US007449139B2

(12) **United States Patent**
Kestle

(10) **Patent No.: US 7,449,139 B2**

(45) **Date of Patent: Nov. 11, 2008**

(54) **MOLDING-SYSTEM PLATEN ACTUATOR**

(75) Inventor: **Martin Richard Kestle**, Everett (CA)

(73) Assignee: **Husky Injection Molding Systems Ltd.**, Bolton, On (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 201 days.

(21) Appl. No.: **11/438,994**

(22) Filed: **May 23, 2006**

(65) **Prior Publication Data**

US 2007/0273059 A1 Nov. 29, 2007

(51) **Int. Cl.**
B29C 45/68 (2006.01)
B22D 17/26 (2006.01)

(52) **U.S. Cl.** **264/334**; 164/137; 164/343; 425/441; 425/451.7; 425/589

(58) **Field of Classification Search** 264/299, 264/319, 328.1, 334; 425/589, 441, 450.1, 425/451.7; 164/137, 342, 343
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,191,235 A * 6/1965 Rougement 425/451.7
3,704,973 A * 12/1972 Renfrew et al. 425/451.7
5,261,810 A * 11/1993 Kamp et al. 425/451.9
5,336,462 A 8/1994 Wohlrab
5,345,766 A * 9/1994 Leonhartsberger et al. 60/545
5,753,153 A 5/1998 Choi
5,922,372 A 7/1999 Schad
6,093,361 A 7/2000 Schad
6,179,607 B1 1/2001 Inaba et al.
6,186,770 B1 2/2001 Ziv-Av
6,200,123 B1 3/2001 Mailliet et al.
6,210,144 B1 4/2001 Mailliet et al.
6,250,905 B1 6/2001 Mailliet et al.
6,439,875 B1 * 8/2002 Morita et al. 425/595
6,719,553 B1 4/2004 Hehl
6,821,463 B2 11/2004 Di Dio et al.
6,835,061 B1 * 12/2004 Hehl 425/589
6,935,111 B2 * 8/2005 Dantlgraber 60/565
6,971,237 B2 * 12/2005 Geiger 60/545
6,984,121 B2 1/2006 Fischbach et al.

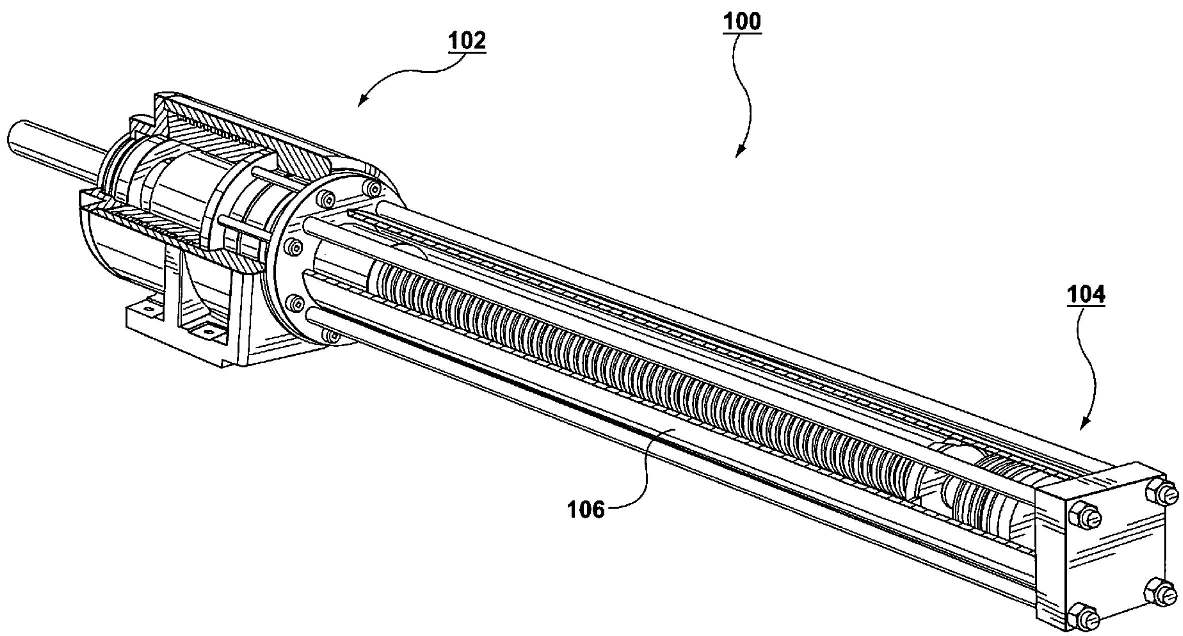
* cited by examiner

Primary Examiner—James Mackey

(57) **ABSTRACT**

Disclosed is a molding-system platen actuator, including: (a) a platen-stroke actuator including: an electrical actuator, and a guide bushing being connected with the electrical actuator; and (b) a mold-break actuator being in-line with the platen-stroke actuator, the mold-break actuator including: a hydraulic actuator having: a piston being strokable along an in-line housing, and air pressure being generatable between the piston and the guide bushing, and the air pressure being useable to push the piston backwardly.

