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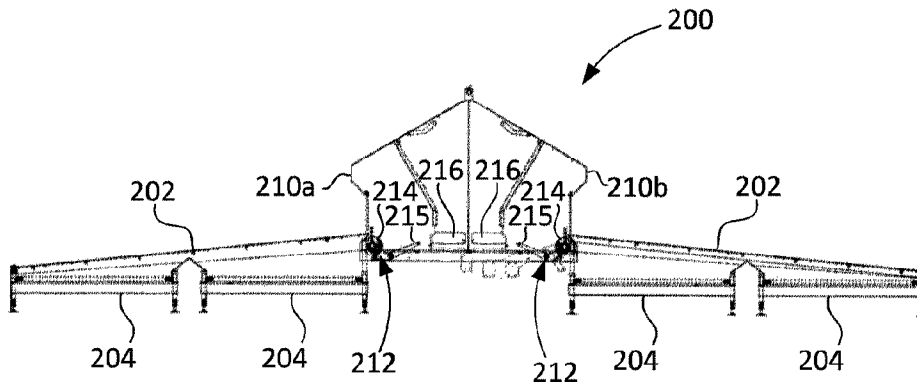
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(57) Abrégé/Abstract:

A bird nest box system is provided comprising a housing defining a nesting enclosure, a movable nest floor, and a floor movement mechanism. The nesting enclosure has a front opening and an egg outlet at a back of the nesting enclosure. The nest floor is mounted within the nesting enclosure and over the floor movement mechanism. The floor movement mechanism comprises a driveshaft and at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor. From a lowered floor position, initial rotation of the driveshaft in a first direction moves at least one of said at least one floor actuation member to tilt the nest floor toward the egg outlet. Continued rotation of the driveshaft moves the at least one floor actuation member to rotate the nest floor toward the front opening and to a raised floor position.

ABSTRACT

A bird nest box system is provided comprising a housing defining a nesting enclosure, a movable nest floor, and a floor movement mechanism. The nesting enclosure has a front opening and an egg outlet at a back of the nesting enclosure. The nest floor is mounted within the nesting enclosure and over the floor movement mechanism. The floor movement mechanism comprises a driveshaft and at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor. From a lowered floor position, initial rotation of the driveshaft in a first direction moves at least one of said at least one floor actuation member to tilt the nest floor toward the egg outlet. Continued rotation of the driveshaft moves the at least one floor actuation member to rotate the nest floor toward the front opening and to a raised floor position.

NEST BOX SYSTEM WITH MOVABLE NEST FLOOR

RELATED APPLICATION

[0001] This application claims priority to U.S. Provisional Patent Application Serial No. 63/151,325, filed on February 19, 2021.

FIELD OF THE DISCLOSURE

[0002] Aspects of the disclosure relate to nest boxes for chickens or other birds. More particularly, the disclosure relates to nest boxes with movable nest floors.

BACKGROUND

[0003] As the egg production industry moves towards more free-run, free-range, and organic production, there are many additional challenges that a producer faces. In particular, periodic collection of eggs becomes a challenge as the birds are free to lay their eggs anywhere in the barn (aka poultry house). To facilitate the automation of egg collection, it may be desirable that most eggs are laid in a particular location. Nest boxes provide a quiet, dark, and comfortable location for the birds to lay their eggs. A nest box may include a housing defining an enclosure for a nest, a nest floor, an entrance/exit opening for birds to enter and exit, and an egg outlet through which eggs exit for collection. The entrance/exit opening may be at a front of the nest box, and the egg outlet may be in a back portion of the nest box. A nest box may typically include curtains around the entrance/exit opening to reduce light and noise inside the nest, as well as using a soft pad on the nest floor (such as Astroturf™ or a carpet material) to increase bird comfort. Typically, the nest floor is sloped or tilted towards the back of the box so that any eggs roll out through the egg outlet and onto an egg belt that collects and moves the eggs from multiple nest boxes to another location (e.g., a front of a barn).

[0004] A number of common challenges exist with this type of nest box arrangement. Some birds will not want to leave the nest box and try to stay in the

box for extended periods, even all day and night. This tendency of the birds may have a negative impact on production because these birds may eat less and may prevent other birds from entering the nest. The soft material of the nest pad on the nest floor often collects debris or waste such as manure, feathers, and dust. As the eggs roll over this dirty surface, the eggs get dirty which may decrease their value. Additionally, the soft material of the nest pad may "cradle" the eggs, which may decrease their tendency to roll out of the nest box even with the usual tilt of the nest floor.

SUMMARY

[0005] According to a aspect, there is provided a bird nest box system comprising: a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the nesting enclosure; and an egg outlet at a back of the nesting enclosure; a movable nest floor having a front end and a back end; and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising: a driveshaft; and at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein, with the nest floor in a lowered floor position, initial rotation of the driveshaft in a first direction moves at least one of said at least one floor actuation member to tilt the nest floor toward the egg outlet; and continued rotation of the driveshaft in the first direction moves the at least one floor actuation member to raise the back end of the nest floor above the front end, thereby rotating the nest floor toward the front opening and to a raised floor position.

[0006] In some embodiments, in the raised floor position, the nest floor is rotated past 90 degrees relative to a horizontal plane.

[0007] In some embodiments, in the lowered floor position, the back end of the nest floor is at an elevation lower than the front end, such that the nest floor is inclined from the back end to the front end at an angle of inclination, and the initial rotation of the driveshaft in the first direction moves the at least one floor actuation member to increase the angle of inclination.

[0008] In some embodiments, the at least one floor actuation member comprises at least first and second actuation members, the initial rotation of the driveshaft rotating the first actuation member to tilt the nest floor toward the egg outlet, and the continued rotation of the driveshaft rotating the second actuation member to raise the back end of the nest floor.

[0009] In some embodiments, the first actuation member comprises a lift cam member mounted to the driveshaft, the lift cam member having a nose portion, a heel portion, and a ramp extending from the heel portion to the nose portion, wherein a front portion of the nest floor rests on the heel portion or the ramp of the lift cam member when the nest floor is in the lowered floor position.

[0010] In some embodiments, the initial rotation of the driveshaft in the first direction rotates the nose portion of the lift cam member to engage the nest floor, thereby raising the front end of the nest floor.

[0011] In some embodiments, the second actuation member further comprises at least one lift arm that engages and rotates the nest floor during the continued rotation of the driveshaft in the first direction.

[0012] In some embodiments, the lift arm has a first end proximal to the driveshaft and a second end distal to the driveshaft, and the continued rotation of the driveshaft in the first direction rotates the lift arm to raise the second end, the second end engaging the nest floor and raising the back end of the nest floor.

[0013] In some embodiments, the continued rotation of the driveshaft in the first direction rotates the lift arm from a lowered arm position to a raised arm position, and rotation of the lift arm to the raised arm position rotates the nest floor to the raised floor position.

[0014] In some embodiments, the front portion of the nest floor is coupled to the housing by a sliding pivot mechanism, the sliding pivot mechanism allowing limited vertical movement of the front end of the nest floor, the lift arm rotating the nest floor about the sliding pivot mechanism to the raised floor position.

[0015] In some embodiments, the lift arm is pivotably mounted to the driveshaft or the lift cam member, the floor movement mechanism further comprising a rotation limiting mechanism that limits rotation of the lift arm relative to the lift cam member.

[0016] In some embodiments, the rotation limiting mechanism comprises an arcuate slot defined in the lift cam member and a guide member fixed to the lift arm and slidably received in the arcuate slot, the arcuate slot extending in a circular arc about a longitudinal axis of the driveshaft.

[0017] In some embodiments, with the nest floor in the raised floor position, rotation of the driveshaft in a second direction opposite to the first direction moves the at least one floor actuation member to return the nest floor to the lowered floor position, the floor movement mechanism further comprising a catch mechanism that engages the lift arm to rotationally lock the lift arm with the lift cam member for at least a portion of the rotation of the driveshaft in the second direction.

[0018] In some embodiments, the at least one floor actuation member comprises a lift arm coupled to the driveshaft and having a distal end positioned to engage the nest floor forward of a center of gravity of the nest floor and lift the nest floor, the system further comprising a sliding pivot mechanism coupling the nest floor to the housing, the sliding pivot mechanism being positioned forward of the distal end of the lift arm, the sliding pivot mechanism allowing limited vertical movement of a front portion of the nest floor and allowing the nest floor to rotate about the sliding pivot mechanism.

[0019] In some embodiments, the system further comprises a drive system configured to rotate the driveshaft and a controller operatively coupled to the drive system to: selectively move the nest floor between the lowered position and the raised floor position.

[0020] In some embodiments, the angle of inclination for the lowered floor position is adjustable.

[0021] In some embodiments, the at least one floor actuation member comprises a lift cam member mounted to the driveshaft, wherein the nest floor

further comprises a cam follower landed on the lift cam member, a position of the cam follower being adjustable along a lengthwise direction of the nest floor to thereby adjust the angle of inclination for the lowered floor position.

[0022] In some embodiments, the cam follower comprises a pin selectively positionable at a plurality of pin positions spaced apart along the lengthwise direction of the nest floor.

[0023] In some embodiments, the system further comprises an adjustable stop mechanism that supports the back end of the nest floor when the nest floor is in the lowered floor position, the adjustable stop mechanism being adjustable to change the elevation of the back end of the nest floor in the lowered floor position.

[0024] According to another aspect, there is provided an adjustable floor system for a nest box, the system comprising: a nest floor having a front end and a back end; and a floor movement mechanism, the nest floor being mounted over the floor movement mechanism, the floor movement mechanism comprising a driveshaft; and at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein, with the nest floor in a lowered floor position, initial rotation of the driveshaft in a first direction moves the at least one floor actuation member to tilt the nest floor toward the back end of the nest floor; and continued rotation of the driveshaft in the first direction moves the at least one floor actuation member to raise the back end of the nest floor above the front end, thereby rotating the nest floor toward the front end of the nest floor and to a raised floor position.

[0025] According to another aspect, there is provided a bird nest box system comprising: a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the enclosure; and an egg outlet at a back of the nesting enclosure; a movable nest floor having a front end and a back end; and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising: a driveshaft; and at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein rotation of the driveshaft rotates the at least one floor actuation member to move the nest floor

between a lowered floor position and a raised floor position, and wherein moving the nest floor to the raised floor position rotates the nest floor toward the front opening and past 90 degrees relative to a horizontal plane.

[0026] According to another aspect, there is provided a bird nest box system comprising: a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the enclosure; and an egg outlet at a back of the nesting enclosure; a movable nest floor having a front end and a back end; and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising: a driveshaft; and at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein, rotation of the driveshaft rotates the at least one floor actuation member to move the nest floor between a lowered floor position and a raised floor position, and wherein, in the lowered position, the back end of the nest floor is at an elevation lower than the front end, such that the nest floor is inclined from the back end to the front end at an angle of inclination, and wherein the angle of inclination for the lowered floor position is adjustable.

[0027] In some embodiments, the at least one actuation member comprises a lift cam member mounted to the driveshaft, wherein the nest floor further comprises a cam follower landed on the lift cam member, a position of the cam follower being adjustable along a lengthwise direction of the nest floor to thereby adjust the angle of inclination for the lowered floor position.

[0028] In some embodiments, the cam follower comprises a pin selectively positionable at a plurality of pin positions spaced apart along the lengthwise direction of the nest floor.

[0029] In some embodiments, the system further comprises an adjustable stop mechanism that supports the back end of the nest floor when the nest floor is in the lowered floor position, the adjustable stop mechanism being adjustable to change the elevation of the back end of the nest floor in the lowered position.

[0030] Other aspects and features of the present disclosure will become apparent to those ordinarily skilled in the art upon review of the following description of the specific embodiments of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The present disclosure will be better understood having regard to the drawings in which:

[0032] Figure 1A is a cross section view of an example nesting system including nest boxes;

[0033] Figure 1B is a cross section view of another example nesting system including nest boxes;

[0034] Figure 2 is a cross section view of still another example nesting system including nest boxes;

[0035] Figure 3 is a front perspective view of a nest box system according to some embodiments, which includes nest boxes having adjustable nest floors;

[0036] Figure 4 is another front perspective view of the nest box system of Figure 3;

[0037] Figure 5 is a side view of a lift cam member of the system of Figures 3 and 4 in isolation, according to some embodiments;

[0038] Figure 6 is a perspective view of the lift cam member and a lift arm of the system of Figures 3 and 4, according to some embodiments;

[0039] Figure 7 is a side view of the lift cam member and lift arm of Figure 6;

[0040] Figure 8 is a side cross-sectional view of a nest box of the system, showing a nest floor in a lowered position;

[0041] Figure 9 is another side cross-sectional view of the nest box with the floor in a lowered position;

[0042] Figure 10 is a lower, front, partial perspective view of the system of Figures 3 and 4.

[0043] Figure 11 is a side cross-sectional view of the nest box of Figures 8 and 9, showing the floor in an increased tilt position;

[0044] Figure 12 is a side cross-sectional view of the nest box, showing the nest floor in a partially raised position;

[0045] Figure 13 is a side cross-sectional view of the nest box, showing the nest floor in a fully raised position;

[0046] Figure 14 is a side cross-sectional partial view of another example nest box system according to some embodiments;

[0047] Figure 15 is a side cross-sectional partial view of another example nest box system according to some embodiments;

[0048] Figures 16 and 17 are side cross-sectional partial views of another example nest box system according to some embodiments;

[0049] Figure 18 is a side cross-sectional partial view of another nest box system according to some embodiments, showing a nest floor in a lowered position;

[0050] Figure 19 is a side cross-sectional view of the system of Figure 18, showing the nest floor in an increased tilt position;

[0051] Figure 20 is a side cross-sectional view of the system of Figures 18 and 19, showing the nest floor in a partially raised position;

[0052] Figure 21 is a side cross-sectional view of the system of Figures 18 to 20, showing the nest floor in a fully raised position; and

[0053] Figure 22 is a perspective view of the nest box system of Figures 3 and 4, but further including a second driveshaft and drive system according to some embodiments.

DETAILED DESCRIPTION

[0054] The terms “front” and “back” and other similar terms such as “backward”, “rearward”, “forward”, etc. are used herein for ease of description and do not limit the embodiments to any particular orientation in normal operation.

[0055] The term “coupled” as used herein may refer to either direct connections or to indirect connections via one or more intermediate elements. The term “coupled” does not require direct physical connection of two elements unless otherwise specified herein.

[0056] In a poultry barn, many different arrangements for nest boxes may be employed. In some systems, multiple stacked tiers of nest boxes may be provided together with a feed distribution system, watering system, and multiple nest floors for the birds to walk on. Such arrangements are common as they increase the number of birds in a barn as they can spread out over the plurality of tiers. These multi-tier systems may reduce the operating cost of the barns as there is less volume to heat and ventilate. Alternative multi-tier systems may be arranged such that there are two nest boxes back-to-back on the same tier, such that eggs from both boxes roll onto a single egg belt.

[0057] Figures 1A to 2 show example systems (100, 150, 200) that may include one or more nest boxes according to the present disclosure. However, embodiments are not limited to the specific exemplary systems shown in Figures 1A to 2. The structure and configuration of nesting systems may vary. In still other systems, birds may simply live on the barn nest floor then enter a nest box, according to some embodiments of the present disclosure, to lay their eggs.

[0058] Figure 1A is a cross section view of an example nesting system 100. The system includes a cage assembly 101 with three tiers or levels 102a, 102b, and 102c and cage nest floors 104. A feed distribution system includes feed trough assemblies 106, and a watering system includes water assemblies 108. This example system 100 includes first and second nest boxes 110a and 110b, which are arranged back-to-back on middle level 102b. The nest boxes 110a and 110b are

each in the form of an enclosure with a respective front opening 111 for birds to enter/exit, and a respective movable nest floor 112. The movable nest floor 112 is inclined to encourage eggs to roll toward an egg outlet 114 and a central egg belt 116 that carries eggs from both nest boxes 110a and 110b out of the system 100. The nest floors 112 are each mounted to an adjustment mechanism comprising a driveshaft 118 that may lift and/or rotate the nest floor to eject a bird from the corresponding nest box 110a or 110b.

