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Vaughn

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(54) **FEED DISPENSER**

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This patent is subject to a terminal dis-
claimer.

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Jan. 29, 2002, now Pat. No. 6,557,490.

(51) **Int. Cl.**⁷ **A01K 5/02**

(52) **U.S. Cl.** **119/56.1; 119/51.13**

(58) **Field of Search** **119/56.1, 51.13,**
119/52.1; 221/3

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(57) **ABSTRACT**

A device (10') for storing and dispensing feed (98) to an animal at predetermined times includes enclosure (12) including a plurality of compartments (16), each including a hinged downwardly opening bottom door (17) having a storage position for supporting feed (98) and an open position for dispensing feed (98), a latch assembly (120) including a latch (121) supporting its associated door (17), and a connector (142) for each compartment (16), movable from a storage position to a dispensing position. A connector release assembly (160) includes a trip (162) for disengaging each connector (142), including a movable ratchet bar (61) including cams (163) and rungs (63). Reciprocating assembly (70) includes solenoid (71) moving pull arm (73) for moving ratchet bar (61) and timer (101) for activating solenoid (71) at predetermined times. Down-stop (90) prevents reverse movement of ratchet bar (61). Up-stop (80) limits the upward movement of ratchet bar rung (63).

21 Claims, 7 Drawing Sheets

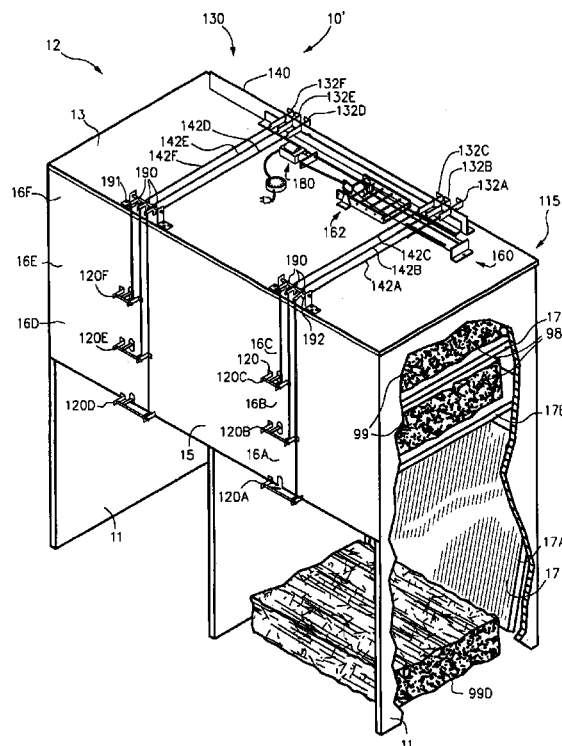
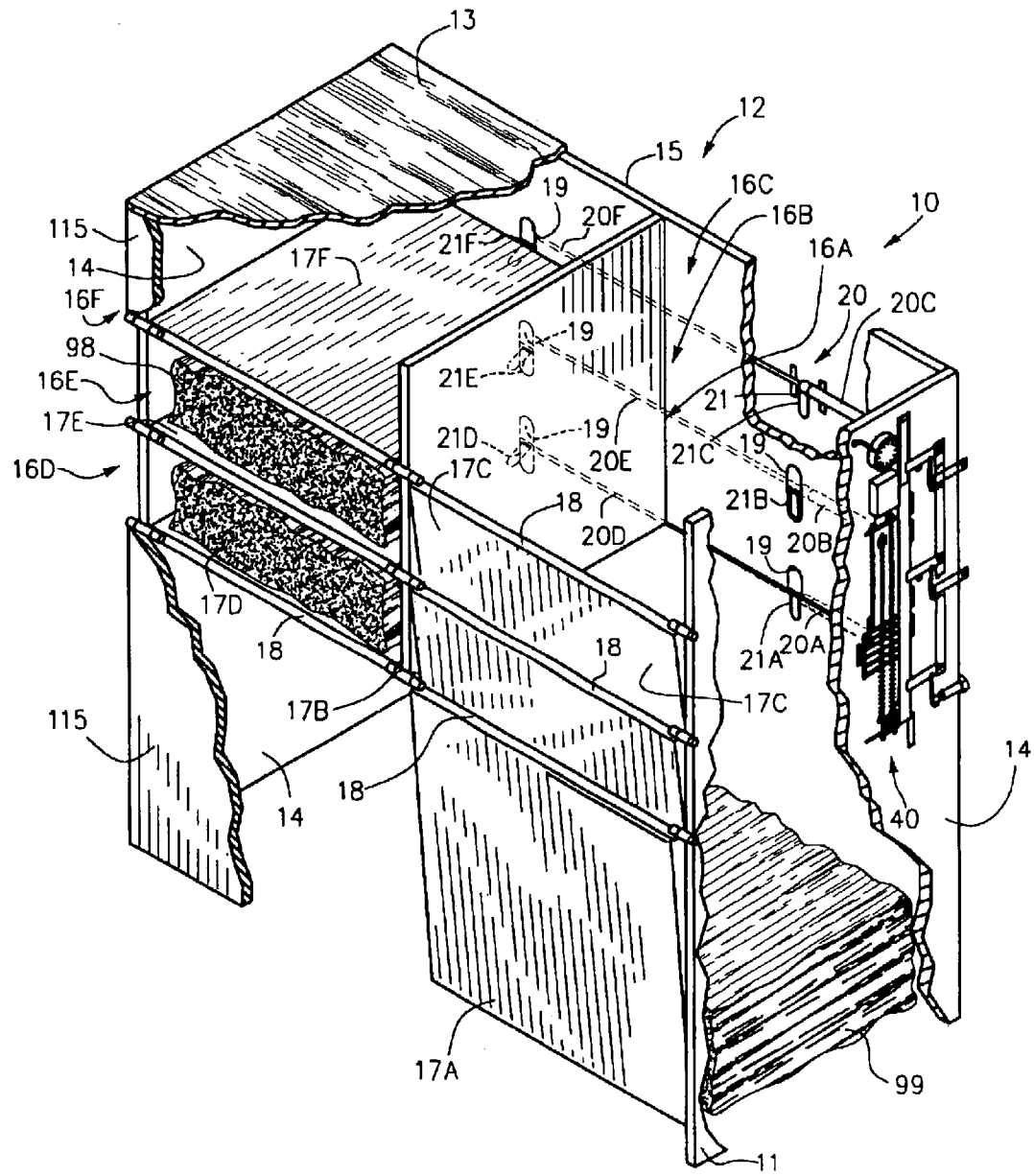


