving down the conveyor 131. As such, the method may further include controlling the air blowing device 148 with the controller 105 to selectively blow air upstream on the face of the conveyor 131 to slow or stop the following shot of molded articles 140-3 from moving down the conveyor 131.

With further reference to FIG. 10 there is depicted an alternate non-limiting embodiment of the molded article conveyance device 230. The molded article conveyance device 230 includes a director 232 that is an actuator for selectively positioning the sample device 334. In use, the method 200 may thus further include positioning the sample device 334, with the director 232, which in this example is a container with an open top, between the conveyor 131 and a treatment device 112 of the injection molding machine 100 for receiving the selected shot of molded articles 140-2 directly therefrom prior to the deposition thereof onto the conveyor 131. Specifically, the director 232 rotates the sample device 334, in the direction indicated, between a position beside the conveyor 131, not shown, and a position beneath the treatment device 112.

With further reference to FIG. 11 there is depicted yet another alternate non-limiting embodiment of the molded article conveyance device 330. The molded article conveyance device 330 includes a director 332 that is a reverser that is associated with the conveyor 131. In use, the method 200 may thus further include controlling operation of the reverser to temporarily reverse a direction of conveyance of the conveyor 131 to direct the selected shot of molded articles towards the sample device 334 that is positioned at an upstream end thereof.

As broadly mentioned previously, the molded article conveyance device may also include or may otherwise cooperate with an inspector with which to inspect the molded articles in the sample device. An inspector 400 is shown with reference to FIG. 11. The inspector 400 may be any variety of known inspection apparatus that is suitable for inspecting a molded article. The inspector may be configured, for example, to conduct an optical inspection of the molded articles. The foregoing species of inspector may include known vision systems.

It is noted that the foregoing has outlined some of the more pertinent non-limiting embodiments. It will be clear to those skilled in the art that modifications to the disclosed non-embodiment(s) can be effected without departing from the spirit and scope thereof. As such, the described non-limiting embodiment(s) ought to be considered to be merely illustrative of some of the more prominent features and applications. Other beneficial results can be realized by applying the non-limiting embodiments in a different manner or modifying them in ways known to those familiar with the art. This includes the mixing and matching of features, elements and/or functions between various non-limiting embodiment(s) is expressly contemplated herein so that one of ordinary skill in the art would appreciate from this disclosure that features, elements and/or functions of one embodiment may be incorporated into another embodiment as skill in the art would appreciate from this disclosure that features, elements and/or functions of one embodiment may be incorporated into another embodiment as appropriate, unless described otherwise, above. Although the description is made for particular arrangements and methods, the intent and concept thereof may be suitable and applicable to other arrangements and applications.

WHAT IS CLAIMED IS:

1. A molded article conveyance device (130, 230, 330) for use with an injection molding machine (100), comprising:

a conveyor (131) for receiving shots of molded articles (140-1, 140-2, 140-3) that are molded in the injection molding machine (100);

a sample device (134, 234, 334); and

a director (132, 232, 332) that is configurable to selectively direct a selected shot of molded articles (140-2), at least in part, into the sample device (134, 234, 334).

2. The molded article conveyance device (130, 230, 330) of claim 1, wherein:

the director (132, 232, 332) is manually or automatically configurable to selectively direct the selected shot of molded articles (140-2) into the sample device (134, 234, 334).

3. The molded article conveyance device (130, 230, 330) of claim 2, wherein:

the director (132, 232, 332) is configured to direct automated sampling on a specified period.

4. The molded article conveyance device (130, 230, 330) of claim 1, wherein:

the sample device (134, 234, 334) is one of a sample container for sequestering the selected shot of molded articles (140-2) or it may be another conveyor.

5. The molded article conveyance device (130, 230, 330) of claim 1, wherein:

an upstream end of the conveyor (131) is positioned, in use, beneath a treatment device (112) of the injection molding machine (100) for receiving the shots of molded articles therefrom.

6. The molded article conveyance device (230) of claim 5, wherein:

the director (232) is an actuator that is configured to selectively position the sample device (334) between the conveyor (131) and the treatment device (112) for receiving the selected shot of molded articles (140-2) directly therefrom prior to the deposition thereof onto the conveyor (131).

7. The molded article conveyance device (130, 230, 330) of claim 1, wherein:

an upstream end of the conveyor (131) is positioned, in use, beneath a mold (116) in the injection molding machine (100) for receiving the shots of molded articles being free-dropped therefrom.

8. The molded article conveyance device (130, 230, 330) of claim 1, wherein:

the director (132) is a chute that is hinged near to a downstream end of the conveyor (131), and wherein the chute may be alternatively selectively positioned to either direct the shots of molded articles towards a downstream structure (136) or to direct the selected shot of molded articles (140-2) towards the sample device (134).

9. The molded article conveyance device (130, 230) of claim 1, further comprising:

a detector (141) that is configured to detect separation between adjacent shots of molded articles on the conveyor (131); and

a controller (105) that is configured to use information from the detector (141) to operate the director (132) to selectively direct the selected shot of molded articles (140-2) into the sample device (134).

10. The molded article conveyance device (130) of claim 9, further comprising:

a barrier (146) that is positioned downstream of the detector (141) and that is selectively positionable to block conveyance of a following shot molded articles (140-3) on the conveyor (131) that follow the selected shot of molded articles (140-2) being sampled; and

the controller (105) is further configured to selectively position the barrier (146) into a detected gap between the selected shot of molded articles (140-2) and the following shot of molded articles (140-3).

11. The molded article conveyance device (130) of claim 10, wherein:

the barrier (146) includes an air blowing device (148) to slow or stop the following shot of molded articles (140-3) from moving down the conveyor (131).

12. The molded article conveyance device (130) of claim 1, further comprising:

a controller (105) that is configured to control operation of the conveyor (131) to temporarily change a speed profile thereof during sampling to increase a gap between adjacent shots of molded articles thereon.

13. The molded article conveyance device (330) of claim 1, wherein:

the director (332) is a reverser that is associated with the conveyor (131) and wherein the reverser is operable to selectively reverse a direction of conveyance of the conveyor (131) to direct the selected shot of molded articles towards the sample device (334) that is positioned at an upstream end thereof.

14. The molded article conveyance device (130, 230, 330) of claim 1, wherein:

the director (132, 232, 332) is configurable to selectively direct one of the selected shot of molded articles (140-2) or a selected portion thereof into the sample device (134, 234, 334).