[0059] Figure 1B is a cross section view of another example nesting system 150. In this example, two nest boxes 152a and 152b are stacked on different levels of the system. In this example, the nest boxes each include a linear actuator 154 for actuating movement of the nest floors 156.

[0060] Figure 2 is a cross section view of an example single tier nesting system 200. The system 200 includes back-to-back nest boxes 210a and 210b, though embodiments are not limited to nest boxes being arranged back-to-back. The number, placement, size and configuration of nest boxes may vary. The example system 200 includes elevated nest floors 202 with manure belts 204 positioned below for removal of waste. The nest boxes 210a and 210b each include a respective floor movement mechanism 212 comprising a driveshaft 214 and lift arm 215 for raising a nest floor of the corresponding box 210a or 210b. In this example, two egg belts 216 are provided, with each nest box 210a and 210b outputting eggs to a respective one of the egg belts 216.

[0061] Typically, the behavior of birds changes throughout the day, and it may be desirable for a nest box system with movable nest floors (such as the examples of Figures 1 and 2) to be adjusted through the day. In the morning, and throughout the day, the birds may be laying their eggs, and therefore they need to have access to nest boxes. For bird comfort, the nest floor may be close to horizontal (i.e., angle of inclination close to zero). Published guidelines show birds prefer nest floors that are not significantly sloped, and therefore it is ideal to keep the angle of the nest floor close to zero when the nest floor is down. From industry studies, this angle is typically less than 10 degrees. However, if the angle of the nest floor is too shallow, then the eggs may not roll out the egg outlet and onto the egg belt. Thus, it may be desirable to increase the angle of inclination of the nest floor to approximately 15

degrees. In the evening and overnight, the birds may roost, and they will no longer lay eggs. To prevent the birds from sleeping in the nest boxes it is common to close the front of the nest, push the birds out with a moving arm, or to lift the nest floor to (or beyond) an angle that is uncomfortable for the birds. This lifting may slope or tilt the nest floors toward the front openings (rather than toward the egg outlets at the back) to expel the birds from the front opening of the nest boxes. Additionally, raising the nest floor allows any debris to fall off, and thus helps produce cleaner eggs.

[0062] Existing solutions for moving the nest floor may only allow limited movement of the nest floor and/or may require a driveshaft to rotate in multiple directions to provide sequential lifting of front and back ends of the nest floor. It may be desirable to move a nest floor through multiple positions by rotation of a driveshaft in a single direction. These positions may include, but are not limited to: lowered; increased tilt toward egg outlet; partially raised toward front; and fully raised.

[0063] Figures 3 and 4 are front perspective views of a nest box system 300 according to some embodiments. The nest box system 300 includes first and second adjacent nest boxes 302a and 302b, which are separated by a nest box divider wall 303 of the system 300. Each of the nest boxes 302a and 302b may have a similar structure and operation. The number of nest boxes may vary in other embodiments. In some embodiments, one or more single nest boxes may be provided in isolation without other adjacent nest boxes.

[0064] The system 300 of Figures 3 and 4, comprises a housing 304. The housing 304 forms, for each nest box 302a and 302b, a respective nesting enclosure 305 and optionally a respective egg collection enclosure 306. For each nesting box, 302a and 302b, the housing 304 has a front 307, a back 308, a first side (309a or 309b), a second side 310, and a top 311. Each egg collection enclosure 306 portion of the housing 304 is positioned behind the corresponding nesting enclosure 305 portion of the housing 304. The shared nest box divider wall 303 forms the second side 310 for each nest box 302a and 302b in this embodiment. The housing 304, including the nesting enclosure 305 and egg collection enclosure 306 may take other forms in other embodiments. In some embodiments, an egg collection area may not include an egg collection enclosure.

[0065] The nesting enclosure 305, for each nest box 302a and 302b, defines a respective front opening 312 for birds (e.g., chickens) to enter and exit the nest boxes 302a and 302b. The openings 312 are optionally covered by curtains 313 (as shown in Figure 3) or another covering that allows birds to walk into and out of the enclosure while also while reducing outside noise and light that enters the enclosure. The curtains 313 of the first nest box 302a are removed in Figure 4 so that the interior of the first nest box 302a is visible.

[0066] The housing 304 may comprise any suitable material. For example, the sides 309a and 309b may be a material chosen to provide structural strength to the nest boxes 302a and 302b and/or reduce the noise within the nest boxes 302a and 302b. For example, the material of at least the sides 309a and 309b may comprise be sheet metal and/or wood. The housing 304 shown in Figures 3 and 4 is provided by way of non-limiting example. Nesting box enclosures of various sizes, shapes and configurations may be used with the disclosed systems and methods.

[0067] The nest box system 300 includes, for each nest box 302a and 302b, a respective movable nest floor 314 (shown in Figure 4) positioned within the respective nesting enclosure 305. The nest box system 300 further includes a floor movement mechanism 315 that moves the nest floor 314 as described below. Each nest floor 314 has a front end 320, a back end 322 and sides 324a and 324b. According to an aspect, a nest floor system comprising the nest floor 314 and the floor movement mechanism 315 may be provided separately from the housing 304.

[0068] The floor movement mechanism 315 comprises a driveshaft 326 and at least one nest floor actuation member coupled to the driveshaft 326. The at least one nest floor actuation member in this embodiment comprises a plurality of lift cam members 328 and a plurality of lift arms 330. Each lift arm 330 is coupled to a respective lift cam member 328 in this embodiment. The driveshaft 326 has a longitudinal axis 327 and extends laterally (relative to the nest boxes 302a and 302b) at a position below the nest floors 314.

[0069] In this embodiment, the at least one nest floor actuator comprises, for each nest box (302a, 302b): a respective a pair of the lift cam members 328 and a respective pair of the lift arms 330. More or fewer lift cam members 328 and lift arms

330 may be used in other embodiments. In other embodiments, a different actuation members may be used to move the nest floor 314. Embodiments are not limited to the specific lift cam members 328 and lift arms 330 shown in Figures 3 and 4. The number and positioning of the lift arms 330 and lift cam members 328 along the driveshaft may also vary. In some embodiments, each nest box 302a and 302b may include only one lift cam members 328 and/or one lift arm 330, or more than two lift cam members 328 and/or lift arms 330 may be used.

[0070] As will be explained in more detail below, rotation of the driveshaft 326 in a first direction moves causes the at least one nest floor actuation member (lift cam members 328 and lift arms 330 in this embodiment) to move the nest floor 314 from a lowered (nesting) position to a fully raised position. The movement from the lowered position to the fully raised position comprises: (1) initially tilting the nest floor 314 toward the back 308 of the nesting enclosure 305; and then (2) rotating the nest floor 314 toward the front opening 312 of the nest enclosure. In the first stage (1), the initial tilting toward the back 308 of the nesting enclosure 305 increases an angle of inclination of the nest floor 314 from the back end 322 to the front end 320, which may help urge any eggs left on the nest floor 314 to roll through an egg outlet 317. In the subsequent stage (2), the rotation tilts the nest floor 314 in the opposite direction. This may be accomplished by raising the back end 322 of the nest floor 314, which initially tilts the nest floor 314 toward the front 307. This second stage (2) of movement may help expel birds from the nesting enclosure 305 through the front opening 312. Movements (1) and (2) may be accomplished by continuous rotation of the driveshaft 326 in one direction, as will be explained below. Rotation of the driveshaft in the opposite direction may then return the nest floor 314 to the lowered position.

[0071] The housing 304 in this example further includes, for each nest box 302a and 302b, an optional partition 316 (visible in Figures 8, 9 and 11 to 13) between the nesting enclosures 305 and the egg collection enclosure 306. Each partition 316 defines the egg outlet 317 therethrough (shown in Figures 8, 9 and 11 to 13) to allow eggs to roll from the nest floor 314 in the nesting enclosure 305 to the corresponding egg collection enclosure 306. The partition 316 and the egg outlet 317 are positioned at a back 321 of the nesting enclosure 305 (see Figure 8). The

partition 316 forms a partial barrier between the nesting enclosure 305 and the egg collection enclosure 306 to help prevent birds from leaving through the back 308 of the nesting enclosure 305 into the egg collection enclosure 306. The partition may comprise a same material as the remainder of the housing (e.g., sheet metal) in some embodiments. A stippled line 335 in Figures 3 and 4 represents the approximate position where the partition 316 meets the first side 309a. The partition may abut, or nearly abut, the top panel 319 of the egg collection enclosure 306, but the top panel is not connected to the top panel 319 in this embodiment (to allow the top panel 319 to be opened without removal or disconnection from the partition 316).

[0072] The top 311 of the nesting enclosure 305 may comprise one or more removable windows, removable panels (such as top panel 318a or 318b), doors and/or other means (not shown) to provide additional access the interior of the nesting enclosure 305. Such access means may allow a user to inspect the nest boxes (302a and 302b), check on birds, and/or perform repairs on the nest box (302a or 302b), for example. Similarly, a top panel or cover 319 of the egg collection enclosure 306 may be removable or openable to provide access to the interior of the egg collection enclosure 306.

[0073] Optionally, an egg belt 336 (shown in Figures 8, 9 and 11 to 13) extends through the egg collection enclosure 306 for bringing eggs to another location. The egg belt may comprise a conveyor belt of any suitable material or configuration for moving eggs. The egg belt 336 in this example may extend through side openings 338 of the egg collection enclosure 306. In this example, the egg belt 336 is positioned rearward of the nest floor 314 and egg outlet 317 and extends through the egg collection enclosures 306. The egg belt 336 is positioned to catch eggs as they roll into the egg collection enclosures 306a and 306b. The egg belt 336 in this example extends laterally through side openings 338 of the system 300. Each of the sides 309a and 309b defines a respective one of the side openings 338, although the egg belt 336 and side openings 338 may be omitted in other embodiments. The egg belt 336 may collect eggs from multiple nest boxes (302a and 302b) and transport them to another location, such as a front of a barn for easier, more automated collection. However, the egg belt 336 may be omitted in

other embodiments, and a person may manually collect the eggs from this area once they have rolled off the nest floor 314.

[0074] A feature may be added to slow or control speed of eggs as they roll out of the nesting enclosure 305 and onto the egg belt 336. Such egg safety features may be referred to as “egg savers” (not shown) and may reduce the speed of eggs and onto the egg belt. The egg saver may, for example, comprise a cable or rope that runs parallel to the egg belt at stops the eggs from crashing onto the egg belt. Periodically, this cable may be raised and lowered, allowing the eggs to slowly roll onto the egg belt.

[0075] For each nest box 302a and 302b, the respective nest floor 314 is mounted within the corresponding nesting enclosure 305 and over the corresponding floor movement mechanism 315 of the nest box 302a or 302b. The driveshaft 326 in this embodiment is shared by the first and second nest boxes 302a and 302b. Thus, rotating the driveshaft 326 may actuate the nest floors 314 of both nest boxes (302a and 302b). In other embodiments, each nest box 302a and 302b may be provided with separate and individually controllable driveshafts. Any suitable motor, actuator, and/or other mechanical power source may be used to impart rotation to the driveshaft 326.

[0076] Figure 5 is a side view of one of the lift cam members 328 and the driveshaft 326 in isolation. In this embodiment, the lift cam members 328 shown in Figure 4 each have the same structure as the one shown in Figure 5. However, different lift cam members and combinations of such may be used in other embodiments. In this embodiment, the lift cam member 328 is mounted to the driveshaft 326 (shown in Figures 3 and 4), such that the lift cam member 328 rotates together with the driveshaft 326.

[0077] The lift cam member 328 in this example is in the form of a cam plate having an irregular, non-circular disc shape. Specifically, the lift cam member 328 has a first face 340, an opposite second face (not visible) that mirrors the first face 340, and a non-circular rim 342 extending between the first face 340 and the second face. The rim 342 forms an outer periphery of the lift cam member 328. The lift cam member 328 defines a hole 344 therethrough, from the first face 340 to the second

face. In this example, the driveshaft 326 (Figures 3 and 4) has a square profile and the hole 344 has a square profile complimentary to the driveshaft 326 so that the lift cam member 328 is rotationally locked with the driveshaft 326 when mounted thereon. However, embodiments are not limited to any particular driveshaft profile shape.

[0078] The lift cam member 328 has an asymmetrical profile about the longitudinal axis 327 of the driveshaft 326. That is, the non-circular rim 342 of the lift cam member is asymmetrical about the hole 344 and driveshaft 326. The asymmetrical profile defines a nose portion 346 and a heel portion 348. The heel portion 348 has a minimum radius from the longitudinal axis 327 (which may be referred to as a 'base circle' radius). The approximate position of the longitudinal axis 327 when the lift cam member 328 is mounted on the driveshaft 326 (Figures 3 and 4) is illustrated in Figure 5. The nose portion 346 has a larger radius, relative to the longitudinal axis 317, than the heel portion 348. A ramp 349 between the heel portion 348 transitions from the base radius of the heel portion 348 to the second, larger radius of the nose portion 346. The heel portion 348, the ramp 349 and the nose portion 346 collectively function as a cam surface to actuate movement of the nest floor 314 as the lift cam member 328 is rotated under the nest floor 314. The radial change between the base radius of the heel portion 348 and the largest radius of the nose portion 346 may be referred to as "lift" distance of the lift cam member 328, and this "lift" distance is the distance by which the lift cam member 328 can raise the nest floor 314.

[0079] The lift cam member 328 in this embodiment optionally defines an arcuate slot 350 therethrough that extends in a circular arc about the hole 344 and longitudinal axis 327. As will be explained below, the arcuate slot 350 cooperates with the lift arm 330 (see Figure 7) to allow a limited degree of rotation of the lift arm 330 relative to the lift cam member 328.

[0080] The lift cam member 328 optionally includes a catch section 351 for a catch mechanism 366 described below (see Figure 6). In this embodiment, the catch section 351 is positioned between the heel portion 348 and the nose portion 346 (at an opposite end of the heel portion 348 than the ramp 349). The catch section 351 which includes a straight rim portion 352, and a step 353. The straight rim portion

352 extends in a straight path tangential to the longitudinal axis 327. The straight rim portion 352 has a first end 354a positioned adjacent the nose portion 346 and a second end 354b positioned adjacent the step 353. The first end 354a of the catch section 351 forms a corner (which may be relatively sharp) with the nose portion 346. The step 353 is raised relative to the catch section 351.

[0081] Figures 6 and 7 are a perspective and side views, respectively, of the lift cam member 328 of Figure 5 and a corresponding lift arm 330 in isolation. Each of the lift arms 330 of the system 300 (Figures 3 and YY) have the same structure in this embodiment, though different lift arms and combinations of such may be used in other embodiments. In this embodiment, the lift arm 330 pivotably couples to the driveshaft 326 (Figures 3 to 5).

[0082] As shown in Figure 6, the lift arm 330 of this embodiment comprises first and second arm pieces 355a and 355b, which mirror each other in this embodiment. The lift cam member 328 is positioned between the first and second arm pieces 355a and 355b. In other embodiments, the lift arm may comprise a single piece rather than mirrored first and second pieces 355a and 355b. The first and second pieces 355a and 355b of the lift arm 330 in this embodiment are each generally L-shaped having a first L-section 356 proximal to the lift cam member 328 and a second L-section 357 distal to the lift cam member 328. The first L-section 356 is at an angle to the second L-section 357. The first L-section 356 of first arm piece 355a is against the first face 340 and the first L-section 356 of the second arm piece 355b is against the second face of the lift cam member. However, embodiments are not limited to a particular lift arm shape or configuration. For example, a straight or curved lift arm may be used in other embodiments. The angle of the bend between the first L-section 356 and the second L-section 357 may also vary. The angle may be approximately 90 degrees or less (where 0 degrees represents the first and second L-sections extending in a straight line). The angle may, for example, be in the range of 40 to 80 degrees. In the embodiment of Figures 6 and 7, the angle of the bend is approximately 70 degrees. The angle between the first L-section 356 and the second L-section 357 may allow the lift arms 330 to rotate the nest floor 314 past vertical (as shown in Figure 13) while providing clearance between the lift arms

330 and other components of the system 300 (such as pin 380 discussed below and shown in Figure 10).