FIG. 1



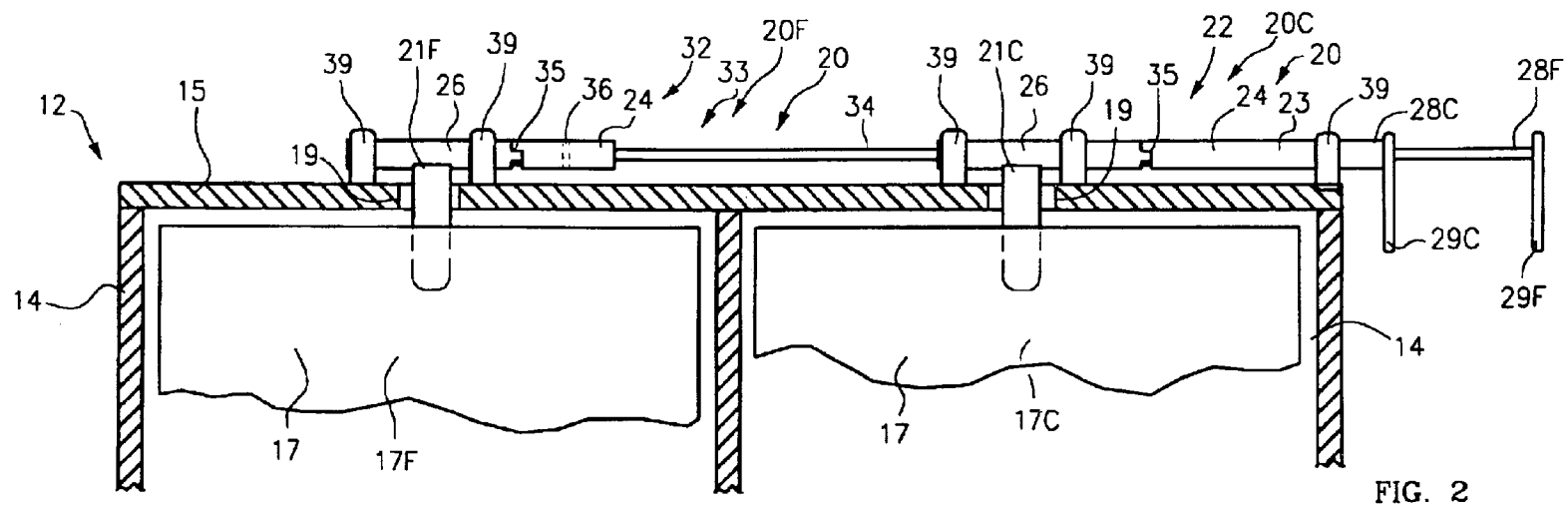


FIG. 2

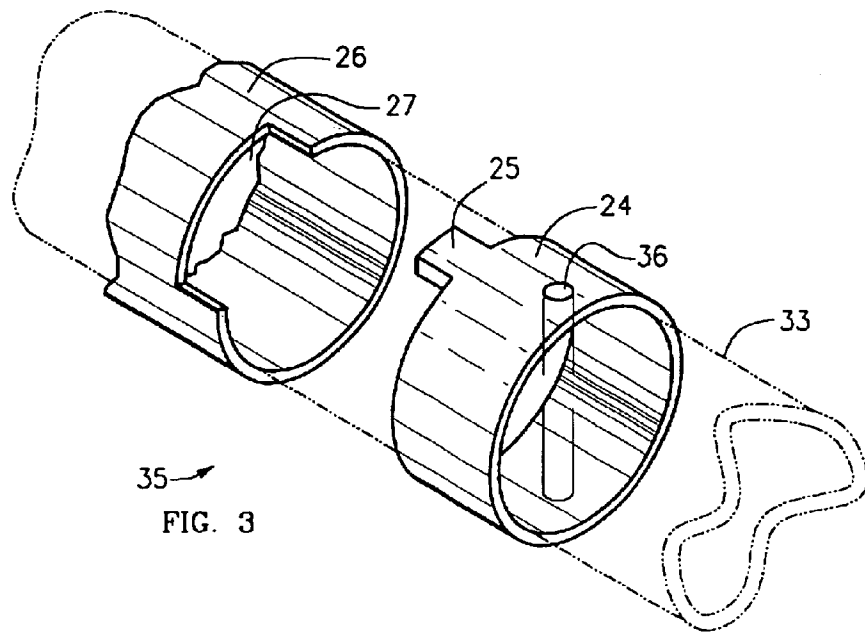
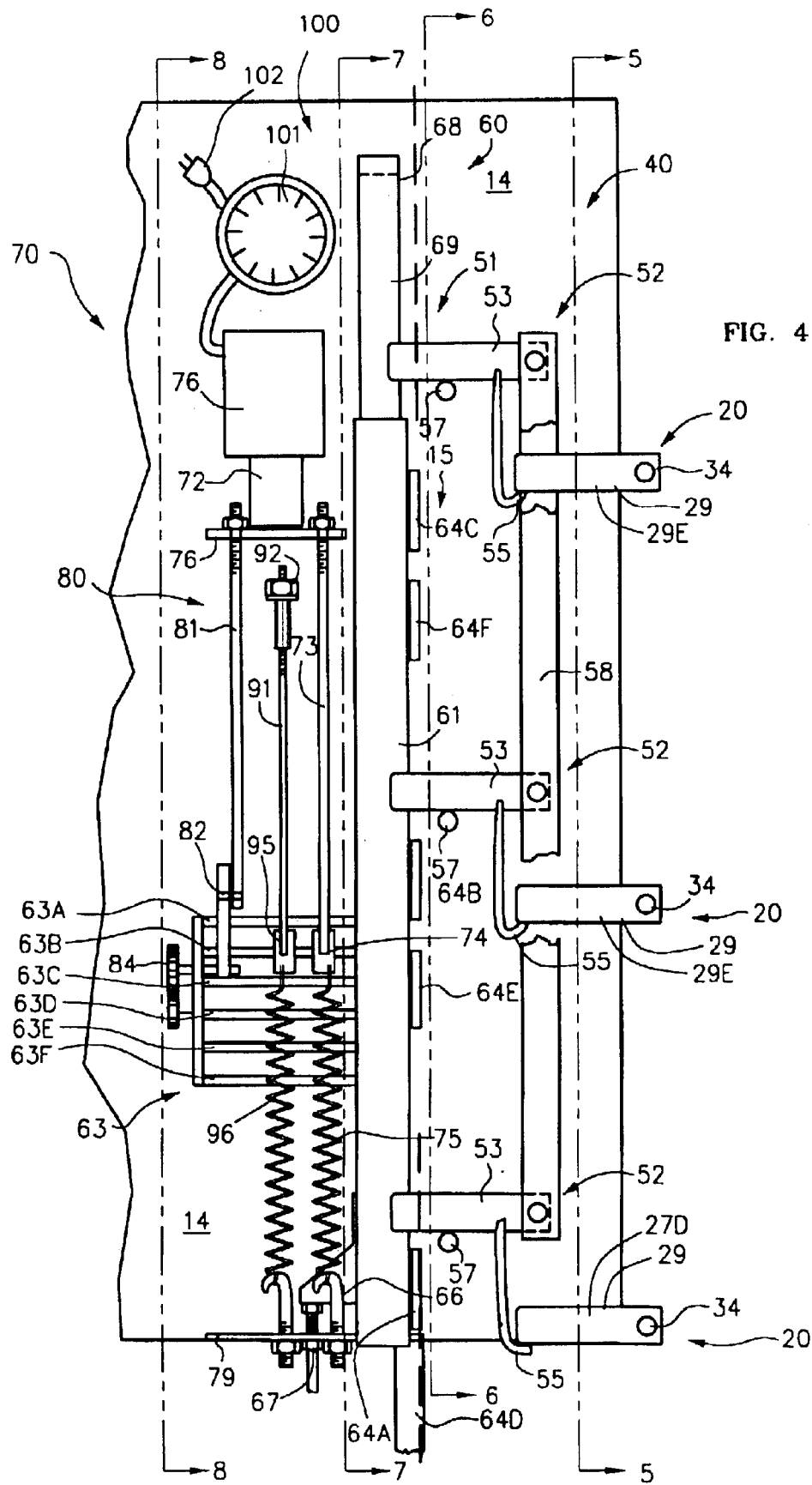
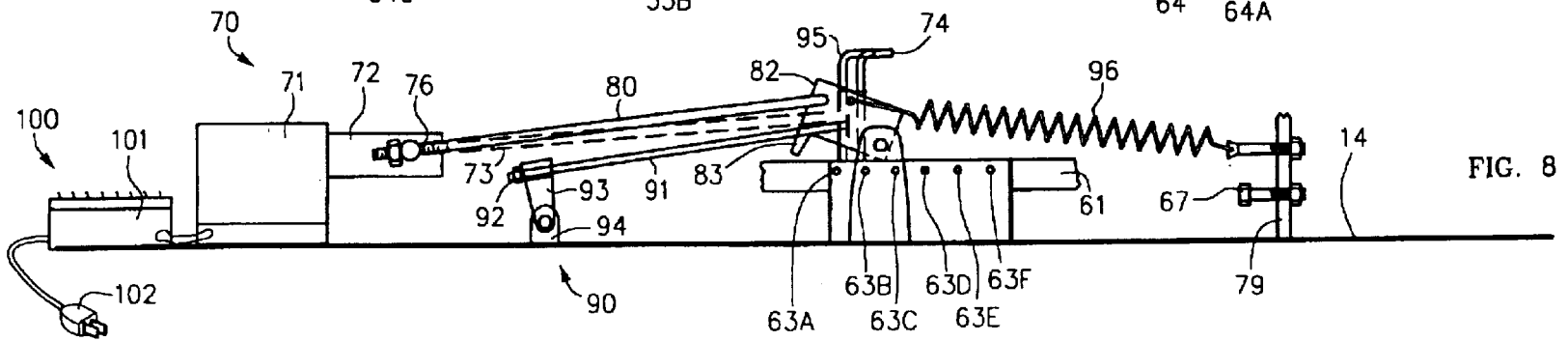
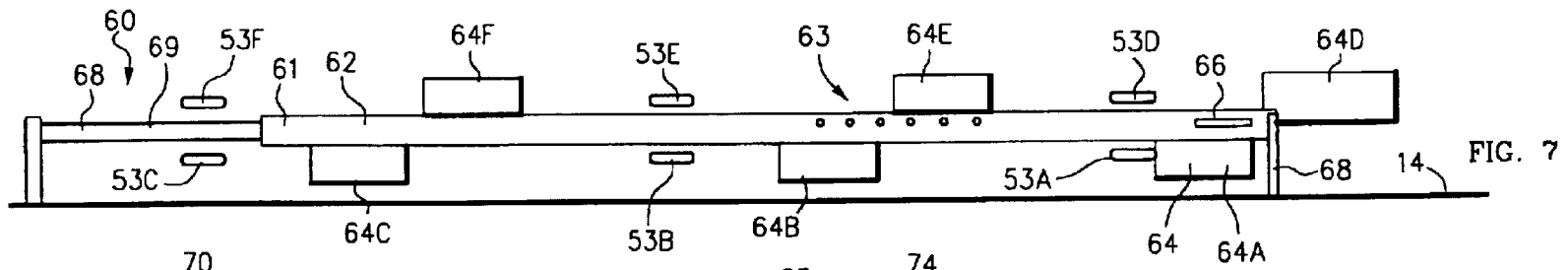
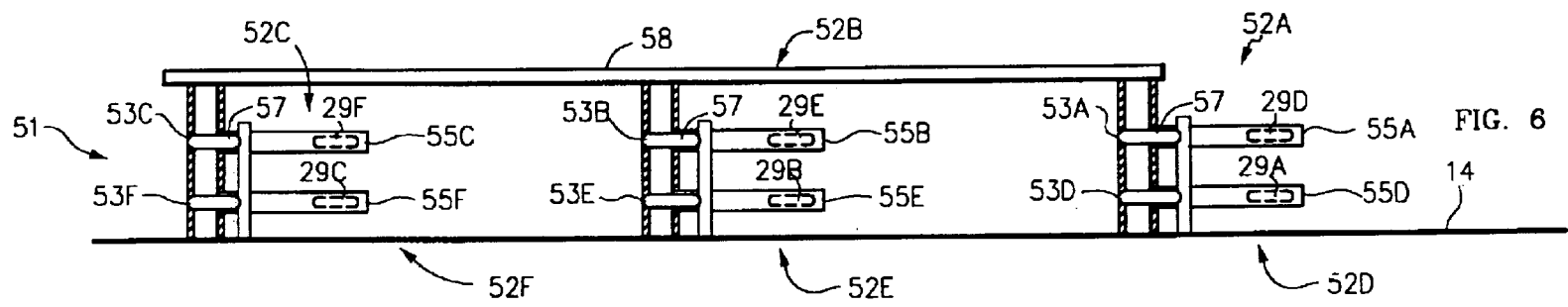
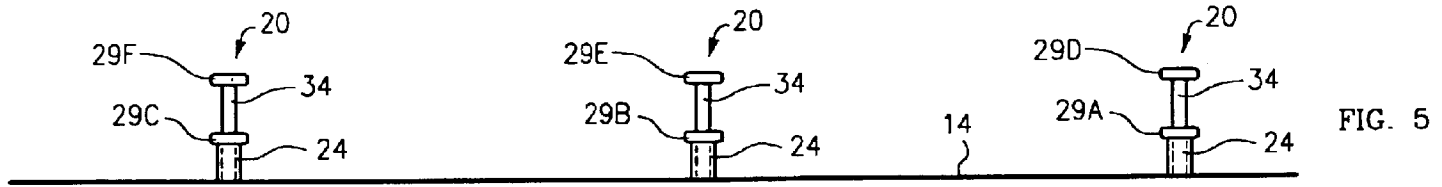
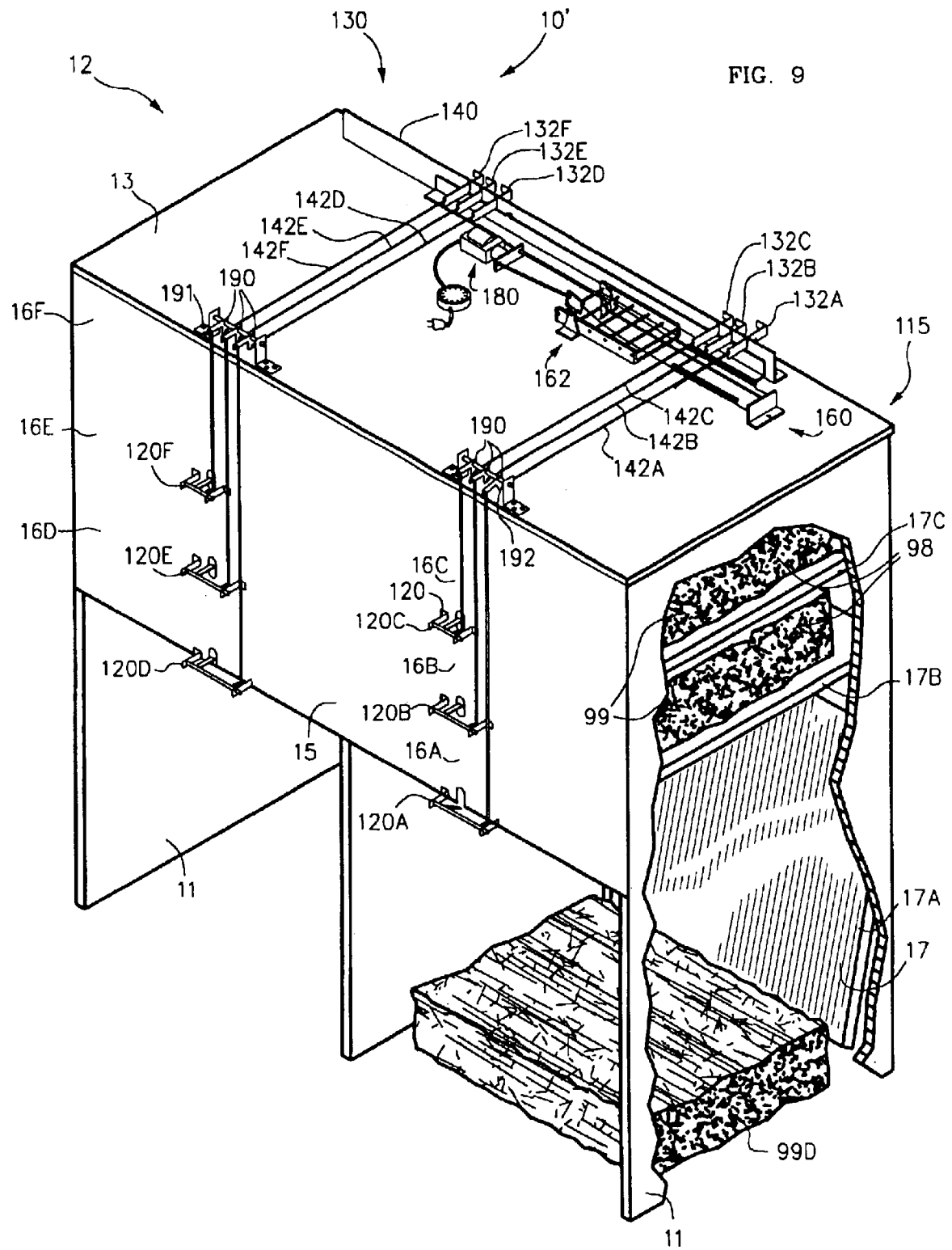