15. The molded article conveyance device (130, 230, 330) of claim 14, wherein:

the selected portion of the shot of molded articles (140-2) corresponds to one of:

one or more molded articles that were molded in specified cavities in a mold (116); or

one or more molded articles that were conditioned in one or more specified holders (124) on a retrieval tool (122).

16. The molded article conveyance device (130, 230, 330) of claim 15, wherein:

the one or more specified cavities in the mold (116) may include a specified row, column, or quadrant of cavities in the mold (116).

17. The molded article conveyance device (130, 230, 330) of claim 15, wherein:

the one or more specified holders in the retrieval tool (122) may include a cooling stage therein.

18. The molded article conveyance device (330) of claim 1, further comprising:

an inspector (400) that is configured to inspect the molded articles (140-2) in the sample device (134, 234, 334).

19. The molded article conveyance device (330) of claim 18, wherein:

the inspector (400) is configured to conduct an optical inspection of the molded articles (140-2).

20. The molded article conveyance device (330) of claim 18, wherein:

the inspector (400) is configured to provide an indication of an out-of-boundary dimension to at least one of a controller (105) of the injection molding machine (100) or a plant monitoring system (109) to prompt remedial action.

21. A method of molding (200) using an injection molding machine (100) having a molded article conveyance device (130, 230, 330), comprising:

successively molding (210) shots of molded articles (140-1, 140-2, 140-3) in the injection molding machine (100) and depositing them onto a conveyor (131) of the molded article conveyance device (130, 230, 330);

conveying (220) the shots of molded articles (140-1, 140-2, 140-3) towards a downstream structure (136); and

selectively sampling (230) a selected shot of molded articles (140-2), at least in part, with selective reconfiguring of a director (132, 232, 332) to direct the selected shot of molded articles (140-2), at least in part, into a sample device (134, 234, 334).

22. The method of molding (200) of claim 21, wherein:

the director (132) is a chute that is hinged near to a downstream end of the conveyor (131), and wherein the selective configuring thereof includes a repositioning thereof to direct the shot of molded articles to either the downstream device (136) or the sample device (134).

23. The method of molding (200) of claim 21, wherein the molded article conveyance device (130) further includes a detector (141) and a controller (105), and wherein the method (200) further comprises:

operating the detector (141) to detect separation between adjacent shots of molded articles on the conveyor (131); and

controlling the director (132) with the controller (105), wherein information received from the detector (141) is used to time the reconfiguration of the director (132) to selectively direct the selected shot of molded articles (140-2) into the sample device (134) and thereafter once again configure the director (132) to direct the following shots of molded articles along the normal production path towards a downstream structure (136).

24. The method of molding (200) of claim 21, wherein the molded article conveyance device (130) further includes a barrier (146) that is selectively positionable to block conveyance of a following shot molded articles (140-3) on the conveyor (131) that follow the selected shot of molded articles (140-2) being sampled, and wherein the method (200) further comprises:

controlling the barrier (146) with the controller (105) to selectively position the barrier (146) into a detected gap between the selected shot of molded articles (140-2) and the following shot of molded articles (140-3).

25. The method of molding (200) of claim 24, wherein the barrier (146) further includes an air blowing device (148), and wherein the method (200) further comprises:

controlling the air blowing device (148) with the controller (105) to selectively blow air upstream on the face of the conveyor (131) to slow or stop the following shot of molded articles (140-3) from moving down the conveyor (131).

26. The method of molding (200) of claim 21, wherein the director (232) is an actuator that is configured to selectively position the sample device (334), and wherein the operation of selectively sampling (230) includes positioning the sample device (334) between the conveyor (131) and a treatment device (112) of the injection molding machine (100) for receiving the selected shot of molded articles (140-2) directly therefrom prior to the deposition thereof onto the conveyor (131).

27. The method of molding (200) of claim 21, wherein the operation of selectively sampling (230) further includes controlling a speed profile of the conveyor (131) during sampling to increase a gap between adjacent shots of molded articles thereon.

28. The method of molding (200) of claim 21, wherein the director (332) is a reverser that is associated with the conveyor (131), and wherein the operation of selectively sampling (230) includes controlling operation of the reverser to temporarily reverse a direction of conveyance of the conveyor (131) to direct the selected shot of molded articles towards the sample device (334) that is positioned at an upstream end thereof.

29. The method of molding (200) of claim 21, wherein:

the selectively sampling (230) is automatically performed on a specified period.

30. The method of molding (200) of claim 21, wherein:

the director (132, 232, 332) is configurable to selectively direct one of the selected shot of molded articles (140-2) or a selected portion thereof into the sample device (134, 234, 334), and wherein the selectively sampling (230) of the selected shot of molded articles (140-2) includes selective reconfiguring of the director (132, 232, 332) to direct the selected shot of molded articles (140-2) or the selected portion thereof into the sample device (134, 234, 334).

31. The method of molding (200) of claim 30, wherein:

the selected portion of the shot of molded articles (140-2) corresponds to one of:

one or more molded articles that were molded in specified cavities in a mold (116); or

one or more molded articles that were conditioned in one or more specified holders (124) on a retrieval tool (122).

32. The method of molding (200) of claim 31, wherein:

the one or more specified cavities in the mold (116) may include a specified row, column, or quadrant of cavities in the mold (116).

33. The molded article conveyance device (130, 230, 330) of claim 31, wherein:

the one or more specified holders in the retrieval tool (122) may include a cooling stage therein.

34. The method of molding (200) of claim 21, further comprising:

inspecting the molded articles (140-2) in the sample device (134, 234, 334) with an inspector (400).

35. The method of molding (200) of claim 34, further comprising:

the inspector (400) providing an indication of an out-of-boundary dimension to at least one of a controller (105) of the injection molding machine (100) or a plant monitoring system (109) to prompt remedial action.

