US010385523B2

(12) **United States Patent**
Bjorge et al.

(10) **Patent No.: US 10,385,523 B2**
(45) **Date of Patent: Aug. 20, 2019**

(54) **MOLDBOARD RETENTION SYSTEM FOR A MILLING MACHINE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/849,033**

(22) Filed: **Dec. 20, 2017**

(65) **Prior Publication Data**

US 2019/0186088 A1 Jun. 20, 2019

(51) **Int. Cl.**
E01C 23/08 (2006.01)
E01C 23/12 (2006.01)
E01C 23/088 (2006.01)

(52) **U.S. Cl.**
CPC ***E01C 23/088*** (2013.01); ***E01C 23/127*** (2013.01)

(58) **Field of Classification Search**
CPC E01C 23/088; E01C 23/127
See application file for complete search history.

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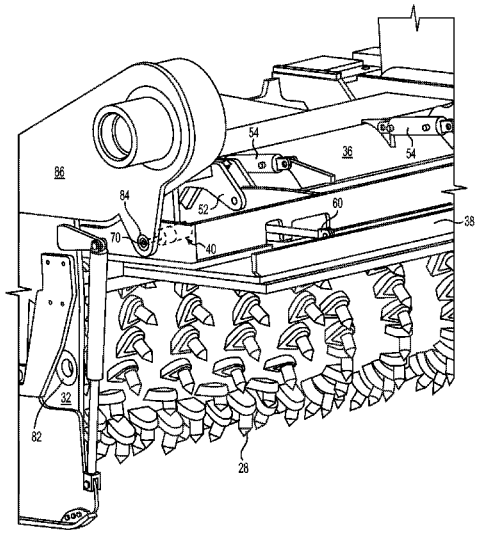
(57) **ABSTRACT**

A milling machine includes a frame, a ground-engaging rotor assembly coupled to the frame, and a rotor chamber surrounding the ground-engaging rotor assembly. The rotor chamber includes a moldboard having a top, a bottom, and two sides positioned between the top and the bottom, and the moldboard further having an open position and a closed position. The rotor chamber also includes at least one movable pin secured to the moldboard, the pin being movable by an in-line actuator between a pin extended position and a pin retracted position. Further, the rotor chamber includes a rotor chamber frame wall having an opening located to receive the pin when the pin is in the extended position and the moldboard is in the closed position, and the receiving of the pin in the rotor chamber frame wall opening secures the moldboard from movement.