[0083] Optionally, the lift arm 330 includes a roller 358 or bumper at a distal end 360 of the lift arm 330 for engaging the nest floor 314. The roller 358 in this example is connected between the first and second arm pieces 355a and 355b at the distal end 360.

[0084] Each of the first and second lift arm pieces 355a and 355b defines a respective pivot hole 362 therethrough for receiving the driveshaft 326. These holes 362 may collectively be referred to as a pivot hole 362 through the lift arm 330, for each of reference. In this example, the pivot hole 362 is circular and sized to fit the driveshaft 326 therethrough such that the lift arm 330 can pivot about the longitudinal axis 327 of the driveshaft 326. In other embodiments, the lift arm 330 may instead be rotationally locked with the driveshaft 326.

[0085] In this embodiment, the lift arm 330 is coupled to the lift cam member 328 such that the lift arm 330 is rotatable, though a limited range of motion, relative to the lift cam member 328 and driveshaft 326. Specifically, the lift arm 330 is pivotably coupled to the lift cam member 328. The rotation limiting mechanism that limits rotation of the lift arm 330 relative to the lift cam member 328 in this example comprises the arcuate slot 350 through the lift cam member and a first arm first arm pin 364 (or other guide member) that is fixed to the lift arm 330 and slidably received in the arcuate slot 350. The first arm pin 364 can slidably travel along the length of the arcuate slot 350 (in a circular arc about the driveshaft 326) such that the lift cam member 328 can rotate through a limited range of motion relative to the lift arm 330. An end 365 (see Figure 5) of the arcuate slot 350 acts as a stop for the first arm pin 364, such that, when the first arm pin 364 engages the end 365 (shown in Figures 5 and 6), further rotation of the cam member 328 (in the clockwise direction in Figures 6 and 7) will cause the lift arm 330 to rotate in the same direction. Different mechanisms for limiting rotation within an allowed range of motion may be used in other embodiments. In other embodiments, the lift arm 330 may always be rotationally locked with the lift cam member 328. The term “pin” as used herein may refer to any guide member structure that extends into a slot or other guide track. For example, a pin may be a simple rod extension. However, pins received in slots may

take various forms, and embodiments are not limited to a particular structure of such pins (or other guide member structures).

[0086] Optionally, the floor movement mechanism 315 further includes a catch mechanism 366 or other latch mechanism that rotationally locks the lift arm 330 and the lift cam member 328 for rotational movement to lower the lift arm 330 from a raised position. The catch mechanism 366 may be disengaged while the driveshaft 326 is rotated in a first direction (e.g., clockwise) to raise the lift arm 330 and the nest floor 314. The catch mechanism 366 may engage the lift arm 330 when the driveshaft 326 is rotated a second, opposite direction (e.g., counter-clockwise) to lower the lift arm 330. The catch mechanism 366 in this example comprises: a catch slot 367 defined in the lift arm 330 (in each of the first and second arm pieces 355a and 355b); a catch pin 368 that extends through the catch slot 367 and between the first and second arm pieces 355a and 355b; and the catch section 351 of the rim 342 of the lift cam member 328 (see Figure 7). The catch slot 367 is generally parallel with the first L-section 356 of the lift arm 330. The catch slot has a first catch slot end 381 positioned such that, when the catch pin 368 is at the first catch slot end 381, the catch pin 368 is clear of the lift cam member 328. The catch slot has a second catch slot end 383.

[0087] At least a portion of the catch section 351 of the lift cam member 328 is alignable with the slot 367 to provide clearance for the catch pin 368 to slide toward the second catch slot end 383. That is, when the catch section 351 of the lift cam member 328 is rotated to a position providing clearance for the catch pin 368, the catch pin 368 can slide to the second catch slot end 383. Operation of the catch mechanism 366 is discussed below. Other releasable catch or latch mechanisms could be used rather than the specific example described herein. For example, a spring latch, releasable pawl, or other latch system could be used. In other embodiments, the catch mechanism 366 may be omitted.

[0088] Embodiments are not limited to the specific structures of the lift cam members 328 and lift arms 330 shown in Figures 5 to 7. The number and positioning of arms 330 and lift cam members 328 along the driveshaft 326 (Figure 4) may also vary, and pairs are not required. In some embodiments, each nest box 302a and

302b may include only one lift cam members 328 and/or one lift arm 330, or more than two lift cam members 328 and/or lift arms 330 may be used.

[0089] Optionally, at least one additional pin 369 interconnects the first and second arm pieces 355a and 355b in the second L-section portion 357.

[0090] Figure 8 is a side cross-sectional view of the nest box system 300 taken along the line A-A in Figure 4 (through the first nest box 302a). Figure 8 shows the nest floor 314 in a lowered position. The driveshaft 326 and one pair of lift cam member 328 and lift arm 330 are shown positioned under a front portion 370 of the nest floor 314.

[0091] The nest box 302a in this example further includes an optional sliding pivot mechanism 371 for restricting forward and rearward (horizontal) movement of the front end 320 of the nest floor 314. In this embodiment, the sliding pivot mechanism 371 comprises a pair of vertically aligned guide tracks 372 (e.g., comprising slots) and a pair of pivot members 373 (e.g., pins) fixed to the sides 324a and 324b (see Figure 2) of the nest floor 318 at or near the front end 320 of the nest floor 318. Each guide track 372 is mounted within the nesting enclosure 305 on a respective one of the sides 309a and 310 of the housing 304 and positioned in the front portion 370 of the nest floor 314 (near the front end 320) when the nest floor 314 is in the lowered position shown in Figure 8. Each pivot members 373 is slidably 372 received in the corresponding vertically aligned guide track 372 and may move vertically, but not horizontally, therein. The sliding pivot mechanism 371 thereby prevents forward/rearward movement of the front end 320 of the nest floor 314, while allowing vertical movement of the front end 320, as well as pivoting of the nest floor 314 about the pivot members 373 at (or near) front end 320. Other pivoting and/or movement guiding means to control or restrict movement of the nest floor 314 may be used in other embodiments.

[0092] Figure 8 also shows partition 316, which is in the form of a wall extending between sides of the nesting enclosure 305. The partition 316 partially divides the nesting enclosure 305 and the egg collection enclosure 306, while leaving open the egg outlet 317 near the back end 322 of the nest floor 314.

[0093] The nest floor 314 in this embodiment is an assembly comprising a structural base 332, which may comprise a panel of sheet metal, wood, and/or wire mesh, for example. The nest floor 314 may further comprise a nest pad 334 made from softer material positioned on the structural base 332. For example, the nest pad 334 may comprise a material chosen to provide birds comfort while they nest on the nest floor 314. Non-limiting examples of such materials include synthetic grass (e.g., Astroturf™) or carpet. The nest floor 314 may comprise any suitable material for supporting a bird nest and allowing the movement of the nest floor 314 described herein.

[0094] The nest floor 314 further optionally comprises, for each floor movement mechanism 315, a respective bracket 374 mounted to an underside of the base 332. The bracket 374 is best shown in Figure 10 and cooperates with the floor movement mechanism 315 as discussed below.

[0095] The nest floor 314 further comprises an optional fence structure 376 is also mounted to the structural base 332. The fence structure 376 includes two side walls 377 positioned on opposite sides of the nest floor 314. The side walls 377 in this example extend from the front end 320 to the back end 322 of the nest floor 314. The side walls 377 define upward extending fence supports 378 at or near the back end 322 of the nest floor 314. The term “upward extending” in this case refers to extending away from an upper face of the structural base 332, relative to the position of the nest floor 314 shown in Figure 8. The side walls 377, including the supports 378, comprise sheet metal in this embodiment, but other materials and configurations may be used. At least one fence rail 379 extends between the fence supports 378. The fence rail 379 is at an elevated position (spaced from) the nest floor 314 and provides clearance for the eggs to roll under the rail 379 and through the egg outlet 317. A skirt or curtain may be hung from the rail 379 to help prevent birds from entering the egg collection enclosure 306 through the egg outlet 317. The nest pad 334 sits on the base 332 and is positioned between the side walls 377.

[0096] The example lowered position of the nest floor 314 shown in Figure 8 may be referred to as a “starting” position of the floor for the following description. This may be a default position of the nest floor 314, which is used for laying eggs during the day. In this position, the lift cam member 328 is positioned such that its

heel portion 348 is at positioned at least partially between the driveshaft 326 and the nest floor 314, such that the ramp 349 or heel portion 348 engages the nest floor 314 (i.e. the nest floor rests on the heel portion 348 or ramp 349). Specifically, in this example, the bracket 374 comprises a bracket pin 380 (best shown in Figure 10) positioned over the ramp 349 of the lift cam member 328. In other embodiments, the bracket pin 380 may rest directly on the heel portion 348. The bracket pin 380 functions as a cam follower positioned near the front end 320 of the nest floor 314 and is landed on the rim 342 of the lift cam member 328. Rotation of the cam member 328 is thereby converted to vertical movement of front portion 370 of the floor via the bracket pin 380.

[0097] In Figure 8, the lift arm 330 is shown in a lowered position and does not engage the nest floor 314, with the lift arm 330 essentially hanging freely downward from the driveshaft 326. However, in some embodiments, the lift arm 330 is supported in a more lifted, horizontal position (see Figure 9) when the nest floor 314 is fully lowered, with the lift cam member 328 in the same position shown in Figure 8. The lift arm 330 may be supported on a surface (not shown in Figure 8) below the nest floor 314 and/or the distal end 360 of the arm may be coupled to the floor, as will be discussed below. Other configurations are also possible.

[0098] In the lowered “starting” position for this example embodiment, the nest floor 314 is slightly inclined from the back end 322 to the front end 320 at an angle of inclination (α_1). This angle (α_1) may, for example, be 10 degrees or less. The nest floor 314 is thus slightly tilted towards the egg outlet 317. In the lowered position, the back end 322 of the nest floor 314 rests on a support member 375 that extends between the sides of the nesting enclosure 305. The support member 375 is not shown in Figures 8, 9 or 11 to 13, but it is shown in Figure 10 discussed below. In this embodiment, in the lowered position, the back end 322 of the nest floor 314 is at a lower elevation than the front end 320, which rests directly or indirectly on the lift cam member 328. In other embodiments, the back end of the floor may rest on another support surface, support member, support bracket, or any other support structure of the system. In some embodiments, the lift arms 330 or another component of the floor movement mechanism may be configured to support the nest floor 314 in the lowered position.

[0099] Figure 9 is another side cross-sectional view of the system 300 with the nest floor 314 in the lowered position, but with lift arm 330 in an alternate “starting” position. In this position, rather than freely hanging down, the lift arm 330 rests on a support surface 393 such that the lift arm is closer to horizontal. The support surface 393 could be, for example, a floor, ground, or other structure above which the nest box system 300 is mounted. The lift arm 330 extends rearward from the driveshaft 326 and its distal end 360 engages a back portion 382 of the nest floor 314 as the lift arm rotates (as shown in Figure 9). The lift cam member 328 is at the same position as in Figure 8, with the ramp 349 (Figure 5) engaging the bracket pin 380, such that the nest floor the nest floor 314 has the same angle of inclination (α_1) as in Figure 9. From this position, the lift cam member 328 can be rotated clockwise (by driveshaft 326) without moving the arm 330 until the arm first arm pin 364 in the arcuate slot 350 of the lift cam member 328 reaches the end 365 of the arcuate slot 350. The lift arm 330 may support the nest floor 314 in this configuration.

[00100] In the configuration of Figure 9, gravity causes the catch pin 368 to rest in the first catch slot end 381, which is the lowest point of the catch slot 367 in this position of the lift arm 330. The catch slot 367 and catch pin 368 do not restrict rotation of the lift arm 330 relative to the lift cam member 328 in this position of the catch pin 368.

[00101] Figure 10 is a lower, front, partial perspective view of the system 300. The nest pad 334 has been removed from the nest floor 314 in Figure 10. The bracket 374 is mounted on an underside 384 of the structural base 332 of the nest floor 314. The bracket 374 in this example includes two parallel flanges 385a and 385b extending downward from the structural base 332. The flanges 385a and 385b run parallel to a plane perpendicular to the longitudinal axis 327 of the driveshaft. The lift cam member 328 and lift arm 330 are positioned laterally between and generally below the flanges 385a and 385b when the nest floor 314 is in the lowered position. To more clearly show bracket pin 380, the nest floor 314 is shown slightly lifted off of the lift cam member 328. However, in normal operation, the bracket pin 380 rides the rim 342 of the lift cam member 328. Thus, the bracket pin 380 may also be referred to as a “cam follower pin.” The roller 358 of the lift arm 330 may roll

along the underside 384 of the floor panel 332 as the nest floor 314 is lifted by the lift arm (as described below).

[00102] The flanges 385a and 385b of the bracket 374 define aligned pairs of holes near the front end 320 of the nest floor 314. Specifically, a first pair comprise hole 386a in the first flange 385a and hole 386b in the second flange 385b, and a second pair comprises hole 386a in the first flange 385a and hole 386b in the second flange 385b. The bracket pin 380 is mounted in, and extends laterally between, the first pair of holes 386a and 386b. The bracket pin 380 may alternatively be mounted in the second pair of holes 387a and 387b, which may slightly alter the angle of inclination (α_1) of the nest floor 314 in the lowered position. Only a single pair of holes or more than two pairs of holes for the bracket pin 380 may be provided in other embodiments. The two pairs of holes (386a/386b and 387a/387b) are spaced apart in the lengthwise direction of the nest floor 314 (i.e. a direction between the front and back ends 320 and 322 of the nest floor 314). The pairs of holes (386a/386b and 387a/387b) thereby provide a plurality of selectable pin positions for altering where the pin 380 is landed on the ramp 349 of the lift cam member 328. The selectable positions may, thus, provide different angles of inclination of the nest floor 314 in the lowered position.

[00103] Other means for fixing the bracket pin 380 to the nest floor 314 may also be used. Alternatively, the bracket 374 or bracket pin 380 may be omitted and the lift cam member may engage other structure of the floor, such as the structural base 332. As the cam member 328 is rotated by driveshaft 326, the bracket pin 380 is moved upward and/or downward by lift cam member 328. Other cam follower structures may be used in other embodiments (other than a pin).

[00104] The guide track 372 is also visible in Figure 10.

[00105] In some embodiments, the lift arm 330 is coupled to the bracket 374, which may help guide or control movement of the lift arm 330 and/or the nest floor 314. For example, a lift arm guide mechanism 388 in this example includes a horizontally extending slot 390 defined through the second flange 385b and a guide member fixed to the lift arm 330 at or near the distal end 360. The slot 390 extends in the direction between front and back ends 320 and 322 of the nest floor 314, and

the roller 358 of the lift arm 330 moves along this direction. The guide member could be a bolt 391 of the roller 358 (shown in Figure 6) that extends outward from the lift arm 330 and into the slot 390. Any other guide member structure (e.g., pin) could be used. The slot 390 is sufficiently long to provide clearance of for movement of the lift arm 330 through the range of motion to lift the nest floor 314 as shown in Figures 9 and 11 to 13. This lift arm guide mechanism 388 may also assist with returning the nest floor 314 from a fully raised position back to a lowered position, as explained below.