53 Claims, 7 Drawing Sheets



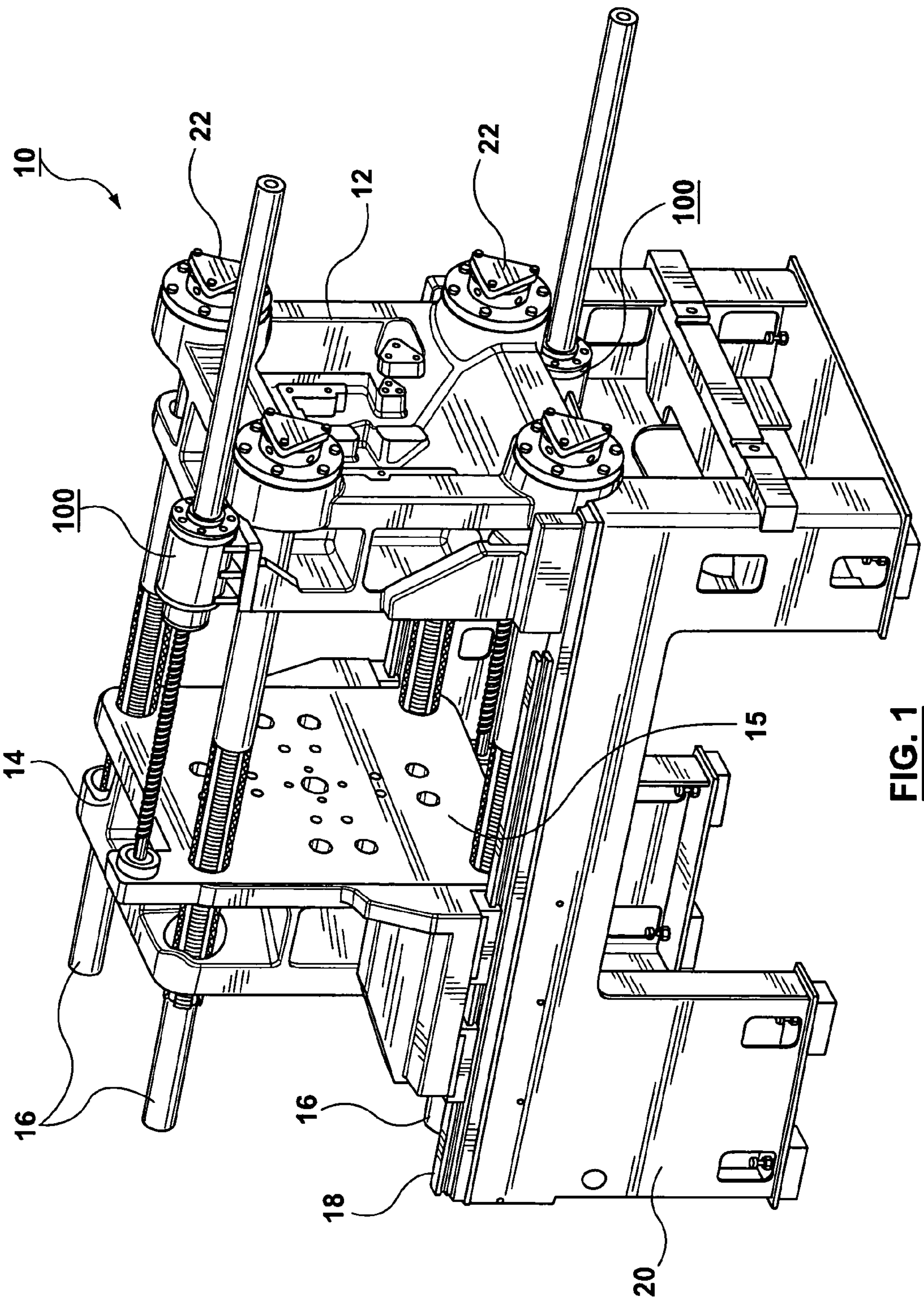


FIG. 1

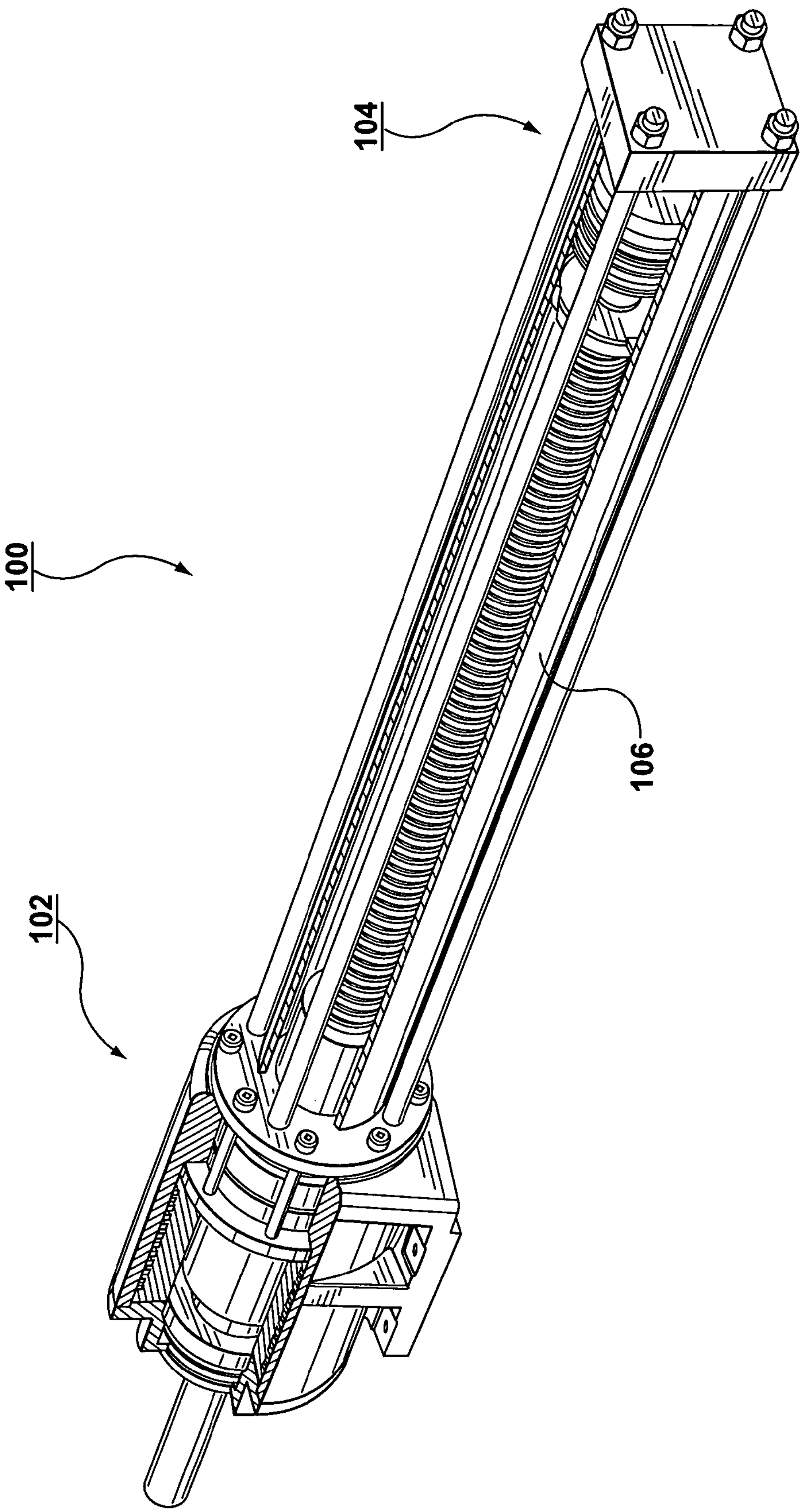


FIG. 2

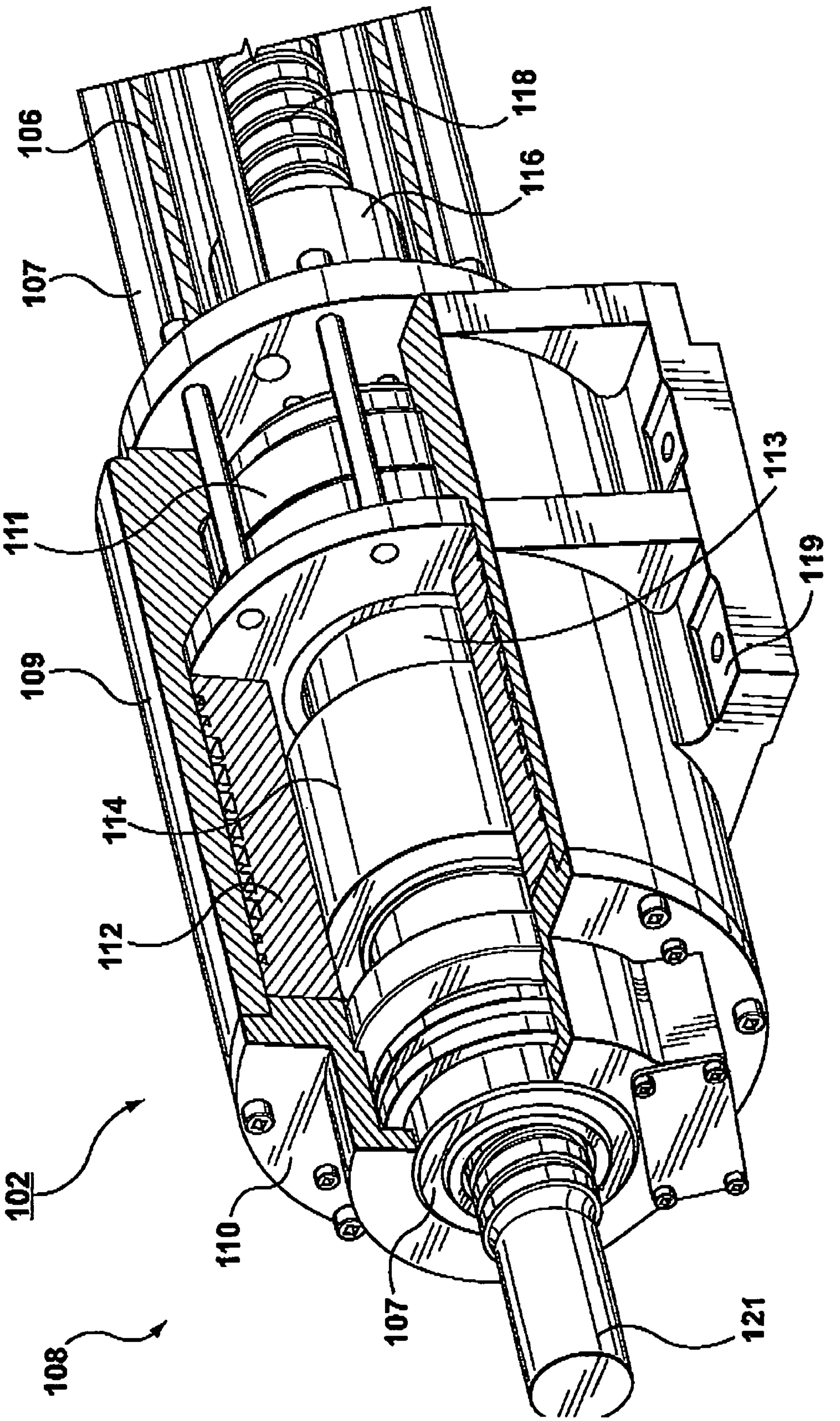


FIG. 3

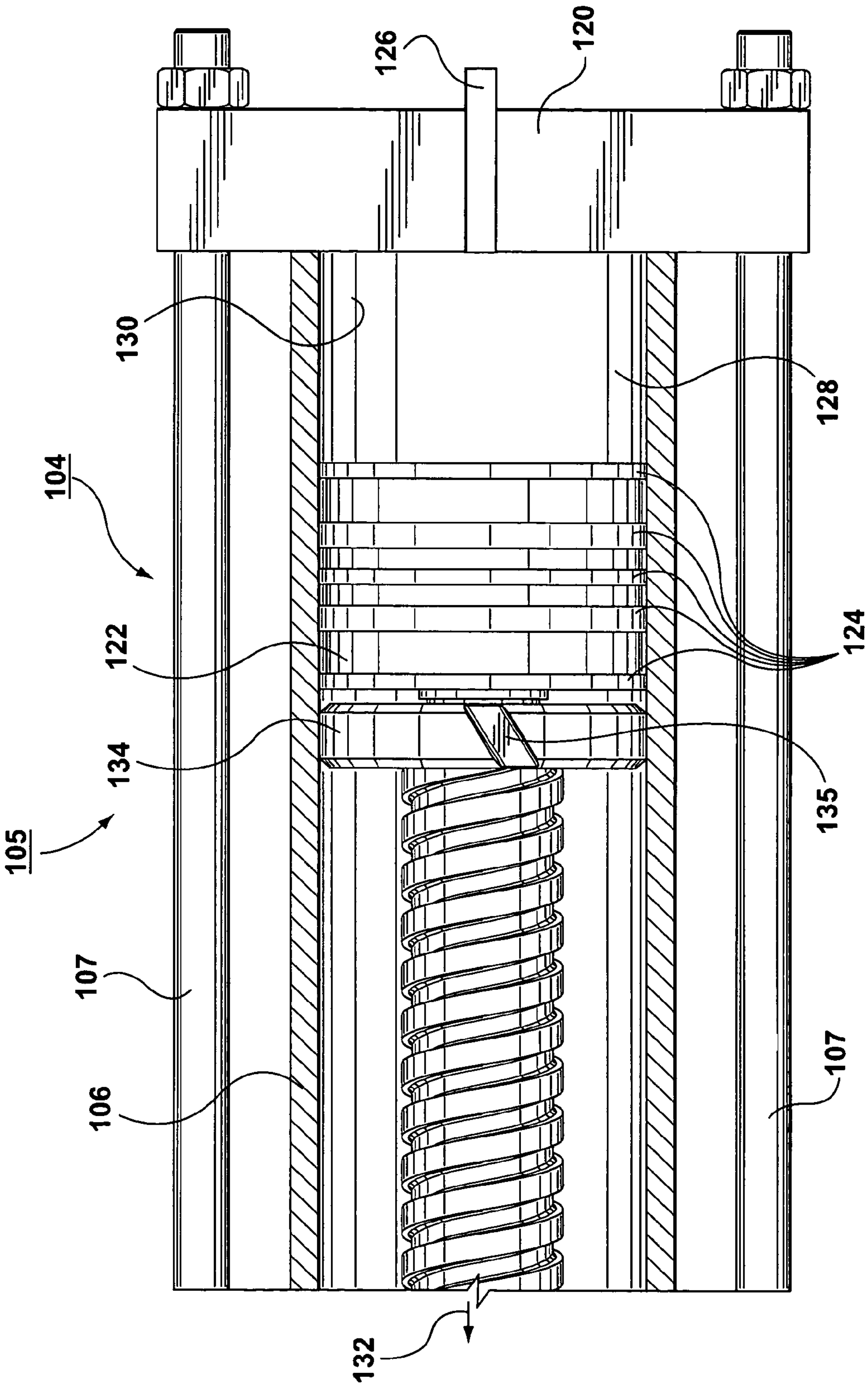


FIG. 4

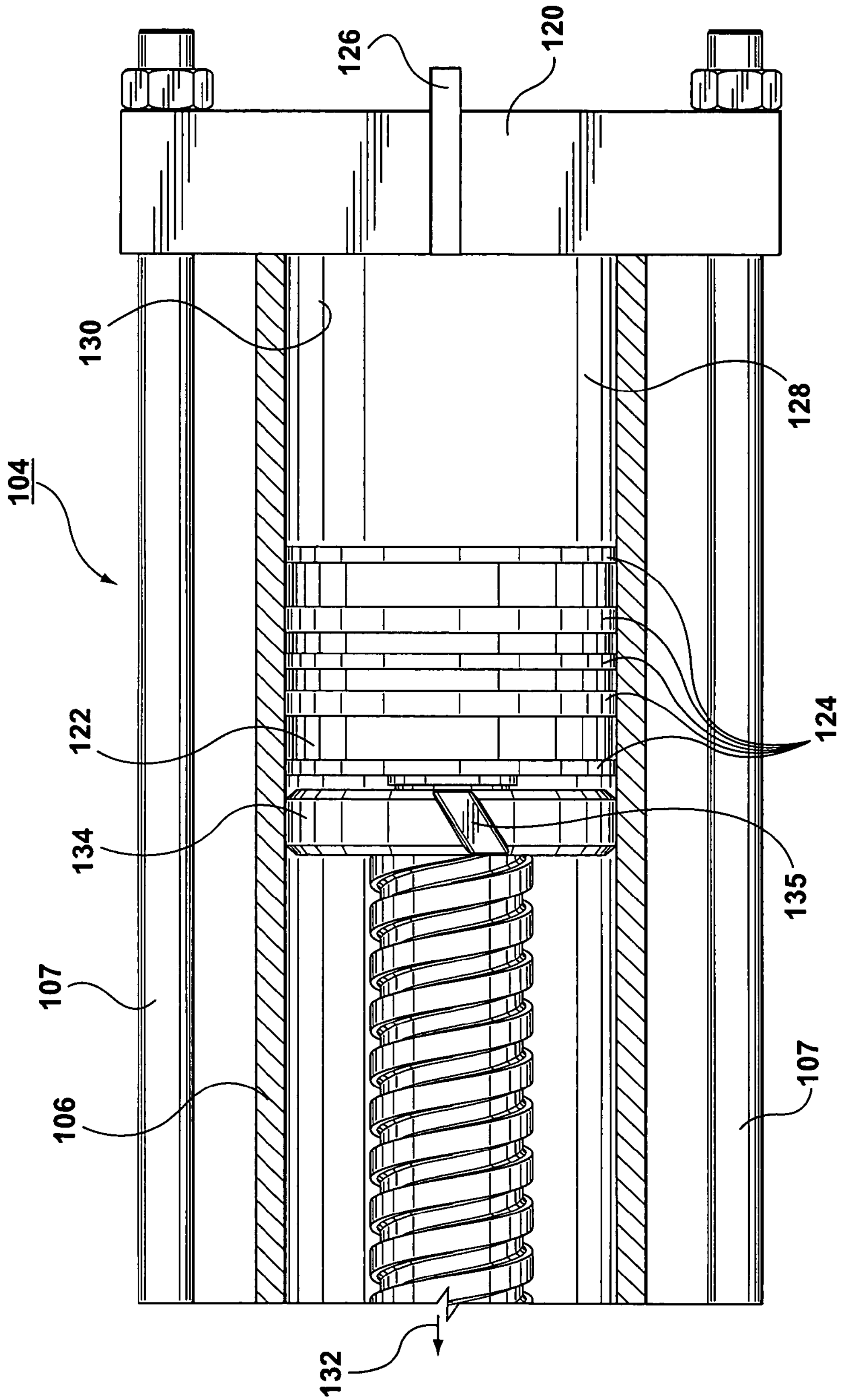


FIG. 5

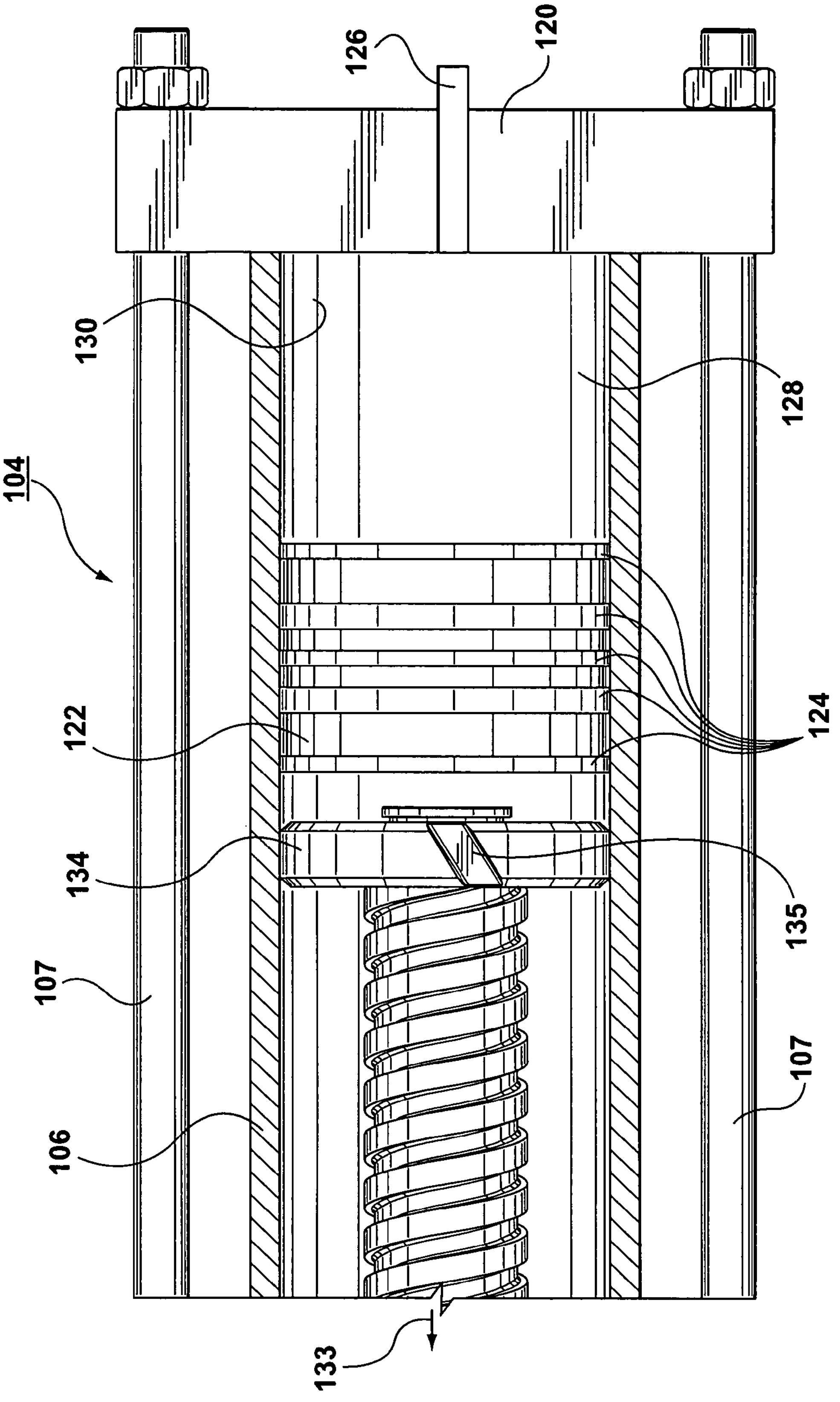


FIG. 6

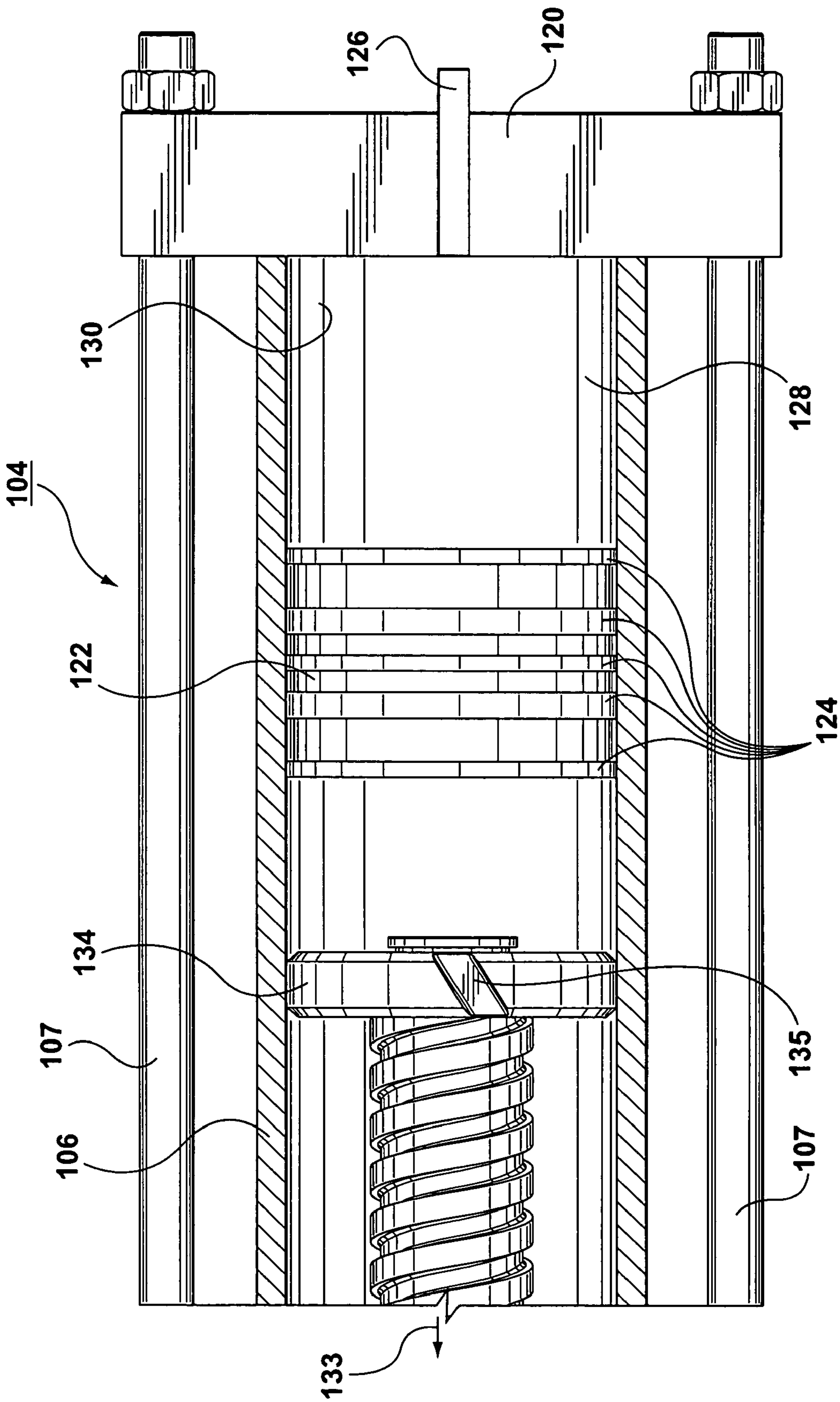


FIG. 7

MOLDING-SYSTEM PLATEN ACTUATOR

TECHNICAL FIELD

The present invention generally relates to, but is not limited to, molding systems, and more specifically the present invention relates to, but is not limited to, (i) molding-system platen actuator, (ii) a molding system having a molding-system platen actuator, and/or (iii) a method of a molding-system platen actuator, amongst other things.

BACKGROUND

U.S. Pat. No. 5,336,462 (Inventor: Wohlrab; Published: 1994 Aug. 9) discloses an injection mold that has two locking cylinders with pistons, high speed layout, and pressure transmission system, coupled hydraulically.

U.S. Pat. No. 5,753,153 (Inventor: Choi; Published: 1998 May 19) discloses a control system for clamp-up and mold-break operations of tie bar clamping mechanisms, which can determine and adjust starting position of securing/clamping mechanism and movable mould after each molding operation to achieve greater accuracy.

U.S. Pat. No. 5,922,372 (Inventor: Schad; Published: 1999 Jul. 13) discloses a molding-machine platen clamping system that includes columns fixed to a moving platen with teeth engaged by a hydraulic clamping system. This patent was reissued on 3 Sep. 2002 as patent USRE37827.

U.S. Pat. No. 6,179,607 (Inventor: Inaba et al; Published: 2001 Jan. 30) discloses a two-platen type mold damper that includes rotating ball nuts moving relative to platen which reciprocates relative to fixed platen.