19 Claims, 7 Drawing Sheets



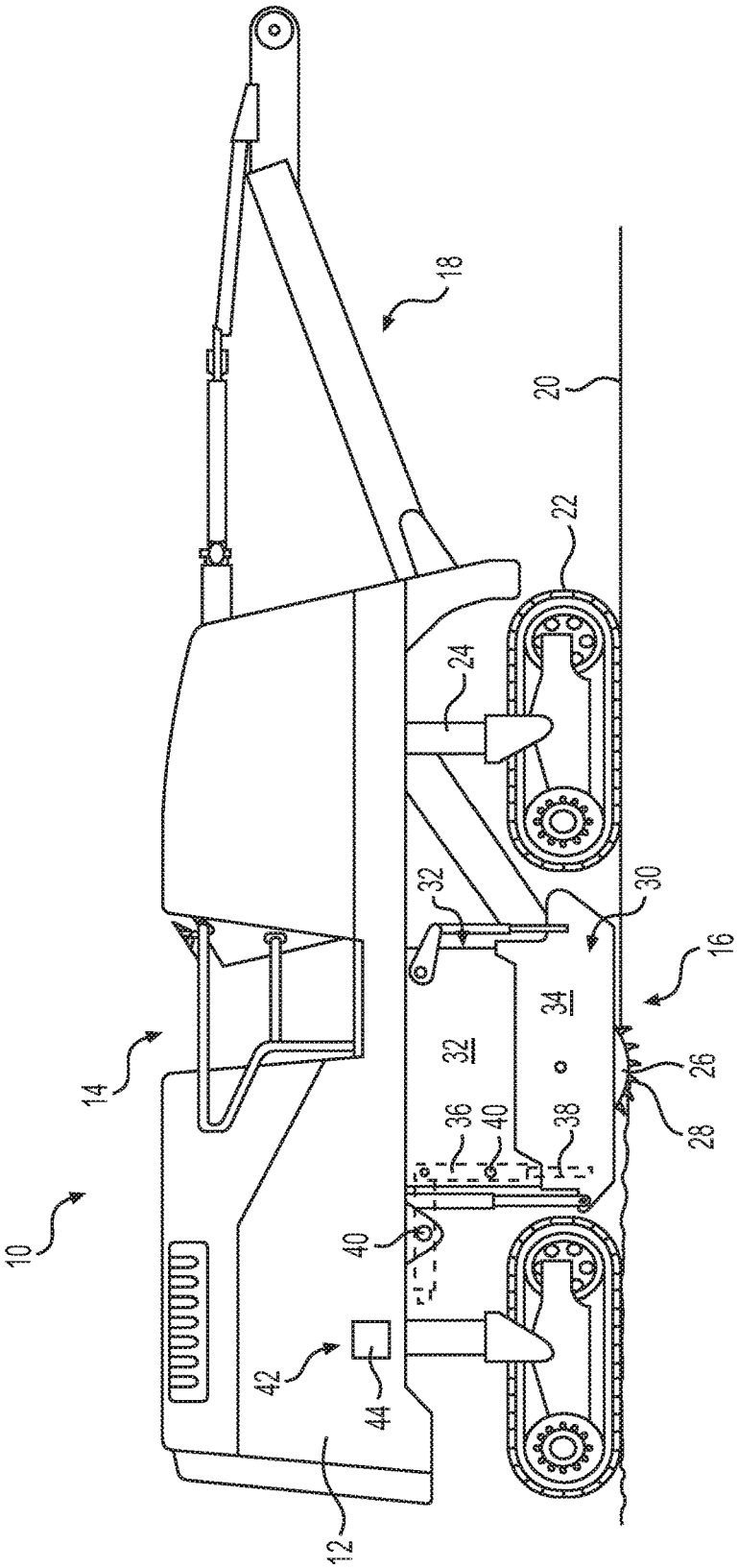


FIG. 1

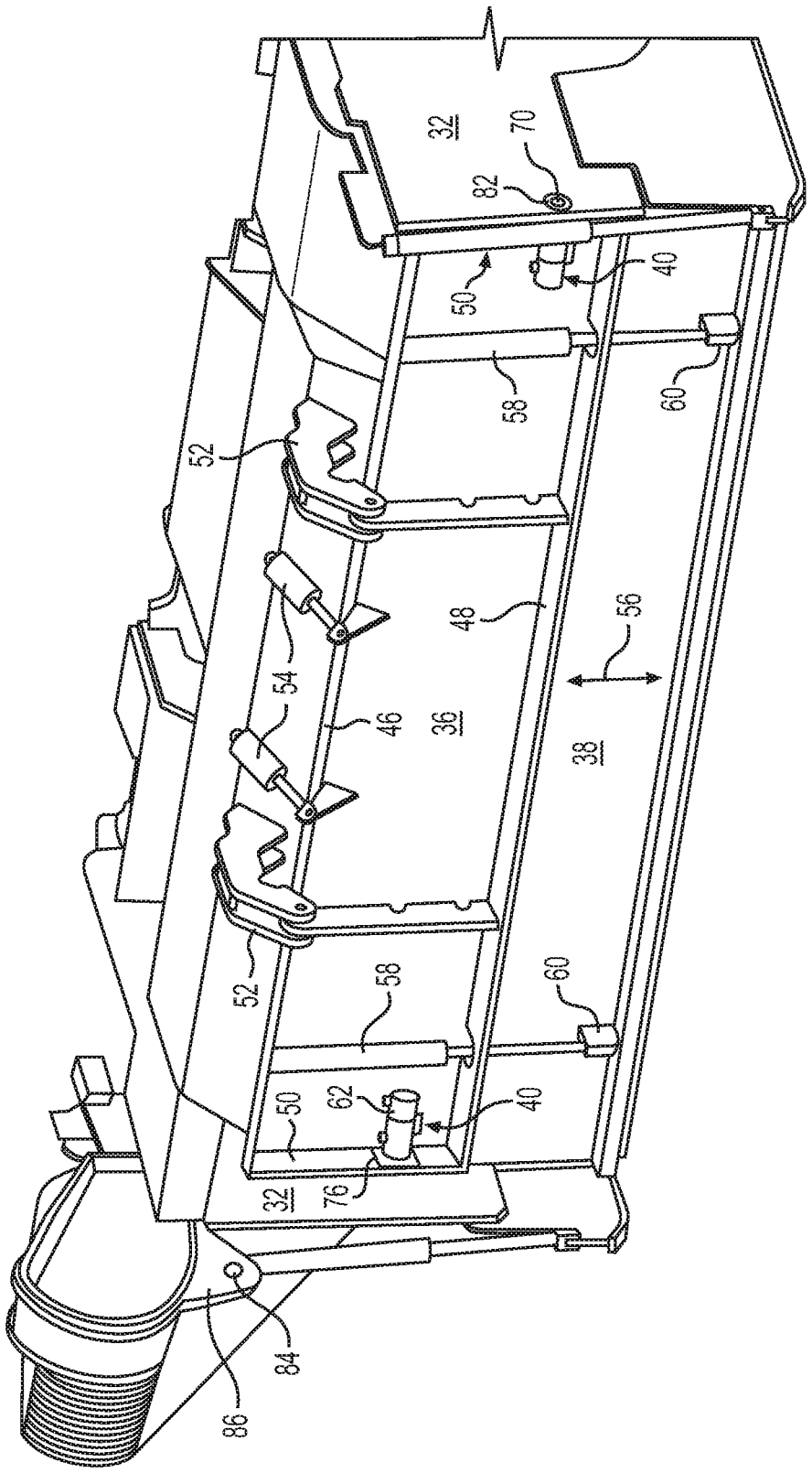


FIG. 2

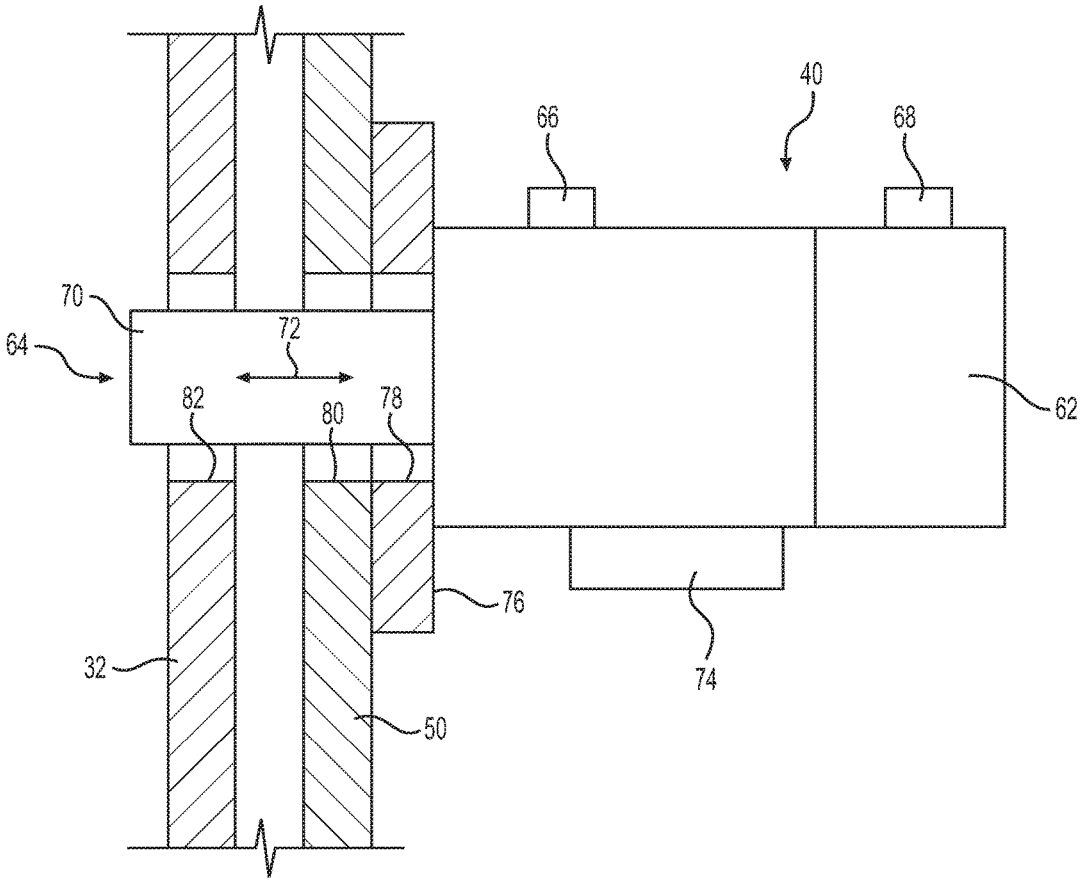


FIG. 3