[00106] Operation of the nest box system 300, including movement of the nest floor 314, will now be described in greater detail with reference to Figures 9 and 10 to 13. Figures 10 to 13 are side cross-sectional view of the system 300 similar to Figures 8 and 9, but with the nest floor 314, lift cam member 328 and lift arm 330 in different positions that illustrate movement of the nest floor 314.

[00107] From the lowered position and perspective shown in Figure 9, the driveshaft 326 is rotated counter-clockwise. The initial rotation of the driveshaft 326 rotates the lift cam member 328 to the position shown in Figure 11, with the nose portion 346 rotated to a position under the nest floor 314, with the nest floor 314 now resting on the nose portion 346 rather than the ramp 349 or heel portion 348. The nose portion 346. Figure 11 shows the nest floor 314 an “increased tilt position”, where the tilt of the nest floor toward the back 308 is increased relative to the lowered position of Figure 9. The movement of the nose portion 346 into position under the nest floor 314 forces the front end 320 of the nest floor 314 upward. This movement raises the front end 320 of the nest floor 314 relative to the back end 322, thereby increasing the angle of inclination to a new, increased angle (α_2). In other words, the tilt of the nest floor 314 toward the back 308 and the egg collection enclosure 306 is increased. The increased angle of inclination (α_2) may, for example, be 15 degrees or more, which may encourage any eggs on the nest floor 314 to roll through the egg outlet 317 and onto the egg belt 336.

[00108] If the lift arm 330 starts fully lowered, as shown in Figure 8, the initial rotation of the driveshaft 326 may rotate the arm 330 toward the position shown in Figure 11. However, from the starting position of Figure 9, the initial rotation of the

driveshaft 326 rotates the lift cam member 328 but not the lift arm 330 (due to the clearance provided by the arcuate slot 350 in the lift cam member 328).

[00109] In the increased tilt position of Figure 11, the first arm pin 364 through the arcuate slot 350 of the lift cam member 328 is positioned against the end 365 of the arcuate slot 350, such that the end 365 (Figure 7) of the arcuate slot 350 acts as a stop for the first arm pin 364.

[00110] From the increased tilt position of Figure 11, continued rotation of the driveshaft 326 in the same clockwise direction imparts rotation to the lift arm 330 (via the first arm pin 364). The distal end 360 of the lift arm 330 lifts the back portion 382 (with back end 322) of the nest floor 314 relative to the front end 320. This lifting by the lift arm 330, therefore, rotates the nest floor 314 toward the front 307 of the nesting enclosure 305 as shown in Figures 12 and 13.

[00111] Figures 12 and 13 show the nest floor 314 and lift arm 330 in partially and fully raised positions respectively. The continued rotation of the driveshaft 326 moves the lift arm 330 through the partially raised position shown in Figure 12 (and toward the fully raised position of Figure 13). This lifting of the back end 322 of the nest floor causes the nest floor to tilt toward the front opening 312. As the back end 322 of the nest floor 314 raises, birds may no longer be comfortable to stay on the nest floor 314 and may therefore exit the nest box 302a as the nest floor moves to the partially raised position. The angle of nest floor 314 for the partially raised position at which birds are encouraged to exit the nest box 302a may vary, and the angle may be continuously variable or adjustable by an operator.

[00112] From the partially raised position of Figure 12, continued rotation of the driveshaft 326 in the same clockwise direction will move the lift arm 330 to a raised arm position, thereby moving the nest floor 314 to the fully raised position of Figure 13. In this example, in the fully raised position, the nest floor 314 is slightly past vertical (i.e., rotated more than 90 degrees from a horizontal plane). This fully raised position of the nest floor 314 may encourage debris and waste to fall from the nest floor 314. The nest pad 334 may only be attached to the structural base 332 and/or the fence structure 376 at or near the back end 322 of the nest floor 314. This may allow the nest pad 334 to hang loose and encourage debris caught in the nest pad to

shake loose. The housing 304 optionally defines an upper clearance area 392 of the nesting enclosure 305 that accommodates the fence structure 376 of the nest floor 314 when the nest floor 314 is fully raised. The upper clearance area 392 is positioned in a top-front region of the housing 304 and is forward of the opening 312 in this embodiment. However, embodiments are not limited to a particular housing shape.

[00113] For the movement shown in Figures 9 and 11 to 13, the driveshaft 326 rotates in a single direction, while imparting two different movements to the nest floor 314. That is, the rotation causes the nest floor to, first, increase the tilt toward the back 308 of the housing 304 and the egg outlet 317, and second, rotate toward the front 307 of the nest box 302a. At the same time, the driveshaft 326, lift cam members 328, and lift arms 330 are also beneficially positioned below the nest floor 314 during normal operation.

[00114] In the fully raised position in Figure 13, the second catch slot end 383 is now the lowest point of the catch slot 367. The relative position of the lift arm 330 and lift cam member 328 for clockwise rotation (as set by the arcuate slot 350) is such that the catch section 351 of the lift cam member 328 provides clearance for the catch pin 368 to move in the catch slot 367. Thus, when the lift arm 330 is rotated to the position of Figure 13, with the second catch slot end 383 being the lowest point of the catch slot 367, the catch pin 368 now falls by gravity to the second catch slot end 383. In this position, the catch pin 368 is adjacent the catch section 351 of the lift cam member 328.

[00115] From the fully raised position in Figure 13, the driveshaft 326 may be rotated in the opposite direction (i.e., counter-clockwise from the perspective of Figure 13) to lower the lift arm 330. From the position in Figure 13, counter rotation of the lift cam member 328 will cause the catch pin 368 to catch on the catch section 351 of the lift cam member 328, thereby rotationally locking the lift arm 330 to the lift cam member 328 for at least an initial part of the counter rotation. This counter-rotation of the lift arm 330 and lift cam member 328 moves the nest floor 314 back to the lowered position shown in Figure 8 or Figure 9. When the catch slot 367 rotates far enough that the first catch slot end 381 is again the lowest point, the catch pin 368 may fall by gravity back to the first catch slot end 381, as shown in Figures 9 to

12. The catch pin 368 falling back to the first catch slot end 381 may thereby release the catch mechanism 366.

[00116] The angle of inclination of the nest floor 314 in the lowered position (Figures 8 and 9) may be a fixed (non-adjustable) angle in some embodiments. However, it may be beneficial to allow adjustment that angle so that different inclinations are obtainable for one or all the positions shown in Figures 8 to 13. For example, a producer might notice that the eggs are not freely rolling out of the nest box 302a and may, therefore, wish to keep the nest floor 314 at a slightly more inclined position. Or, if eggs are rolling out of the nest box too fast the producer may wish to reduce the angle of inclination for the lowered position of the nest floor.

[00117] For the embodiments of Figures 3 to 13, one way to adjust the angle of inclination for the lowered position is simply prevent the lift cam member 328 from rotating all the way back as the nest floor 314 is being lowered. If the driveshaft 326 is driven by a drive system controlled by a control system that allows programmable and controlled rotation of the driveshaft, the system could be programmed to start/stop at a given shaft and cam position to control the inclination of the nest floor. Other, more mechanical options are also possible. The drive system may be an electro-mechanical device with built-in feedback (such as the linear actuator 154 shown in Figure 1B).

[00118] Another method for adjusting the angle of inclination in the lowered position of the nest floor 314, is to use a shim or other structure may to raise the back end 322 of the nest floor 314 (thereby reducing the starting angle of inclination).

[00119] Figure 14 is a side cross-sectional partial view of a nest box 402 according to some embodiments. The nest box 402 is similar in structure and function to the nest boxes 302a and 302b of the system shown in Figures 3 to 13, with like reference elements signifying like elements. For example, the nest floor 314, lift cam member 328 and lift arm 330 are shown and function similar to the embodiment of Figures 3 to 13. The nest box 402 in Figure 14, however, includes a spacer block 404 positioned under a back portion 382 of the nest floor 314 (i.e., under the nest floor 314 toward the back end 322). The spacer block 404 acts as an

inclination adjustment device, which be added to reduce the inclination of the nest floor 314 in the lowered position relative to the embodiment of Figures 3 to 13. The spacer block 404 vertically spaces the back end 322 of the nest floor 314 from a floor support member 403 or other support structure of the nest box 402, thereby reducing the tilt angle of the nest floor 314 in the lowered position. Other similar elements, such as a shim, may be used in a similar manner to adjust the inclination angle of the nest floor 314 in its lowered position.

[00120] Adding a shim or spacer to the system (as in Figure 14), may also create a larger drop from the back end of the floor to the egg outlet, which may increase the likelihood of egg damage. To address this, in some embodiments, the egg belt 336 may be adjusted with the position of the nest floor such that the transition from the nest floor onto the belt is gentle.

[00121] Figure 15 is a side cross-sectional partial view of a nest box 502 according to some embodiments. The nest box 502 is similar in structure and function to the nest boxes 302a and 302b of the system shown in Figures 3 to 13, with like reference elements signifying like elements. The nest box 502 in Figure 15, however, includes a threaded bolt 504 that functions as an adjustable stop mechanism or spacer. The bolt 504 can be turned to adjust the inclination of the nest floor 314 in the lowered position. Any other adjustable stop mechanism that supports the back end of the floor when the floor is in the lowered floor position may be used. The adjustable stop mechanism may, for example, comprise a pin, an adjustable bracket or support member, or any other structure capable of supporting the back end 322 of the nest floor 314 and adjustable to change the elevation of the back end 322 in the lowered position.

[00122] In still another example, the angle of inclination for the lowered position may be adjusted by modifying the contact point between the nest floor 314 and the cam member 328. For example, a cam follower (such as a pin) landed on the lift cam member 328 may be adjustable along a lengthwise direction of the nest floor (i.e. front to back) to thereby adjust the angle of inclination for the lowered floor position.

[00123] Figures 16 and 17 are side cross-sectional partial views of another nest box 506 according to some embodiments. The nest box 602 is similar in structure and function to the nest boxes 302a and 302b of the system shown in Figures 3 to 13, with like reference elements signifying like elements. Only the second arm piece 355 of the lift arm 330 is shown (first arm piece 355a is removed in Figures 16 and 17).

[00124] In Figures 16 and 17, the nest floor 614 is similar to the nest floor 314 of Figures 3 to 13, except the bracket 674 includes more holes 680a to 680e for additional possible positions of a bracket pin (similar to pin 380 in Figure 10). Each position for the bracket pin (i.e., provided by holes 680a to 680e) may provide a slightly different inclination angle of the floor 614 in the lowered position. For example, Figure 16 shows the lowered position for a bracket pin in the second forward-most hole 680d, and Figure 17 shows the lowered position for a bracket pin in the rear-most hole 680a. The lowered position of Figure 16 has a slightly lower angle of inclination than Figure 17. In other words, the holes 680a to 680e provide a plurality of selectable positions for the pin (similar to bracket pin 380 of Figure 1) along the sides of the nest floor 614. Each of the plurality of hole positions provides a different contact location between the lift cam member 328 and the nest floor 614. Each contact location provides a slightly different tilt angle (angle of inclination).

[00125] In some embodiments, methods of adjusting the angle of inclination of the nest floor may be implemented without the two-part movement of the nest floor described herein (i.e. without the floor movement mechanism (1) initially increasing the tilt of the nest floor by raising the front end of the nest floor and then (2) rotating the floor toward the front opening).

[00126] In the embodiments described with reference to Figures 3 to 17, a combination of a lift cam member and a lift arm provided the two-part movement of the nest floor while the driveshaft rotates in one direction. The cam member is a first lift mechanism that provides the first part of the movement (increasing the angle of inclination or tilt toward the egg outlet) and the lift arm is a second lift mechanism that provides the second part of the movement (lifting the back end of the nest floor toward the front opening to expel a bird). However, the floor movement mechanism that provides this two-part movement by rotation of the driveshaft in one direction is

not limited to cam members combined with lift arms. In other embodiments, other structural arrangements provide similar functionality.

[00127] Figures 18 to 21 are side cross-sectional partial views of a nesting system 700 comprising a nest box 702 according to another embodiment. The nest box 702 includes an adjustable nest floor 718 and housing 701 defining an enclosure similar to the nest box 302a or 302b of Figures 3 and 7. The housing 701 similarly has a front 704 and a back 706. The housing 701 defines a nesting enclosure 705 and an egg collection enclosure positioned behind the nesting enclosure, and an egg outlet 716 for eggs to roll from the nesting enclosure 705 into the egg collection enclosure 707 (onto egg belt 711). The housing 701 further defines a front opening 714. The nesting box 702 also includes a floor movement mechanism 713.

[00128] In this embodiment, the floor movement mechanism 713 comprises a driveshaft 726 positioned under the nest floor 718, similar to the nest floor 314 and driveshaft 326 in Figures 3 and 7. However, in this example, the floor movement mechanism does not include a cam plate. Rather, the floor movement mechanism comprises a lift arm 730 that is sized to engage a front portion 764 of the nest floor 718 (i.e., in front of a center of gravity of the nest floor 718). Vertical guide slots 719 are provided on either side of the nest floor 718 near its front end 722. The nest floor 718 is engaged with the guide slots 719 to allow limited vertical movement of the front end 722 of the nest floor 718. Front pins 721 attached to the floor 718 (near front end 722) are engaged in the slots 719. The pins 721 and slots 719 function as a sliding pivot mechanism. Any other suitable guide track mechanism or other mechanical structure to allow limited vertical movement of the front end 722 may be used in other embodiments.

[00129] A pair of lift arms 730 arms are provided, one for each side of the nest floor 718. Only one lift arm 730 is visible in Figures 18 to 21, but the other arm has a similar structure and configuration. The lift arms 730 are slidably coupled to the nest floor 718. In this specific example, a slot 750 aligned with the length of the nest floor 718 is defined in each side of the nest floor 718, and the distal end 756 of the corresponding lift arm 730 is engaged with the nest floor 718 by a rear pin 731

received in the slot 750. Thus, the distal end 756 of the lift arms 730 may travel a limited distance along the sides of the nest floor 718.

[00130] In this embodiment the driveshaft 726 again rotates in one direction for a two-part movement of the nest floor 718 that is similar to the two-part lifting movement of the nest floor 314 illustrated in Figures 8 to 13. The driveshaft 726 rotates in a clockwise direction from the perspective of Figures 18 to 21 to raise the nest floor 718 for this two-part movement. In this example, the lift arm 730 is fixed directly onto, and rotationally locked with the driveshaft 726.

[00131] From the lowered position of the nest floor 718 shown in Figure 18, the driveshaft may rotate clockwise, thereby raising the lift arm 730. Because the distal end 756 of the lift arm 730 is in front of the nest floors centroid or center of gravity, the front end 722 of the nest floor 718 will rise for the initial rotation of the driveshaft. This will move the pin 721 upwards to the top of the vertical slot 719 in a similar motion as the cam member 328 in the embodiment of Figures 3 to 17. Thus, in a first part of the movement of the nest floor 718, the nest floor 718 will move to the increased inclination position shown in Figure 19. The front pin 721 and vertical slot 719 are near the front end of the nest floor 718 in this embodiment. In other embodiments, the front pin 721 and vertical slot 719 may be positioned further rearward, so long as the front pin 721 and vertical slot 719 are forward of the center of gravity of the nest floor 718 and the distal end 756 of the lift arm.

[00132] Once the front pin 721 is at the top of the vertical slot 719, continued rotation of the driveshaft 726, will force the back end 724 of the nest floor 718 up. The nest floor 718 will then rotate toward the partially raised position of Figure 20 and eventually to the fully raised position shown in Figure 21. The rear pin 731 will slide in the corresponding slot 750 as the back end 724 of the nest floor 718 raises until past vertical. This slot 750 may prevent the front of the nest floor 718 from dropping down due to gravity. Thus, in a second part of the movement of the nest floor 718, the nest floor 718 may move to the fully raised position shown in Figure 21.