FIG. 3







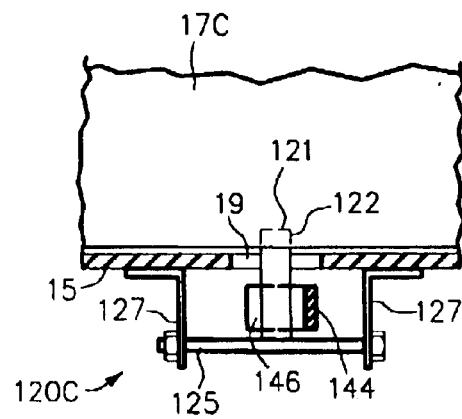
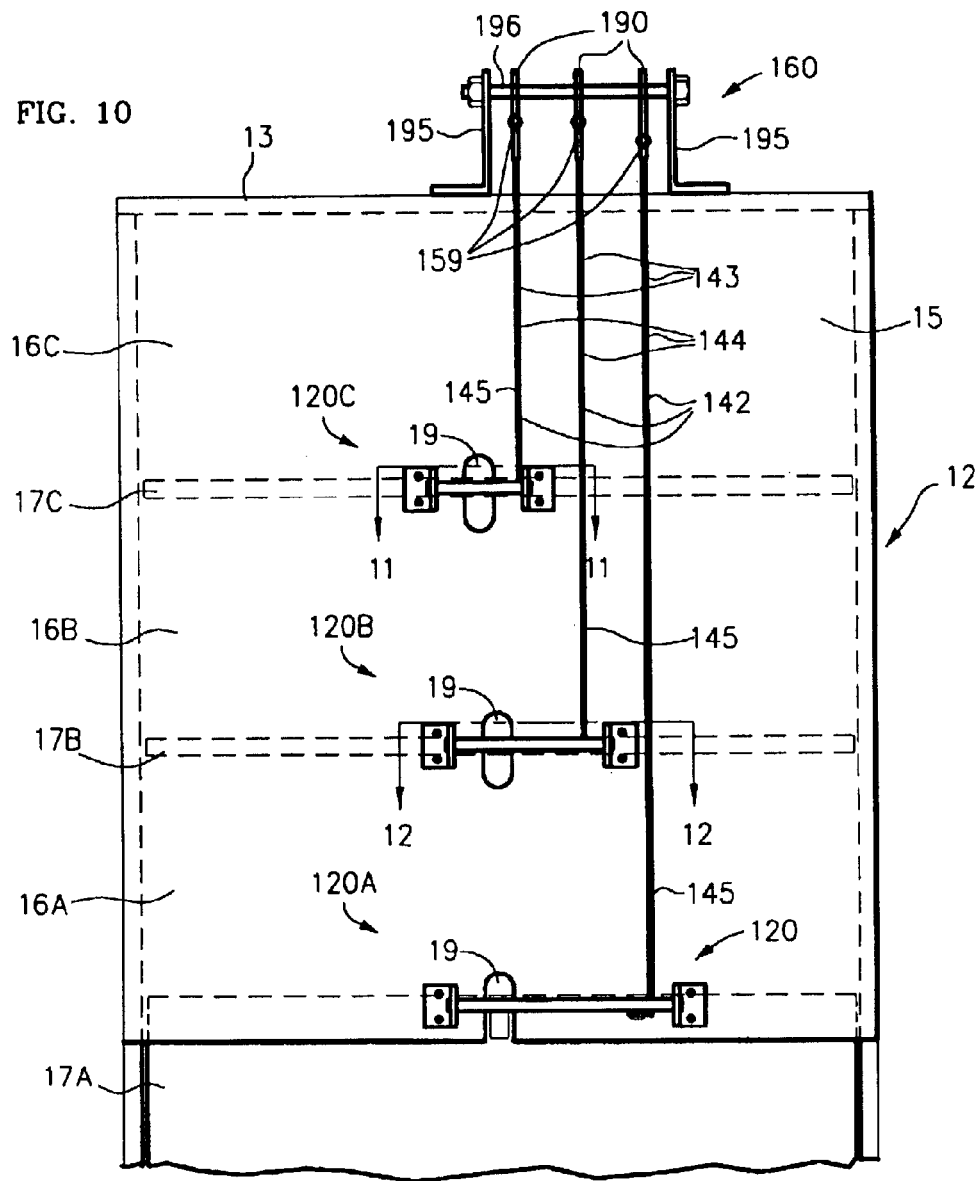