U.S. Pat. No. 6,200,123 (Inventor: Mailliet et al; Published: 2001 Mar. 13) discloses a hydraulic-closure unit in a pressure injection molding machine. The unit combines double-acting annular cylinder with breech-action locking which allows relative sliding of pressure rod and turns to engage inner and outer threads, taking up play and arriving at force transmission position.

U.S. Pat. No. 6,186,770 (Inventor: Ziv-Av; Published: 2001 Feb. 13) discloses a clamping assembly for an injection-molding machine, and the clamping assembly includes a pair of tie bars with threads which engage with threaded bushings in platens by relative rotation of tie bar and platens generated by an actuation system.

U.S. Pat. No. 6,210,144 (Inventor: Mailliet et al: Published: 2001 Apr. 3) discloses a closure unit for injection-molding machines, which allows free sliding of a moving platen. The closure unit includes double-acting hydraulic cylinders on a fixed platen which act through locking bushes onto tie rods with interrupted threads which are engaged whilst taking up backlash by turning.

U.S. Pat. No. 6,250,905 (Inventor: Mailliet et al; Published: 2001 Jun. 26) discloses an injection-molding machine closure unit that has locking bushes on tie bars between fixed and moving platens, and the locking bushes engage with threads on bars to absorb backlash and to transmit a closure force from double-acting hydraulic cylinders.

U.S. Pat. No. 6,719,553 (Inventor: Hehl; Published: 2004 Apr. 13) discloses a slide-bar or C-frame pressure injection molding machine.

U.S. Pat. No. 6,821,463 (Inventor: Di Dio et al; Published: 2004 Nov. 23) discloses clamping of molds in an injection molding press by supporting tie-rods sliding with respect to platens, providing locking bush for the tie-rod, moving platen, and inter engaging screw threaded portions of tie-rods and locking bushes.