[00133] From the fully raised position shown in Figure 21, the nest floor 718 may be lowered by rotating the driveshaft in the counter-clockwise direction.

[00134] It may be advantageous to have a single mechanical drive mechanism (such as the linear actuator 154 in Figure 2) turn the driveshaft (e.g., driveshaft 326 or 726 of the systems 300 or 700 described above) and provide the motion to as many nest floors as possible. However, as the driveshaft gets longer it may have a tendency to twist due to the applied load of the nest floor and any birds left in the boxes. If the driveshaft is long enough, this tendency to twist may become a problem as there could be a significant difference in inclination between the nest floors close to the mechanical drive mechanism, and those further away. To address this, one option is to make the driveshaft stiffer. However, due to geometry constraints, the size (e.g., thickness) of the driveshaft may be limited and it may not be possible to provide a sufficiently stiff driveshaft to prevent unacceptable twisting.

[00135] As another option, in some embodiments, a second driveshaft may be provided that is parallel to the first driveshaft (e.g., driveshaft 326 or 726 described above) such that load is distributed along the driveshafts. If the second shaft is run parallel to the first shaft, and they are rotatably coupled at two or more locations, the loads may be distributed across both shafts and therefore the angle of twist may be reduced. The location of the second driveshaft may not be critical. Thus, the second driveshaft may be positioned moved away from the first driveshaft and remainder of the floor movement mechanism. Thus, the second driveshaft may potentially be significantly larger and stiffer than the first driveshaft.

[00136] Figure 22 is a perspective view of the nest box system 300 of Figures 3 and 4 according to another embodiment, where the system 300 further includes a second driveshaft 826 that is parallel to the first driveshaft 326. The second driveshaft 826 is rotationally coupled to the first driveshaft 326 by first and second spaced apart sprocket and chain couplings 802a and 802b. Embodiments are not limited to sprockets and chains, and any suitable rotational coupling may be used (e.g., pulleys, belts, gears, linkages, etc.). The second driveshaft 826 has a larger diameter than the first driveshaft 326 and has a higher torsional stiffness. The second driveshaft 826 may be driven and may impart rotation to the first driveshaft 326. The couplings 802a and 802b may distribute the load along the first driveshaft 326.

[00137] The system 300 in this embodiment further includes an example drive system 810 comprising a motor 812 and a controller 814 operatively coupled to the motor 812. The motor 812 is coupled to the second drive shaft 826 and is operable to drive rotation of the second drive shaft 826 (and thereby the move the nest floor 314 shown in Figures 8 to 13. The controller 814 may be configured to move the nest floor 314 through the movements described above. The controller 814 may be external to the drive system 800. For example, the controller 814 may be positioned at a remote location.

[00138] In some embodiments, the floor movement mechanism may comprise a driveshaft (e.g. driveshaft 326 of Figures 3 and 4) and at least one actuator. The at least one actuator may comprise a lift arm as described herein (such as the lift arm 330 of Figures 5 and 6 or lift arm 730 of Figures 18 to 21). The floor movement mechanism may rotate the nest floor past vertical, but without initially increasing the nest floor to an increased tilt position. That is, the floor movement mechanism may omit a structure described herein for causing initial rotation of the driveshaft to initially raise the front end of the nest floor relative to the back end.

[00139] It is to be understood that a combination of more than one of the approaches described above may be implemented. Embodiments are not limited to any particular one or more of the approaches, methods or apparatuses disclosed herein. One skilled in the art will appreciate that variations or alterations of the embodiments described herein may be made in various implementations without departing from the scope of the claims.

CLAIMS

We claim:

1. A bird nest box system comprising:

a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the nesting enclosure and an egg outlet at a back of the nesting enclosure;

a movable nest floor having a front end and a back end;

and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising:

a driveshaft; and

at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein the at least one floor actuation member comprises a lift cam member mounted to the driveshaft and at least one lift arm, wherein the lift cam member comprises a nose portion, a heel portion, and a ramp extending from the heel portion to the nose portion,

wherein, with the nest floor in a lowered floor position, a front portion of the nest floor rests on the heel portion or the ramp of the lift cam member, and initial rotation of the driveshaft in a first direction rotates the nose portion of the lift cam member to engage the nest floor, thereby raising the front end of the nest floor and tilting the nest floor toward the egg outlet; and

continued rotation of the driveshaft in the first direction moves the lift arm to raise the back end of the nest floor above the front end, thereby rotating the nest floor toward the front opening and to a raised floor position.

2. The nest box system of claim 1, wherein in the raised floor position, the nest floor is rotated past 90 degrees relative to a horizontal plane.

3. The nest box system of claim 1 or 2, wherein, in the lowered floor position, the back end of the nest floor is at an elevation lower than the front end, such that the nest floor is inclined from the back end to the front end at an angle of inclination, and the initial rotation of the driveshaft in the first direction moves the at least one floor actuation member to increase the angle of inclination.
4. The nest box system of claim 3, wherein the angle of inclination for the lowered floor position is adjustable.
5. The nest box system of claim 1, wherein the lift arm has a first end proximal to the driveshaft and a second end distal to the driveshaft, and the continued rotation of the driveshaft in the first direction rotates the lift arm to raise the second end, the second end engaging the nest floor and raising the back end of the nest floor.
6. The nest box system of claim 5, wherein the continued rotation of the driveshaft in the first direction rotates the lift arm from a lowered arm position to a raised arm position, and rotation of the lift arm to the raised arm position rotates the nest floor to the raised floor position.
7. The nest box system of claim 6, wherein the front portion of the nest floor is coupled to the housing by a sliding pivot mechanism, the sliding pivot mechanism allowing limited vertical movement of the front end of the nest floor, the lift arm rotating the nest floor about the sliding pivot mechanism to the raised floor position.
8. The nest box system of any one of claims 1 to 7, wherein the lift arm is pivotably mounted to the driveshaft or the lift cam member, the floor movement mechanism further comprising a rotation limiting mechanism that limits rotation of the lift arm relative to the lift cam member.
9. The nest box system of claim 8, wherein the rotation limiting mechanism comprises an arcuate slot defined in the lift cam member and a guide member fixed to the lift arm and slidably received in the arcuate slot, the arcuate slot extending in a circular arc about a longitudinal axis of the driveshaft.

10. The nest box system of claim 1, wherein, with the nest floor in the raised floor position, rotation of the driveshaft in a second direction opposite to the first direction moves the at least one floor actuation member to return the nest floor to the lowered floor position, the floor movement mechanism further comprising a catch mechanism that engages the lift arm to rotationally lock the lift arm with the lift cam member for at least a portion of the rotation of the driveshaft in the second direction.

11. The nest box system of any one of claims 1 to 10, further comprising a drive system configured to rotate the driveshaft and a controller operatively coupled to the drive system to: selectively move the nest floor between the lowered position and the raised floor position.

12. A bird nest box system comprising:

a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the nesting enclosure and an egg outlet at a back of the nesting enclosure;

a movable nest floor having a front end and a back end;

and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising:

a driveshaft; and

at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein the at least one floor actuation member comprises a lift arm coupled to the driveshaft and having a distal end positioned to engage the nest floor forward of a center of gravity of the nest floor and lift the nest floor, the system further comprising a sliding pivot mechanism coupling the nest floor to the housing, the sliding pivot mechanism being positioned forward of the distal end of the lift arm,

wherein, with the nest floor in a lowered floor position, initial rotation of the driveshaft in a first direction raises the distal end of the lift arm, the distal end

engaging the nest floor forward of a center of gravity of the nest floor, to raise a front portion of the nest floor, thereby tilting the nest floor toward the egg outlet, the sliding pivot mechanism allowing limited vertical and upward movement of the front portion of the nest floor; and

continued rotation of the driveshaft in the first direction further raises the distal end of the lift arm to raise the back end of the nest floor above the front end, thereby rotating the nest floor toward the front opening and to a raised floor position, the sliding pivot mechanism allowing the nest floor to rotate about the sliding pivot mechanism.

13. A bird nest box system comprising:

a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the nesting enclosure and an egg outlet at a back of the nesting enclosure;

a movable nest floor having a front end and a back end;

and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising:

a driveshaft; and

at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor,

wherein, with the nest floor in a lowered floor position, initial rotation of the driveshaft in a first direction moves at least one of said at least one floor actuation member to tilt the nest floor toward the egg outlet; and

continued rotation of the driveshaft in the first direction moves the at least one floor actuation member to raise the back end of the nest floor above the front end, thereby rotating the nest floor toward the front opening and to a raised floor position,

wherein the at least one floor actuation member comprises a lift cam member mounted to the driveshaft, wherein the nest floor further comprises a cam follower and the lift cam member engages the cam follower, a position of the cam follower being adjustable along a lengthwise direction of the nest floor to thereby adjust the angle of inclination for the lowered floor position.

14. The nest box system of claim 13, wherein the cam follower comprises a pin selectively positionable at a plurality of pin positions spaced apart along the lengthwise direction of the nest floor.

15. The nest box system of claim 14, further comprising an adjustable stop mechanism that supports the back end of the nest floor when the nest floor is in the lowered floor position, the adjustable stop mechanism being adjustable to change the elevation of the back end of the nest floor in the lowered floor position.

16. An adjustable floor system for a nest box, the system comprising:

a nest floor having a front end and a back end; and

a floor movement mechanism, the nest floor being mounted over the floor movement mechanism, the floor movement mechanism comprising

a driveshaft; and

at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein the at least one floor actuation member comprises a lift cam member mounted to the driveshaft and at least one lift arm, wherein the lift cam member comprises a nose portion, a heel portion, and a ramp extending from the heel portion to the nose portion,

wherein, with the nest floor in a lowered floor position, a front portion of the nest floor rests on the heel portion or the ramp of the lift cam member, and initial rotation of the driveshaft in a first direction rotates the nose portion of the lift cam member to engage the nest floor, thereby raising the front end of the nest floor and tilting the nest floor toward the back end of the nest floor; and

continued rotation of the driveshaft in the first direction moves the lift arm to raise the back end of the nest floor above the front end, thereby rotating the nest floor toward the front end of the nest floor and to a raised floor position.

17. A bird nest box system comprising:

a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the enclosure and an egg outlet at a back of the nesting enclosure;

a movable nest floor having a front end and a back end;

and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising:

a driveshaft; and

at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor, wherein the at least one floor actuation member comprises a lift arm having a guide member at a distal end of the lift arm that engages the nest floor, the nest floor comprising a bracket having a slot defined therein, the guide member engaging the slot,

wherein rotation of the driveshaft rotates the at least one floor actuation member to move the nest floor between a lowered floor position and a raised floor position, and wherein moving the nest floor to the raised floor position rotates the nest floor toward the front opening and past 90 degrees relative to a horizontal plane, the guide member and the slot maintaining engagement of the lift arm and the nest floor when the nest floor is rotated past 90 degrees relative to the horizontal plane.

18. A bird nest box system comprising:

a housing defining a nesting enclosure, the nesting enclosure defining a front opening for a bird to enter and exit the enclosure and an egg outlet at a back of the nesting enclosure;

a movable nest floor having a front end and a back end;

and a floor movement mechanism, the nest floor being mounted within the nesting enclosure and over the floor movement mechanism, the floor movement mechanism comprising:

a driveshaft; and

at least one floor actuation member coupled to the driveshaft and rotatable by the driveshaft to move the nest floor,

wherein, rotation of the driveshaft rotates the at least one floor actuation member to move the nest floor between a lowered floor position and a raised floor position, and

wherein, in the lowered position, the back end of the nest floor is at an elevation lower than the front end, such that the nest floor is inclined from the back end to the front end at an angle of inclination, and wherein the angle of inclination for the lowered floor position is adjustable, and

wherein the at least one actuation member comprises a lift cam member mounted to the driveshaft, wherein the nest floor further comprises a cam follower and the lift cam member engages the cam follower, a position of the cam follower being adjustable along a lengthwise direction of the nest floor to thereby adjust the angle of inclination for the lowered floor position.

19. The nest box system of claim 18, wherein the cam follower comprises a pin selectively positionable at a plurality of pin positions spaced apart along the lengthwise direction of the nest floor.

20. The nest box system of claim 18, further comprising an adjustable stop mechanism that supports the back end of the nest floor when the nest floor is in the lowered floor position, the adjustable stop mechanism being adjustable to change the elevation of the back end of the nest floor in the lowered position.