FIG. 11

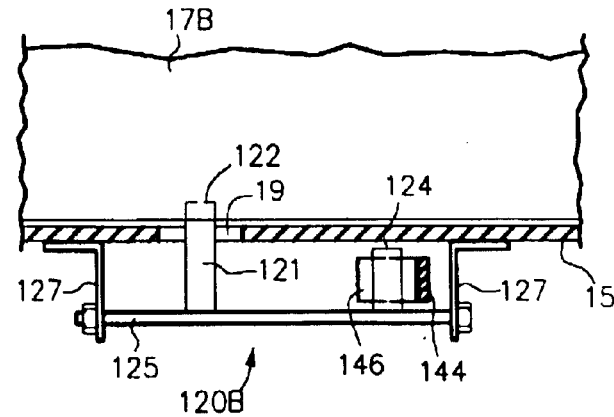
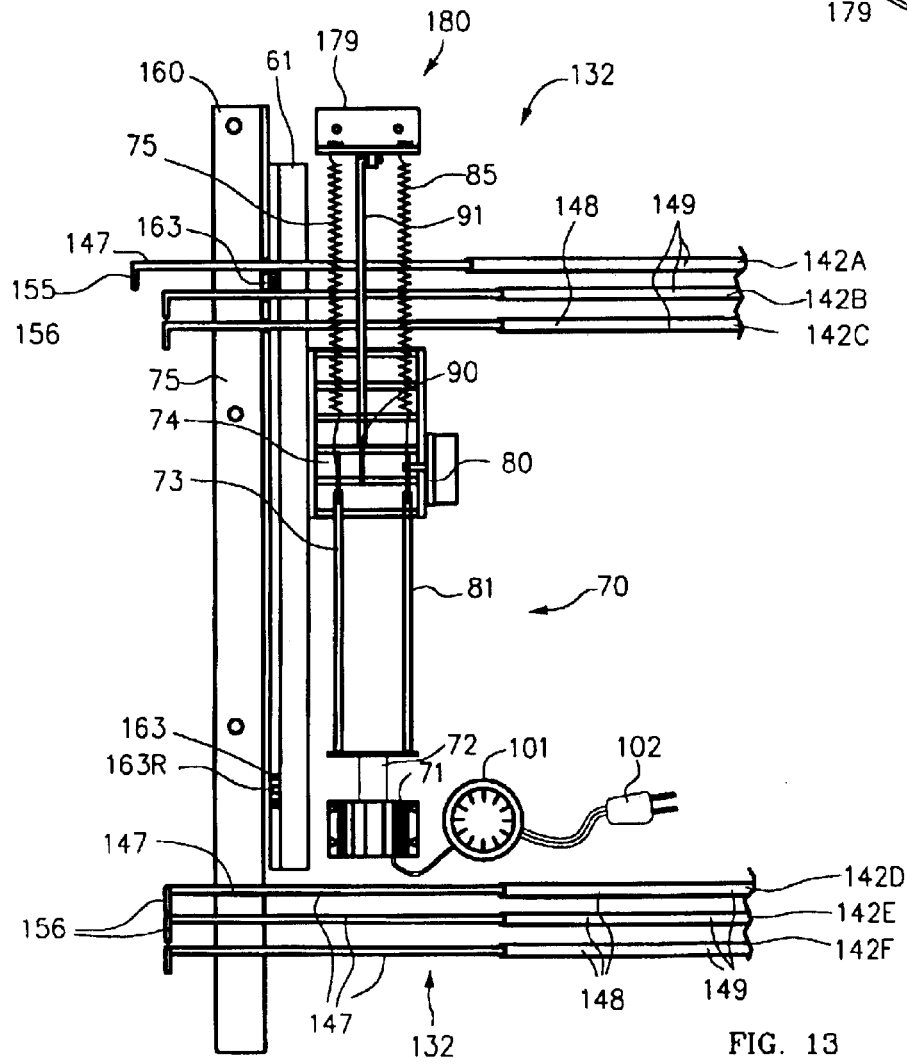
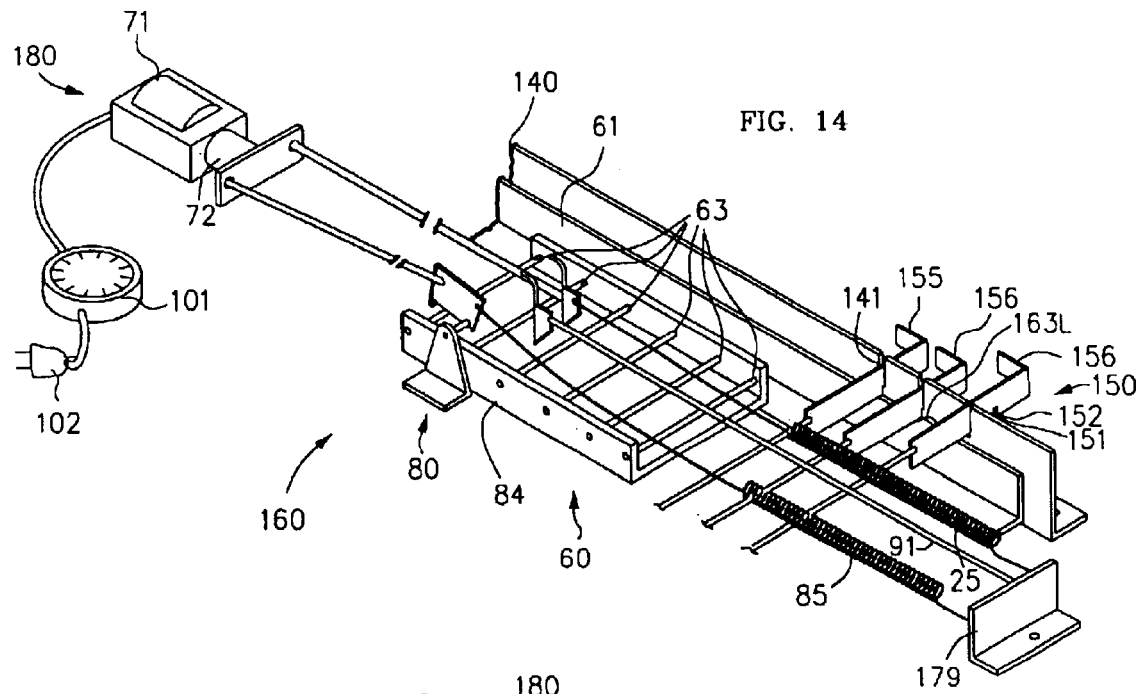


FIG. 12



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FEED DISPENSER**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a continuation-in-part of application Ser. No. 10/057,893, filed Jan. 29, 2002 now U.S. Pat. No. 6,597,490.

FIELD OF THE INVENTION

This invention relates in general to a dispenser for storing and dispensing animal feed, such as hay, to an animal at pre-determined intervals and more specifically involves using a plurality of connectors to operate dispensing latches and even more specifically involves using a single linearly reciprocating device, such as a solenoid, to operate the connectors.

SUMMARY OF THE INVENTION

This invention is a device for storing and dispensing feed to an animal at predetermined times and it generally includes an enclosure including an array of compartments, including left and right compartments and upper and lower compartments.

Each compartment includes a hinged, downwardly opening bottom door having a storage position for supporting feed and an open position for dispensing feed. A latch assembly associated with each compartment includes a latch having a storage position for supporting its associated door in the storage position and a dispensing position for not supporting its door. Each latch, in the supported position, may rotate upward for upward passage of its door for resetting the door.

A latch activation mechanism operates the latches. The latch activation mechanism includes a plurality of catch assemblies, a catch assembly associated with each latch assembly. Each catch assembly includes a retainer attached to the enclosure and a connector movable from a storage position to a dispensing position. Each connector has a catch portion and a retention portion. The catch portion includes a catch end, including a catch vertically movable between a storage position, wherein the catch supports its associated latch in the storage position, and a dispensing position, wherein the catch does not support its associated latch. The retention portion is connected to the catch portion and includes a retention end including retention means for selectively engaging the retainer. The connector is movable from a support position, wherein the retention means of the retention end is engaged with the retainer whereby the connector holds the catch in its support position, to a dispensing position, wherein the retention means is disengaged from the retainer and wherein the catch is in its dispensing position.

A connector release assembly includes a trip for disengaging each retention means from the retainer; and trip movement means for incrementally moving the trip so as to sequentially disengage each retention means and drop the doors.

The trip movement means includes a reciprocating assembly including a reciprocating linear activation device, such as a solenoid, including a rod reciprocatingly movable between an extended position and a retracted position, a pull arm connected to the rod and to a pull-pawl for engaging the ratchet bar rungs and moving the ratchet bar when the rod moves from the extended position to the retracted position and for moving to engage another of the ratchet bar rungs

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when the rod moves to the extended position. A down-stop prevents reverse movement of the ratchet bar. An up-stop limits the movement of the ratchet bar rung upon retraction of the rod. A cam or cams on the ratchet bar acts as trips.

Other features and many attendant advantages of the invention will become more apparent upon a reading of the following detailed description together with the drawings wherein like reference numerals refer to like parts throughout.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially-cut-away top, front, right side perspective view of a first exemplary embodiment of the feed dispenser.