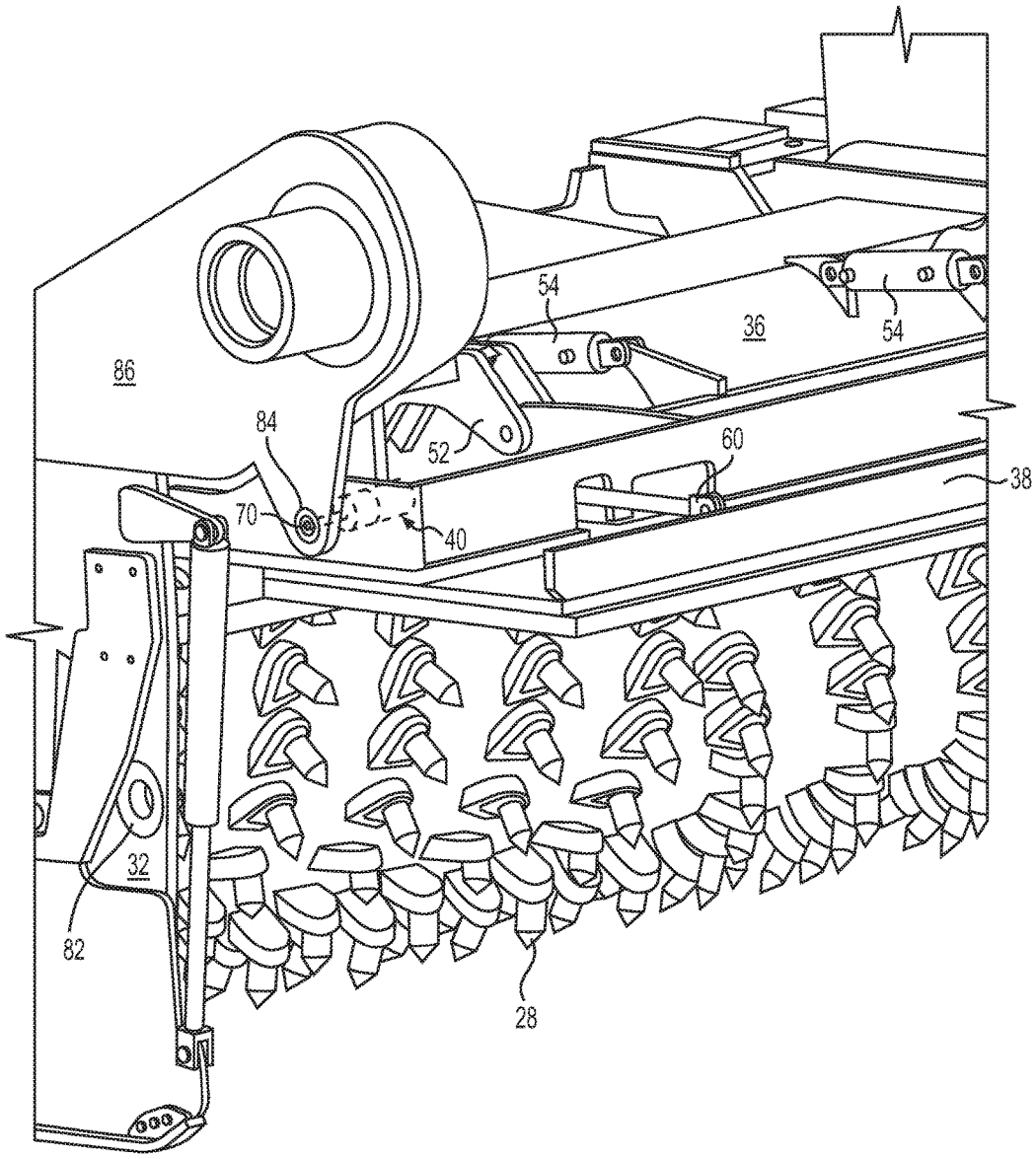


FIG. 4

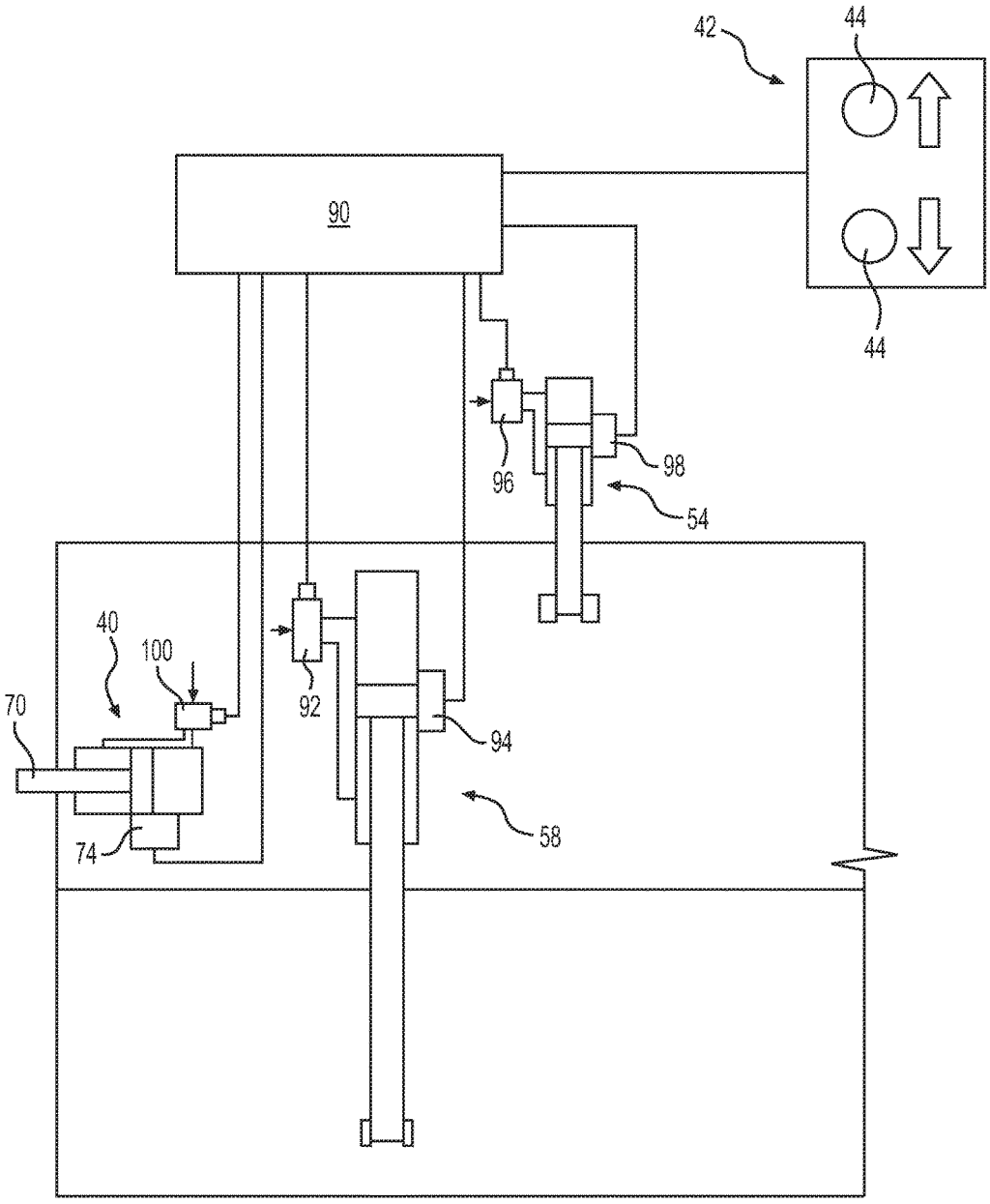


FIG. 5

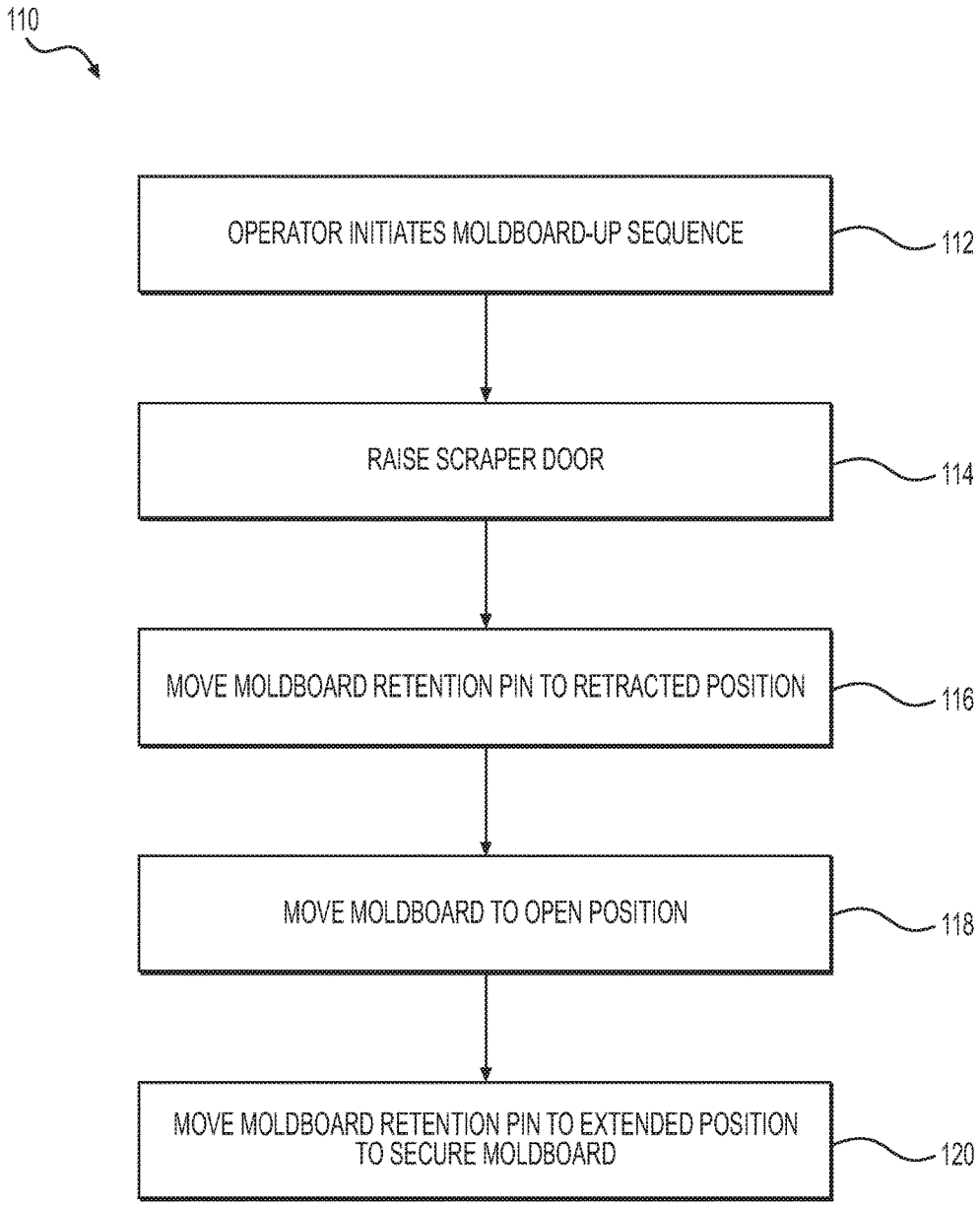

110
OPERATOR INITIATES MOLDBOARD-UP SEQUENCE
112
RAISE SCRAPER DOOR
114
MOVE MOLDBOARD RETENTION PIN TO RETRACTED POSITION
116
MOVE MOLDBOARD TO OPEN POSITION
118
MOVE MOLDBOARD RETENTION PIN TO EXTENDED POSITION TO SECURE MOLDBOARD
120