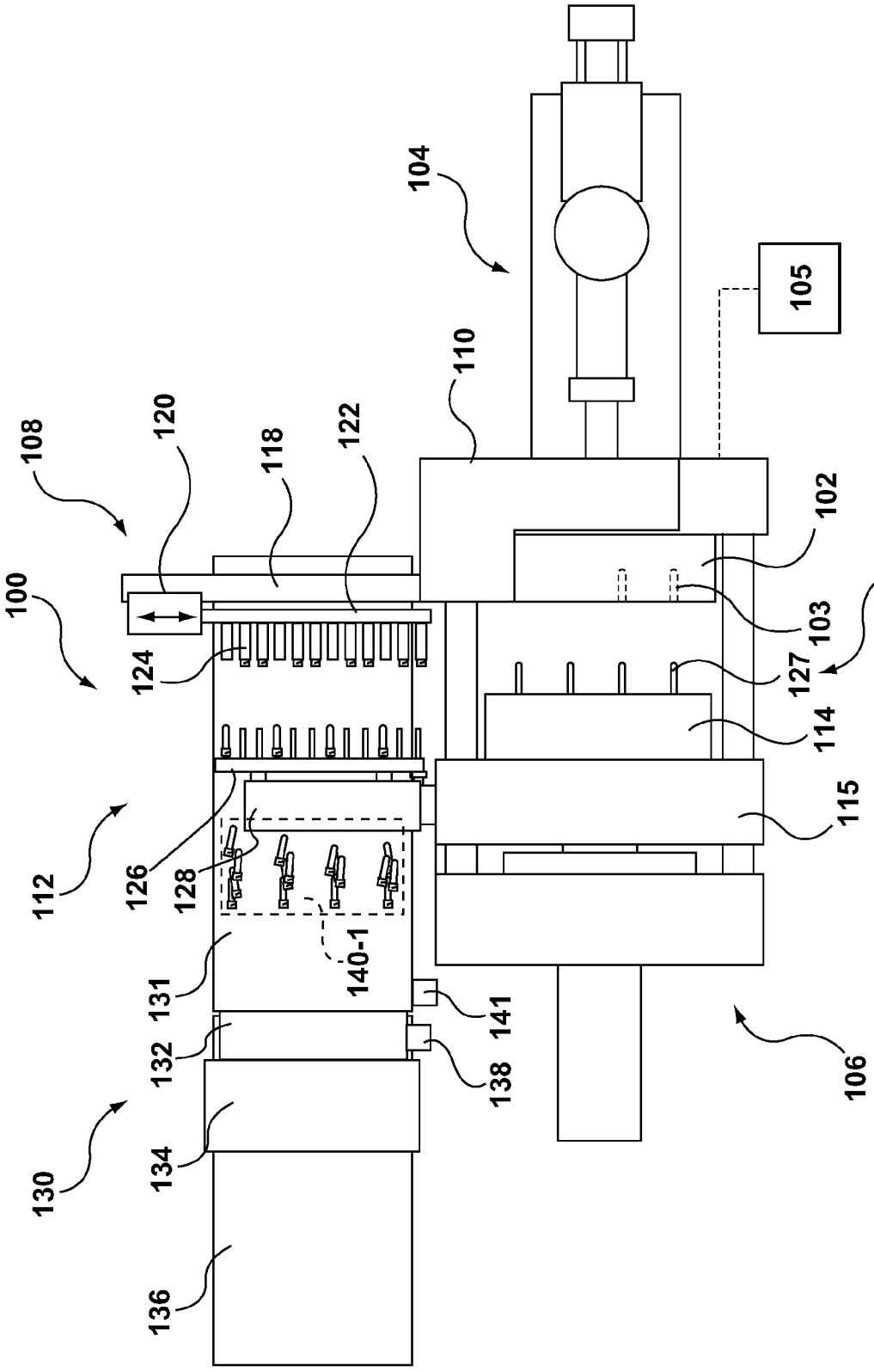
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FIG. 1

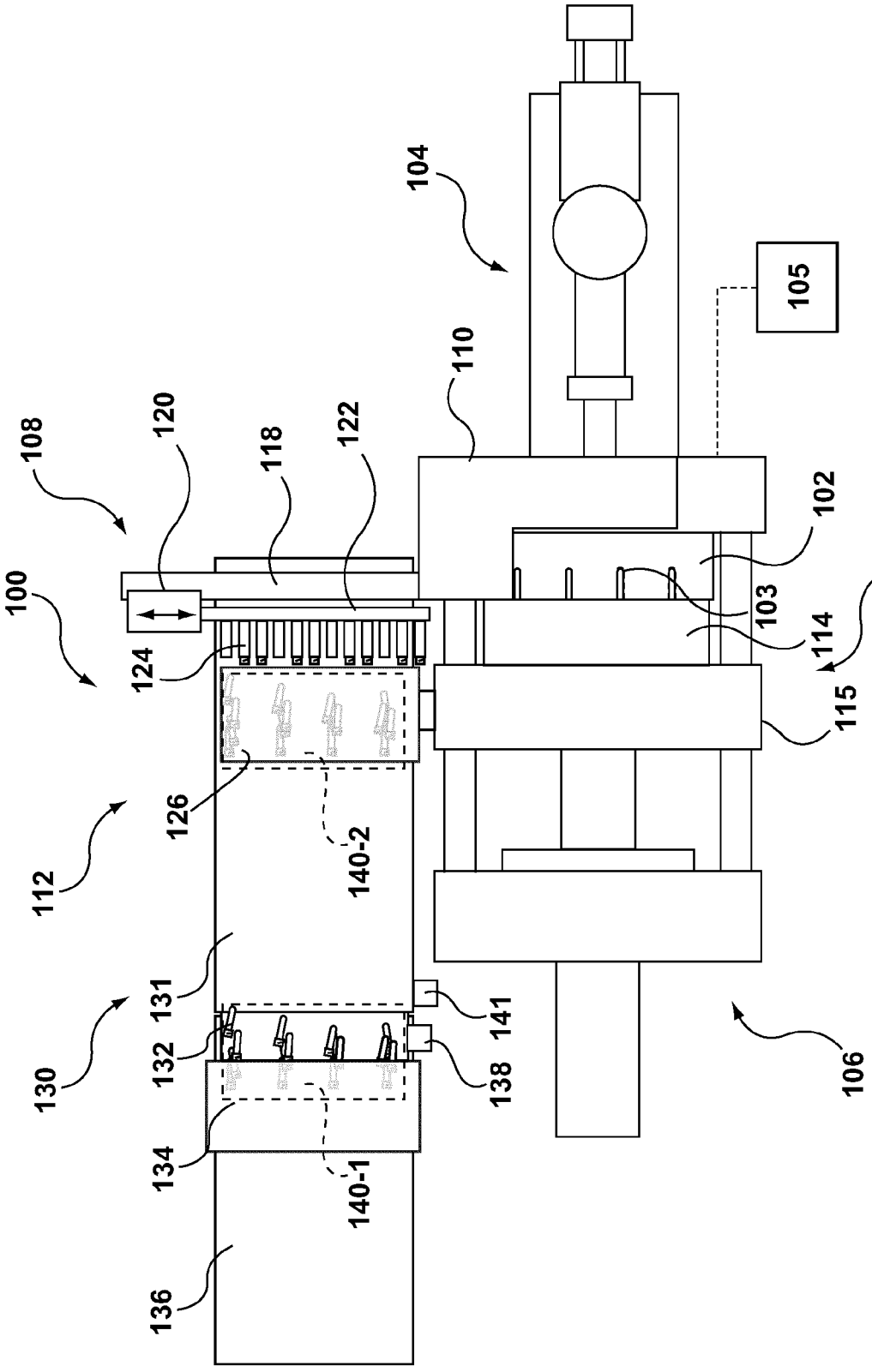
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FIG. 2