FIG. 2 is a partial top plan view of the rear wall portion of the dispenser showing latch assemblies.

FIG. 3 is an enlarged cut-away perspective view of a latch coupling of FIG. 2.

FIG. 4 is an enlarged side elevation view of the latch activation mechanism.

FIG. 5 is a front elevation view taken on line 5—5 of FIG. 4 of the catch arms of the latch assemblies.

FIG. 6 is a front elevation view taken on line 6—6 of FIG. 4 featuring the catch assembly portion.

FIG. 7 is a front elevation view taken on line 7—7 of FIG. 4 featuring the ratchet bar assembly.

FIG. 8 is a front elevation view taken on line 8—8 of FIG. 4 of the timer and reciprocating assembly.

FIG. 9 is a top, rear, left side perspective view of a second exemplary embodiment of the invention.

FIG. 10 is a partial rear elevation view of the right side of FIG. 9.

FIG. 11 is an enlarged partial sectional view taken on line 11—11 of FIG. 10 of a latch assembly.

FIG. 12 is an enlarged partial sectional view taken on line 12—12 of FIG. 10 of an offset latch assembly.

FIG. 13 is a partial top plan view of FIG. 9.

FIG. 14 is a partial top rear perspective view of the connector release assembly.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to the drawings, and more particularly to FIG. 1 thereof, there is shown a partially-cut-away top three-quarter perspective view of an exemplary embodiment of the feed dispenser 10 of the invention. Feed dispenser 10 generally comprises legs 11 supporting an enclosure 12 having a roof 13, side walls 14, a rear wall 15, a front wall 115, and a plurality of compartments 16, such as compartments 16A–16F, each including a bottom door 17, such as doors 17A–17F. Although three levels, a lower, middle and upper, of compartments 16 are shown and described, the principles of the invention apply to any number of levels. Front wall 115 includes securable doors (not shown) for access to compartments 16A–16F and, if desired, to beneath lower compartments 16A, 16d. Alternatively, instead of being supported by legs 11, dispenser 10 may be hung on a fence by methods well known in the art.

Enclosure 12 protects the stored feed 98 from the weather and from animals. Enclosure 12 also prevents the animal being fed by feed dispenser 10 from taking feed 98 prematurely. Typically, the bottom of rear wall 15 is level with the

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bottom of lower compartments 16A, 16D allowing dispensed feed 98 to exit enclosure 12 to a feeding trough. In a preferred embodiment, feed dispenser 10 stands on the ground adjacent a fenced corral containing an animal. A platform is disposed below the lower compartments 16A, 16D for receiving dispensed feed 98, so that the animal may eat feed 98, such as by the animal extending its neck through widely-spaced rails of the corral. In another preferred embodiment, a slide disposed under the lower compartments 16 of enclosure 12 may receive dispensed feed 98 and move feed 98 by gravity outside enclosure 12, through the rails of the corral, and onto the ground inside the corral. In another preferred embodiment, feed dispenser 10 may stand on the ground in a field. Walls do not extend to ground level, leaving openings to allow an animal to eat dispensed feed 98.

Doors 17 have a hinged end 18 hingedly attached to enclosure 12 so as to open downwardly from a storage position supporting feed 98, such as hay 99, to an open position for dispensing feed 98. Doors 17A–17C are shown in the open position. Doors 17D–17F are shown in the storage position. Doors 17, in the open, or dispensing position, hang substantially vertically. Doors 17 are released from bottom to top such that feed 98 of middle and upper compartments 16 falls through the space of the lower compartments 16 during dispensing.

Each compartment 16, is associated with a latch assembly 20, attached to rear wall 15. Each latch assembly 20 includes a latch 21, such as latches 21A–F, protruding through a hole 19 in rear wall 15. Each latch 21 has a storage position for supporting its associated door 17 in the storage position and has a dispensing position for not supporting door 17. Latches 21A–21C are shown in the dispensing position. Latches 21D–21F are shown in the storage position, supporting doors 17D–17F.

A latch activation mechanism 40 operates on latch assembly 20 so as to move latches 21 to the dispensing position at a predetermined time and sequence so as to dispense feed 98.

Turning now to FIGS. 2 and 3, FIG. 2 is a partial top plan view of the rear wall 15 of dispenser 10 showing the upper-most latch assemblies 20, such as right latch assembly 20C for door 17C of upper right compartment 16C and left latch assembly 20F for door 17F of upper left compartment 16F. Middle right and left compartments 16B, 16E and lower right and left compartments 16A, 16D have similar associated latch assemblies 20B, 20E and 20A, 20D respectively (see FIG. 1), such that a latch assembly 20A–20F including a catch arm 29A–29F is associated with each latch 21A–21F. Latch assemblies 20 are mounted in bearings 39 attached to rear wall 15. FIG. 3 is an enlarged cut-away perspective view of a latch coupling 35 of FIG. 2. Right latch assembly 20C includes latch 21C attached, such as by welding, to a right shaft means 22, such as right tubular shaft 23 including a distal end connected to right latch 21C and a proximal end 28C having a catch arm 29, such as catch arm 29C attached, such as by welding, at a right angle thereto. Right catch arm 29C is coupled by shaft 23 to latch 21C such that supporting the distal end of arm 29C supports latch 21C in the storage position.

Left latch assembly 20F includes latch 21F attached, such as by welding, to left shaft means 32, such as left shaft 33 including distal end connected to left latch 21F and a proximal end 28F having an arm 29, such as catch arm 29F attached, such as by welding, at a right angle thereto. Left catch arm 29F is coupled by left shaft 33 to latch 21F such

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that supporting the distal end of arm 29F supports latch 21F in the storage position. Left shaft 33 includes a midsection 34 partially disposed within right tubular shaft 23 and that is coaxial therewith and freely journaled therein. Midsection 34 is attached, such as by welding or a pin 36, to drive section 24, described below.

Doors 17 are set on latches 21 in the support position by swinging doors 17 upward. Means is provided for each latch 21 in the support position to freely swing upward as its upward swinging door 17 encounters it. After upward passage of its door 17, latch 21 falls back to the support position and door 17 is placed on latch 21 to be supported by latch 21. As best seen in FIGS. 2 and 3, each latch 21C, 21F is connected to latch shaft 23, 33 including a coupling means 35 wherein the shaft includes a drive portion 24 including an engaging means, such as tooth 25, and a driven portion 26 including a slot 27. Tooth 25 bears against the end of slot 27 to hold latch 21 in the support position. Driven portion 26 can be freely rotated the length of slot 27 such that latch 21 rotates upward to allow for passage of door 17 to set door 17 ready to receive feed 98 for storage.

FIG. 4 is an enlarged side elevation view of the latch activation mechanism 40 for selectively periodically operating latches 21 for dispensing portions of feed 98 to an animal. FIG. 5 is a front elevation view taken on line 5–5 of FIG. 4 of catch arms 29 of the latch assemblies 20. In the exemplary embodiment, latch arms 29 for each level are disposed and spaced one above the other, and latch arms 29 for right and left sides are respectively disposed side by side. Activation mechanism 40 generally comprises a catch assembly portion 51, a ratchet bar assembly 60, a reciprocating assembly 70, and means 100, including timer 101, for activating reciprocating assembly 60.

Looking primarily at FIGS. 4 and 6, there is featured catch assembly portion 51. FIG. 6 is a front elevation view taken on line 6–6 of FIG. 4 featuring catch assembly portion 51. Catch assembly portion 51 includes a support structure 58 connected to enclosure side 14 and supporting catch assemblies 52, a catch assembly 52A–52F being associated with each catch arm 29A–29F respectively. Each catch assembly 52 includes a trigger 53, such as triggers 53A–53F, pivotally mounted to support structure 58. Each trigger 53 includes a catch 55, such as catches 55A–55F. Triggers 53A–53F are clockwise pivotable between an engaging position, shown, wherein their respective catches 55A–55F engage their associated catch arms 29A–29F, shown in phantom, to support their associated latches 21A–21F in the storage position and a tripped position not so engaged and not supporting the catch arms 29A–29F such that latches 21A–21F drop to the dispensing position. A plurality of stops 57, connected to side wall 14, retain triggers 53 in a position for setting catch arms 29 on catches 55.

Looking primarily at FIGS. 4 and 7, there is featured a ratchet bar assembly 60 including mounting structure 68 attached to side wall 14 including an elongate slide 69, shown square in lateral cross-section, for linearly slidingly supporting a ratchet bar 61. Ratchet bar 61 includes a tube 62 adapted, such as by being square, for sliding on slide 69.

A plurality of trip means, such as trips 64, with a trip 64A–64F associated with each trigger 53A–53F, are attached to ratchet bar 61 for tripping each associated trigger 53A–53F to the tripped position upon successive movements of ratchet bar 61. Trips 64 are plates attached to ratchet bar 61. As best seen in FIG. 7, as shown, trips 64 are spaced such that sliding movement of ratchet bar 61 trips triggers 53A–53D successively. Alternatively, trips 64 could

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be attached to ratchet bar **61** so as to trip triggers **53** in another desirable order, such as A, D, B, E, C, F, or to simultaneously trip triggers, such as A and D, B and E, and C and F. Means, such as stop member **66** and stop **67**, are provided for adjusting the initial set position of ratchet bar **61**. Stop member **66**, attached to ratchet bar **61**, encounters stop **67**, which limits further downward movement of ratchet bar **61**. Stop **67**, as shown, is a screw threadably attached to a mounting plate **79** attached to side wall **14**. Screwing stop **67** up or down adjusts the initial position of ratchet bar **61**.

