US 20120116832A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2012/0116832 A1**

(43) **Pub. Date: May 10, 2012**

DUBINSKY

(54) **DEVICE, SYSTEM AND METHOD FOR LIVESTOCK FEEDING**

(76) Inventor: **Ziv DUBINSKY**, Tel Aviv (IL)

(21) Appl. No.: **13/017,055**

(22) Filed: **Jan. 31, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/300,187, filed on Feb. 1, 2010.

Publication Classification

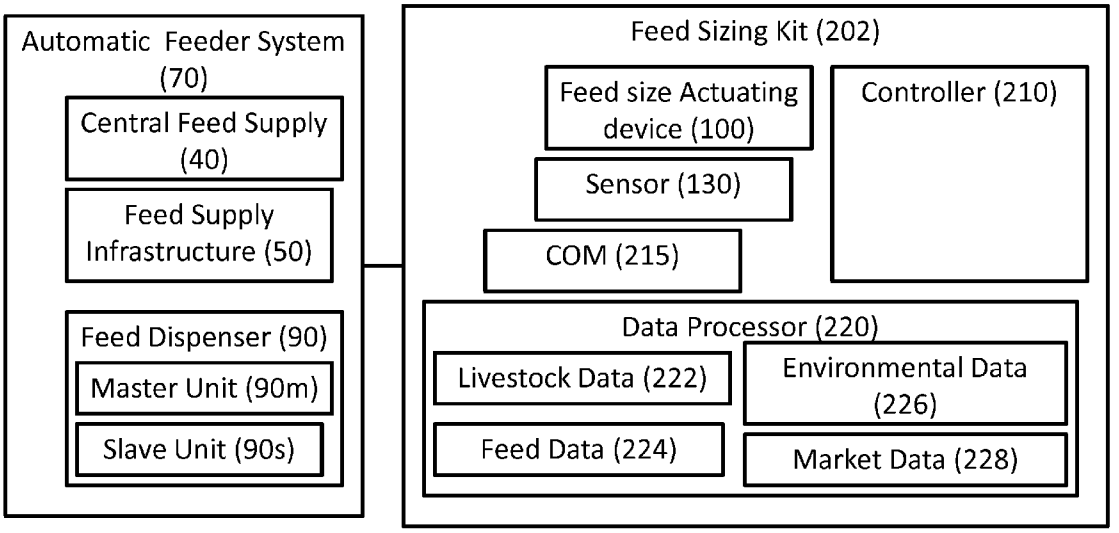
(51) **Int. Cl.**

A01K 5/02	(2006.01)
G06Q 10/00	(2006.01)
G06F 7/00	(2006.01)

(52) **U.S. Cl.** **705/7.22**; 119/57.92; 700/214

(57) **ABSTRACT**

A device, system and a method for livestock feeding, and in particular, to such a device, system and method in which, the meal size and frequency of meal delivery are controllable based on measureable parameters and expected livestock growth curve, more preferably real time parameters.