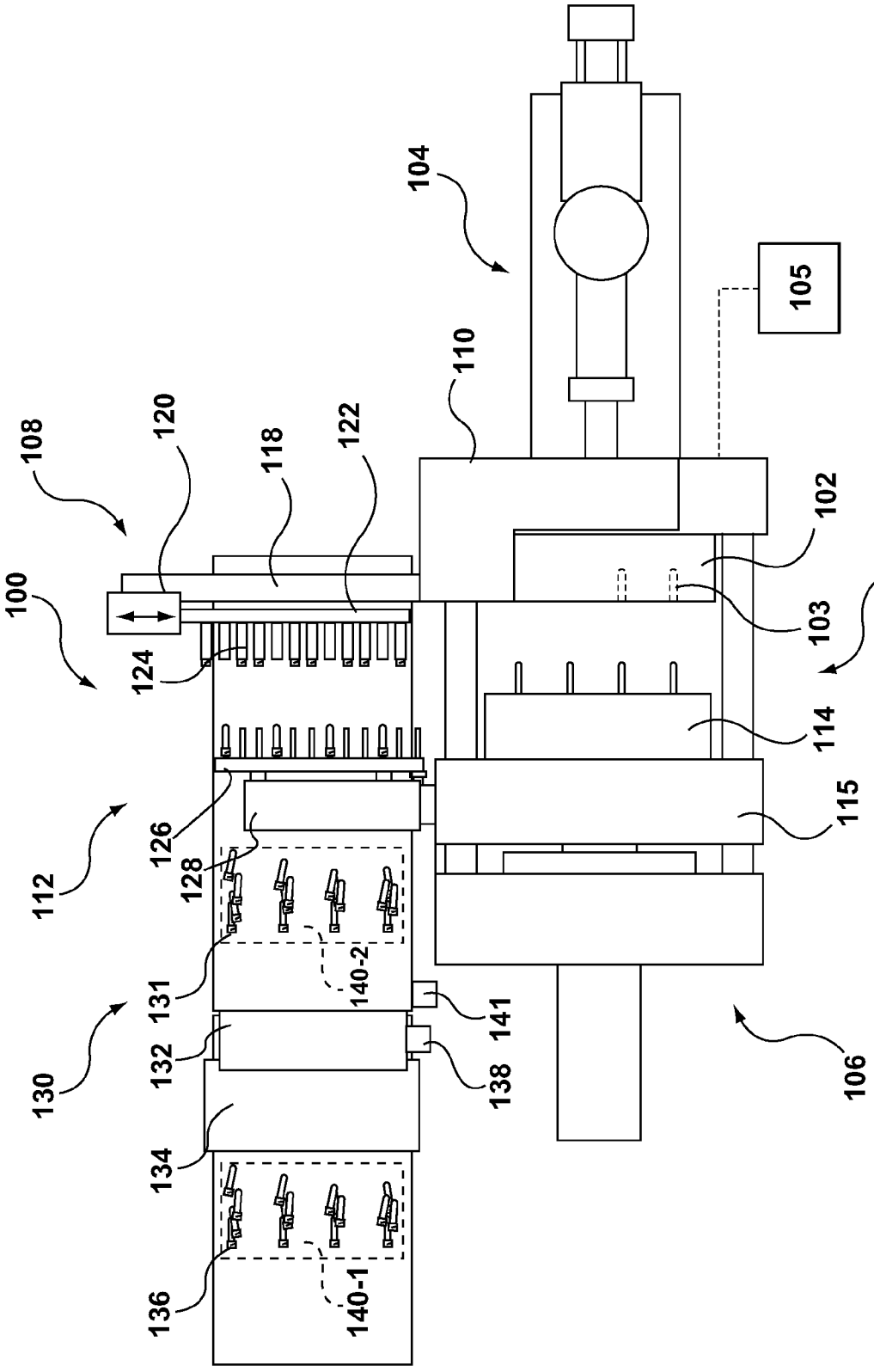
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FIG. 3

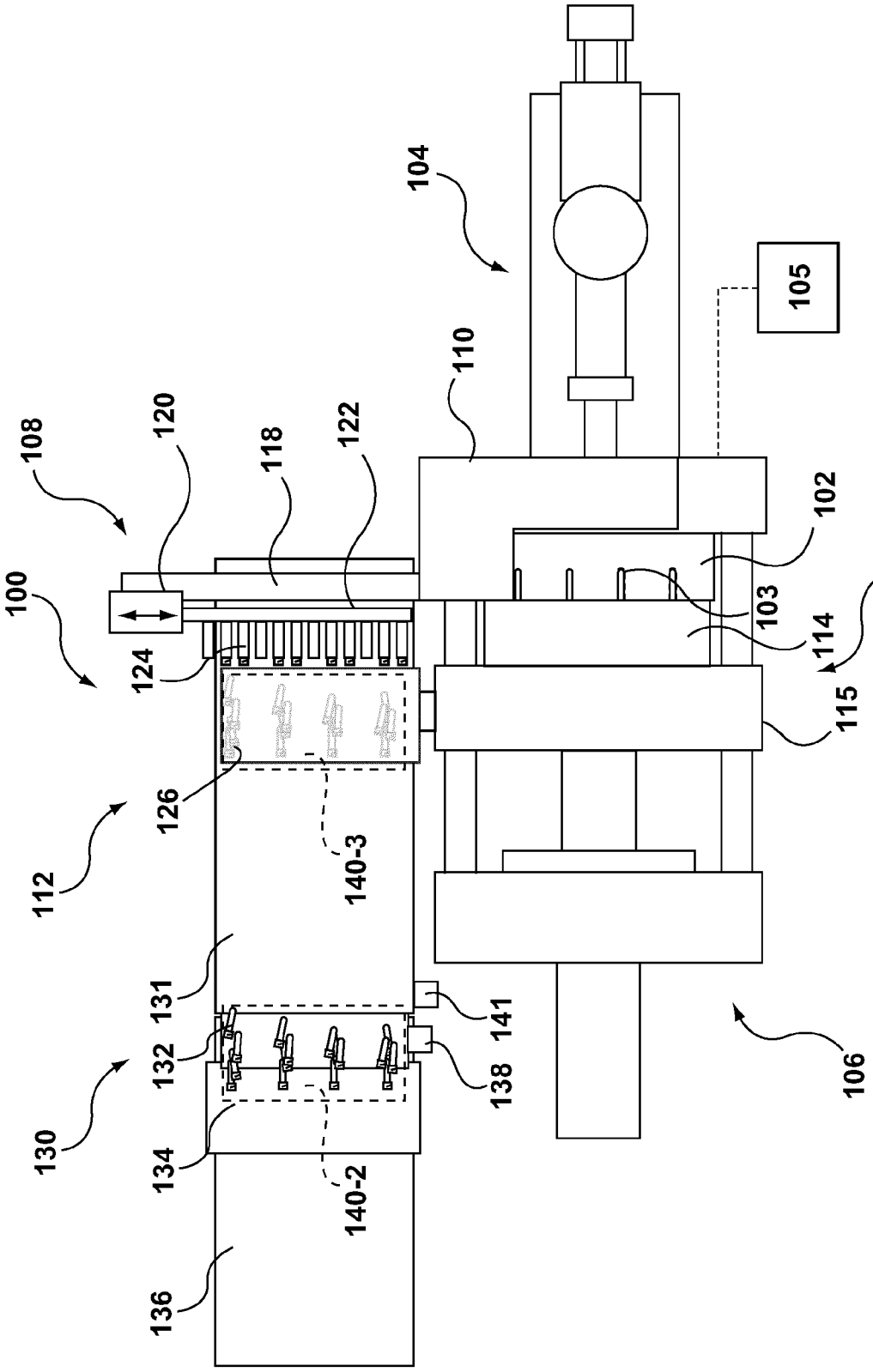
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FIG. 4