As best seen in FIG. 4, a ratchet bar **61** includes a plurality of spaced engaging means, such as rungs **63**, attached thereto and movable therewith, a rung **63A–63F** being associated with each latch **21A–21F**. Alternatively, not shown but as discussed above, a rung could be associated with more than one latch **21**. Rungs **63** are spaced in accordance with the spacing of trips **64** as will be more fully understood below.

Looking primarily at FIGS. 4 and 8, there is featured a reciprocating assembly **70** for moving ratchet bar **61** and means **100** for activating reciprocating assembly **70**. FIG. 8 is a front elevation view taken on line 8—8 of FIG. 4. Reciprocating device **70** includes a reciprocating device, such as solenoid **71**. Other reciprocating devices include pneumatic or hydraulic rams. Solenoid **71** includes a rod **72** reciprocatingly movable between an extended position, shown, and a retracted position when solenoid **71** is activated.

A pull arm **73** includes a first end pivotally connected to rod **72**, such as to a lateral bolt **76** through rod **72**, so as to be movable therewith and a second end including a pull-pawl **74** for engaging a rung **63** and thereby moving ratchet bar **61** when rod **72** moves from the extended position to the retracted position and for moving to engage another rung when rod **72** moves to the extended position. Pull-pawl **74** has a first side adapted for engaging a rung **63** and an opposite side adapted, such as by having an incline, for riding over a rung **63** upon movement to the extended position. Means, such as spring **75**, biases pull-pawl **74** to remain in contact with rungs **63**. Each time solenoid **71** is activated, pull-pawl **74** pulls a rung **63** upward and then extends to engage the next rung **63**. Means is provided for adjusting the length of pull arm **73** such as connecting it to rod **72** with a threaded nut adjustment as shown.

An up-stop assembly **80** limits the movement of a rung **63** upon retraction of rod **72**. Up-stop assembly **80** includes an up-stop arm **81** including a first end pivotally attached to rod **72**, such as to lateral bolt **76**, so as to be movable therewith and a second end pivotally attached to an up-stop **82** pivotally mounted on mount **84** attached to side wall **14**. Up-stop **82** includes means, such as a tooth **83**, for engaging rungs **63**. Upon retraction of rod **72**, arm **81** causes up-stop **82** to pivot downward such that tooth **83** blocks further movement of the rung **63** pulled by pull-pawl **74**. Means is provided for adjusting the length of up-stop arm **81**, such as being attached by a threaded nut to bolt **76**. Up-stop assembly **80** checks the momentum of ratchet bar **61** so that it does not move further than desired. Up-stop assembly **80** also controls the maximum retraction of rod **72**, such that even if rod **72** would retract further, it is prevented by assembly **80**. This feature permits the use and substitution of solenoids **71** having different throws.

A down-stop assembly **90** prevents reverse movement of ratchet bar **61**. Down-stop assembly **90** includes a down-stop arm **91** having a first end attached such as by wing nut **92** to a swing arm **93** pivotally attached to mount **94**

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mounted on side wall **14** and having a second end including a down-stop pawl **95**. Down-stop pawl **95** has a first side adapted for engaging a rung **63** and an opposite side adapted, such as by having an incline, for riding over a rung **63** as rod **72** is retracted. Means, such as spring **96**, biases down-stop pawl **95** to remain in contact with rungs **63**. Each time solenoid **71** is activated, pull-pawl **74** pulls a rung **63** upward and down-stop pawl **95** rides over the next rung **63** to engage its back side to prevent backward movement. Means is provided for adjusting the length of down-stop arm **91**, such as connecting it to swing arm **93** with a threaded nut **92** adjustment as shown.

Activation means **100**, such as timer **101**, is connected to solenoid **71** for activating solenoid **71**. Timer **71** may be of any conventional type that is programmable or settable to activate solenoid **71** at predetermined times, such as to feed the animal portions of feed **98** at set hours of the day. Of course, solenoid **71** could be activated by any switch, either manually operated or automatic. Timer **101** and solenoid **71** may be connected, such as by plug **102**, to any desirable power source, such as a power line or battery, not shown. The device uses very little power because solenoid **71** requires only a short burst of energy periodically for each door drop. Such periodic power use is ideal for a battery and a battery will last a long time. Since use is usually out of doors and often at remote locations, a small solar charger with tile battery will provide years of power for the device.

In use, activation mechanism **40** is set to the start position as shown. Ratchet bar **61** is all the way down and resting on stop **67**. Triggers **53** rest on stops **57** and catches **55** hold catch arms **29**. Doors **17** are supported by latches **21**. Feed **98** is loaded into compartments **16** as desired.

At a predetermined feeding time or interval, solenoid **71** is activated by timer **101** such that rod **72** retracts, pull-pawl **74** pulls rung **63A** upward, up-stop **82** pivots down to limit upward movement of rung, **63A**, and down-stop pawl **95** slides behind rung **63B** to prevent retreat. Ratchet bar **61** moves upward and trip **64A** trips trigger **53A** moving catch **55A** to release catch arm **29A** thus dropping latch **21A** to the dispensing position whereby door **17A** drops downward dispensing feed **98** from compartment **16A**.

As solenoid **71** extends rod **72**, up-stop **82** pivots up and pull-pawl **74** drops behind rung **63B**. The process is then repeated with rung **631B** and each successive rung **63** being pulled up.

To reset dispenser **10** to the start position, pull-pawl **74** and down-stop pawl **95** are manually disengaged from rungs **63**, such as by pulling outward on them **74**, **95**, whereupon, ratchet bar **61** slides downward by gravity to the start position. Catch arms **29** are re-set in catches **55**. Doors **17** are manually swung upward, starting with the highest fallen door **17** on the left or right side of enclosure **12**. Each door **17** is swung past start position so as to swing past latch **21** and then released so as to be caught by its latch **21**. Fresh portions of feed **98** are placed on each door **17**, such as by access doors (not shown) in front wall **115**.

FIGS. 9–13 illustrate a second exemplary embodiment of the invention.

With reference now to FIG. 9 there is shown a top, rear, left side perspective view of dispenser **10'**. Dispenser **10'** is similar to dispenser **10** of the first embodiment, except as indicated below. Dispenser **10'** includes legs **11** supporting an enclosure **12** off the ground. Enclosure **12** includes a plurality of compartments **16**, such as **16A–16F** each having a hinged downwardly opening bottom door **17**, such as doors **17A–17F**, having a storage position for supporting

feed 98, such as hay 99, and a dispensing position for dispensing hay 99. Although three levels, lower, middle and upper levels, of compartments 16 are shown and described, the principles of the invention apply to any number of levels. Loading wall or front wall 115 includes securable doors (not shown) for access to compartments 16A–16F for loading hay 99 therein. The rear, or feed dispensing side, of dispenser 10' is open on the bottom and enclosure 12 includes a rear wall 15, which is adapted, such as by being solid, for keeping animals away from hay 99 stored in compartments 16A–16F.

Each compartment 16A–16F has an associated latch assembly 120A–120F attached to rear wall 15. A latch activation mechanism 130 includes a plurality of catch assemblies 132A–132F, a catch assembly 132 associated with each latch assembly 120. Each catch assembly 132 includes a connector 142, such as connectors 142A–142F and a retaining means, such as common retainer 140, for retaining one end of each connector 142. A connector release assembly 160 includes a trip 162 and trip movement means 180 for incrementally moving trip 162 so as to sequentially disengage each connector 142 from retainer 140. The components of compartment 16A are shown in the dispensing position wherein hay 99D has been dispensed.

FIG. 10 is a partial rear elevation view of the right side of FIG. 9. FIG. 11 is an enlarged partial sectional view taken on line 11–11 of FIG. 10 of a latch assembly 120, such as 120C. FIG. 12 is an enlarged partial sectional view taken on line 12–12 of FIG. 10 of an offset latch assembly, such as 120B.

Each latch assembly includes a latch 121 attached to pivot rod 125 that is pivotally attached to and supported by brackets 127 supported by rear wall 15. Each latch 121 extends from its pivot rod 125 through a small opening 19 in rear wall 15 and is pivotable from a storage position wherein its free end 122 supports door 17 of its compartment 16 in the storage position to a dispensing position for not supporting its door 17 such that door 17 drops to dispense feed 98.

Each connector 142 includes a catch portion 143 including a substantially vertical member 144 having a catch end 145 including catch 146. Vertical member 144 is vertically movable between a storage position wherein catch 146 supports its associated latch 121 in the storage position and a dispensing position wherein catch 146 does not support its associated latch 121 in the storage position.

FIG. 11 shows latch assembly 120C in the support position wherein catch 146 directly supports the underside of latch 121.

In the exemplary embodiment shown, openings 19 are aligned so that latches 121 support the center of doors 17. Because of this preferred alignment, latch assemblies 120 may vary somewhat to accommodate connection to connectors 142. For example, FIG. 12 illustrates offset latch assembly 120B in the dispensing position. Offset latch assembly 120B has a finger 124 on pivot rod 125 for being supported by catch 146 so that vertical member 144 can be offset from other vertical members 144.

Alternatively, with a small number of vertical compartments, some latches 121 could be offset slightly from center such that latch assemblies 120 could all be identical.

Looking at FIGS. 13 and 14, FIG. 13 is a partial top plan view of FIG. 9 and FIG. 14 is a partial top rear perspective view of connector release assembly 160.