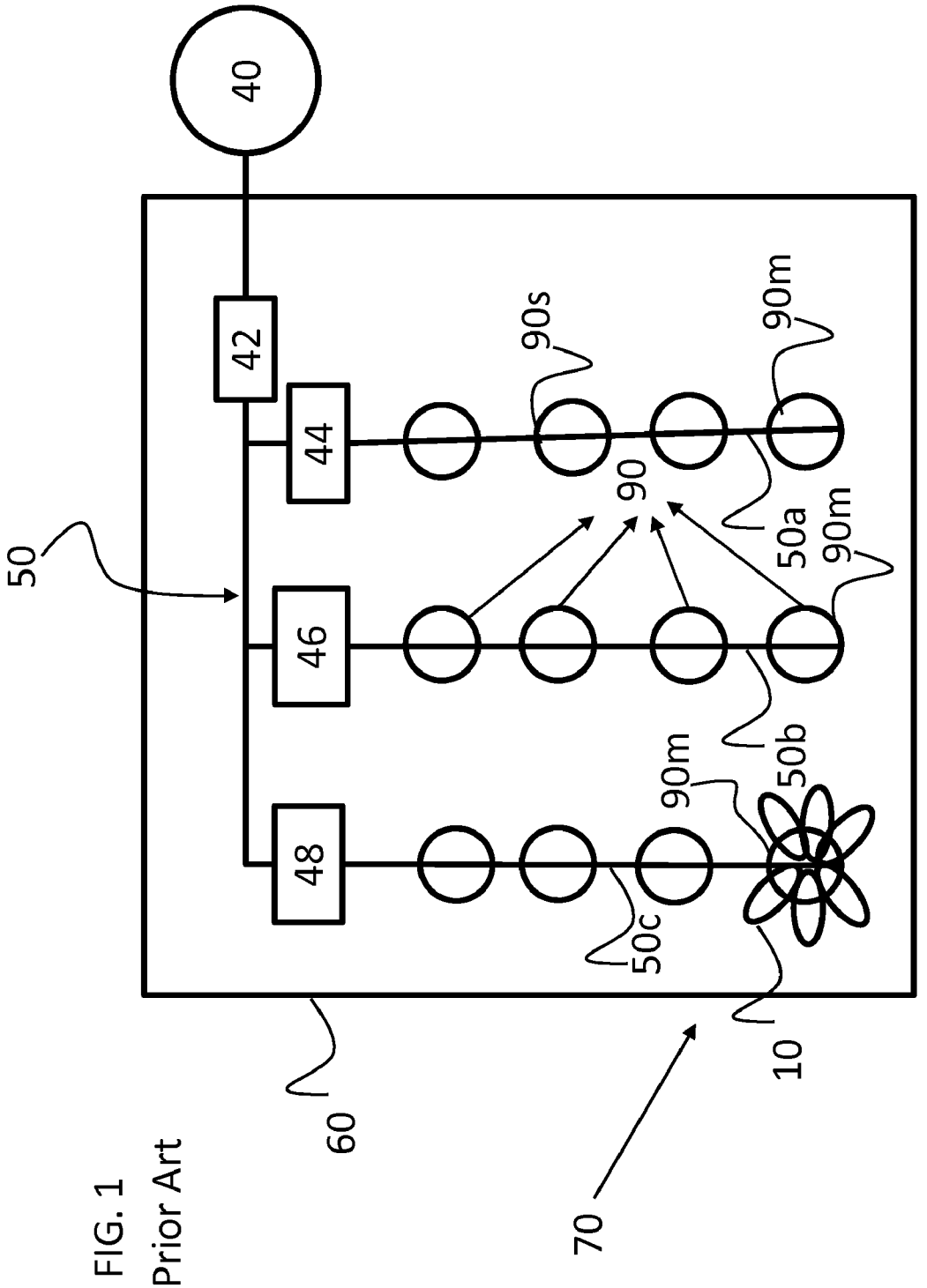


FIG. 1
Prior Art

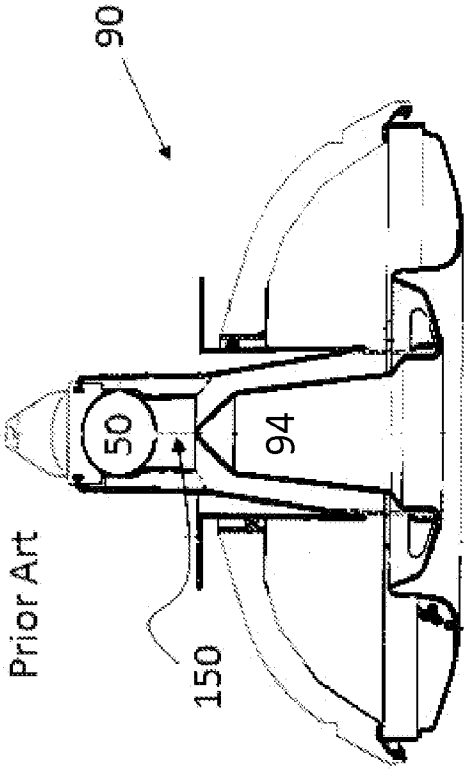


FIG. 2A
Prior Art

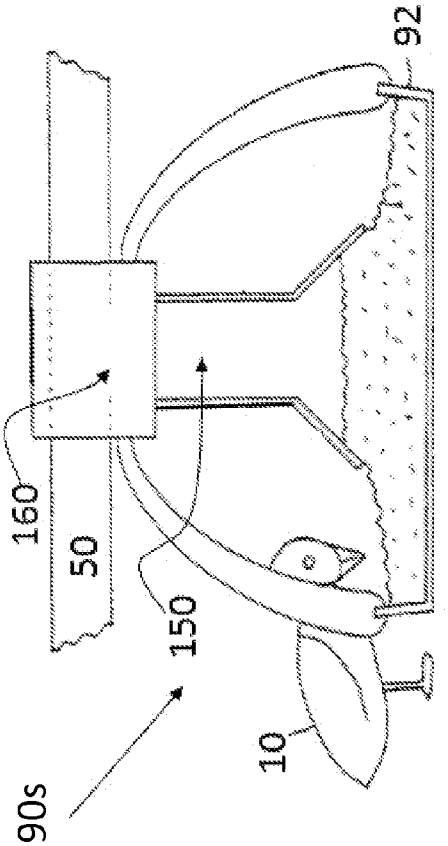


FIG. 2B
Prior Art

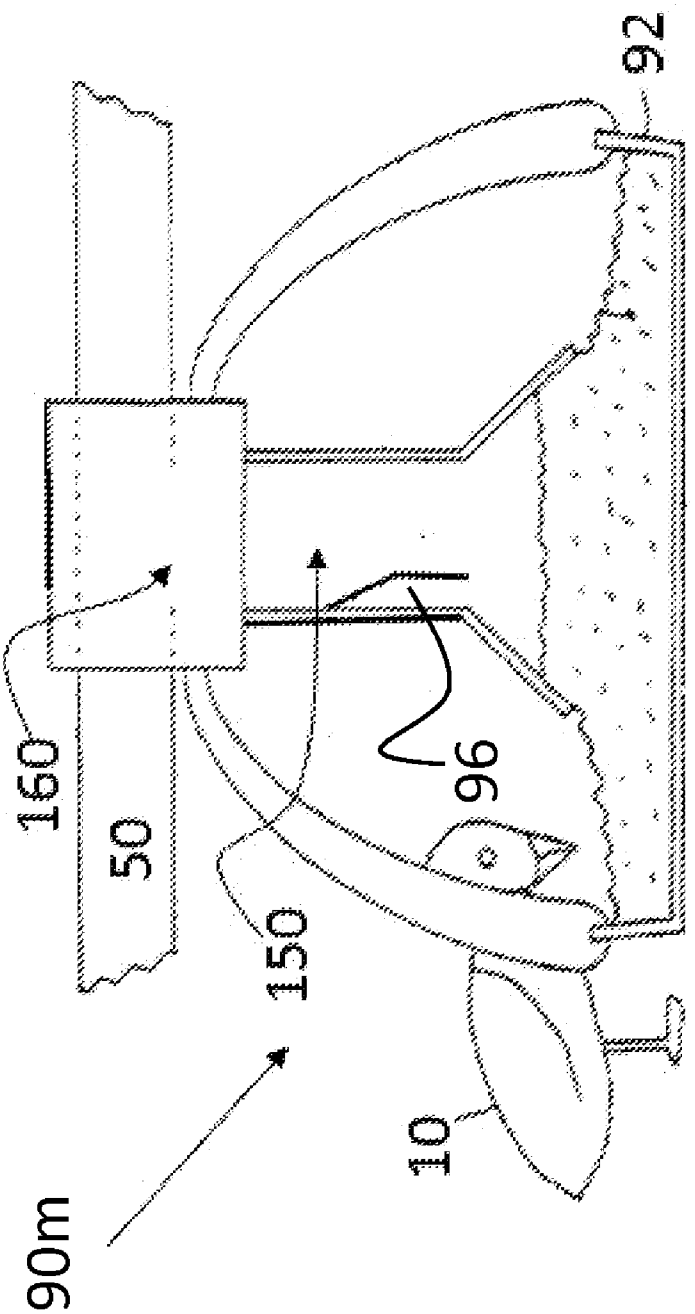


FIG. 2C
Prior Art