FIG. 6A

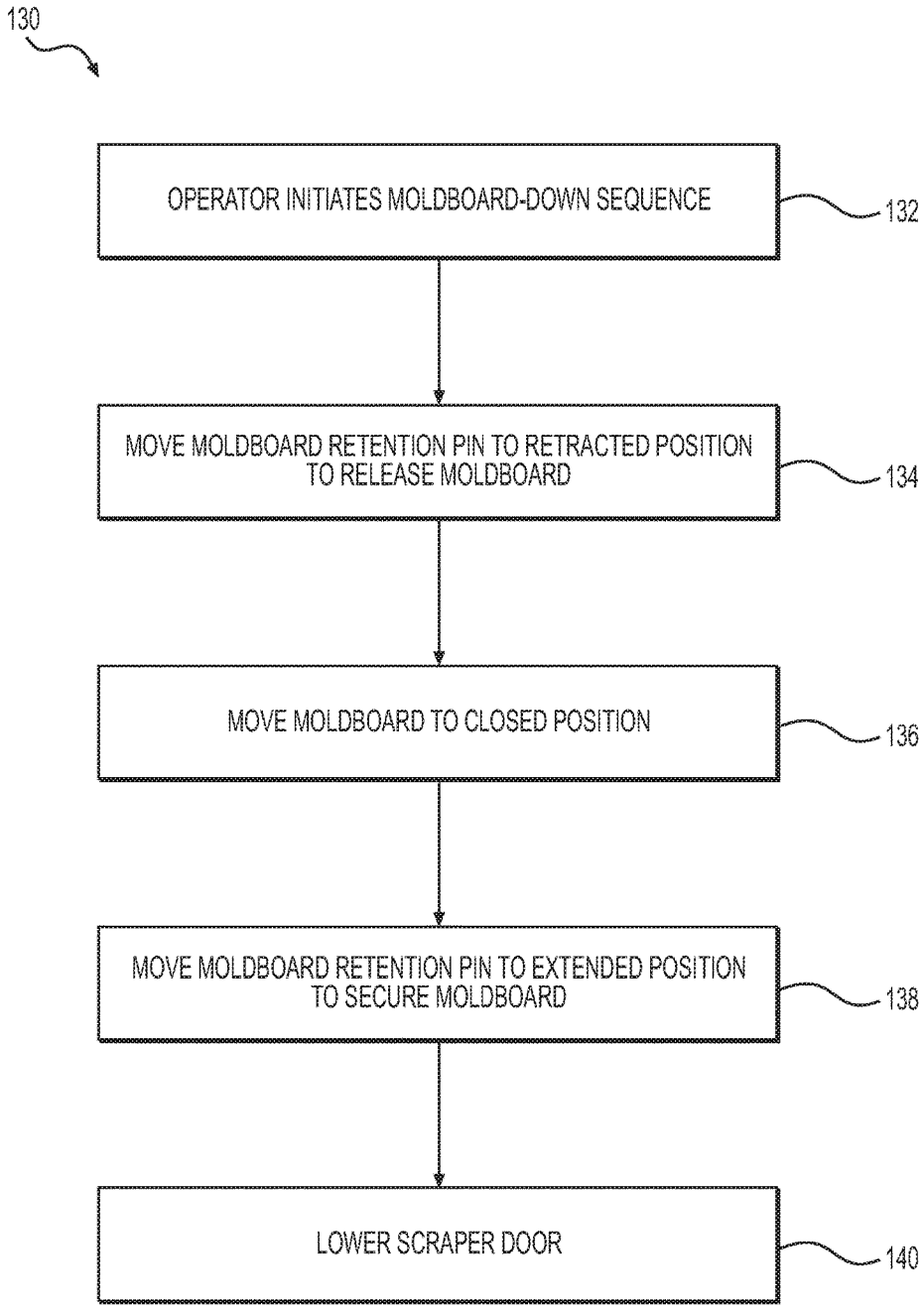

130
OPERATOR INITIATES MOLDBOARD-DOWN SEQUENCE
132
MOVE MOLDBOARD RETENTION PIN TO RETRACTED POSITION TO RELEASE MOLDBOARD
134
MOVE MOLDBOARD TO CLOSED POSITION
136
MOVE MOLDBOARD RETENTION PIN TO EXTENDED POSITION TO SECURE MOLDBOARD
138
LOWER SCRAPER DOOR
140

FIG. 6B

MOLDBOARD RETENTION SYSTEM FOR A MILLING MACHINE

TECHNICAL FIELD

The present disclosure relates generally to moldboard retention system for a milling machine, and more particularly, to a pin assembly for securing the moldboard in both an open and closed position.

BACKGROUND

The present disclosure relates to milling machines that are used in road surface preparation or repairs. Milling machines are typically used to remove a layer or layers of ground surface or old or defective road surface in preparation for road formation or resurfacing. Many milling machines include a rotor having rotor bits for breaking up the ground surface, and include a rotor chamber to help direct the milled material toward a conveyor or back toward the surface. Such rotor chambers may include chamber walls that surround the rotor. The chamber walls may include a moldboard at the rear of the chamber that is movable between a closed position for milling, and an open position for access to the rotor for inspection and/or repair.

U.S. Pat. No. 5,474,397, issued to Lyons on Dec. 12, 1995 ("the '397 patent"), describes a mobile milling machine 1 for milling a road surface that includes a floating moldboard 20 for directing milled material onto a loading device 30 positioned behind the machine. The moldboard 20 is vertically movable between a top and bottom stop positions, and is pivotable about a horizontal axis at the top stop position to expose the milling roller 10 for repairs. A locking pin 84 is slidably positioned in a housing 86 fastened to moldboard 20. Pin 84 can be extended into an adjacent slot 88 in the adjacent frame rail 14. The pin 84 is locked in place by a removable key 90 that extends through housing 86 and blocks movement of pin 84. With pin 84 in the slot 88 moldboard 20 can only move vertically. Removal of pin 84 from slot 88 permits moldboard 20 to pivot outwardly and upwardly, as shown in FIG. 4 of the '397 patent. However, the pin 84 securement of the '397 patent suffers drawbacks in its manual nature and lack of full securement in the moldboard closed and pivoted positions.

The moldboard retention system of the present disclosure may solve one or more of the problems set forth above and/or other problems in the art. The scope of the current disclosure, however, is defined by the attached claims, and not by the ability to solve any specific problem.

SUMMARY

In one aspect of the present disclosure, a milling machine includes a frame, a ground-engaging rotor assembly coupled to the frame, and a rotor chamber surrounding the ground-engaging rotor assembly. The rotor chamber includes a moldboard having a top, a bottom, and two sides positioned between the top and the bottom, and the moldboard further having an open position and a closed position. The rotor chamber also includes at least one movable pin secured to the moldboard, the pin being movable by an in-line actuator between a pin extended position and a pin retracted position. Further, the rotor chamber includes a rotor chamber frame wall having an opening located to receive the pin when the pin is in the extended position and the moldboard is in the closed position, and the receiving of the pin in the rotor chamber frame wall opening secures the moldboard from movement.

According to another aspect of the present disclosure, a milling machine includes a frame, a ground-engaging rotor assembly coupled to the frame, and a rotor chamber surrounding the ground-engaging rotor assembly. The rotor chamber includes a moldboard having a top, a bottom, and two sides positioned between the top and the bottom, and the moldboard further having an open position and a closed position. The rotor chamber also includes at least one hydraulic actuator secured to the moldboard, the hydraulic actuator having a cylinder end and a rod, with the hydraulic actuator being movable between a rod extended position and a rod retracted position. The rotor chamber further includes a first frame wall having an opening located to receive the rod end when the hydraulic actuator is in the extended position and the moldboard is in the closed position, the receiving of the rod in the first frame wall opening secures the moldboard from movement. Further, the rotor chamber includes a second frame wall having an opening located to receive the rod end when the hydraulic actuator is in the extended position and the moldboard is in the open position, the receiving of the rod in the second frame wall opening secures the moldboard from movement.