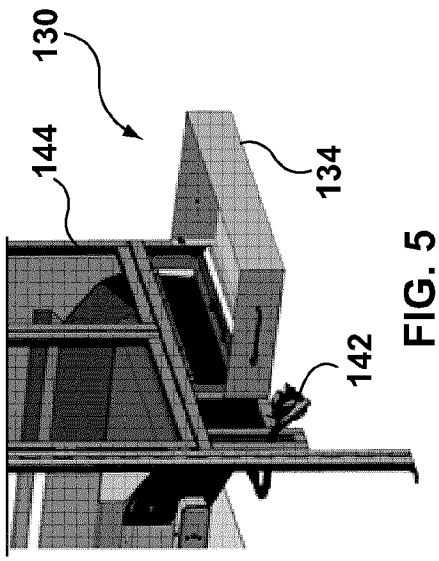

FIG. 5

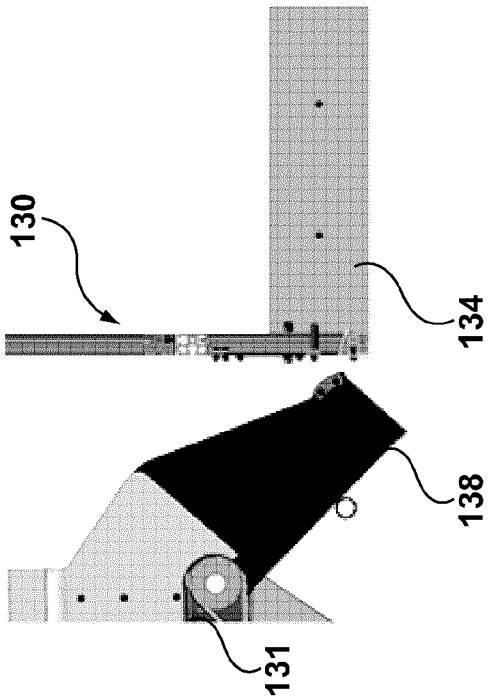

FIG. 6

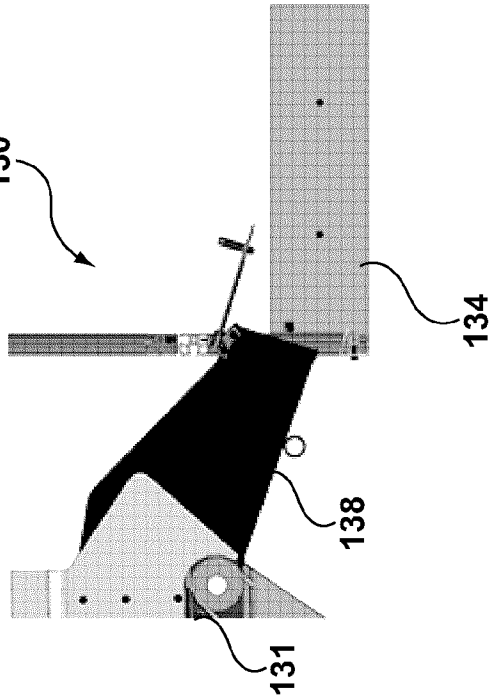

FIG. 7

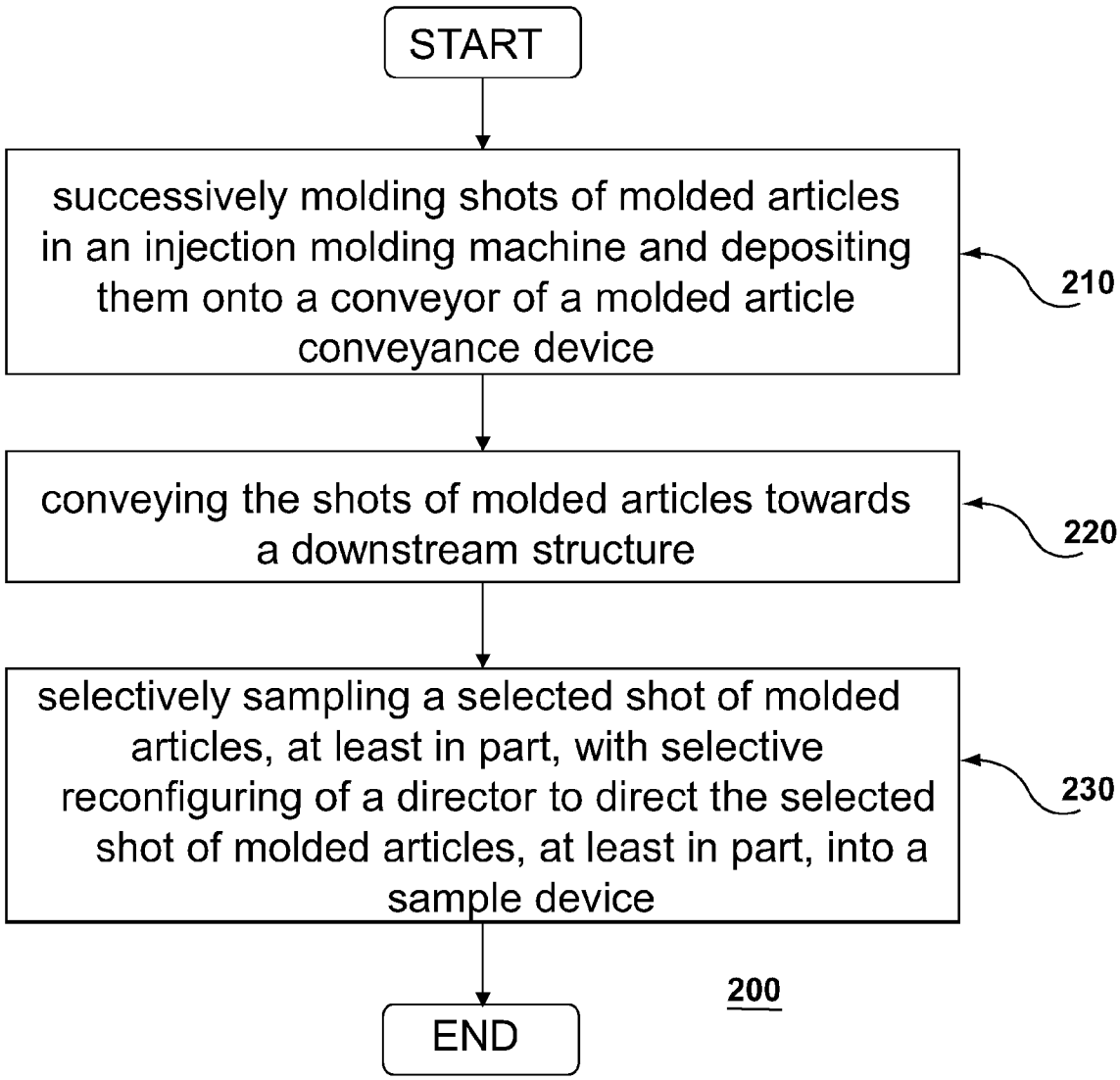
START
successively molding shots of molded articles in an injection molding machine and depositing them onto a conveyor of a molded article conveyance device
210