U.S. Pat. No. 6,984,121 (Inventor: Fischbach et al; Published: 2006 Jan. 10) discloses a mold-clamping plate for an injection-molding machine consists of central plate with sleeves at its corners which surround bores for spindles of spindle drive, sleeves being only partially connected to plate.

SUMMARY

According to a first aspect of the present invention, there is provided a molding-system platen actuator, including: (a) a platen-stroke actuator including: an electrical actuator, and a guide bushing being connected with the electrical actuator; and (b) a mold-break actuator being in-line with the platen-stroke actuator, the mold-break actuator including: a hydraulic actuator having; a piston being strokable along an in-line housing, and air pressure being generatable between the piston and the guide bushing, and the air pressure being useable to push the piston backwardly.

According to a second aspect of the present invention, there is provided a molding-system platen actuator, including: (a) a platen-stroke actuator including: an electrical actuator, and a guide bushing being connected with the electrical actuator; and (b) a mold-break actuator being in-line with the platen-stroke actuator, the mold-break actuator including: a hydraulic actuator having; a piston being strokable along an in-line housing, and air pressure being generatable between the piston and the guide bushing, and the air pressure being useable to push the piston backwardly.

According to a third aspect of the present invention, there is provided a method of molding-system platen actuator, the method including: (a) placing a mold-break actuator in-line with a platen-stroke actuator, the platen-stroke actuator including: (i) an electrical actuator, and (ii) a guide bushing being connected with the electrical actuator, and the mold-break actuator including a hydraulic actuator having a piston being strokable along an in-line housing: and (b)generating air pressure between the piston and the guide bushing, and the air pressure pushing the piston backwardly.