According to yet another aspect of the present disclosure, a method of operating a milling machine is provided, wherein the milling machine includes a operator control, a moldboard, a scraper door coupled to the moldboard, and a pin assembly coupled to the moldboard. The method includes receiving a signal from the operator control corresponding to a requested moldboard-up sequence. The following sequence is performed in response to the signal: raising the scraper door; moving a pin of the pin assembly from a pin securing position to a pin releasing position to release the moldboard from a frame wall of the machine; moving the moldboard to an open position; and moving the pin to a securing position to secure the moldboard to another frame wall of the machine when the moldboard is in the open position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an exemplary milling machine having a according to the present disclosure;

FIG. **2** illustrates the moldboard of the milling machine of FIG. **1** in the closed position;

FIG. **3** illustrates an exemplary pin assembly of the moldboard retention system of FIG. **1**;

FIG. **4** illustrates the moldboard of the milling machine of FIG. **1** in the open position;

FIG. **5** illustrates an exemplary moldboard control system for the milling machine of FIG. **1**;

FIG. **6**A shows an exemplary process for moving the moldboard between closed and open positions; and

FIG. **6**B shows an exemplary process for moving the moldboard between open and closed positions.

DETAILED DESCRIPTION

Both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the features, as claimed. As used herein, the terms "comprises," "comprising," "having," "including," or other variations thereof, are intended to cover a non-exclusive inclusion such that a process, method, article, or apparatus that comprises a list of elements does not

include only those elements, but may include other elements not expressly listed or inherent to such a process, method, article, or apparatus.

For the purpose of this disclosure, the term "ground surface" is broadly used to refer to all types of surfaces that form typical roadways (e.g., asphalt, cement, clay, sand, dirt, etc.) or can be milled in the removal or formation of roadways. In this disclosure, relative terms, such as, for example, "about," "substantially," "generally," and "approximately" are used to indicate a possible variation of ±10% in a stated value or characteristic. The current disclosure is described with reference to a milling machine. As used herein, a milling machine includes any machine that includes a ground engaging rotor or cutter to displace ground surfaces. Examples of such milling machines include cold planers and ground reclaimers.

FIG. **1** illustrates an exemplary milling machine **10** according to the present disclosure. Machine **10** includes a frame **12** supporting an operator station **14**, and a milling assembly **16** coupled to an underside of the frame **12**. Machine **10** also includes a conveyor assembly **18** configured to advance milled material from milling assembly **16** away from the ground surface **20**, for example, to be deposited into a bed of a truck (not shown). Machine **10** includes a plurality of track members or wheels **22** coupled to frame **12** via hydraulic cylinders **24**.

Milling assembly **16** may include a ground-engaging rotor or cutter **26** having rotor bits **28**. The rotor **26** may be enclosed within a series of walls forming a rotor chamber **30**. The walls of the rotor chamber **30** may include, inter alia, front and side frame walls **32**, adjustable side plates **34** extending below the side frame walls **32**, a moldboard **36** (shown in dashed lines) at the rear of the rotor chamber **30**, and an adjustable scraper door **38** (shown in dashed lines) extending below the moldboard **36**. During operation, as rotor **26** rotates in ground surface **20**, the rotor chamber **30** forms a barrier that retains much of the milled material, and urges the milled material toward the conveyor assembly **18**.

As will be explained in more detail below, the moldboard **36** and scraper door **38** may be moved between a closed position extending generally vertically, to an open position extending generally horizontally. These positions are both depicted in dashed lines in FIG. **1**. Further, the moldboard **36** may be secured in each of these different positions by a hydraulically actuated pin assembly **40**. An ground-located operator panel **42** may include operator controls **44** for controlling the movement of the moldboard **36**, scraper door **38**, pin assembly **40**, and other aspects of rotor chamber **30**.

As shown in FIG. **2**, moldboard **36** is depicted in the closed position and may include a top **46**, bottom **48**, and sidewalls **50**. Moldboard **36** may further include a pair of hinges **52** and hydraulic actuators **54** for pivoting the moldboard **36** between the open and closed positions. Hydraulic lines are omitted in the figures of this disclosure for clarity. While the opening and closing of moldboard **36** is shown with pivoting hinges **52**, it is understood that alternative opening configurations could also be used, such as opening via linear, vertical movement of the moldboard **36**. Scraper door **38** is coupled to moldboard **36** so as to allow for a raising and lowering movement **56** of the scraper door **38** between a lowered position (FIG. **2**) and a raised or retracted position (FIG. **3**). Movement of the scraper door **38** may be provided by, for example, hydraulic actuators **58** coupled at a head end to the moldboard **36** and at the rod end to a bottom portion **60** of the scraper door **38**.

The hydraulically actuated pin assembly **40** may be coupled to each of the opposite sidewalls **50** of the moldboard **36**. A single pin assembly **40** will be described below, but it is understood that the description will be equally applicable to both pin assemblies **40**. Referring to FIG. **3**, pin assembly **40** may include a head end **62** and a rod end **64**. Head end **62** may be a conventional head end of a hydraulic actuator with hydraulic fluid connections **66** and **68** located on opposite sides of an internal piston (not shown) that is connected to a retention rod or pin **70**. Thus, control of fluid into and out of head end **62** controls the movement **72** and position of the pin **70**. A position sensor **74**, schematically illustrated in FIG. **3**, may be included with pin assembly **40** to assist in determining the linear location of pin **70** between an extended position (shown in FIG. **3**) and a retracted position. Position sensor **74** may be any type of conventional position sensor, such as a magnetostrictive, variable-resistance, or variable-inductance type position sensor.

Referring to FIGS. **2** and **3**, pin assembly **40** may also include a distal flange **76** fixedly secured to the head end **62** to assist in coupling the pin assembly **40** to sidewall **50**. Flange **76** may be coupled to the bottom half of sidewall **50** of moldboard **36** in any conventional manner, such as by welding or bolts. Alternatively, flange **76** may be omitted, and head end **62** may be coupled adjacent to, but not directly on, sidewall **50**. A pin opening **78** in flange **76** may be aligned with a pin opening **80** in sidewall **50** and a pin opening **82** in an associated frame wall **32**. When the pin **70** is in the extended position, the pin **70** of pin assembly **40** extends through pin openings **78**, **80**, **82**, thereby securing the moldboard **36** to the frame wall **32**. The pin openings **78**, **80**, **82** may be, for example, circular, oval, or any other shape that serves to secure pin **70** and moldboard **36** from any movement when the pin **70** is in the extended position in pin openings **78**, **80**, **82**. As shown in FIG. **3**, the pin assembly **40** provides an in-line configuration with the head end **62**, pin **70**, and pin openings **78**, **80**, **82** being aligned linearly. Referring back to FIG. **2**, another pin opening **84** may be formed in a frame wall **86** at a location corresponding to the moldboard **36** open position. While not shown, another pin opening may be included in a frame wall opposite pin opening **84**. As used herein, the term "frame wall" includes any element or feature of milling machine **10** that is stationary relative to moldboard **36**. For example, as shown in FIGS. **2** and **4**, frame wall **86** may be a portion of a rotor drive support member.