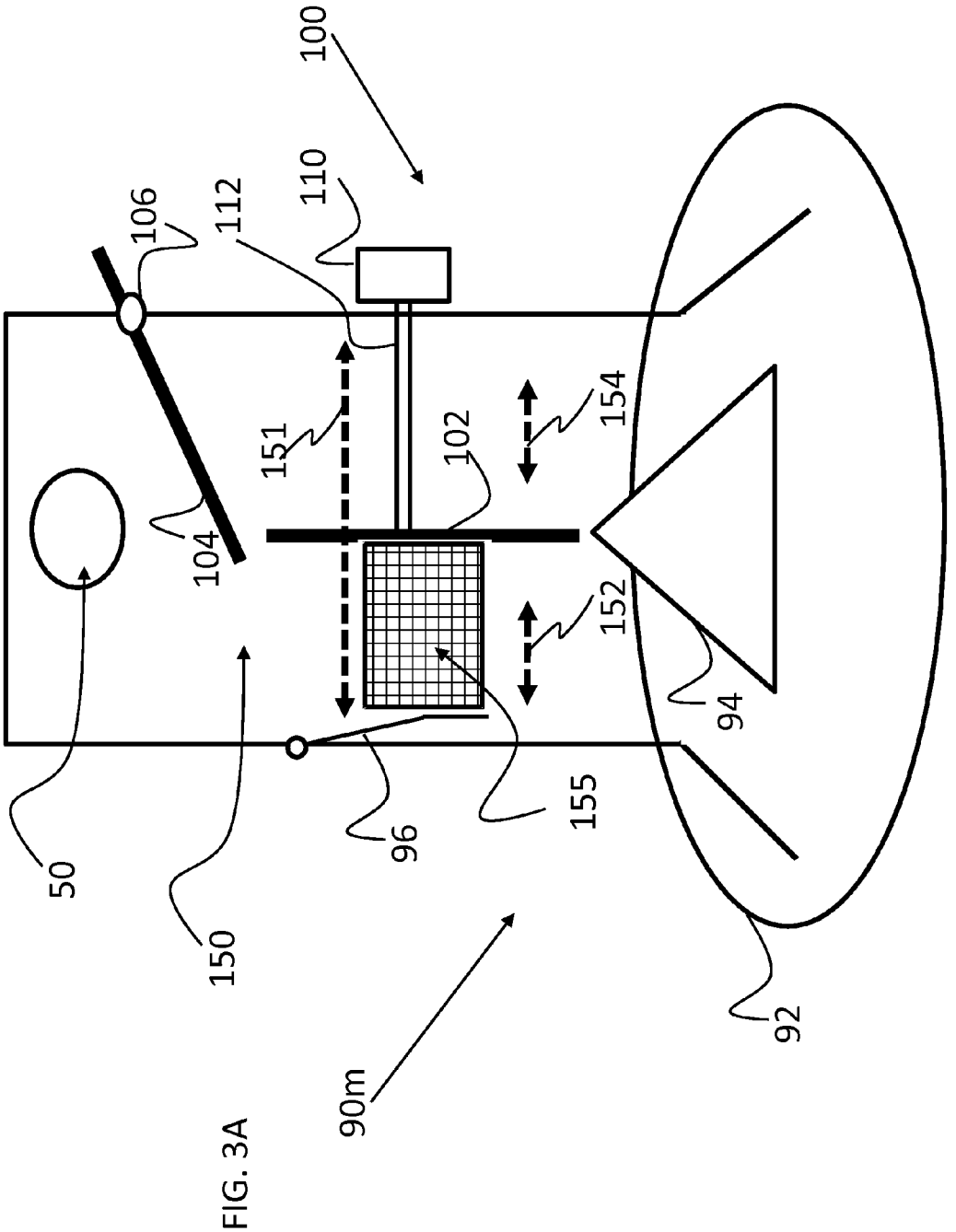


FIG. 3A

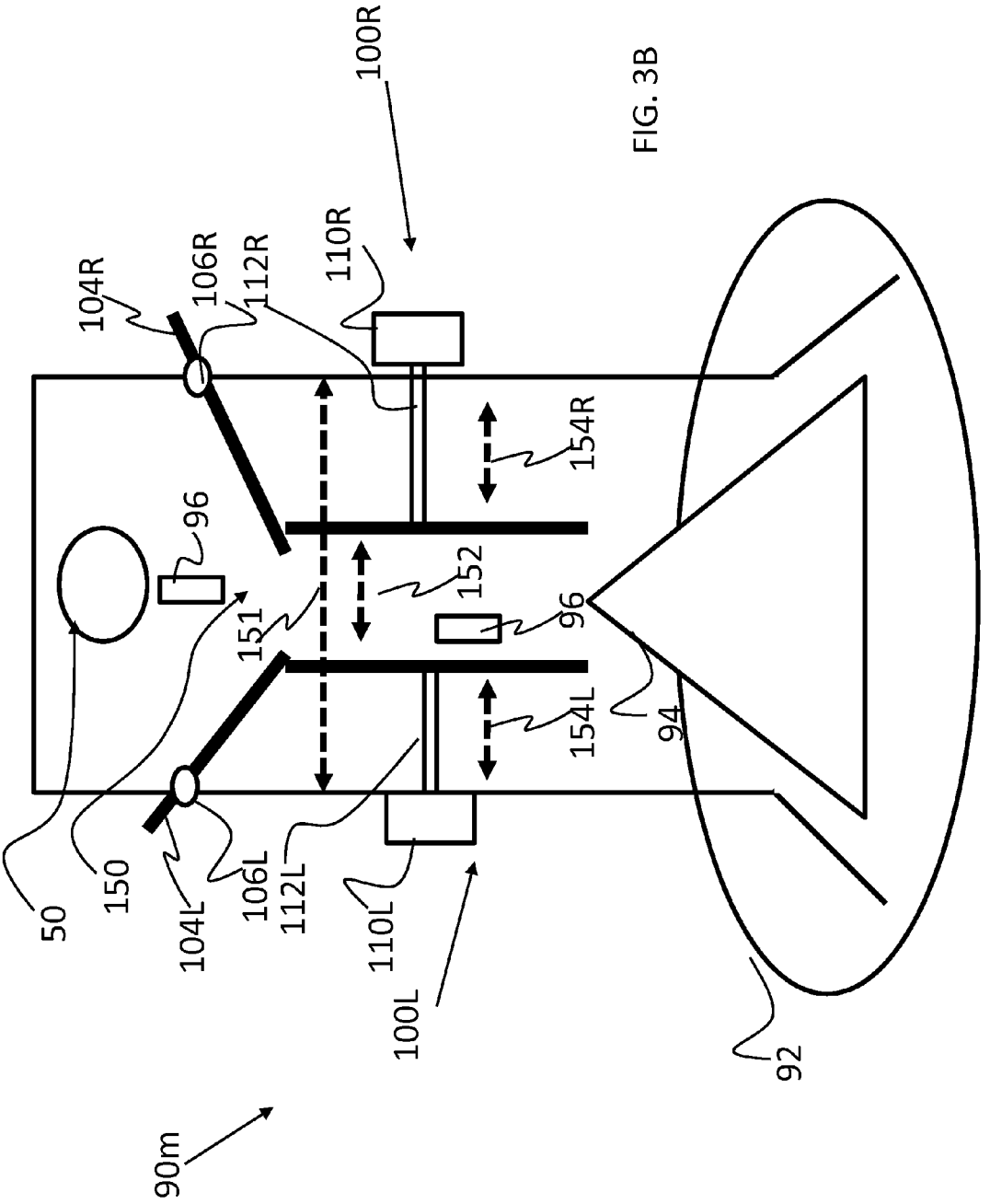

100R
110R
112R
106R
104R
154R
96
152
151
96
154L
94
50
150
104L
106L
112L
110L
100L
92
90m

FIG. 3B

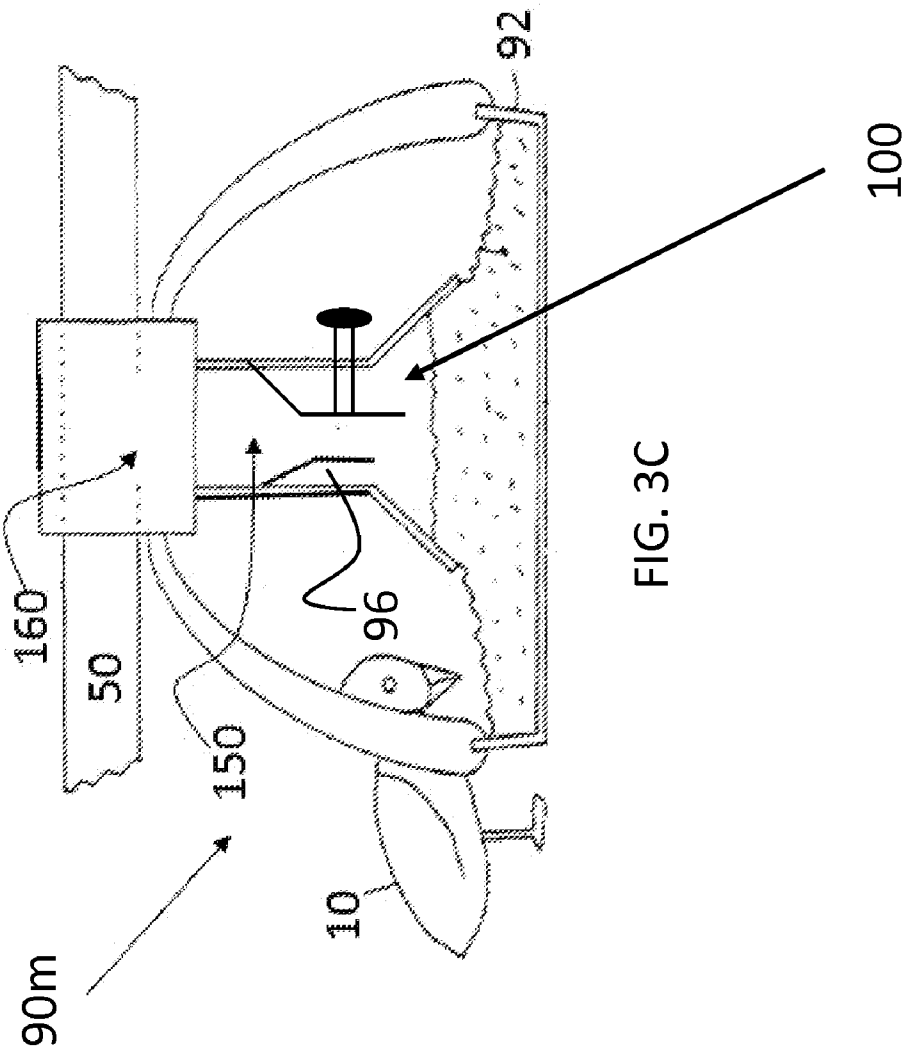


FIG. 3C

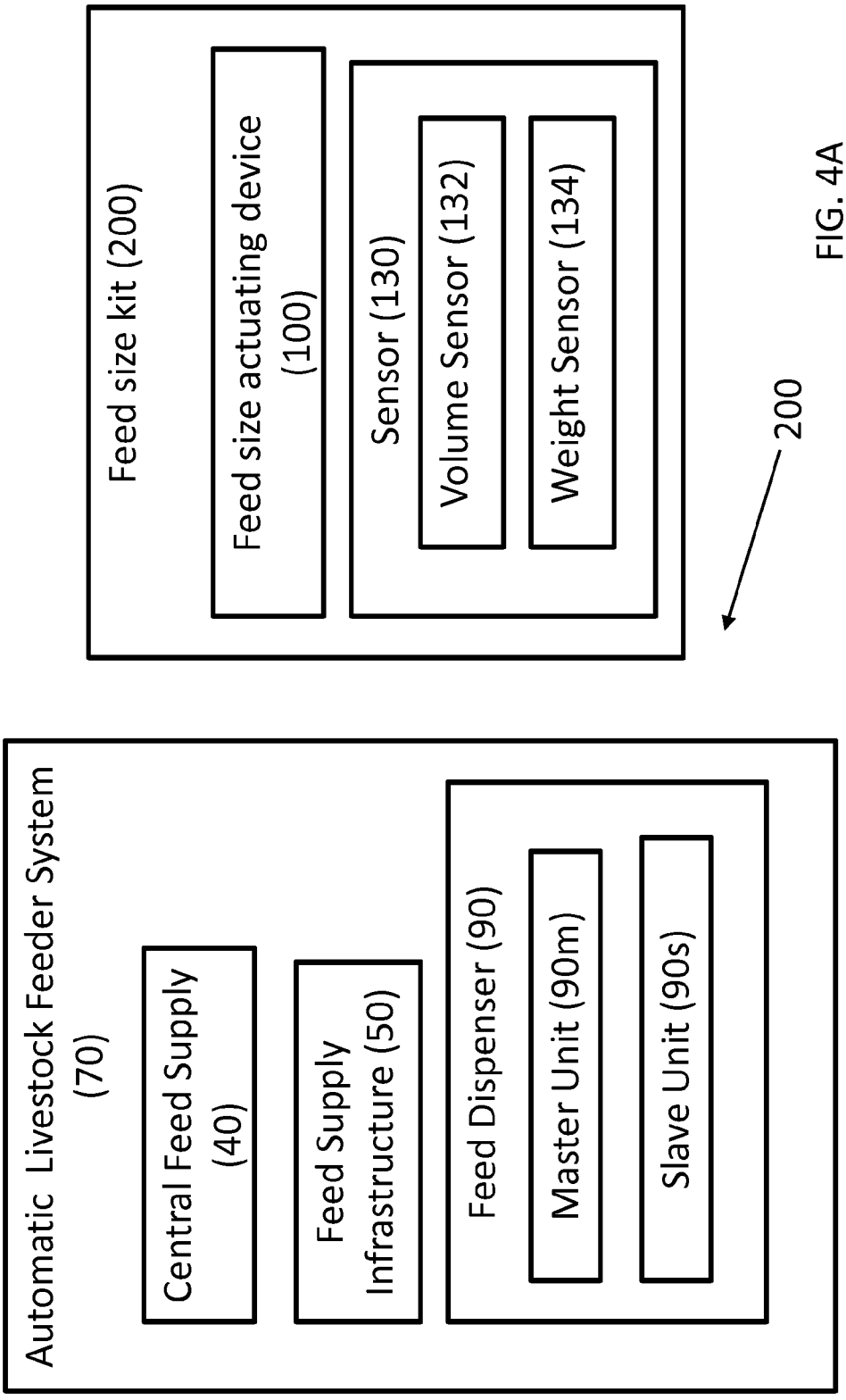

Automatic Livestock Feeder System (70)
Central Feed Supply (40)
Feed Supply Infrastructure (50)
Feed Dispenser (90)
Master Unit (90m)
Slave Unit (90s)
Feed size kit (200)
Feed size actuating device (100)
Sensor (130)
Volume Sensor (132)
Weight Sensor (134)
200