conveying the shots of molded articles towards a downstream structure
220
selectively sampling a selected shot of molded articles, at least in part, with selective reconfiguring of a director to direct the selected shot of molded articles, at least in part, into a sample device
230
200
END

FIG. 8

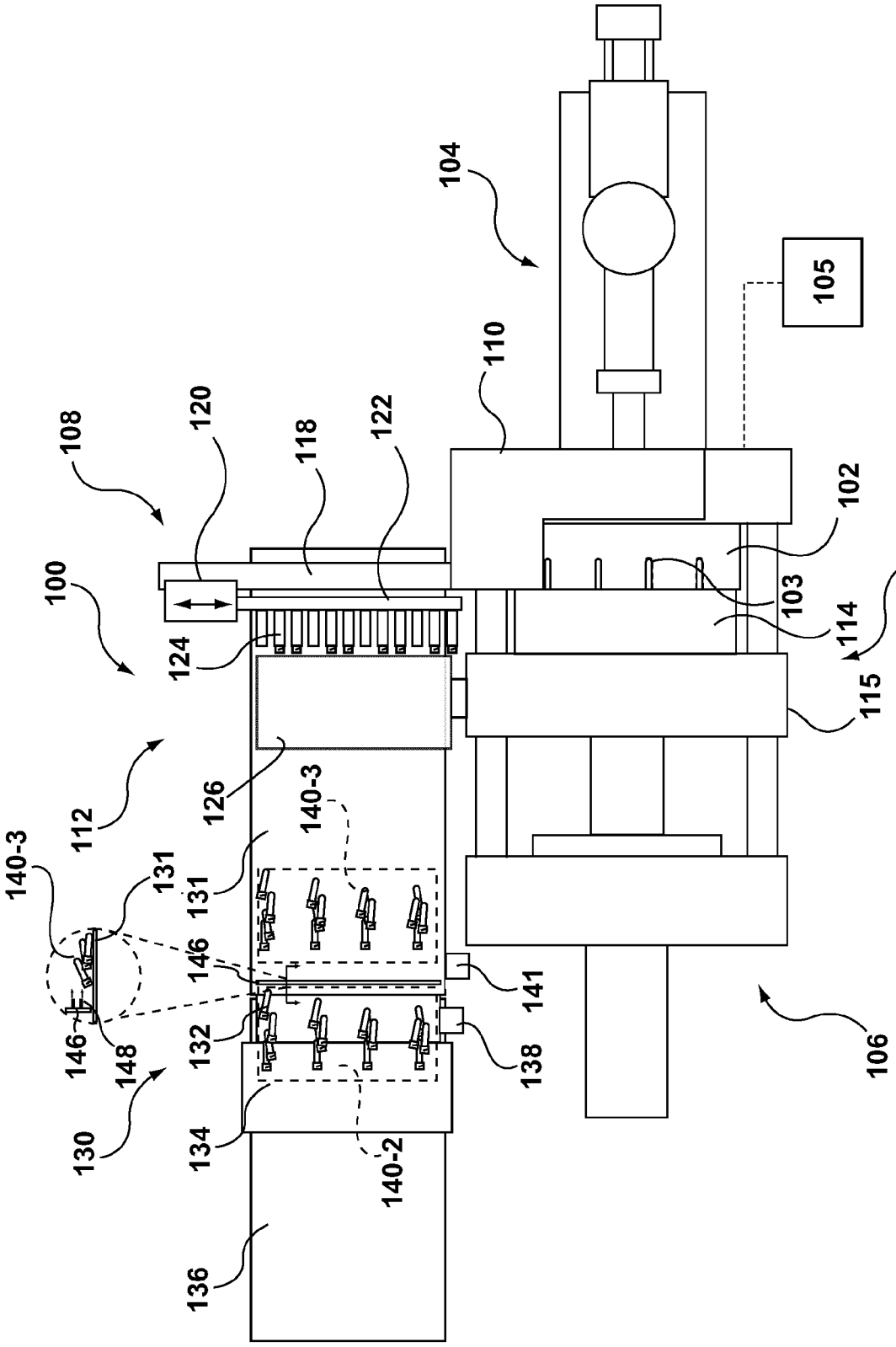
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FIG. 9