FIG. **4** shows the moldboard **36** secured from movement when the moldboard **36** is in the open position, with the scraper door **38** retracted, and the pin assembly **40** in the extended position within pin opening **84** of frame wall **86**. Movement of the moldboard **36** to the open position may be achieved by moving the moldboard hydraulic actuators **54** to a retracted position. As used herein, securing the moldboard **36** from movement means restricting any substantial movement of the moldboard **36**. Thus, the moldboard **36** is secured from movement even if there is some clearance or play between pin **70** and the pin opening **82**.

FIG. **5** shows an exemplary moldboard control system for the milling machine **10** of FIG. **1**. Only half of the moldboard is depicted in FIG. **5**, and it is understood that the other half of the moldboard **36** would include the same control system. The control system of FIG. **5** shows a portion of the ground-located operator panel **42** of the milling machine **10**. The operator panel **42** may include operator controls **44** that control movement of the moldboard **36**, scraper door **38**, and pin assemblies **40**. Operator controls **44** may include "up" and "down" buttons corresponding to moldboard up and moldboard down operator commands. However, it is under-

stood that operator controls **44** can alternatively be one or more of dials, switches, touch displays, or any other conventional operator controls. Operator controls **44** may be electronically coupled to a control unit **90** to send and/or receive signals therefrom. Control unit **90** may also be electronically coupled to send and/or receive signals from: (1) a hydraulic control valve **92** and a position sensor **94** of the scraper door hydraulic actuator **58**; (2) a hydraulic control valve **96** and a position sensor **98** of the moldboard hydraulic actuator; and (3) a hydraulic control valve **100** and the position control sensor **74** of the pin assembly **40**. Control unit **90** may include a processor, storage, and memory, assembled together in a single device and/or provided separately. The processor may include one or more known processing devices, such as a microprocessor. The memory may include one or more storage devices configured to store information used by the control unit to perform certain functions related to the disclosed system. The storage may include a volatile or non-volatile, magnetic, semiconductor, tape, optical, removable, nonremovable, or other type of storage device or computer-readable medium. Further, the storage may store programs and/or other information, such as information related to processing data received from one or more sensors, as discussed in greater detail below.

INDUSTRIAL APPLICABILITY

The disclosed moldboard retention system may be applicable to any machine having a rotor and rotor chamber, and may assist in providing proper operation and safe access to the rotor within the rotor chamber. In particular, the pin assembly **40** provides a straightforward design for securing the moldboard **36** in the open position (FIG. **4**) and the closed position (FIG. **2**). In particular, the disclosed design provides an in-line securing configuration with minimal linkages, and a readily identified secured-not secured condition. Proper securing of the moldboard **36** in the closed position helps to ensure that milled material is properly contained within the rotor chamber **30** during the milling operation. Further, securing the moldboard in the open position with the pin assembly **40** helps to provide safe access to the rotor **26** during maintenance.

FIGS. **5**, **6**A and **6**B illustrate an exemplary control system and operation of the moldboard retention system of the present disclosure. Moldboard **36** and scraper door **38** may be initially positioned as shown in FIG. **2**, with the moldboard **36** in the closed position, and the scraper door **38** in the fully lowered position. Further, the pin assembly **40** is in an extended position securing the moldboard **36** to the frame walls **32** of the milling machine **10**. When the milling operation is stopped, the operator can initiate movement of the moldboard **36** into the open position or closed position according to the processes **110** and **130**, respectively, of FIGS. **6**A and **6**B.

Referring to FIG. **6**A, the operator can initiate or request the "moldboard-up" sequence (step **112**) by depressing an "up" button of operator controls **44** in operator station **14**. Once initiated, the moldboard-up sequence may include sending signals from control unit **90** to control valve **92** to actuate the hydraulic actuators **58** to raise the scraper door **38** (step **114**). When the control unit **90** receives a signal from position sensor **94** corresponding to a scraper door **38** fully raised position, control unit **90** sends signals to control valve **100** of pin assembly **40** to move the retention pin **70** to the retracted position (step **116**). When the control unit **90** receives a signal from position sensor **74** of the pin assembly **40** corresponding to pin fully retracted position, signals from control unit **90** are sent to the control valve **96** to actuate the moldboard hydraulic actuator **54** to pivot the moldboard **36** about hinges **52** to an open position as shown in FIG. **4** (step **118**). When the control unit **90** receives a signal from position sensor **98** corresponding to a moldboard **36** fully open position, control unit **90** will send signals to control valve **100** of pin assembly **40** to move retention pin **70** to the extended position to secure pin **70** within pin opening **84** of frame wall **86** (step **120**). This process is completed when control unit **90** receives a signal from position sensor **74** that pin **70** is in the fully extended position within pin opening **84**.

Referring to the exemplary "moldboard-down" process **130** of FIG. **6**B, the operator can initiate or request the moldboard-down sequence (step **132**) by depressing a "down" button of the operator controls **44** to send a signal to control valve **100** to move retention pin **70** to the retracted position (step **134**). When the control unit **90** receives a signal from position sensor **74** of the pin assembly **40** corresponding to pin fully retracted position, signals from control unit **90** are sent to the control valve **96** to actuate the moldboard hydraulic actuators **54** to pivot the moldboard **36** about hinges **52** to the closed position as shown in FIG. **2** (step **136**). When the control unit **90** receives a signal from position sensor **98** corresponding to a moldboard **36** fully closed position, control unit **90** will send signals to control valve **100** of pin assembly **40** to move pin **70** to the extended position to secure pin **70** within pin opening **82** of frame wall **32** (step **138**), and thus secure the moldboard **36** in the closed position. When the control unit **90** receives a signal from position sensor **74** corresponding to a pin fully extended position, control unit **90** will send signals to control valve **92** of scraper door hydraulic actuators **58** to move the scraper door **38** to an extended position as shown in FIG. **2** (step **140**) corresponding to a predetermined position or a operator-desired position.