FIG. 4A

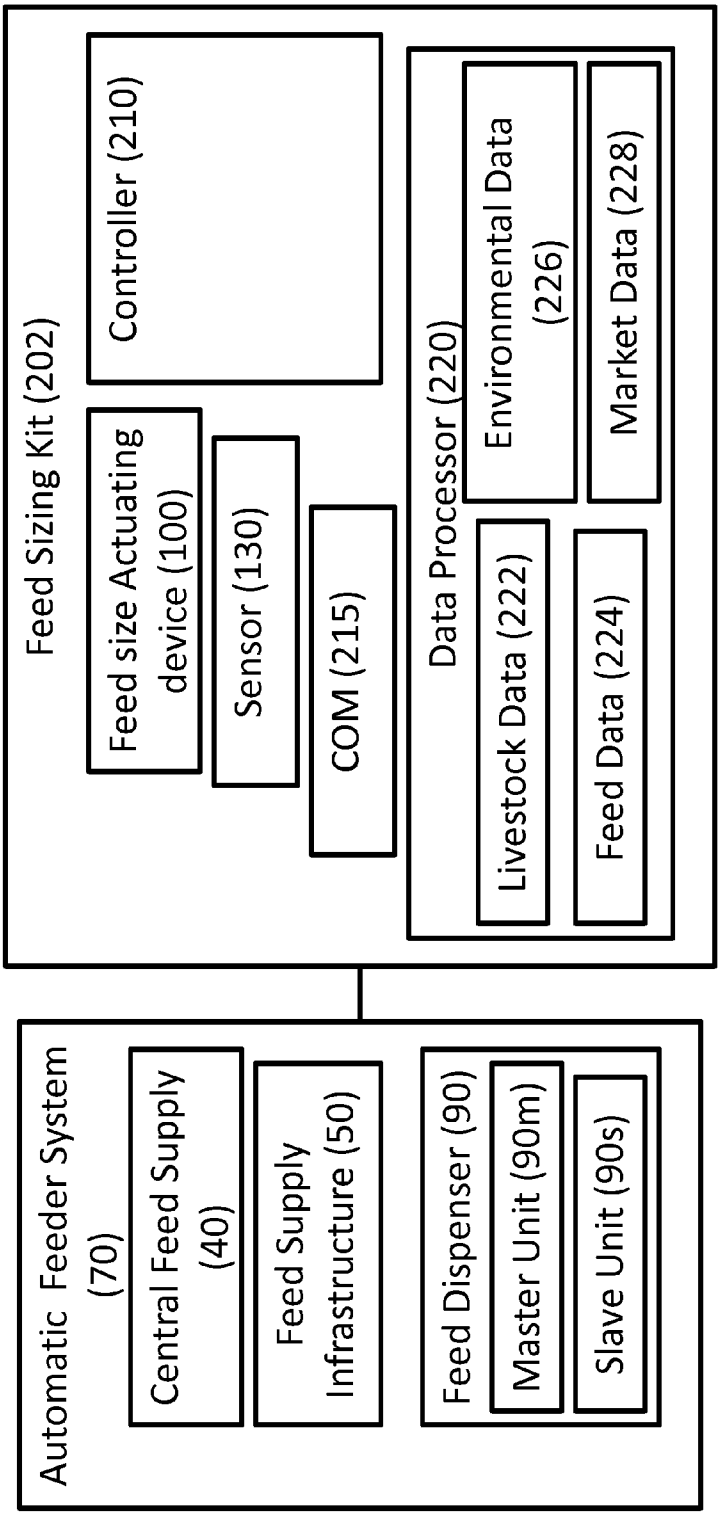
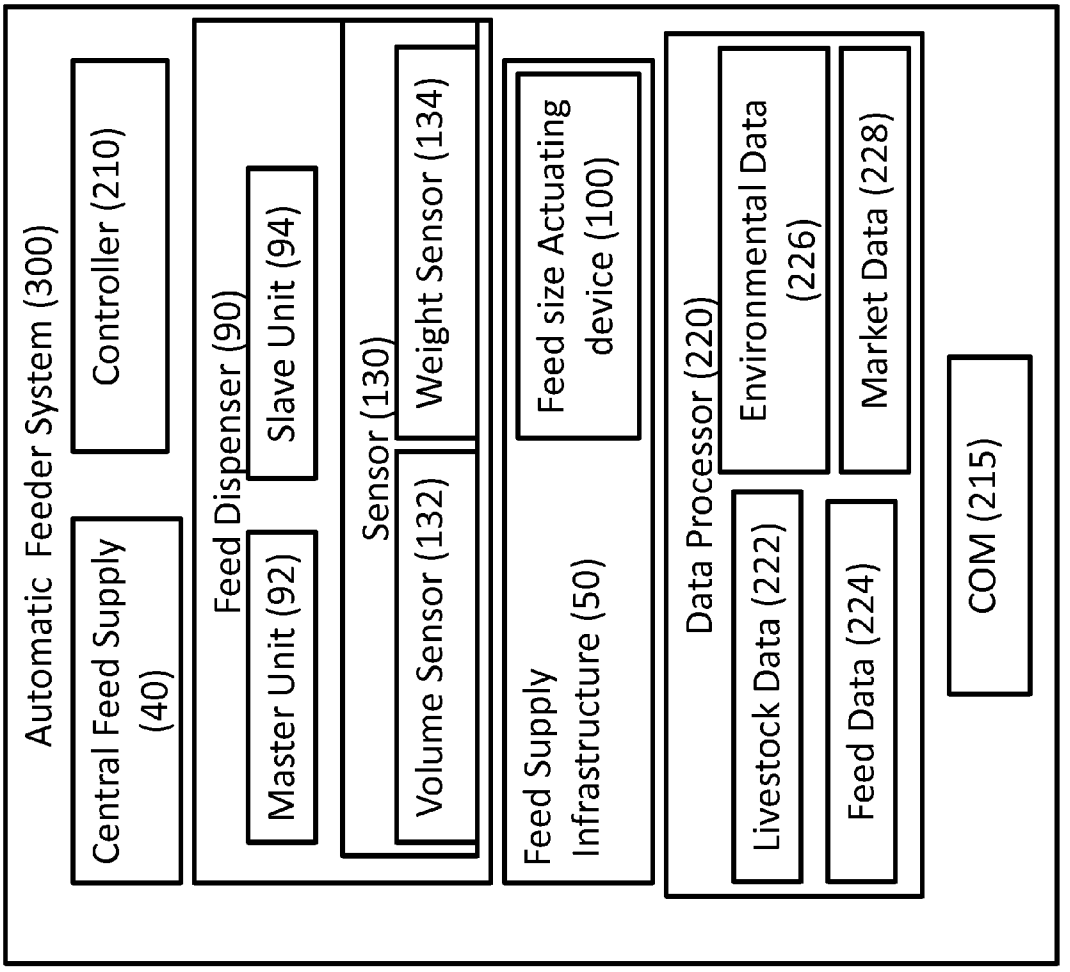

Feed Sizing Kit (202)
Controller (210)
Feed size Actuating device (100)
Sensor (130)
COM (215)
Data Processor (220)
Environmental Data (226)
Market Data (228)
Livestock Data (222)
Feed Data (224)
Automatic Feeder System (70)
Central Feed Supply (40)
Feed Supply Infrastructure (50)
Feed Dispenser (90)
Master Unit (90m)
Slave Unit (90s)

FIG. 4B

FIG. 5A


Automatic Feeder System (300)
Central Feed Supply (40)
Controller (210)
Feed Dispenser (90)
Master Unit (92)
Slave Unit (94)
Sensor (130)
Volume Sensor (132)
Weight Sensor (134)
Feed Supply Infrastructure (50)
Feed size Actuating device (100)
Data Processor (220)
Livestock Data (222)
Feed Data (224)
Environmental Data (226)
Market Data (228)
COM (215)

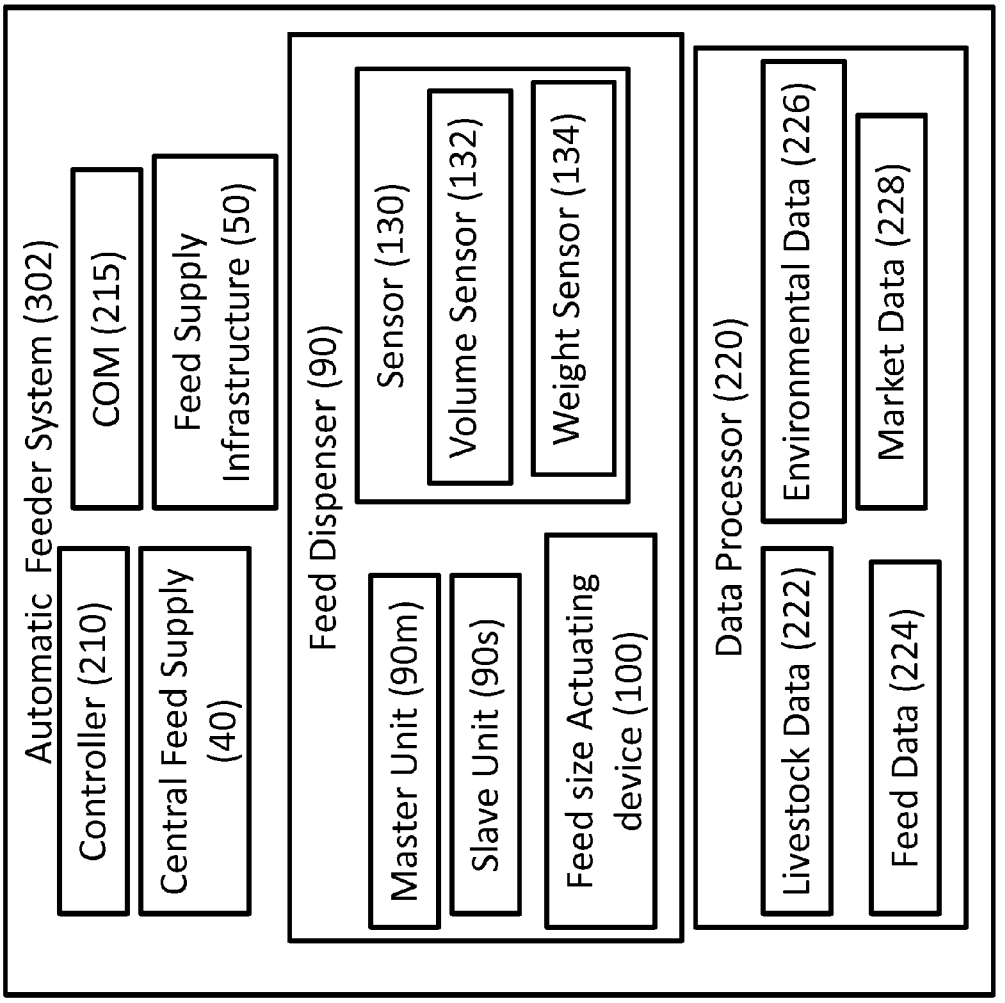

Automatic Feeder System (302)
Controller (210)
Central Feed Supply (40)
COM (215)
Feed Supply Infrastructure (50)
Feed Dispenser (90)
Master Unit (90m)
Slave Unit (90s)
Feed size Actuating device (100)
Sensor (130)
Volume Sensor (132)
Weight Sensor (134)
Data Processor (220)
Livestock Data (222)
Feed Data (224)
Environmental Data (226)
Market Data (228)