According to a fourth aspect of the present invention, there is provided a molded article manufactured by a molding-system platen actuator, having a platen-stroke actuator including an electrical actuator, and also having a mold-break actuator including a hydraulic actuator, the mold-break actuator being in-line with the platen-stroke actuator.

According to a fifth aspect of the present invention, there is provided a molded article manufactured by a molding system, including a molding-system platen actuator, having a platen-stroke actuator including an electrical actuator, and also including a mold-break actuator including a hydraulic actuator, the mold-break actuator being in-line with the platen-stroke actuator.

A technical effect, amongst other technical effects, of the aspects of the present invention is: (i) reduction in cost in sharp contrast to using only an electrical actuator, and (ii) improved accuracy and efficiency in sharp contrast to using only a hydraulic actuator.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the exemplary embodiments of the present invention (including alternatives and/or variations thereof) may be obtained with reference to the detailed description of the exemplary embodiments along with the following drawings, in which:

FIG. **1** is a perspective view of a molding-system platen actuator according to a first exemplary embodiment;

FIG. **2** is another perspective view of the molding-system platen actuator of FIG. **1**, in which the molding-system platen actuator has a platen-stroke actuator and also has a mold-break actuator;

FIG. **3** is a perspective view of the platen-stroke actuator of FIG. **2**; and

FIGS. **4**, **5**, **6** and **7** are side views of the mold-break actuator of FIG. **2**.