The above described process steps need not be performed in the order described, but rather certain steps can be performed in a different order and/or can be performed simultaneously with other steps. Further, the operator controls **44** may be configured to require depression or operator input throughout the entire sequence of the process to actuate all of the steps of the sequence, or alternatively, the entire sequence (raising, lowering, and securing the moldboard) may be done automatically after triggering by a single depression or operator action of the operator control **44** at the beginning of the desired sequence.

It will be apparent to those skilled in the art that various modifications and variations can be made to the disclosed machine without departing from the scope of the disclosure. Other embodiments of the machine will be apparent to those skilled in the art from consideration of the specification and practice of the moldboard support structure disclosed herein. For example, while pin assembly **40** is described as hydraulically actuated, any other type of actuator may be used, such as a pneumatic, solenoid, electronic, or piezoelectric type actuator. It is intended that the specification and examples be considered as exemplary only, with a true scope of the disclosure being indicated by the following claims and their equivalents.

What is claimed is:

1. A milling machine, comprising

a frame;

a ground-engaging rotor assembly coupled to the frame;

a rotor chamber surrounding the ground-engaging rotor assembly, the rotor chamber including:

a moldboard having a top, a bottom, and two sides positioned between the top and the bottom, the moldboard further having an open position and a closed position;

at least one movable pin secured to the moldboard, the pin being movable by an in-line actuator between a pin extended position and a pin retracted position;

a rotor chamber frame wall having an opening located to receive the pin when the pin is in the extended position and the moldboard is in the closed position, and the receiving of the pin in the rotor chamber frame wall opening secures the moldboard from movement; and

a sensor system associated with the movable pin to determine when the pin is in the pin extended or pin retracted position.

2. The milling machine of claim **1**, wherein the in-line actuator is a hydraulic actuator, and the pin is a piston rod of the hydraulic actuator.

3. The milling machine of claim **1**, wherein the frame wall is a first frame wall, and the milling machine further including a second frame wall, the second frame wall having an opening located to receive the pin when the pin is in the extended position and the moldboard is in the open position.

4. The milling machine of claim **2**, wherein the at least one movable pin is a first movable pin, and the milling machine further includes a second movable pin secured to an opposite side of the moldboard with respect to the first movable pin, the second movable pin being movable by an in-line actuator between an pin extended position and a pin retracted position, and

the rotor chamber frame wall is a first rotor chamber frame wall, and the milling machine further includes a second rotor chamber frame wall opposite the first rotor chamber frame wall, the second rotor chamber frame wall having an opening located to receive the second movable pin when the second pin is in the extended position and the moldboard is in the closed position.

5. The milling machine of claim **1**, further including an operator input device for initiating a moldboard-up sequence, the moldboard-up sequence includes moving of the pin to the extended position after one or more moldboard sensors indicate that the moldboard is in the open position.

6. The milling machine of claim **5**, further including a scraper door extending from the bottom of the moldboard, the scraper door being movable between a raised position and a lowered position, and the moldboard-up sequence includes moving the moldboard toward the open position after one or more scraper door sensors indicate that the scraper door is raised.

7. The milling machine of claim **6**, further including moldboard one or more actuators configured to pivot the moldboard to the open position.

8. A milling machine, comprising

a frame;

a ground-engaging rotor assembly coupled to the frame;

a rotor chamber surrounding the ground-engaging rotor assembly, the rotor chamber including:

a moldboard having a top, a bottom, and two sides positioned between the top and the bottom, the moldboard further having an open position and a closed position;

at least one hydraulic actuator secured to the moldboard, the hydraulic actuator having a cylinder end and a rod, with the hydraulic actuator being movable between a rod extended position and a rod retracted position;

a first frame wall having an opening located to receive the rod end when the hydraulic actuator is in the extended position and the moldboard is in the closed position, the receiving of the rod in the first frame wall opening secures the moldboard from movement; and

a second frame wall having an opening located to receive the rod end when the hydraulic actuator is in the extended position and the moldboard is in the open position, the receiving of the rod in the second frame wall opening secures the moldboard from movement.

9. The milling machine of claim **8**, wherein the at least one hydraulic actuator is a first hydraulic actuator, and the milling machine further includes a second hydraulic actuator secured to an opposite side of the moldboard with respect to the first hydraulic actuator, the second hydraulic actuator having a cylinder end and a rod end, with the second hydraulic actuator being movable between a rod extended position and a rod retracted position, and

the milling machine further includes a third frame wall opposite the first frame wall, the third frame wall having an opening located to receive the rod end of the second hydraulic actuator when the second actuator is in the extended position and the moldboard is in the closed position.

10. The milling machine of claim **8**, further including a sensor system associated with the hydraulic actuator to determine when the hydraulic actuator is in the extended or retracted position.

11. The milling machine of claim **8**, further including an operator input device for initiating a moldboard-up sequence, wherein the moldboard-up sequence includes moving of the rod end to the extended position after one or more moldboard sensors indicate that the moldboard is in the open position.

12. The milling machine of claim **11**, further including a scraper door extending from the bottom of the moldboard, the scraper door being movable between a raised position and a lowered position, and the moldboard-up sequence includes moving the moldboard toward the open position after one or more scraper door sensors indicate that the scraper door is raised.

13. The milling machine of claim **12**, further including moldboard actuators configured to pivot the moldboard to the open position.

14. A method of operating a milling machine, the milling machine having a operator control, a moldboard, a scraper door coupled to the moldboard, and a pin assembly coupled to the moldboard, the method comprising:

receiving a signal from the operator control corresponding to a requested moldboard-up sequence; and

performing the following in response to the signal:

raising the scraper door;

moving a pin of the pin assembly from a pin securing position to a pin releasing position to release the moldboard from a frame wall of the machine;

moving the moldboard to an open position; and

moving the pin to a securing position to secure the moldboard to another frame wall of the machine when the moldboard is in the open position.

15. The method of claim **14**, wherein the moving of the moldboard to an open position is initiated after confirming that the pin is in the pin releasing position.

16. The method of claim **15**, moving of the pin to the securing position is achieved via hydraulic actuation.

17. The method of claim 14, further including receiving a signal from the operator control corresponding to a requested moldboard-down sequence; and

performing the following in response to the moldboard-down signal:

moving the pin of the pin assembly from a pin securing position to a pin releasing position to release the moldboard from the another frame wall of the machine;

moving the moldboard to a closed position;

moving the pin to a securing position to secure the moldboard to the frame wall of the machine, when the moldboard is in the closed position; and

lowering the scraper door.

18. The method of claim 17, wherein moving the moldboard to a closed position is initiated after confirming that the pin is in the pin releasing position.

19. The method of claim 18, moving of the pin to the securing position is achieved via hydraulic actuation.

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