FIG. 5B

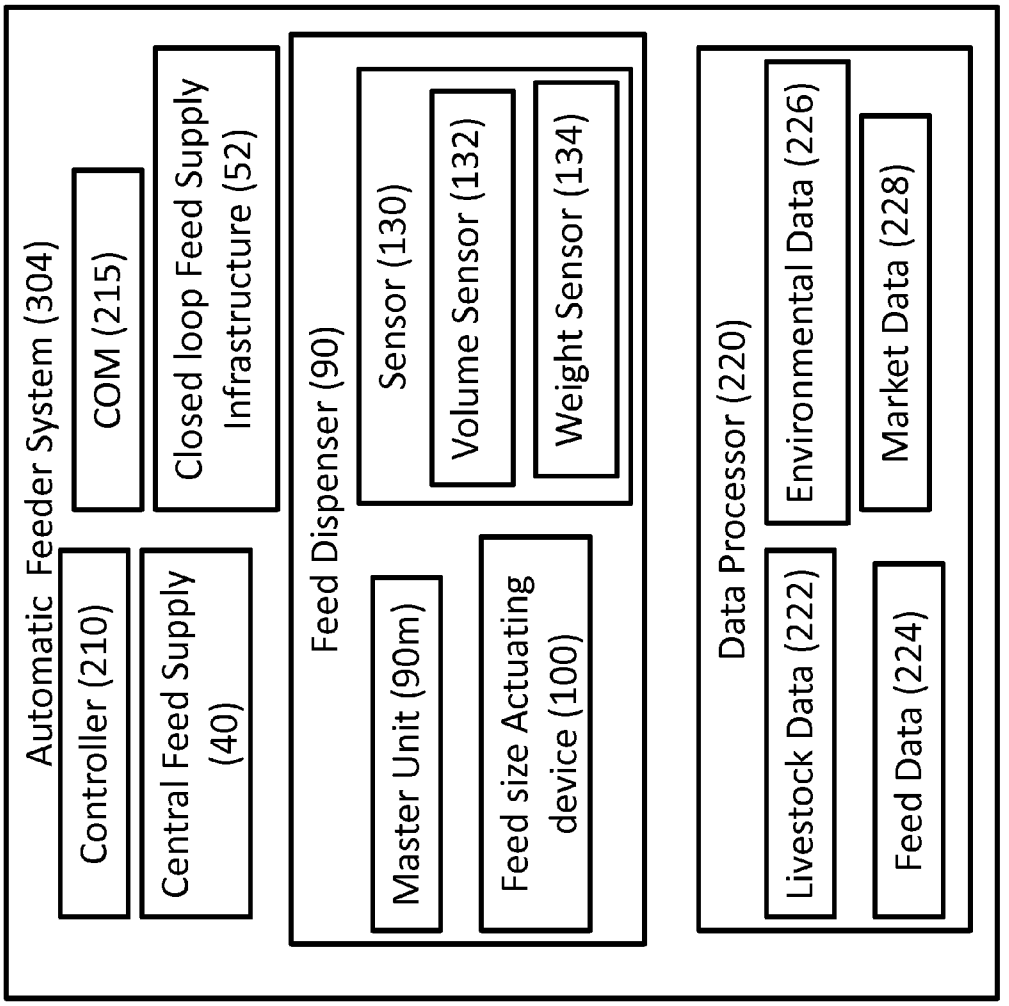

Automatic Feeder System (304)
Controller (210)
Central Feed Supply (40)
COM (215)
Closed loop Feed Supply Infrastructure (52)
Feed Dispenser (90)
Master Unit (90m)
Feed size Actuating device (100)
Sensor (130)
Volume Sensor (132)
Weight Sensor (134)
Data Processor (220)
Livestock Data (222)
Feed Data (224)
Environmental Data (226)
Market Data (228)