The drawings are not necessarily to scale and are sometimes 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 EXEMPLARY EMBODIMENTS

FIG. **1** is a perspective view of a molding-system platen actuator **100** (hereafter referred to as "the MSP actuator **100**") according to the first exemplary embodiment. The MSP actuator **100** is used to: (i) apply a stroke force so as to stroke platens (such as a movable platen **14** and a stationary platen **12**) of a molding system **10** (partially depicted), and (ii) apply a mold break force to the platens so as to break apart (i.e. separate) a mold (sometimes called a mold set) held between the platens after an article has been molded. The molding system **10** is used to manufacture molded articles (not depicted) such as: (i) a completed article that requires no further processing, (ii) a preform that requires further processing, and/or (iii) a completed article that is requires further processing to place it in its closed or other position. Examples of the molding system **10** are: (i) the HyPET™ System, (ii) the Quadloc™ System, (iii) the Hylectric™ System, and (iv) the Magnesium Molding System, all manufactured by Husky Injection Molding Systems Limited (Location: Bolton, Ontario, Canada; WWW-URL: www.husky.ca).

The molding system **10** includes a frame **20**. The stationary platen **12** is operatively mounted to the frame **20**. Guide rails **18** are supported by the frame **20**, and the movable platen **14** is mounted so as to be slidable along the guide rails **18** toward and away from the stationary platen **12**. Tie bars **16** extend from the stationary platen **12** toward the movable platen **14**, and the movable platen **14** is slidably engagable with the tie bars **16**. The movable platen **14** has a mold-bearing surface **15** to which a mold half (not depicted) may be removably mounted thereto. Similarly, the stationary platen **12** has a mold-bearing face (hidden in this view) to which another mold half may be fixedly mounted. A clamping actuator **22** is used to apply a clamp-up force to the mold halves (via the tie bars **16**) after the MSP actuator **100** has stroked the platens **12**, **14** so that the mold halves may become closed against each other. An injection unit (not depicted in this view) is used to inject a molding material into a cavity defined by the mold halves to form a molded article. Once the molded article is formed and solidified in the mold cavity, the MSP actuator **100** is used to: (i) apply a mold-break force to the platens **12**, **14** so as to break open the mold halves, and then (ii) stroke the platens **12**, **14** apart after which the molded article may be removed from the mold halves. Then, the mold may be closed for the next cycle of the molding system.

Preferably, two MSP actuators **100** are used such as: (i) a first actuator is located above the stationary platen **12**, and (ii) a second actuator is located below the stationary platen **12** (at opposite corners of the platens) so as to: (i) improve stoke movement of the platens **12**, **14** and (ii) maintain the mold-bearing surfaces substantially parallel while the platens **12**, **14** are stroked. It will be appreciated that one, two or more MSP actuators may be used as may be needed depending on the requirements imposed by a molding system.

FIG. **2** is another perspective view of the molding-system platen actuator **100** of FIG. **1**. The MSP actuator **100** includes: (i) a platen-stroke actuator **102** (hereafter referred to as "the PS actuator **102**"), and (ii) a mold-break actuator **104** (hereafter referred to as "the MB actuator **104**") that operates in-line with the PS actuator **102**. Preferably, the PS actuator **102** and the MB actuator **104** share an in-line housing **106** that extends between the PS actuator **102** and the MB actuator **104**. In-line means that the MB actuator **104** shares an axis of operation with the PS actuator **102**. In-line includes the concept that the MB actuator **104** and the PS actuator **102** share a common axis of operation. A technical effect, amongst other technical effects, is that the electrical actuator may be sized sufficiently large enough to stroke a platen without having to oversize the electrical actuator in order for the electrical actuator to output a (large) mold break force (because the mold break force is applicable by the hydraulic actuator).

FIG. **3** is a perspective view of the PS actuator **102** of FIG. **2**. The PS actuator **102** includes components that are arranged to actuatably impart a platen-stroking force to a platen (either to the stationary platen **12** or to the movable platen **14**). Preferably, the PS actuator **102** includes an electric motor **110** (hereafter referred to at "the electric motor **110**") that has: (i) a stator **112**, and (ii) a rotor **114**. Preferably, the electric motor **110** is a hollow-shaft electric motor. The electric motor **110** is generally known as an electrical actuator **108**. A motor housing **109** houses the stator **112** so that, in effect, the stator **112** is preferably linkable (via a connection point **121**) to the stationary platen **12**. The rotor **114** is used to actuatably rotate a ball nut **116** that is threadably engagable to a ball screw **118**, which is preferably a non-rotatable ball screw **118**. An equivalent (not depicted) to the ball screw **118** is a roller screw, and an equivalent to the ball nut **116** is planetary roller nut. The ball screw **118** is preferably linkable (vie a connection point **121**) to the movable platen **14**, and so in this manner the rotor **114** is linked to the movable platen **14**. Thrust bearings **111** maintain the rotating nut **116** in axial position when the nut **116** rotates to stroke the screw **118** (which then strokes the platen **14**). The in-line housing **106** extends from the electric motor **110**. The ball screw **118** is accommodated inside the in-line housing **106**. Supports **107** are used to support the in-line housing **106**. An end cap **107** is connected to the motor housing **109**. The ball screw **118** engages the end cap **107**. The end cap **107** includes a bearing that is used to support a hollow shaft **113**, and the hollow shaft **113** is connected to the rotor **114**.

In operation, the stator **112** and the rotor **114** are energized so that the rotor **114** rotates the ball nut **116**. Once the ball nut **116** rotates, the ball nut **116**: (i) rotatably travels along the ball screw **118** and (ii) urges the ball screw **118** to linearly stroke.

FIGS. **4**, **5**, **6** and **7** are side views of the MB actuator **104** of FIG. **2**. FIG. **4** depicts a condition in which the platens **12**, **14** have been stroked closed so that the mold halves are closed, and a molded article has been formed within the mold but the mold-break force **132** has not yet been applied to the mold. The MB actuator **104** is generally known as a hydraulic actuator **105**.

Preferably, the MB actuator **104** includes components that are arranged to actuatably impart a mold-break force **132** onto a platen (either the stationary platen **12** or the movable platen **14**) so that the mold-break force **132** may be transmitted to the mold. Preferably, a distal end of the in-line housing **106** is sealed with an end cap **120**. The supports **107** are used to: (i) maintain the end cap **120** in place; and/or (ii) improve the structural integrity of the in-line housing **106**, which is depicted as a cylinder.

A guide bushing **134** is linked or attached to the end of the ball screw **118**. The guide bushing **134** is equipped with a vent **135** that allows air to flow freely between: (i) a space defined between the piston **122** and the guide bushing **134**, and (ii) another space defined between the electric motor **110** and the guide bushing **134**. According to a variant, a one-way check valve (not depicted) is embedded in the guide bushing **134** and the vent **135** is not used, and this arrangement allows some air pressure to accumulate and act as a bumper to prevent the guide bushing **134** from striking a piston **122** with too much force.

A guide bushing **134** is linked or attached to the end of the ball screw **118**. The guide bushing **134** is equipped with a vent **135** that allows air to flow freely between: (i) a space defined between the piston **122** and the guide bushing **134**, and (ii) another space defined between the electrical motor **110** and the guide bushing **134**. According to a variant, a one-way check valve (not depicted) is embedded in the guide bushing **134** and the vent **135** is not used, and this arrangement allows some air pressure to accumulate and act as a bumper to prevent the guide bushing **134** from striking a piston **122** with too much force.