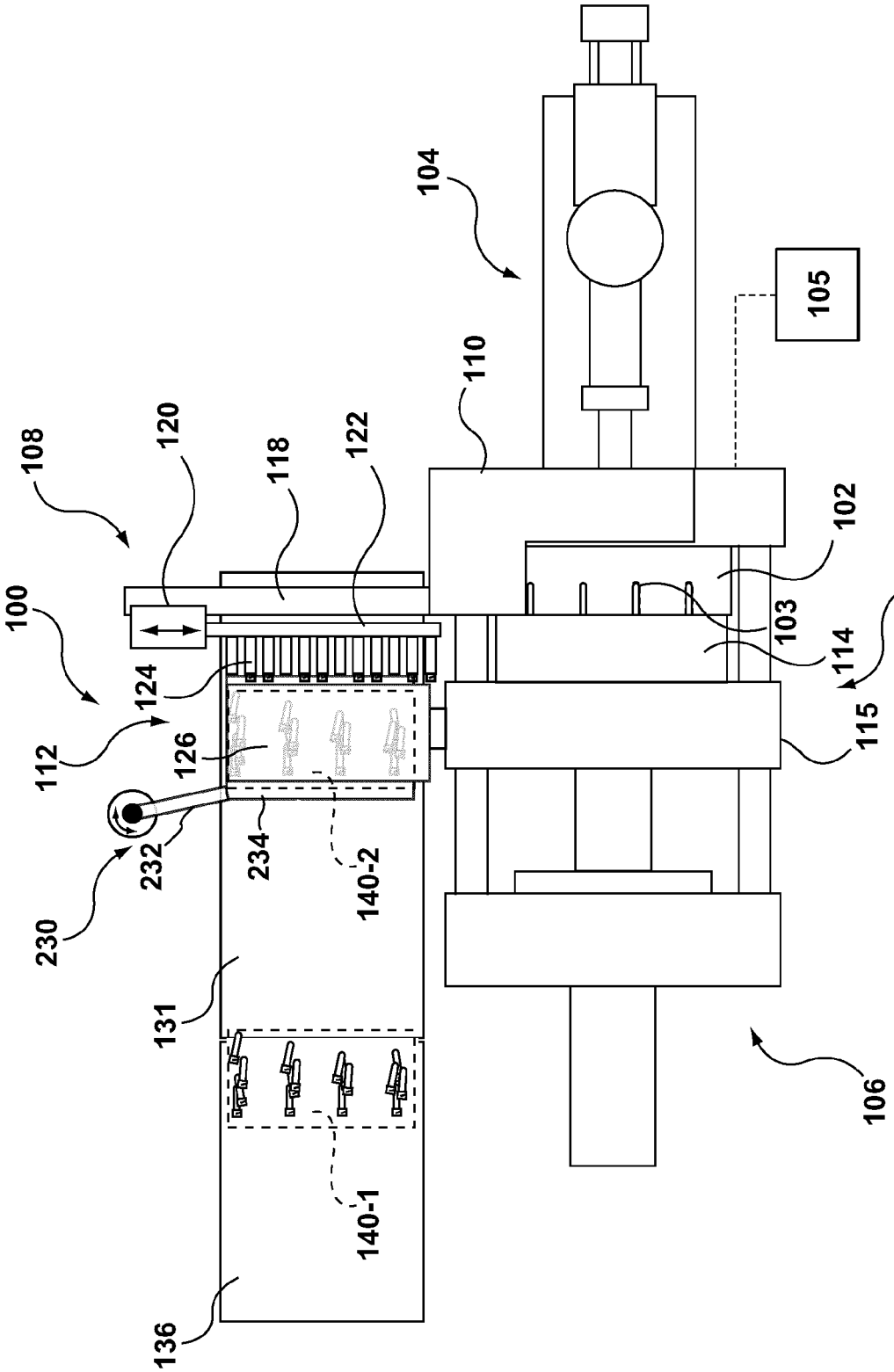
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FIG. 10

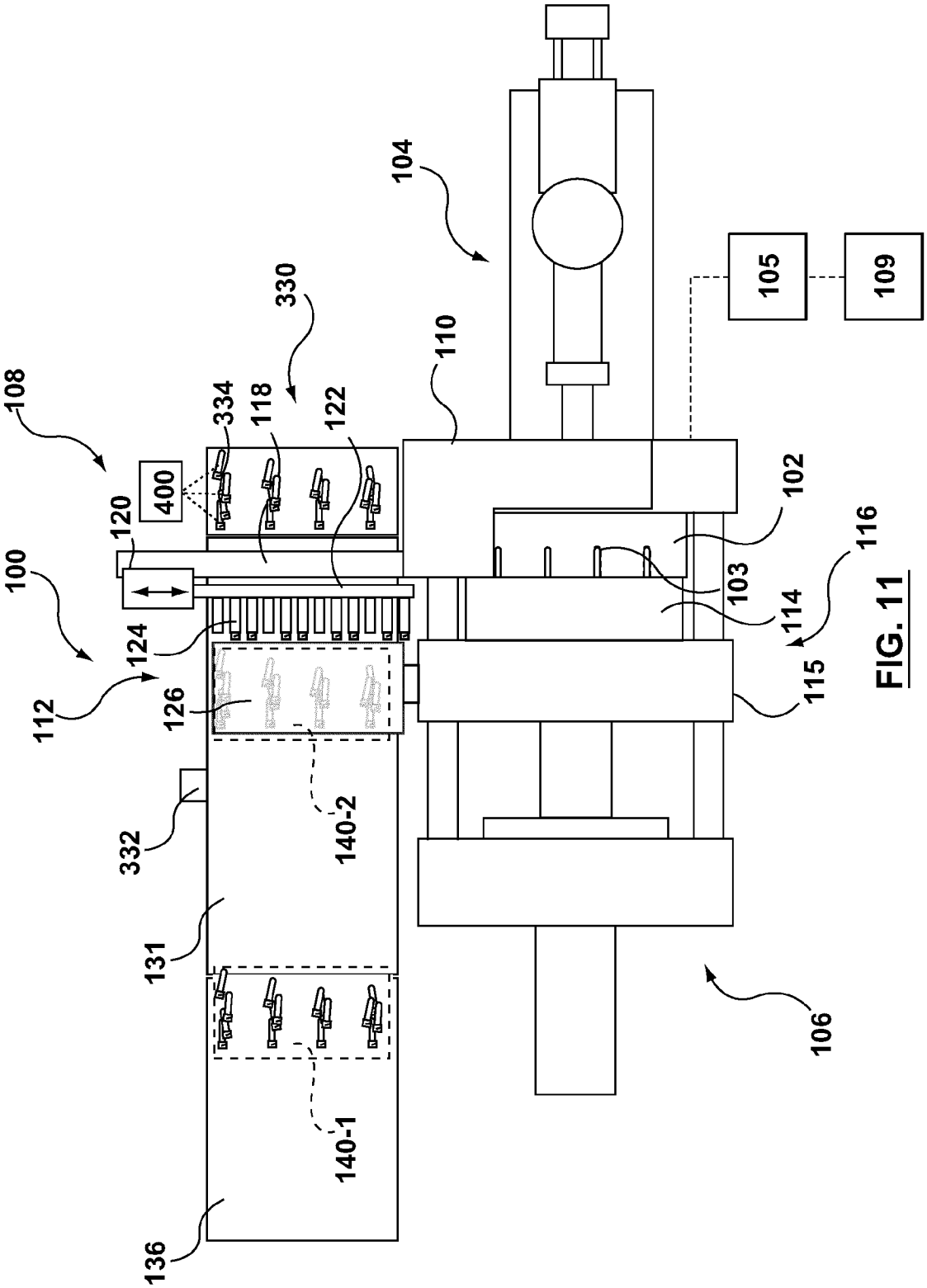
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FIG. 11