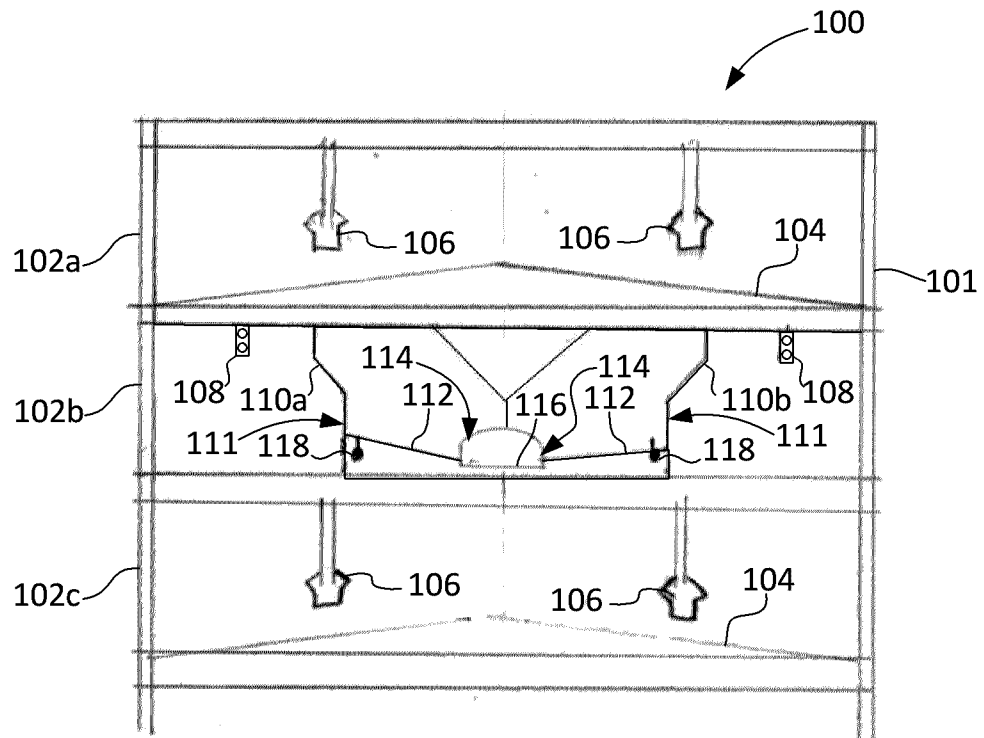


FIG. 1A

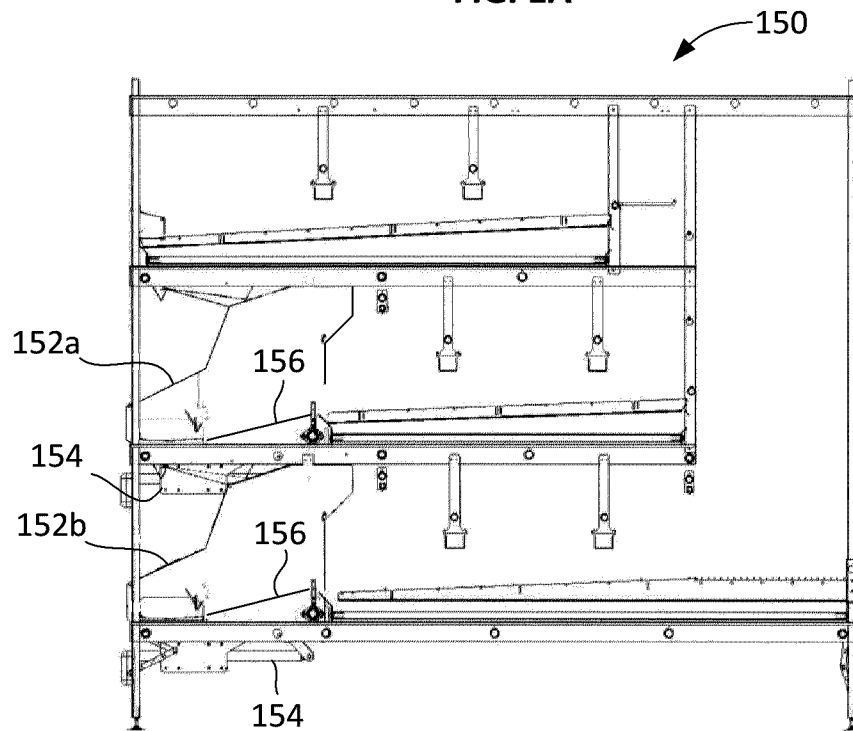


FIG. 1B

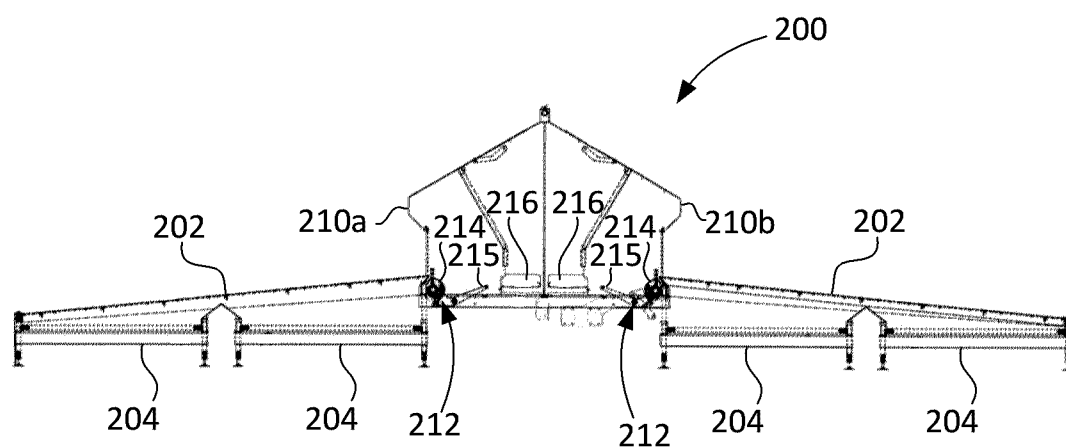
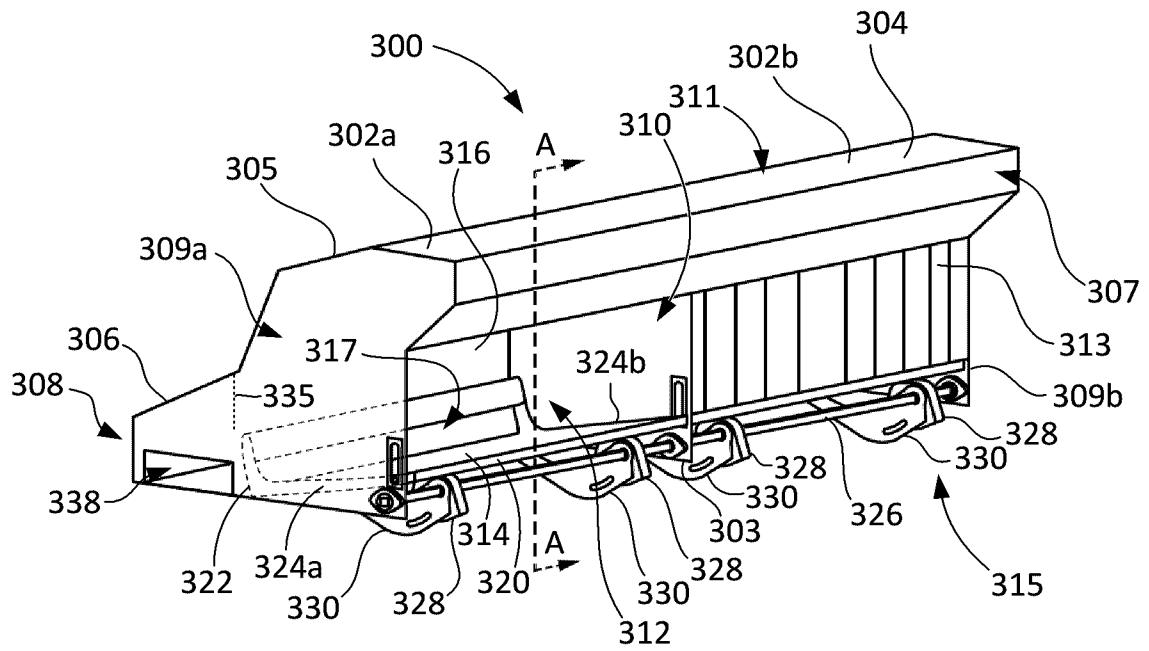
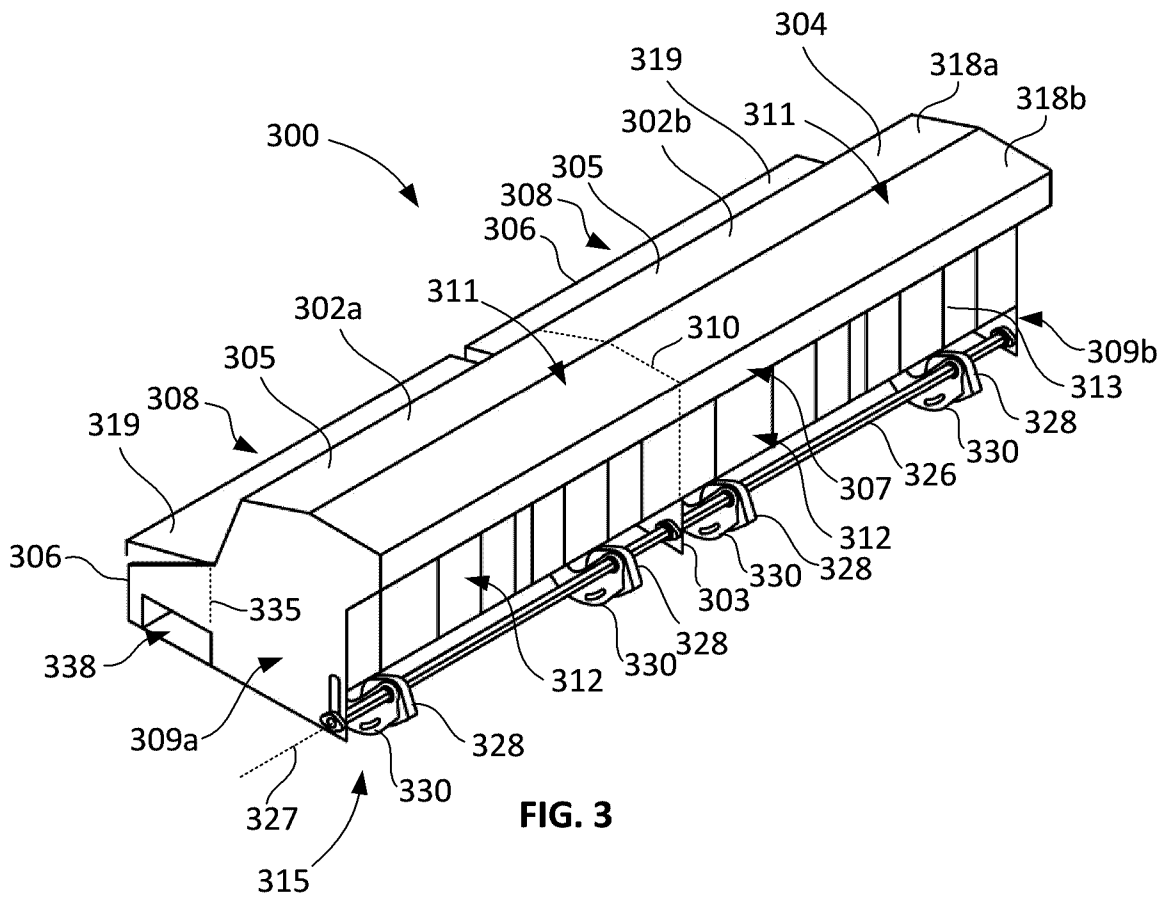