The piston **122** is slidably mountable within the in-line housing **106**, and slidable between the end cap **120** and the ball screw **118**. The piston **122** is abuttable against the distal end of the ball screw **118**. The piston **122** may be either: (i) attached to the end of the ball screw **118**, or (ii) detached from the ball screw **118**. When the mold-break force **132** is not required, the piston **122** is not used and it preferably remains positioned in the end of the in-line housing **106**.

Located at the end of the in-line housing **106** near the end cap **120** (between the piston **122** and the end cap **120**), there is a hydraulic chamber **130** (hereafter referred to as "the chamber **130**") to which a pressurized fluid **128** is receivable therein. The port **126** is used to communicate, from a valve (not depicted), pressurized hydraulic fluid **128** with the chamber **130**. The port **126** is used to allow the pressurized hydraulic fluid **128** to flow in or out of the in-line housing **106** (preferably at low pressure). Preferably, the port **126** is contained in the end cap **120**. A seal **124** is used to: (i) seal the piston **122** against the in-line housing **106** so as to prevent leakage of the hydraulic fluid, but (ii) permit the piston **122** to slide along the in-line housing **106**. Alternatively, another port (not depicted) is provided to permit the hydraulic fluid **128** to flow out of the in-line housing **106**.

FIG. **5** depicts the MB actuator **104** generating the mold-break force. When the mold-break force is **132** required, the pressurized hydraulic fluid **128** is introduced into the chamber **130** via the port **126**. Then, the pressurized hydraulic fluid **128** acts to push the piston **122** against the distal end of the ball screw **118**, and in this manner the pressurized hydraulic fluid **128** is used to apply the mold-break force **132** that is required to separate (break open) the mold halves.

FIG. **6** depicts the MB actuator **104** removing the mold-break force. Once the mold halves have been separated or broken apart, the valve connected to the port **126** is either: (i) closed so as to block flow of hydraulic fluid, or (ii) switched to a low-pressure circuit or connection (such as to a tank, or to atmospheric pressure) so that the pistons are stopped from advancing further.

A decision to stop the flow of pressurized fluid **128** to the chamber **130** may be based on: (i) a position of the mold halves, (ii) a timer indication, and/or (iii) an amount of pressure decay (of the pressurized fluid **128**) after the mold halves begin to open (in any combination or permutation thereof). As the mold halves spread apart, the ball screw **118** escapes away from the piston **122**.

When the mold halves are closed against each other, the end of the ball screw **118** pushes the piston **122** back towards the end cap **120**, exhausting the hydraulic fluid **128** in the chamber **130**. The floating piston **122** operates in the portion of the in-line housing **108** which is defined by a closed height of the mold. The floating piston **122** is self-adjusting for mold-height variation.

According to a variant, air pressure is generated between the piston **122** and the guide bushing **134**, which could be used to push the piston **122** back or reduce the impact load between the ball screw **118** and the piston **122** during closure of the mold.

According to a variant, the guide bushing **134** or the piston **122** is equipped with a bumper (not depicted) made of a flexible material or a separate spring-loaded assembly to cushion impacts.

FIG. **7** depicts the rotor **114** having urged the motor housing **109** to translate.

The description of the exemplary embodiments provides examples of the present invention, and these examples do not limit the scope of the present invention. It is understood that the scope of the present invention is limited by the claims. The concepts described above may be adapted for specific conditions and/or functions, and may be further extended to a variety of other applications that are within the scope of the present invention. Having thus described the exemplary embodiments, it will be apparent that modifications and enhancements are possible without departing from the concepts as described. Therefore, what is to be protected by way of letters patent are limited only by the scope of the following claims:

What is claimed is:

1. A molding-system platen actuator, comprising:

a platen-stroke actuator including:

an electrical actuator, and

a guide bushing being connected with the electrical actuator; and

a mold-break actuator being in-line with the platen-stroke actuator, the mold-break actuator including:

a hydraulic actuator having:

a piston being strokable along an in-line housing, and air pressure being generatable between the piston and the guide bushing, and the air pressure being useable to push the piston backwardly.

2. The molding-system platen actuator of claim **1**, wherein the platen-stroke actuator and the mold-break actuator share the in-line housing.

3. The molding-system platen actuator of claim **1**, wherein the electrical actuator is configured to be a hollow-shaft electric motor.

4. The molding-system platen actuator of claim **1**, wherein the electrical actuator includes:

a stator; and

a rotor being cooperative with the stator.

5. The molding-system platen actuator of claim **1**, wherein the electrical actuator includes:

a stator;

a rotor being cooperative with the stator;

a ball nut connected to the rotor; and

a ball screw being cooperative with the ball nut.

6. The molding-system platen actuator of claim **1**, wherein the electrical actuator includes:

a stator being connectable to a first platen;

a rotor being connectable to a second platen, and the rotor being cooperative with the stator;

a ball nut connected to the rotor; and

a ball screw being cooperative with the ball nut.

7. The molding-system platen actuator of claim **1**, wherein the electrical actuator includes:

a stator being connectable to a first platen;

a rotor being connectable to a second platen, and the rotor being cooperative with the stator;

a ball nut connected to the rotor; and

a ball screw being cooperative with the ball nut the first platen includes a stationary platen, and the second platen includes a movable platen.

8. The molding-system platen actuator of claim **1**, wherein the electrical actuator includes:

a stator;

a rotor being cooperative with the stator;

a ball nut connected to the rotor; and

a ball screw being cooperative with the ball nut, the ball nut is threadably engagable with the ball screw.

9. The molding-system platen actuator of claim **1**, wherein the platen-stroke actuator and the mold-break actuator share the in-line housing, the in-line housing extends from the platen-stroke actuator and the mold-break actuator.

10. The molding-system platen actuator of claim **1**, wherein the electrical actuator includes:

a stator;

a rotor being cooperative with the stator;

a ball nut connected to the rotor; and

a ball screw being cooperative with the ball nut, the platen-stroke actuator and the mold-break actuator share the in-line housing, and the ball screw is accommodated inside the in-line housing.

11. The molding-system platen actuator of claim **1**, wherein the electrical actuator includes:

a stator;

a rotor being cooperative with the stator;

a ball nut connected to the rotor; and

a ball screw being cooperative with the ball nut, and the ball screw is non-rotatable.

12. The molding-system platen actuator of claim **1**, wherein the platen-stroke actuator and the mold-break actuator share the in-line housing, and an end of the in-line housing is sealed with an end cap.

13. The molding-system platen actuator of claim **1**, wherein the piston is strokable along the in-line housing between an end cap and the platen-stroke actuator.

14. The molding-system platen actuator of claim **1**, wherein the piston includes a seal that seals the piston against the in-line housing.

15. The molding-system platen actuator of claim **1**, wherein:

the electrical actuator includes:

a stator;

a rotor being cooperative with the stator;

a ball nut connected to the rotor; and

a ball screw being cooperative with the ball nut; and

the piston is attached to an end of the ball screw.

16. The molding-system platen actuator of claim **1**, wherein the mold-break actuator includes:

an end cap, the piston and the end cap define a hydraulic chamber configured to accommodate a hydraulic fluid.

17. The molding-system platen actuator of claim **1**, wherein the mold-break actuator includes:

an end cap, the piston and the end cap define a hydraulic chamber being configured to accommodate a hydraulic fluid, the hydraulic chamber includes a port for communicating the hydraulic fluid.

18. The molding-system platen actuator of claim **1**, wherein the mold-break actuator includes:

an end cap, the piston and the end cap define a hydraulic chamber being configured to accommodate a hydraulic fluid,

when a mold-break force is not required to break open a mold, the piston is not used and remains in an end of the in-line housing.