FIG. 6A

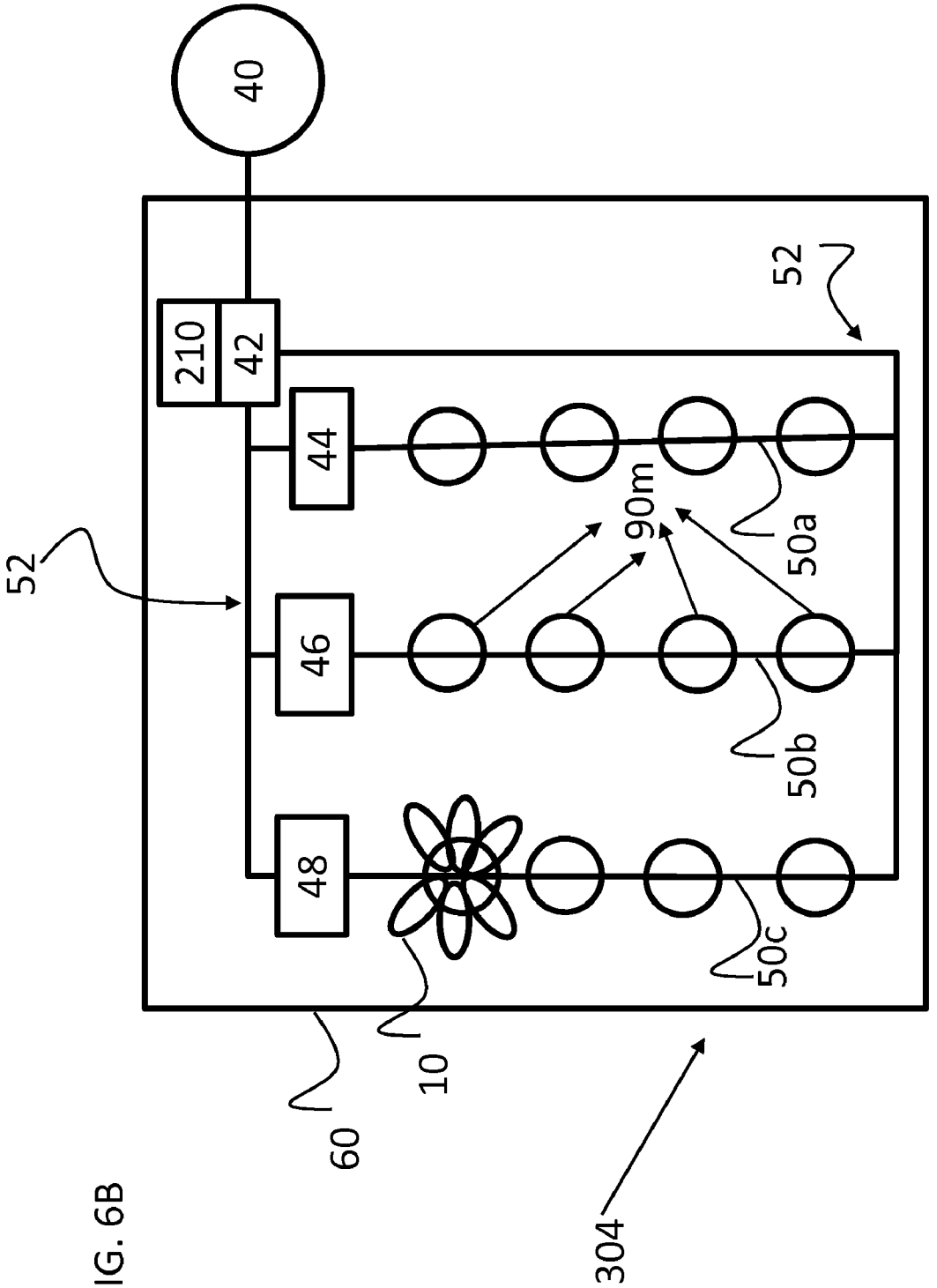


FIG. 6B

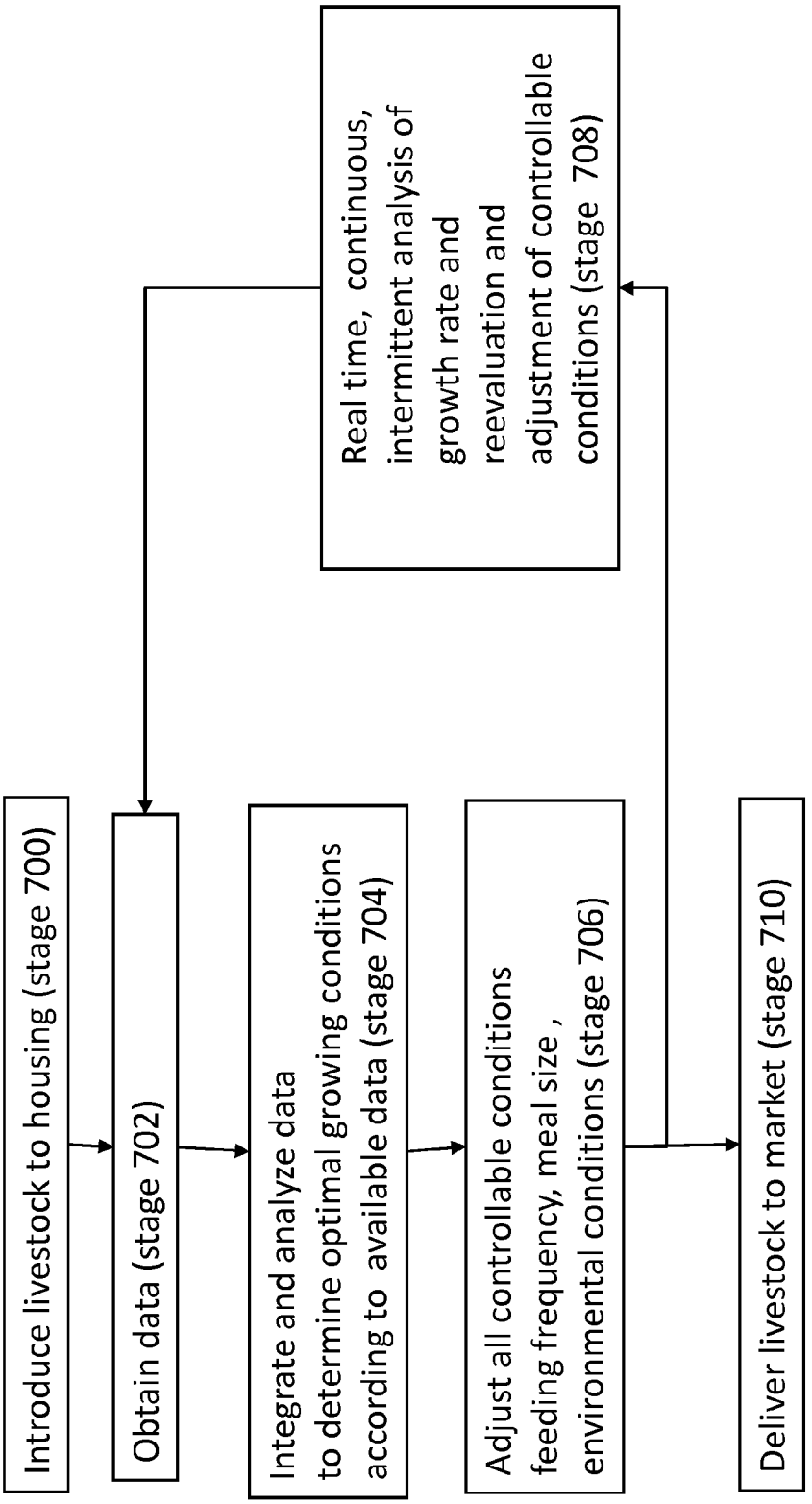

Introduce livestock to housing (stage 700)
Obtain data (stage 702)
Integrate and analyze data to determine optimal growing conditions according to available data (stage 704)
Adjust all controllable conditions feeding frequency, meal size , environmental conditions (stage 706)
Deliver livestock to market (stage 710)
Real time, continuous, intermittent analysis of growth rate and reevaluation and adjustment of controllable conditions (stage 708)

FIG. 7

DEVICE, SYSTEM AND METHOD FOR LIVESTOCK FEEDING

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional application Ser. No. 61/300,187, filed on Feb. 1, 2010, all of which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a device, system and a method for livestock feeding, and in particular, to such a device, system and method in which, the meal size and frequency of meal delivery are controllable based on measureable parameters and expected livestock growth curve, more preferably real time parameters.

BACKGROUND OF THE INVENTION

[0003] Livestock and in particular poultry are bred, and grown mass to meet the growing needs for their consumable products primarily in the form of meat, eggs, and the like foods. In order to allow for mass growing an automatic growing and feeding system has been developed for example to allow for mass production of meat, allowing poultry farmers to grow their livestock in cycle of about 45 days.

[0004] Such early systems, dating back to 1958, as for example taught by GB802421A to James MFG. Co., incorporated herein by reference as if fully set forth, depicts an automated feeding system that allows such mass growth of poultry livestock for the meat market. Such system teach a centralized feeding system that may supply feed to thousands of birds simultaneously, which greatly reduced the human intervention required in growing and raising livestock, such as poultry, allowing mass production to meet the increasing need for meat.

Since its early days the primary development in the automatic feeding system has been based on the feed dispenser or plate itself. For example, U.S. Pat. No. 3,971,340 to Allen, incorporated herein by reference as if fully set forth, describes a feed through system for controlling the amount of food made available to poultry by controlling the size of the plate opening by controlling the height of the feeding plate.

Similarly, U.S. Pat. No. 5,765,503 to van Daele, incorporated herein by reference as if fully set forth, depicts and improvements with respect to the feed dispenser to control feed rationing for the livestock.

Various improvements have been directed to the overall improvement and dimensions of the livestock housing, as for example taught by U.S. Pat. No. 6,786,178 to De Rouck, incorporated herein by reference as if fully set forth.

[0005] Poultry for example in the form of chicken or turkey are generally grown en-masse for varying markets such as the meat market, breeding market, egg market or the like utility market. In order to meet the market demand for poultry mass production is required whereby poultry is grown in large coops or poultry housing allowing the simultaneous growth of many birds. Such mass poultry production is greatly dependent on continuous livestock yield, large flock turnaround, quick growth period in order to meet market demand and maintaining livestock welfare, maintain bird size uniformity.

[0006] Prior art mass poultry and livestock feeding systems have a fixed feed dispensing points within the poultry house, where the feed is dispensed to individual plates and/or troughs by convey the feed from a central storage place. For conveying the feed to be dispensed from a central storage place to the feed dispensing points, a pipe conveyor system is present, which pipe conveyor system comprises one or more substantially horizontally directed feed conveyor pipes, which are disposed substantially parallel to each other, and which feed conveyor pipes are provided with means for conveying feed through them forming a poultry production line. In general the feed distribution points are situated along the feed conveyor pipes.