FIG. 2



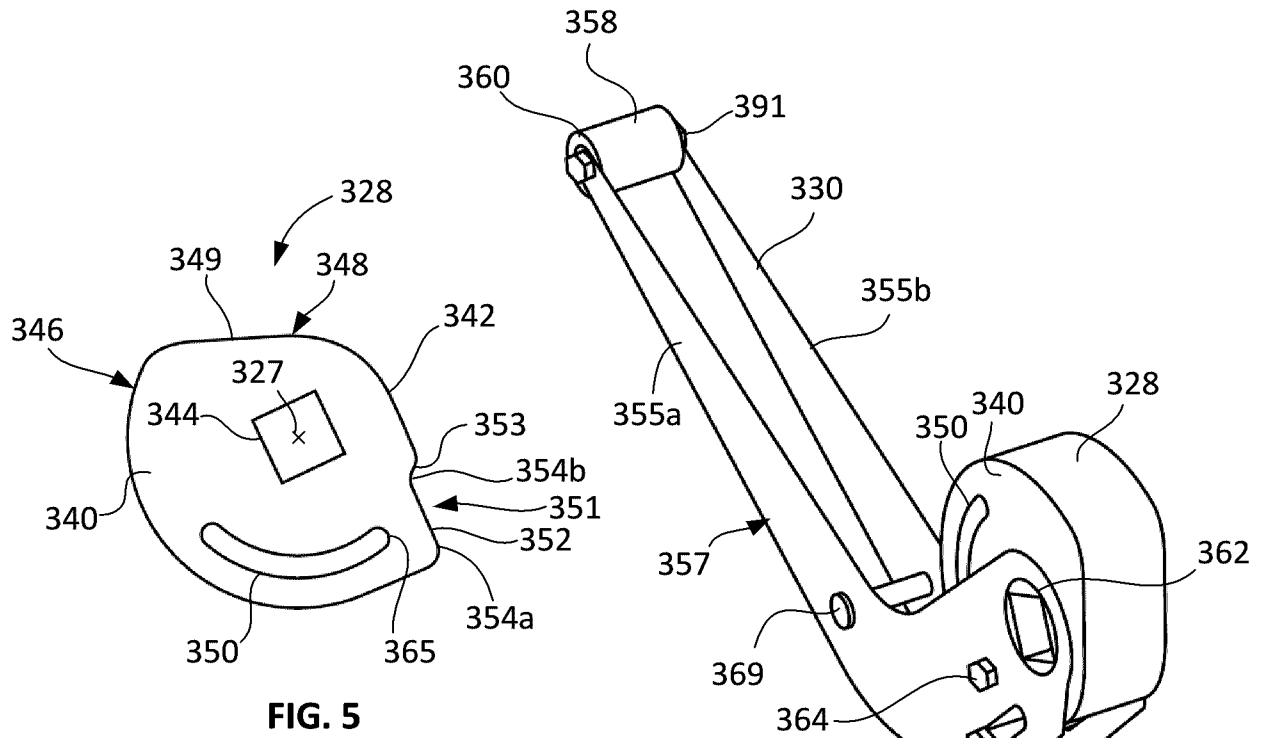


FIG. 6

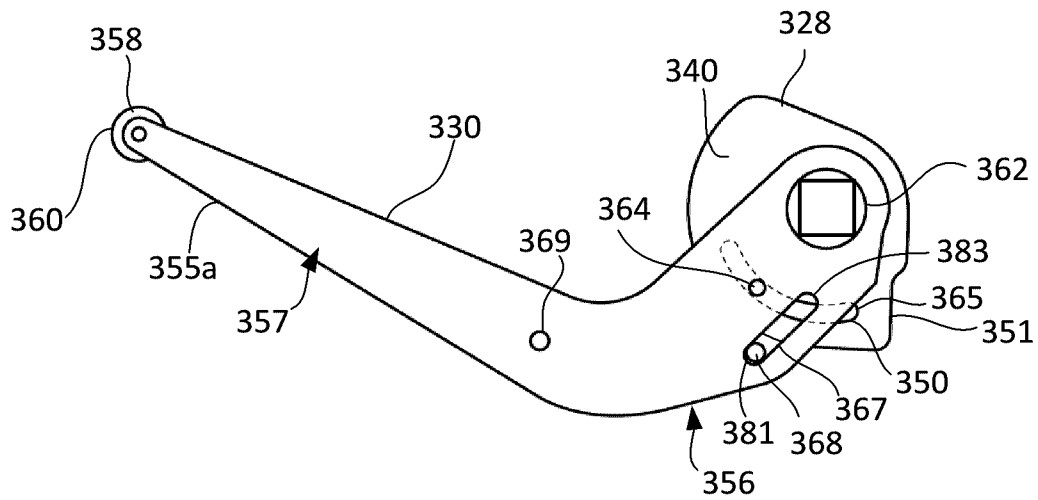


FIG. 7

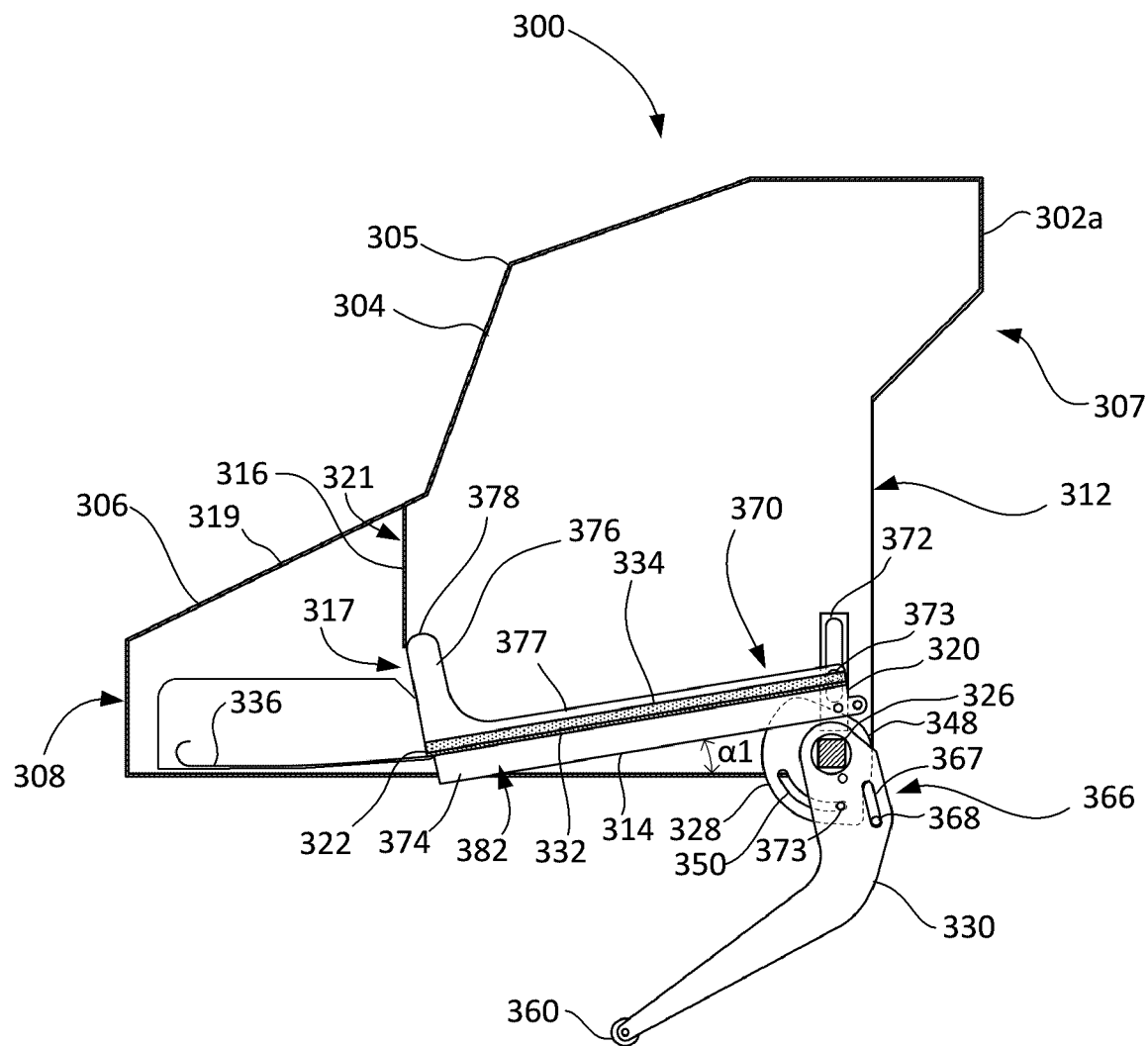


FIG. 8

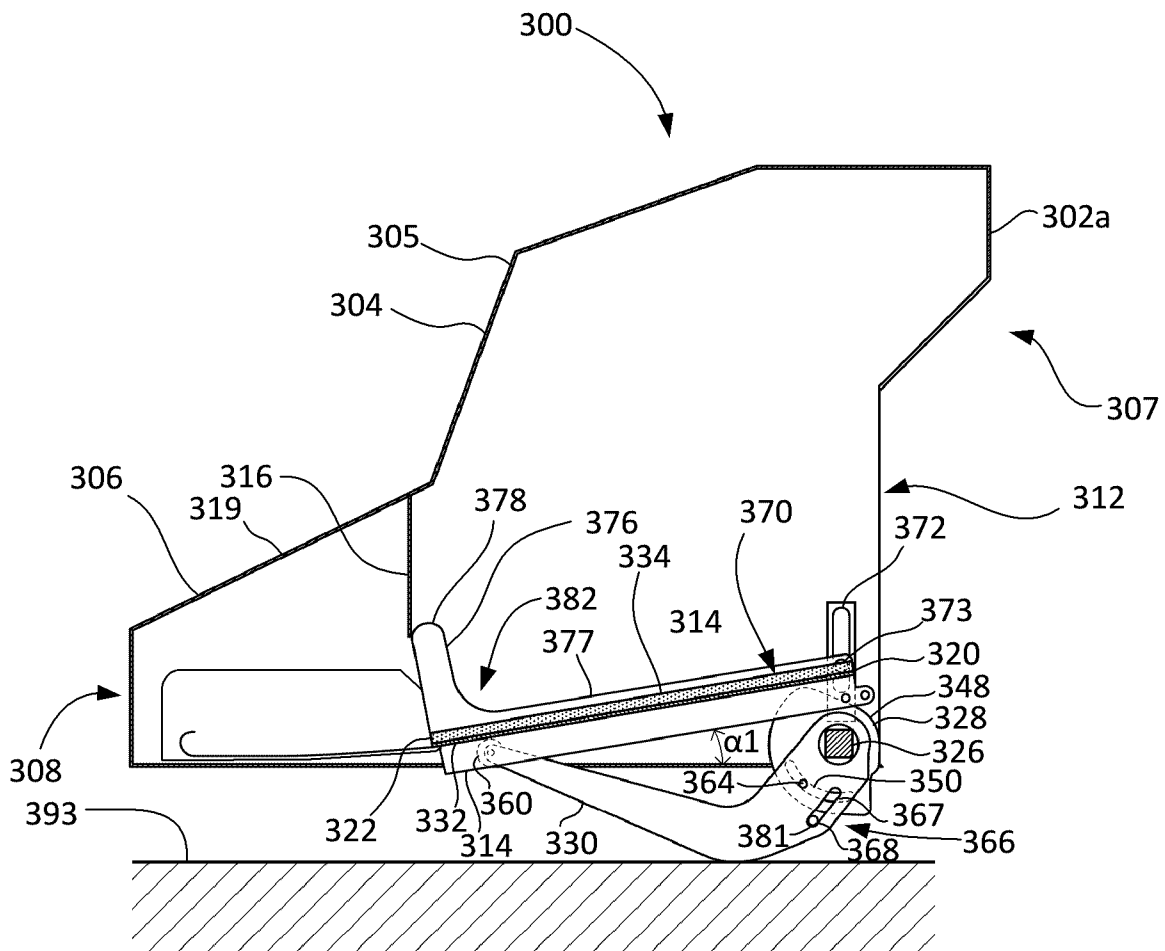


FIG. 9

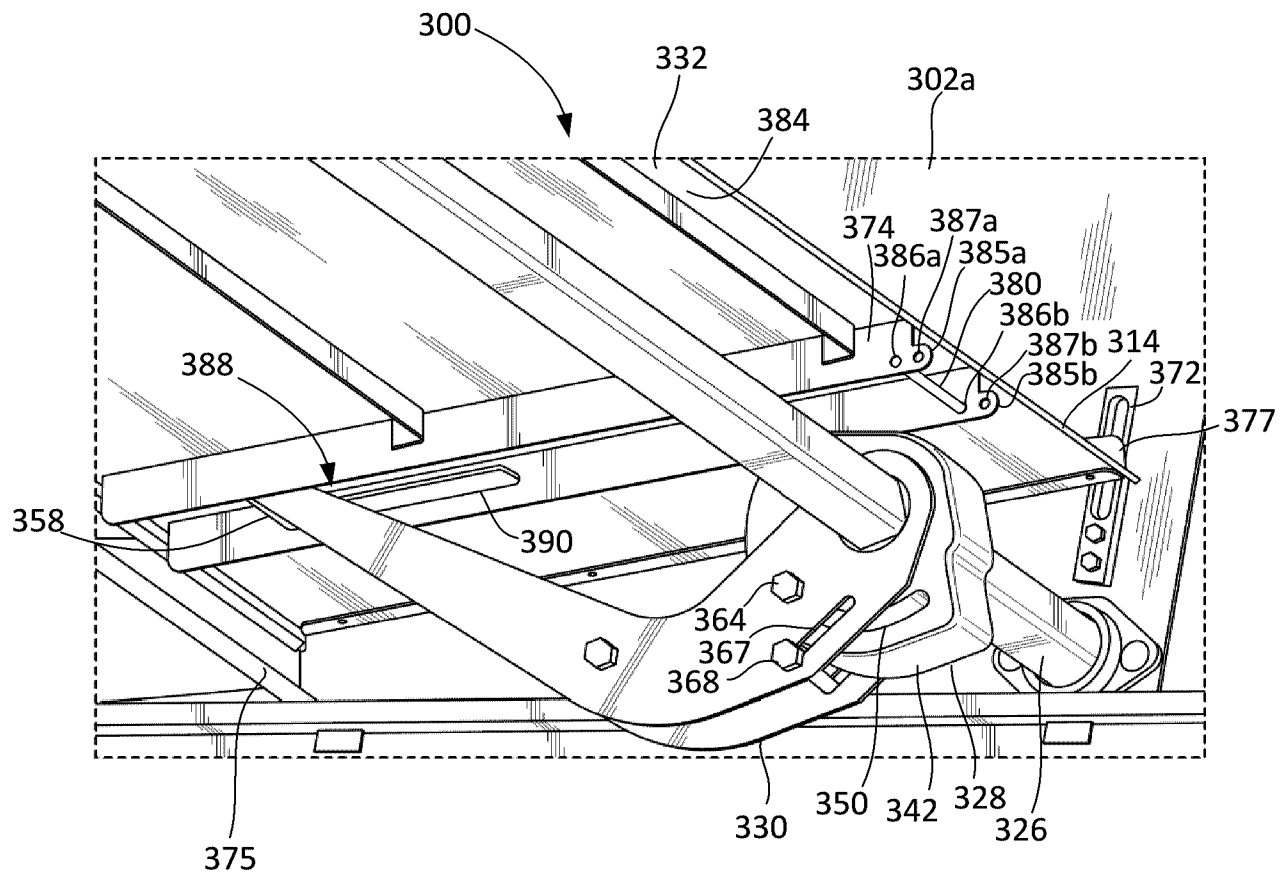


FIG. 10

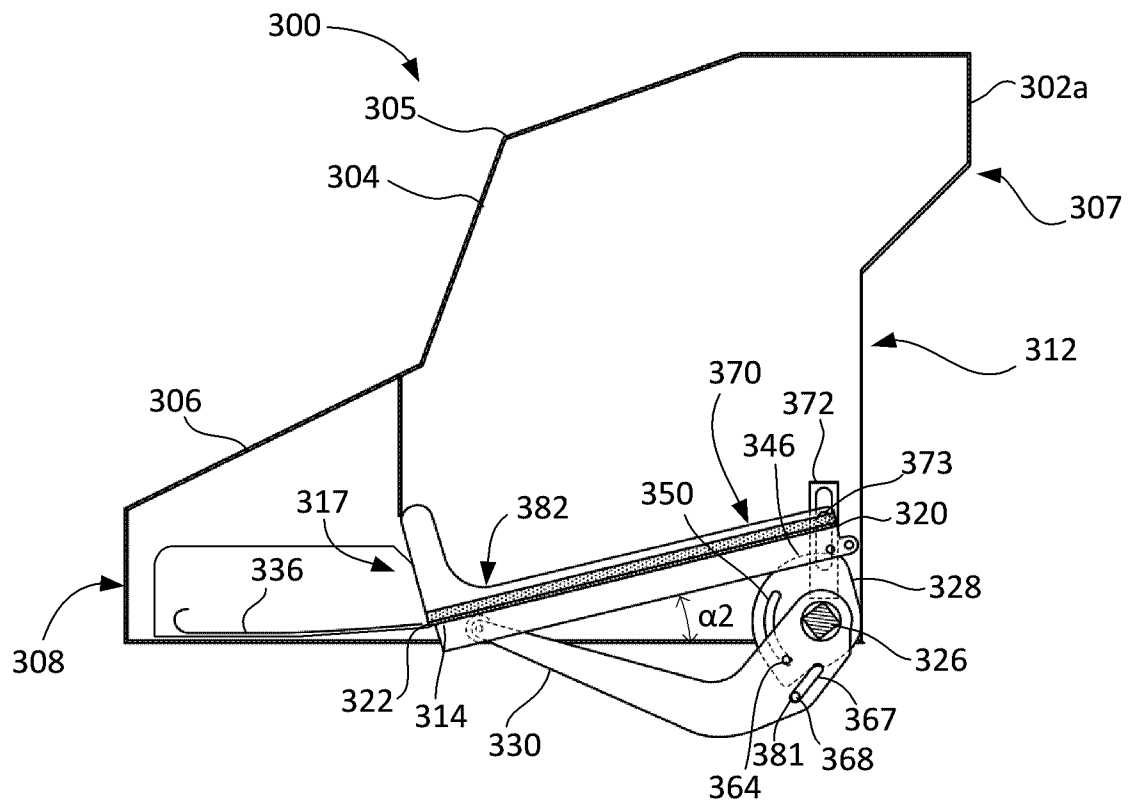


FIG. 11

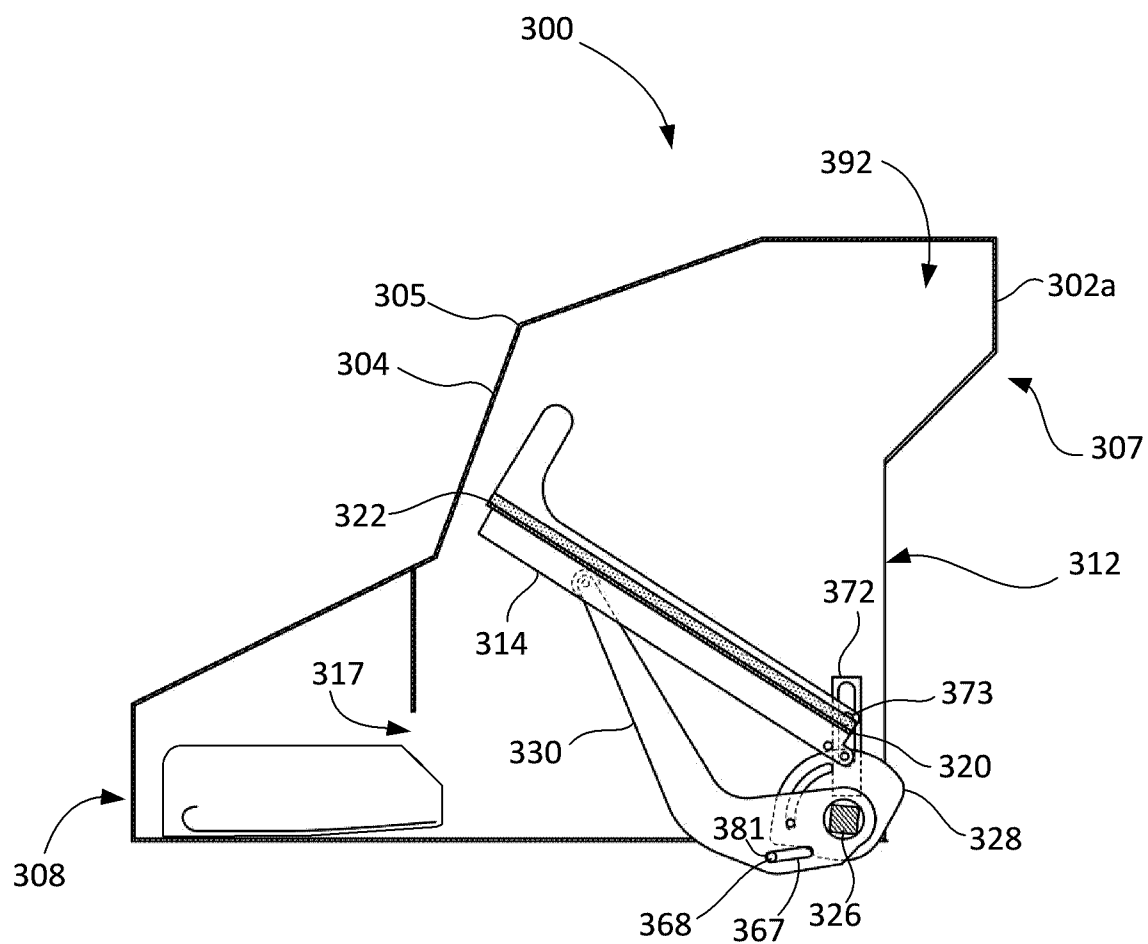


FIG. 12

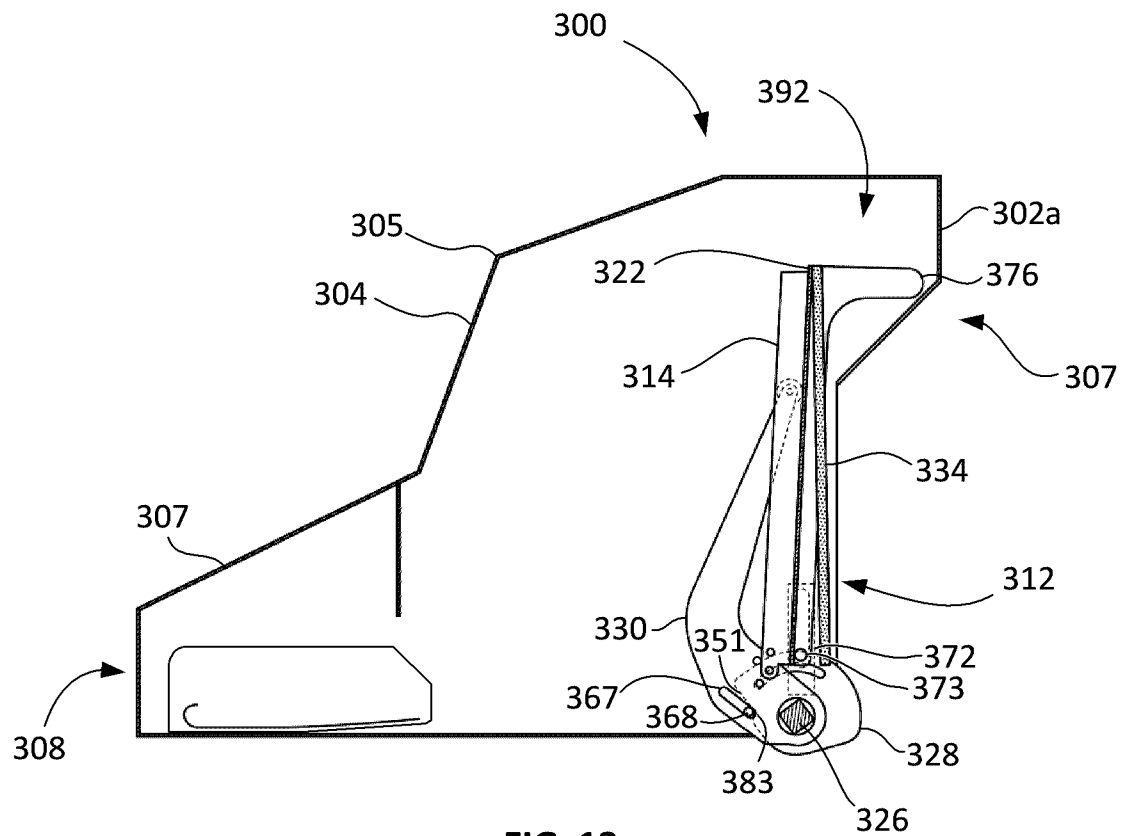


FIG. 13