19. The molding-system platen actuator of claim **1**, wherein the mold-break actuator includes:

an end cap, the piston and the end cap define a hydraulic chamber being configured to accommodate a hydraulic fluid,

when a mold-break force is required:

a pressurized hydraulic fluid is introduced into the in-line housing via a port,

the pressurized hydraulic fluid pushes the piston against the platen-stroke actuator, and the hydraulic fluid is used to apply an additional force that is required to break open a mold.

20. The molding-system platen actuator of claim **1**, wherein a mold is broken open, and the platen-stroke actuator departs from the piston.

21. The molding-system platen actuator of claim **1**, wherein when a mold is closed, the platen-stroke actuator pushes the piston back towards an end cap to exhaust a hydraulic fluid in a hydraulic chamber,

22. The molding-system platen actuator of claim **1**, wherein the piston is configured to operate in a portion of the in-line housing which is defined by a closed height of a mold.

23. The molding-system platen actuator of claim **1**, wherein the piston is adjustable for mold-height variation.

24. The molding-system platen actuator of claim **1**, wherein the guide bushing is positionable on the platen-stroke actuator.

25. The molding-system platen actuator of claim **1**, wherein:

the guide bushing includes:

a one-way check valve, the one-way check valve allows air to flow into a space defined between the piston and the guide bushing.

26. The molding-system platen actuator of claim **1**, wherein:

the electrical actuator includes:

a stator;

a rotor being cooperative with the stator;

a ball nut connected to the rotor;

a ball screw being cooperative with the ball nut, and the guide bushing is positionable on an end of the ball screw; and

the air pressure is useable to reduce an impact load between the ball screw and the piston during closure of a mold.

27. A molding system, comprising:

a molding-system platen actuator, including:

a platen-stroke actuator including:

an electrical actuator, and

a guide bushing being connected with the electrical actuator; and

a mold-break actuator being in-line with the platen-stroke actuator, the mold-break actuator including:

a hydraulic actuator having:

a piston being strokable along an in-line housing, and air pressure being generatable between the piston and the guide bushing, and the air pressure being useable to push the piston backwardly.

28. The molding system of claim **27**, wherein the platen-stroke actuator and the mold-break actuator share the in-line housing.

29. The molding system of claim **27**, wherein the electrical actuator is configured to be a hollow-shaft electric motor.

30. The molding system of claim **27**, wherein the electrical actuator includes:
- a stator; and
- a rotor being cooperative with the stator.

31. The molding system of claim **27**, wherein the electrical actuator includes:
- a stator;
- a rotor being cooperative with the stator;
- a ball nut connected to the rotor; and
- a ball screw being cooperative with the ball nut.

32. The molding system of claim **27**, wherein the electrical actuator includes:
- a stator being connectable to a first platen;
- a rotor being connectable to a second platen, and the rotor being cooperative with the stator;
- a ball nut connected to the rotor; and
- a ball screw being cooperative with the bail nut.

33. The molding system of claim **27**, wherein the electrical actuator includes:
- a stator being connectable to a first platen;
- a rotor being connectable to a second platen, and the rotor being cooperative with the stator;
- a ball nut connected to the rotor; and
- a ball screw being cooperative with the ball nut, the first platen includes a stationary platen, and the second platen includes a movable platen.

34. The molding system of claim **27**, wherein the electrical actuator includes:
- a stator;
- a rotor being cooperative with the stator;
- a ball nut connected to the rotor; and
- a ball screw being cooperative with the ball nut, the ball nut is threadably engagable the ball screw.

35. The molding system of claim **27**, wherein the platen-stroke actuator and the mold-break actuator share the in-line housing, the in-line housing extends from the platen-stroke actuator and the mold-break actuator.

36. The molding system of claim **27**, wherein the electrical actuator includes:
- a stator;
- a rotor being cooperative with the stator;
- a ball nut connected to the rotor; and
- a ball screw being cooperative with the ball nut, the platen-stroke actuator end the mold-break actuator share the in-line housing, and the ball screw is accommodated inside the in-line housing.

37. The molding system of claim **27**, wherein the electrical actuator includes:
- a stator;
- a rotor being cooperative with the stator;
- a ball nut connected to the rotor; and
- a ball screw being cooperative with the bail nut, and the ball screw is non-rotatable.

38. The molding system of claim **27**, wherein the platen-stroke actuator and the mold-break actuator share the in-line housing, and an end of the in-line housing is sealed with an end cap.

39. The molding system of claim **27**, wherein the piston is strokable between an end cap and the platen-stroke actuator.

40. The molding system of claim **27**, wherein the piston includes a seal that seals the piston against the in-line housing.

41. The molding system of claim **27**, wherein:
- the electrical actuator includes:
  - a stator;
  - a rotor being cooperative with the stator;
  - a ball nut connected to the rotor; and
  - a ball screw being cooperative with the ball nut; and
- the piston is attached to an end of the ball screw.

42. The molding system of claim **27**, wherein the mold-break actuator includes:
- an end cap, the piston and the end cap define a hydraulic chamber being configured to accommodate a hydraulic fluid.

43. The molding system of claim **27**, wherein the mold-break actuator includes:
- an end cap, the piston and the end cap define a hydraulic chamber being configured to accommodate a hydraulic fluid, the hydraulic chamber includes a port for communicating the hydraulic fluid.

44. The molding system of claim **27**, wherein the mold-break actuator includes:
- an end cap, the piston and the end cap define a hydraulic chamber being configured to accommodate a hydraulic fluid,
- when a mold-break force is not required to break open a mold, the piston is not used and remains in an end of the in-line housing.

45. The molding system of claim **27**, wherein the mold-break actuator includes:
- an end cap, the piston and the end cap define a hydraulic chamber being configured to accommodate a hydraulic fluid,
- when a mold-break force is required:
  - a pressurized hydraulic fluid is introduced into the in-line housing via a port,
  - the pressurized hydraulic fluid pushes the piston against the platen-stroke actuator, and the hydraulic fluid is used to apply an additional force that is required to break open a mold.

46. The molding system of claim **27**, wherein as a mold is broken open, and the platen-stroke actuator departs from the piston.

47. The molding system of claim **27**, wherein when a mold is closed, the platen-stroke actuator pushes the piston back towards an end cap to exhaust a hydraulic fluid in a hydraulic chamber.

48. The molding system of claim **27**, wherein the piston is configured to operate in a portion of the in-line housing which is defined by a closed height of a mold.

49. The molding system of claim **27**, wherein the piston is adjustable for mold-height variation.

50. The molding system of claim **27**, wherein the guide bushing is positionable on the platen-stroke actuator.

51. The molding system of claim **27**, wherein the guide bushing includes:
- a one-way check valve, the one-way check valve allows air to flow into a space defined between the piston and the guide bushing.

52. The molding system of claim **27**, wherein:
- the electrical actuator includes:
  - a stator;
  - a rotor being cooperative with the stator;
  - a ball nut connected to the rotor;

a ball screw being cooperative with the ball nut, and the guide bushing is positionable on an end of the ball screw; and

the air pressure is useable to reduce an impact load between the ball screw and the piston during closure of a mold.

53. A method of operating a molding-system platen actuator, the method comprising:

placing a mold-break actuator in-line with a platen-stroke actuator, the platen-stroke actuator including: (i) an electrical actuator, and (ii) a guide bushing being connected with the electrical actuator, and the mold-break actuator including a hydraulic actuator having a piston being strokable along an in-line housing; and

generating air pressure between the piston and the guide bushing, and the air pressure pushing the piston backwardly.

* * * * *