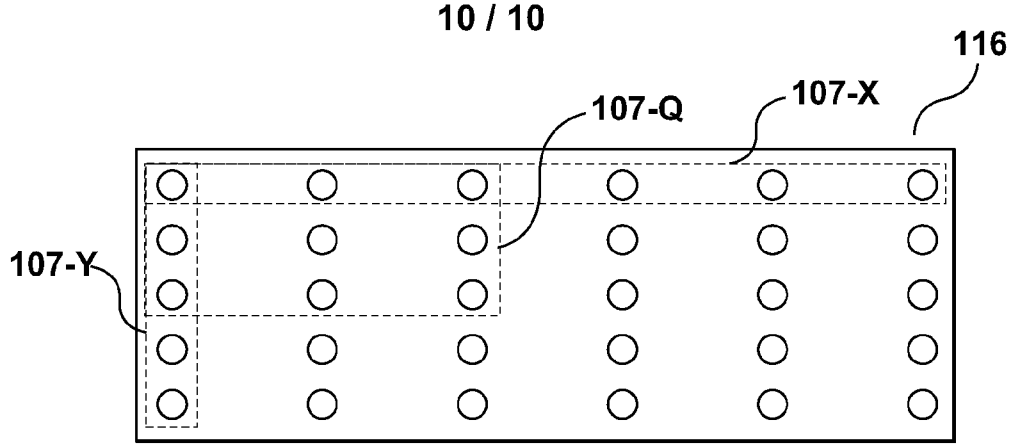

FIG. 12A

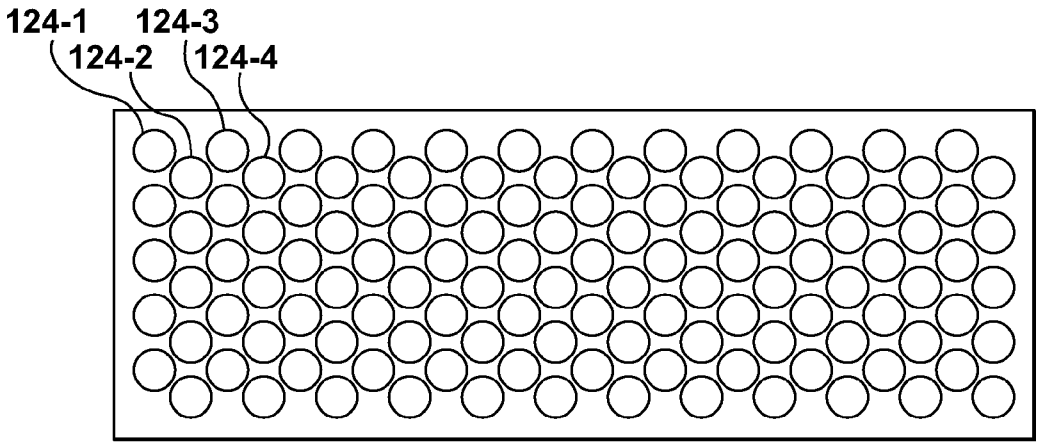

FIG. 12B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2014/050816

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***B29C 45/17*** (2006.01)

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)
IPC: ***B29C 45/**** (2006.01)

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Questel-Orbit (Fampat), CPD with key words, such as: molding, picker*, end of arm tooling, EOAT, robot, tak*-off device, conveyor, post-mold cooling, inspect* and sample*

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7250130 B2 (WEINMANN, R. et al.) 31 July 2007 (31-07-2007) * figs. 1, 2a-2c and 8; col. 3, lines 4-16 and col. 8, lines 3-22, col. 2, line 45-53*	1-35
A	US 6171541 B1 (NETER, W. et al.) 9 January 2001 (09-01-2001) *whole document*	1-35
A	US 2005/0093207 A1 (SIMONE, J. D. et al.) 5 May 2005 (05-05-2005) *whole document*	1-35

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

☑ See patent family annex.

* 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 3 November 2014 (03-11-2014)	Date of mailing of the international search report 27 November 2014 (27-11-2014)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Authorized officer Pengfei Zhang (819) 953-0654

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2014/050816

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
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		AU2003201599A1	09 September 2003 (09-09-2003)
		CN1635945A	06 July 2005 (06-07-2005)
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		EP1476293A1	17 November 2004 (17-11-2004)
		EP1476293B1	23 March 2011 (23-03-2011)
		WO03070448A1	28 August 2003 (28-08-2003)
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		AT226135T	15 November 2002 (15-11-2002)
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		AU746598C	08 May 2003 (08-05-2003)
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		EP0947304B2	07 December 2011 (07-12-2011)
		EP1260339A2	27 November 2002 (27-11-2002)
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		HK1036031A1	16 June 2006 (16-06-2006)
		HK1052156A1	09 February 2007 (09-02-2007)
		IL138727D0	31 October 2001 (31-10-2001)
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		JP3665568B2	29 June 2005 (29-06-2005)
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		JP4358715B2	04 November 2009 (04-11-2009)
		JP2004515392A	27 May 2004 (27-05-2004)
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		WO0249820A2	27 June 2002 (27-06-2002)
		WO0249820A3	31 October 2002 (31-10-2002)
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