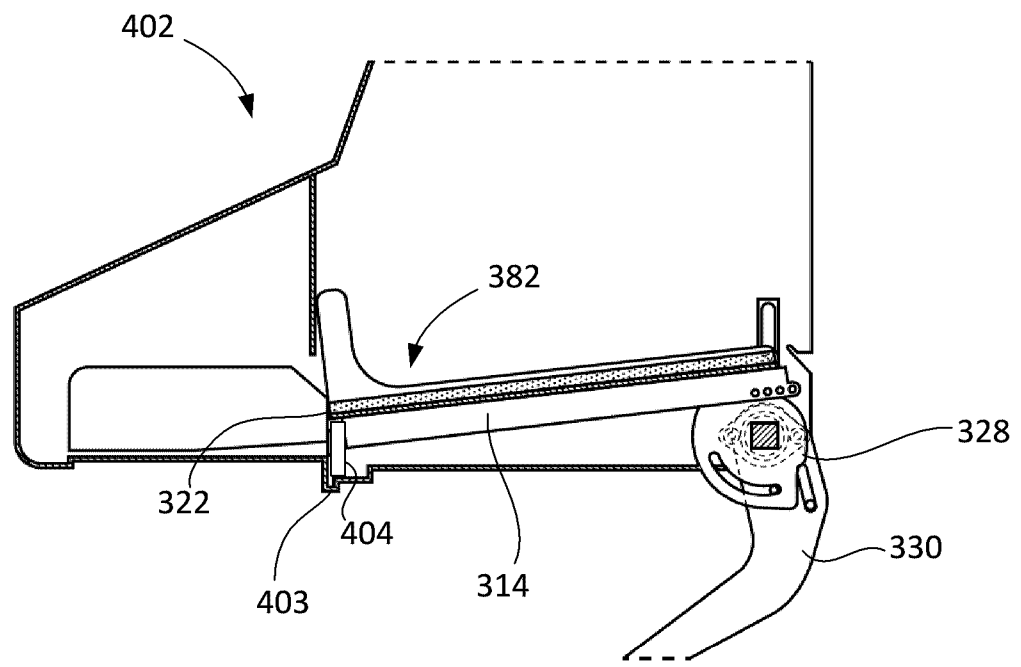


FIG. 14

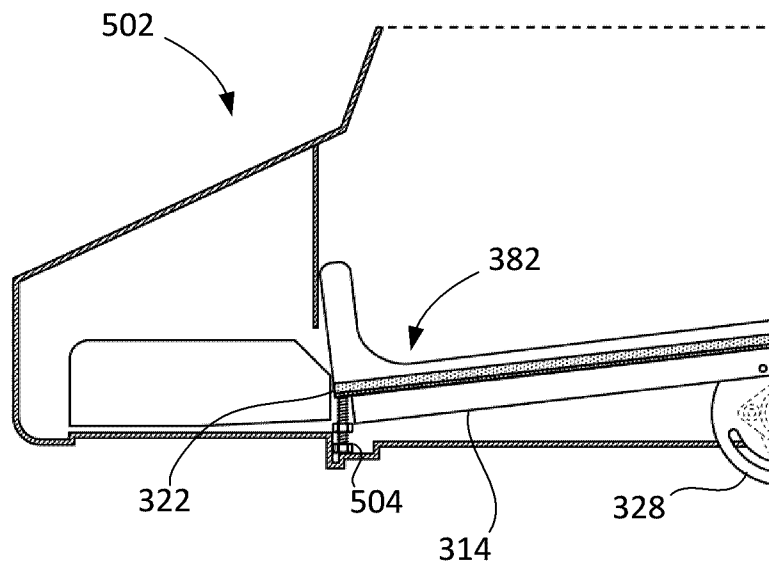


FIG. 15

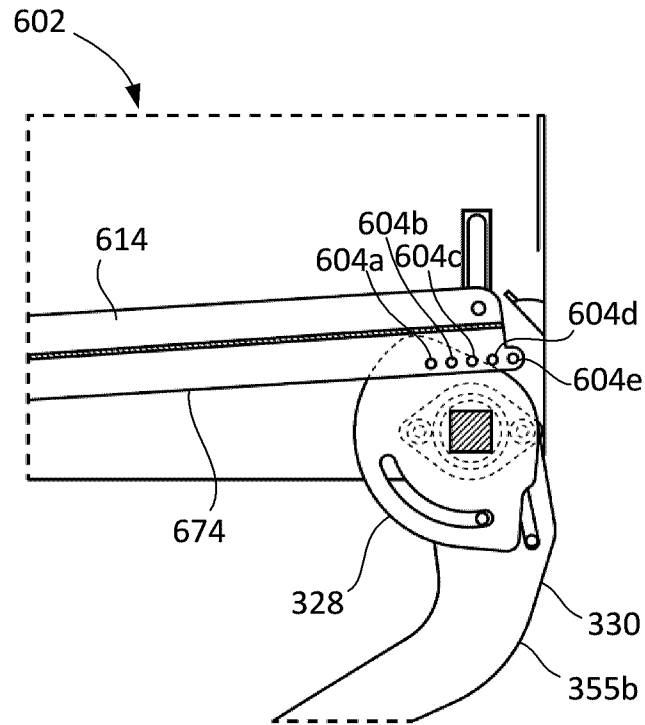


FIG. 16

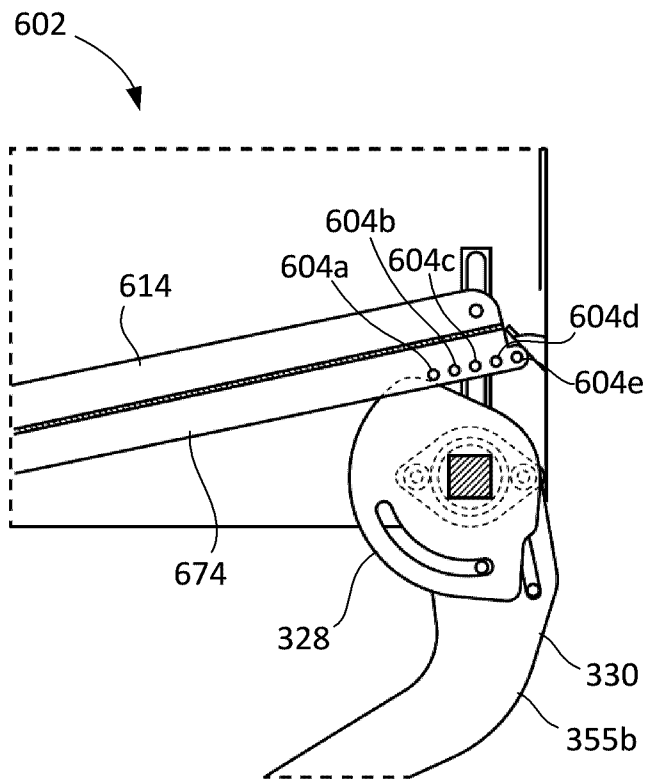


FIG. 17

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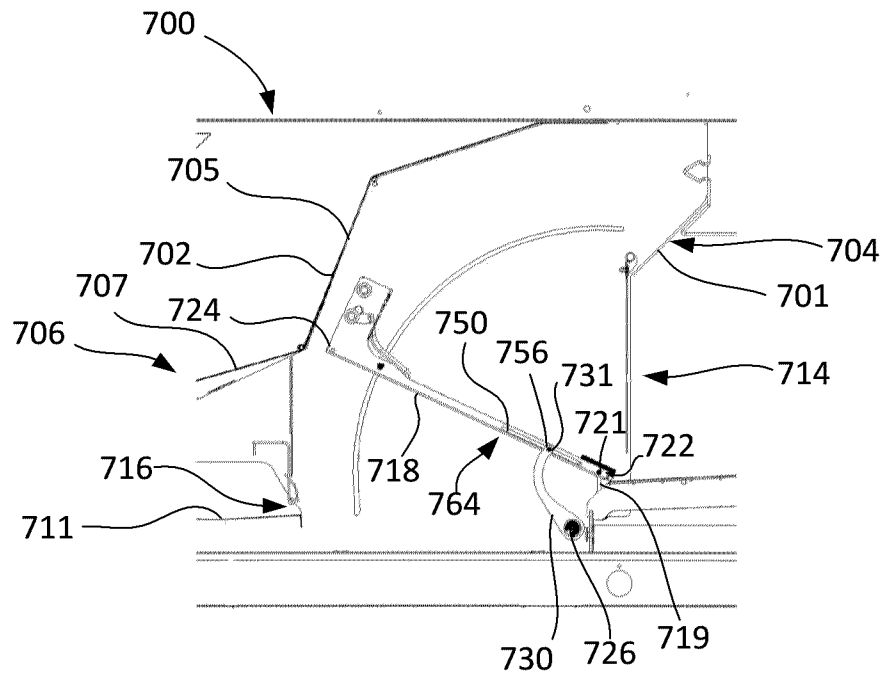


FIG. 20

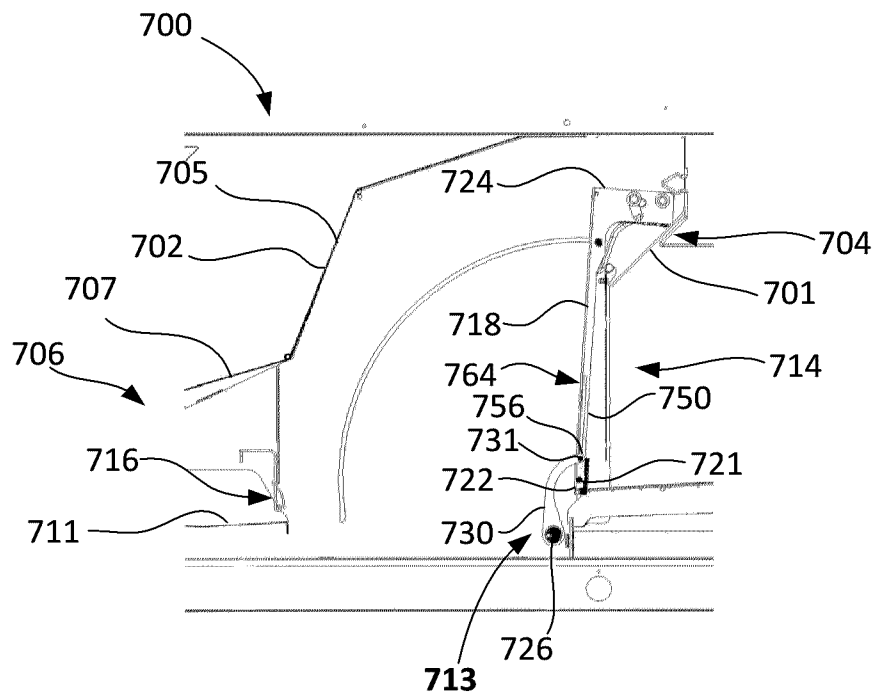


FIG. 21

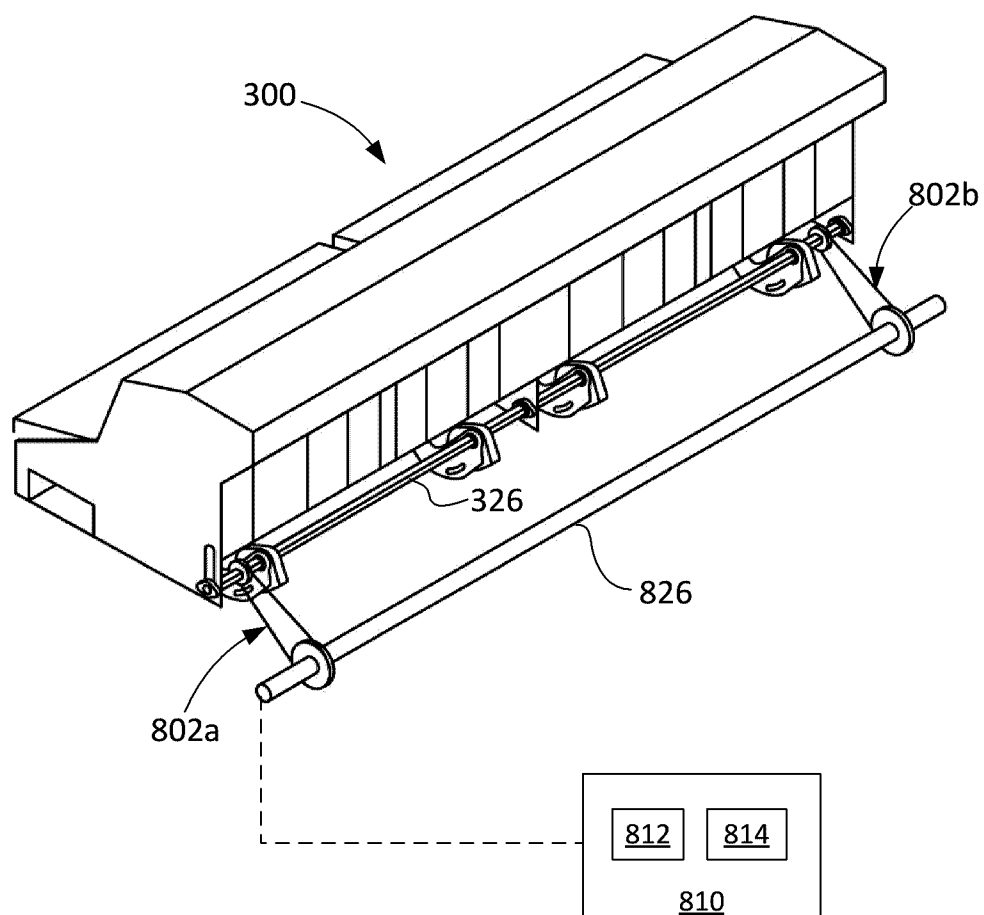


FIG. 22