Retainer 140 is an angle connected to roof 13 including a plurality of guide slots 141 in the upright portion, each guide slot 141 for receiving one connector.

Each connector 142A–142F of each catch assembly 132A–132F includes a retention portion 147 including a substantially horizontal member 148 including a connected end 149 ultimately connected to catch portion 143 and a retention end 150 including retention means 151, such as notch 152 in lock bar 155. Lock bar 155 slides in guide slot 141 and notch 152 engages retainer 140 to hold connector 142 in a support position whereby connector 142 holds its catch 146 in its support position. Connector 142A is shown in the dispensing position with notch 152 disengaged from retainer 140. The other connectors 142B–142F are shown in the engaged position. Lock bar 155 is re-engaged by pushing back on thumb push 156 until notch 152 engages retainer 140.

Returning briefly to FIGS. 9 and 10, in the exemplary embodiment shown, each catch assembly 132 includes joining means, such as a bell crank 190, pivotally mounted on a pivot rod 196 supported by supports 195 mounted on roof 13. Bell crank 190 includes a rear arm 191 and a front arm 192. Connected end 159 of vertical member 144 of connector 142 is pivotally connected to rear arm 191. Connected end 149 of horizontal member 148 is pivotally connected to front arm 192. Although vertical member 144 and horizontal member 148 are shown joined by bell crank 190, other joining means are contemplated. For example, vertical member 144 and horizontal member 148 can be a continuous tension member, such as a cable, changing direction over a pulley where the bell crank is shown, or the bell crank arms can be arranged to place the horizontal member also in tension.

Trip 162 of connector release assembly 160 includes a ratchet bar assembly 60 including a movable ratchet bar 61 and trip means, such as cams 163, attached to ratchet bar 61 for disengaging each lock bar notch 152 from retainer 140 upon separate movements of ratchet bar 61. Two cams 163 are used and shown. One cam 163L trips the left connectors, 142A–142C, and then the other cam 163R trips the right connectors 142D–142F. Using the principles taught herein, it is apparent that other arrangement of cams and connectors could be used to trip connectors in other orders. Ratchet bar 61 includes a plurality of spaced engaging means, such as rungs 63; such as one rung 63 for each connector 142.

Trip movement means 180 is the same as reciprocating assembly 70 described with respect to first exemplary embodiment 10 except: up-stop assembly 80 includes a spring 85 connected between mounting plate 179 and up-stop 82 for raising the stop tooth 83 upon return of rod 72 of solenoid 71; and down-stop arm 91 of down stop assembly 90 is pivotally mounted to roof 13, such as to mounting plate 179.

Covers, not shown, cover the latch assemblies 120 and latch activation mechanisms 130 for weather protection and so that animals do not contact them.

From the foregoing description, it is seen that the present invention provides an extremely simple, efficient, and reliable device for dispensing feed. It is particularly useful for isolated use with battery power because very little power is required for timer and solenoid.

Although a particular embodiment of the invention has been illustrated and described, various changes may be made in the form, composition, construction, and arrangement of the parts herein without sacrificing any of its advantages. Therefore, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense, and it is intended to cover in the appended claims such modifications as come within the true spirit and scope of the invention.

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In the appended claims, “rung” means any device such as a tooth, depression, or surface feature for engaging a pawl. Also, the terms “left” and “right” are relative.

I claim:

1. A device for storing and dispensing feed to an animal; 5
said device comprising:
an enclosure including:

plurality of compartments; each including:

a hingedly attached, downwardly opening bottom door 10
having a storage position for supporting feed and a
open dispensing position for dispensing feed;

a plurality of latch assemblies attached to said enclosure; a
said latch assembly associated with each said compart-
ment; each said latch assembly including:

a latch having a storage position for supporting said door 15
of said latch’s associated compartment in the storage
position and having a dispensing position for not sup-
porting said door of said latch’s associated compart-
ment; and

a latch activation mechanism including; 20

a plurality of catch assemblies, a said catch assembly
associated with each said latch assembly; each said
catch assembly including:

a retainer attached to said enclosure; and

a connector movable from a storage position to a 25
dispensing position including:

a catch portion including:

a catch end including:

a catch vertically movable between a storage 30
position wherein said catch supports its asso-
ciated said latch in the storage position and a
dispensing position wherein said catch does
not support its associated said latch in the
storage position; and

a retention portion connected to said catch portion 35
including:

a retention end including:

retention means for selectively engaging said 40
retainer; said connector movable from a sup-
port position, wherein said retention means of
said retention end is engaged with said retainer
whereby said connector holds said catch in its
support positions to a dispensing position
wherein said retention means of said retention 45
end is disengaged from said retainer and
wherein said catch is in its dispensing position;
and

a connector release assembly including:

a trip for disengaging each said retention means from 50
said retainer; and

trip movement means for incrementally moving said
trip so as to sequentially disengage each said reten-
tion means.

2. The device of claim 1 wherein: 55

said catch portion includes:

a substantially vertical member having said catch end at
one end and including:

a connected end opposite said catch end; and

said retention portion includes: 60

a substantially horizontal member having said retention
end at one end and including:

a connected end opposite said retention end, said
connected end connected to said connected end of
said vertical member. 65

3. The device of claim 1 wherein:

said catch assembly includes:

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a bell crank support mounted on said enclosure;

said connector includes:

a bell crank pivotly mounted to said bell crank support;

said catch portion includes:

a substantially vertical member having said catch end at
one end and including:

a connected end opposite said catch end and con-
nected to said bell crank; and

said retention portion includes:

a substantially horizontal member having said retention
end at one end and including:

a connected end opposite said retention end and
connected to said bell crank.

4. The device of claim 1 wherein:

said trip includes: 15

a ratchet bar assembly including:

a movable ratchet bar including:

a plurality of spaced engaging means; and

trip means attached to said ratchet bar for disengaging
each said retention means from said retainer upon
separate movements of said ratchet bar; and

said trip movement means includes:

a reciprocating assembly including:

a rod reciprocatingly movable between an extended
position and a retracted position when said device is
activated;

a pull arm including:

a first end connected to said rod; and

a second end including:

a pull-pawl for engaging one of said engaging
means of said ratchet bar and moving said
ratchet bar when said rod moves from the
extended position to the retracted position and
for moving to engage another of said ratchet
bar engaging means when said rod moves to
the extended position.

5. The device of claim 4 further including:

up-stop means for limiting the movement of said engag-
ing means of said ratchet bar upon retraction of said
rod.

6. The device of claim 2 wherein:

said trip includes: 20

a ratchet bar assembly including:

a movable ratchet bar including:

a plurality of spaced engaging means; and

trip means attached to said ratchet bar for disengaging
each said retention means from said retainer upon
separate movements of said ratchet bar; and

said trip movement means includes:

a reciprocating assembly including:

a rod reciprocatingly movable between an extended
position and a retracted position when said device is
activated;

a pull arm including:

a first end connected to said rod; and

a second end including:

a pull-pawl for engaging one of said engaging
means of said ratchet bar and moving said
ratchet bar when said rod moves from the
extended position to the retracted position and
for moving to engage another of said engaging
means of said ratchet bar when said rod moves
to the extended position.

7. The device of claim 6 further including:

up-stop means for limiting the movement of said engag-
ing means of said ratchet bar upon retraction of said
rod.

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8. The device of claim 3 wherein:
said trip includes:
- a ratchet bar assembly including:
 - a movable ratchet bar including:
 - a plurality of spaced engaging means; and 5
 - trip means attached to said ratchet bar for disengaging each said retention means from said retainer upon separate movements of said ratchet bar; and
 - said trip movement means includes:
 - a reciprocating assembly including: 10
 - a rod reciprocatingly movable between an extended position and a retracted position when said device is activated;
 - a pull arm including:
 - a first end connected to said rod; and 15
 - a second end including:
 - a pull-pawl for engaging one of said engaging means of said ratchet bar and moving said ratchet bar when said rod moves from the extended position to the retracted position and for moving to engage another of said engaging means of said ratchet bar when said rod moves to the extended position. 20
9. The device of claim 8 further including: 25
- up-stop means for limiting the movement of said ratchet bar engaging means upon retraction of said rod.
10. A device for storing and dispensing feed to an animal; said device comprising:
- an enclosure including: 30
 - a lower compartment including:
 - a hingedly attached, downwardly opening bottom door having a storage position for supporting feed and a dispensing position for dispensing feed; and
 - an upper compartment above said lower compartment; 35
 - said upper compartment including:
 - a hingedly attached, downwardly opening bottom door having a storage position for supporting feed and a dispensing position for dispensing feed;
 - a lower latch assembly including: 40
 - a lower latch having a storage position for supporting said door of said lower compartment in the storage position and a dispensing position for not supporting said door of said lower compartment;
 - an upper latch assembly including: 45
 - an upper latch having a storage position for supporting said door of said upper compartment in the storage position and a dispensing position for not supporting said door; and
 - a latch activation mechanism comprising: 50
 - a lower catch assembly including:
 - a lower retainer attached to said enclosure; and
 - a lower connector movable from a storage position to a dispensing position including:
 - a lower catch portion including: 55
 - a catch end including:
 - a lower catch vertically movable between a storage position wherein said lower catch supports said lower latch in the storage position and a dispensing position wherein said lower catch does not support said lower latch in the storage position; and 60
 - a retention portion connected to said lower catch portion including:
 - a retention end including: 65
 - retention means for selectively engaging said lower retainer; said lower connector movable

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- from a support position, wherein said retention means of lower connector is engaged with said lower retainer whereby said lower connector holds said lower catch in its support position, to a dispensing position, wherein said retention means of said lower connector is disengaged from said lower retainer and wherein said lower catch is in its dispensing position; and
- an upper catch assembly including:
 - a upper retainer attached to said enclosure; and
 - an upper connector movable from a storage position to a dispensing position including:
 - an upper catch portion including:
 - a catch end including:
 - a upper catch vertically movable between a storage position wherein said upper catch supports said upper latch in the storage position and a dispensing position wherein said upper catch does not support said upper latch in the storage position; and
 - a retention portion connected to said upper catch portion including:
 - a retention end including:
 - retention means for selectively engaging said upper retainer; said upper connector movable from a support position, wherein said retention means of said upper connector is engaged with said upper retainer whereby said upper connector holds said upper catch in its support position, to a dispensing position, wherein said retention means of said upper connector is disengaged from said upper retainer and wherein said upper catch is in its dispensing position; and
 - a connector release assembly including:
 - a trip for disengaging each said retention means from its said retainer; and
 - trip movement means for incrementally moving said trip so as to sequentially disengage said retention means of said lower connector from said lower retainer and then disengage said retention means of said upper connector from said upper retainer.
11. The device of claim 10 wherein:
said trip includes:
- a ratchet bar assembly including:
 - a movable ratchet bar including:
 - plurality of spaced engaging means; and
 - trip means attached to said ratchet bar for disengaging each said retention means from said retainer upon separate movements of said ratchet bar; and
 - said trip movement means includes:
 - a reciprocating assembly including:
 - a rod reciprocatingly movable between an extended position and a retracted position when said device is activated;
 - a pull arm including:
 - a first end connected to said rod; and
 - a second end including:
 - a pull-pawl for engaging one of said engaging means of said ratchet bar and moving said ratchet bar when said rod moves from the extended position to the retracted position and for moving to engage another of said engaging means of said ratchet bar when said rod moves to the extended position.
12. The device of claim 10 wherein:
each said catch portion includes:

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a substantially vertical member having said catch end at one end and including:
 a connected end opposite said catch end; and
 each said retention portion includes:
 a substantially horizontal member having said retention end at one end and including:
 a connected end opposite said retention end; said connected end connected to said connected end of said vertical member.

13. The device of claim 12 wherein:
 said trip includes:
 a ratchet bar assembly including:
 a movable ratchet bar including:
 a plurality of spaced engaging means; and
 trip means attached to said ratchet bar for disengaging each said retention means from said retainer upon separate movements of said ratchet bar; and
 said trip movement means includes:
 a reciprocating assembly including:
 a rod reciprocatingly movable between an extended position and a retracted position when said device is activated;
 a pull arm including:
 a first end connected to said rod; and
 a second end including:
 a pull-pawl for engaging one of said engaging means of said ratchet bar and moving said ratchet bar when said rod moves from the extended position to the retracted position and for moving to engage another of said engaging means of said ratchet bar when said rod moves to the extended position.

14. The device of claim 10 wherein:
 each said catch assembly includes:
 a bell crank support mounted on said enclosure;
 each said connector includes:
 a bell crank pivotly mounted to said bell crank support;
 each said catch portion includes:
 a substantially vertical member having said catch end at one end and including:
 a connected end opposite said catch end and connected to said bell crank; and
 said retention portion includes:
 a substantially horizontal member having said retention end at one end and including:
 a connected end opposite said retention end and connected to said bell crank.

15. The device of claim 14 wherein:
 said trip includes:
 a ratchet bar assembly including:
 a movable ratchet bar including:
 a plurality of spaced engaging means; and
 trip means attached to said ratchet bar for disengaging each said retention means from said retainer upon separate movements of said ratchet bar; and
 said trip movement means includes:
 a reciprocating assembly including:
 a rod reciprocatingly movable between an extended position and a retracted position when said device is activated;
 a pull arm including:
 a first end connected to said rod; and
 a second end including:
 a pull-pawl for engaging one of said engaging means of said ratchet bar and moving said ratchet bar when said rod moves from the

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extended position to the retracted position and for moving to engage another of said engaging means of said ratchet bar when said rod moves to the extended position.

16. A device for storing and dispensing feed to an animal; said device comprising:
 an enclosure including:
 a right compartment including:
 a hingedly attached, downwardly opening bottom door having a storage position for supporting feed and a dispensing position for dispensing feed; and
 a left compartment horizontally disposed from said right compartment; said left compartment including:
 a hingedly attached, downwardly opening bottom door having a storage position for supporting feed and a dispensing position for dispensing feed;
 a right latch assembly including:
 a right latch having a storage position for supporting said door of said right compartment in the storage position and a dispensing position for not supporting said door;
 a left latch assembly including:
 a left latch having a storage position for supporting said door of said left compartment in the storage position and a dispensing position for not supporting said door;
 a latch activation mechanism comprising:
 a right catch assembly including:
 a right retainer attached to said enclosure; and
 a right connector movable from a storage position to a dispensing position including:
 a right catch portion including:
 a catch end including:
 a right catch vertically movable between a storage position wherein said right catch supports said right latch in the storage position and a dispensing position wherein said right catch does not support said right latch in the storage position; and
 a retention portion connected to said right catch portion including:
 a retention end including:
 retention means for selectively engaging said right retainer; said right connector movable from a support position, wherein said retention means of right connector is engaged with said right retainer whereby said right connector holds said right catch in its support position, to a dispensing position, wherein said retention means of said right connector is disengaged from said right retainer and wherein said right catch is in its dispensing position; and
 a left catch assembly including:
 a left retainer attached to said enclosure; and
 a left connector movable from a storage position to a dispensing position including:
 a left catch portion including:
 a catch end including:
 a left catch vertically movable between a storage position wherein said left catch supports said left latch in the storage position and a dispensing position wherein said left catch does not support said left latch in the storage position; and
 a retention portion connected to said left catch portion including:
 a retention end including:
 retention means for selectively engaging said left retainer; said left connector movable from a

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support position, wherein said retention means of said left connector is engaged with said upper retainer whereby said upper connector holds said upper catch in its support position, to a dispensing position, wherein said retention means of said upper connector is disengaged from said upper retainer and wherein said upper catch is in its dispensing position; and

- a connector release assembly including:
 - a trip for disengaging each said retention means from its said retainer; and
 - trip movement means for incrementally moving said trip so as to sequentially disengage said retention means of said right connector from said right retainer and then disengage said retention means of said left connector from said left retainer.

17. The device of claim **16** wherein: said trip includes:

- a ratchet bar assembly including:
 - a movable ratchet bar including:
 - a plurality of spaced engaging means; and
 - trip means attached to said ratchet bar for disengaging each said retention means from said retainer upon separate movements of said ratchet bar; and

said trip movement means includes:

- a reciprocating assembly including:
 - a rod reciprocatingly movable between an extended position and a retracted position when said device is activated;
 - a pull arm including:
 - a first end connected to said rod; and
 - a second end including:
 - a pull-pawl for engaging one of said engaging means of said ratchet bar and moving said ratchet bar when said rod moves from the extended position to the retracted position and for moving to engage another of said engaging means of said ratchet bar when said rod moves to the extended position.

18. The device of claim **16** wherein:

- each said catch portion includes:
 - a substantially vertical member having said catch end at one end and including:
 - a connected end opposite said catch end; and

- each said retention portion includes:
 - a substantially horizontal member having said retention end at one end and including:
 - a connected end opposite said retention end; said connected end connected to said connected end of said vertical member.

19. The device of claim **18** wherein:

- said trip includes:
 - a ratchet bar assembly including:
 - a movable ratchet bar including:
 - a plurality of spaced engaging means; and
 - trip means attached to said ratchet bar for disengaging each said retention means from said retainer upon separate movements of said ratchet bar; and

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said trip movement means includes:

- a reciprocating assembly including:
 - a rod reciprocatingly movable between an extended position and a retracted position when said device is activated;
 - a pull arm including:
 - a first end connected to said rod; and
 - a second end including:
 - a pull-pawl for engaging one of said engaging means of said ratchet bar and moving said ratchet bar when said rod moves from the extended position to the retracted position and for moving to engage another of said engaging means of said ratchet bar when said rod moves to the extended position.

20. The device of claim **16** wherein:

- each said catch assembly includes:
 - a bell crank support mounted on said enclosure;
- each said connector includes:
 - a bell crank pivotly mounted to said bell crank support;
- each said catch portion includes:
 - a substantially vertical member having said catch end at one end and including:
 - a connected end opposite said catch end and connected to said bell crank; and
- said retention portion includes:
 - a substantially horizontal member having said retention end at one end and including:
 - a connected end opposite said retention end and connected to said bell crank.

21. The device of claim **20** wherein:

- said trip includes:
 - a ratchet bar assembly including:
 - a movable ratchet bar including:
 - a plurality of spaced engaging means; and
 - trip means attached to said ratchet bar for disengaging each said retention means from said retainer upon separate movements of said ratchet bar; and
 - said trip movement means includes:
 - a reciprocating assembly including:
 - a rod reciprocatingly movable between an extended position and a retracted position when said device is activated;
 - a pull arm including:
 - a first end connected to said rod; and
 - a second end including:
 - a pull-pawl for engaging one of said engaging means of said ratchet bar and moving said ratchet bar when said rod moves from the extended position to the retracted position and for moving to engage another of said engaging means of said ratchet bar when said rod moves to the extended position.

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