[0007] Poultry are generally fed with a powder form and/or granular form of feed. The feed is distributed by an automatic feeding system to feed a flock of birds within a dedicated living area or coop, as described above. Prior art automatic poultry feeding system, as described in U.S. Pat. No. 6,786,178 is shown in FIG. **1**. The automatic poultry feeding system **70** comprising a central feed supply trough **40** placed externally to the coop **60** housing a plurality the poultry flock members **10**. The automatic poultry feeding system **70** further comprises feed supply infrastructure **50** including a piping distribution system able to automatically distribute animal feed on three individual production lines **50***a-c*, where each line comprising a plurality of feed dispensers **90**. The feed is distributed to individual production lines **50***a-c* using a central feed distributors **42** and line specific distributors **44** to line **50***a*, **46** to line **50***b*, and **48** to line **50***c*, respectively. The feed is thereafter distributed to individual feed dispensers **90** according to the rate the livestock **10** eating rate at master feed dispenser **90***m* that is provided to sense and uniformly control the feed distribution to all slave feed dispensers **90***s*. The rate at which livestock eats the available feed at master feed dispenser **90***m* determines the frequency and availability of feed provided through the dedicated line **50***a-c*, therein master feed dispenser **90***m* controls the activation of the dedicated distributor **44**, **46**, **48**. Usually a single master feed dispenser **90***m* and a plurality of slave feed dispensers **90***s* are provided for individual production lines **50***a-c*.

[0008] A feed dispenser **90** is disposed at each feed point. A feed dispenser comprises a tray **92** on which feed comes to rest, which feed can be pecked off tray **92** by the birds. Some feed dispenser's **90** comprise feed dispersion guide **94** for guiding a part of the feed out of the horizontal feed conveyor pipe **50** and into the tray **92** of the dispenser **90** in an even manner around tray **92**. Guide **94** comprise in general a suitably dimensioned, substantially vertically oriented within the feed down pipe **150**, the top end of which is connected to an outlet **160** of the feed conveyor pipe **50**, and the bottom end of which is situated above a central part of tray **92**

[0009] More particularly, feed dispenser comprising the tray **92**, the down pipe form a modular unit that can be attached as a whole or in part to a feed conveyor pipe **50**. In this way, during use feed is conveyed into the tray, which feed is pecked out of said tray **92** by the birds **10**.

[0010] Prior art feed dispensers are schematically depicted in FIG. **2**A-**2**C. The down pipe **150** of dispenser **90** has a set volume that determines the amount of feed that may be delivered and distributed to each tray **92**. Current system, such as that depicted in FIG. **1**, utilize a master feed dispenser **90***m*, as shown in FIG. **2**C, to control and determine when dispensers

90 and/or slave dispensers **90***s*, as shown in FIG. **2**B, in a feed line **50***a-c*, are to be replenished, with a volume equal to a pre-set and predetermined feed volume that is equivalent to the volume of down pipe **150**. FIG. **2**A shows a feed dispenser **90** that comprise a tray **92** and a feed dispersion guide **94** to evenly disperse the feed about plate **92**. FIG. **2**B shows a slave feed dispenser **90***s* that comprise a tray **92**, while FIG. **2**C shows a master feed dispenser **90***m* comprising a tray **92** and level sensor **96** to determine when to active feed delivery through infrastructure **50**.

SUMMARY OF THE INVENTION

[0011] There is an unmet need for, and it would be highly useful to have, a kit, apparatus, device, system and a method providing for fine control of a livestock automatic feeding system, for example including but not limited to poultry automatic feeding system, that is provided by controllable a feed volume and frequency actuating device.

[0012] The present invention overcomes the deficiencies of the background by providing a kit, apparatus, device, system and method for fine control of livestock automatic feed systems providing for improved livestock production yield.

[0013] Although the present invention is described by way of examples and illustrations with respect to poultry and in particular broilers, such examples and description are not intended to be limiting to such livestock. Embodiments of the present invention may be applied to and/or adapted for any livestock for example including but not limited to pigs, sheep, goats, cows, emu, ostrich or the like livestock.

[0014] Within the context of this application the term livestock quarters, livestock housing, poultry housing, coop, poultry coop, chicken coop may be used interchangeably to refer to the a housing structure for housing livestock optionally and preferably in the form of poultry for example including but not limited to chicken, turkey, quail, ducks, geese, emu, ostrich or the like poultry.

[0015] Within the context of this application the term master feed dispenser refers to a control feed dispenser that is adapted for controlling the timing of feed delivery into at least one or more feed dispenser disposed in an automatic livestock feed delivery system and more specifically a production line within such an automatic livestock feed delivery system. Optionally a master feed dispenser comprises at least one sensor for detecting feed level and/or feed volume. Most preferably a master feed dispenser may control and/or otherwise activate feed delivery within the feed delivery system along at least one or more production lines.

[0016] Within the context of this application the term slave feed dispenser refers to a feed dispenser that is controlled by a master feed dispenser or by the automatic livestock delivery system. Optionally and preferably a slave feed dispenser does not comprise a sensor.

[0017] An optional embodiment of the present invention comprises an apparatus and/or kit for retrofitting existing livestock automatic feeder system with a device provided for fine control of the livestock feed volume and frequency of feed delivery.

[0018] Optionally the kit and/or apparatus may provide for manual, automatic and/or semi-automatic control of the feed delivery size and frequency of delivery.

[0019] Optionally the kit and/or apparatus may comprise at least one or more sensor, for example including but not limited to a level sensor, volume sensor and/or weight sensor, motion sensor, camera or the like. Optionally the sensor may be based on various different technology for example including but not limited to an optical, piezoelectric, mechanical, capacitance, magnetic, infrared ('IR'), radio frequency ('RF'), MEMS or the like sensor.

[0020] Optionally the sensor may provide for controlling a gate or switch. Optionally the sensor may be coupled with an actuator for example for activating, stopping or otherwise controlling the actuator associated with the sensor.

[0021] An optional embodiment of the present invention provides a device for fine control of the livestock feed volume and frequency of feed delivery that may be installed, coupled or otherwise integrated with a feed dispenser within an automatic livestock feed delivery system. Optionally the actuating device may be installed, integrated or otherwise coupled with a feed dispenser, for example including but not limited to a master feed dispenser or a slave feed dispenser.

[0022] Optionally the actuating device may be installed, integrated or otherwise coupled with at least one or more master feed dispenser.

[0023] Optionally the actuating device may be installed, integrated or otherwise coupled with at least one master feed dispenser and a plurality of slave feed dispensers.

[0024] Optionally the actuating device may be installed, integrated or otherwise coupled with at least one or more master feed dispenser per production line within the automatic feed dispensing system.

[0025] Optionally the actuating device may be installed, integrated or otherwise coupled with at least one or more production line of the automatic feed dispensing system through at least one feed dispenser.

[0026] Optionally the actuating device may be installed, integrated or otherwise coupled with each production line of the automatic feed dispensing system through at least one feed dispenser.

[0027] Optionally the actuating device may be installed, integrated or otherwise coupled with each production line of the automatic feed dispensing system through at least one or more master feed dispenser.

[0028] Optionally the actuating device may be installed, integrated or otherwise coupled with each production line of the automatic feed dispensing system within one master feed dispenser and a plurality of slave feed dispensers.

[0029] Optionally the actuating device may be installed, integrated or otherwise coupled with all feed dispensers associated with each production line of the automatic feed dispensing system.

[0030] Optionally the actuating device may be installed, integrated or otherwise coupled with at least one or more master feed dispenser per production line within the automatic feed dispensing system, therein preferably producing independently controllable sub-production lines segments within a production line.

[0031] An optional embodiment of the present invention provides for a feed dispenser comprising fine control device of feed volume and frequency of delivery. Optionally the feed dispenser may provide for manual, mechanical automatic and/or semi-automatic control of the feed delivery size and frequency of delivery.

[0032] An optional embodiment of the present invention provides for an automatic livestock feed system comprising a controller, data processor and a feed volume and feed frequency actuator.

[0033] Optionally and preferably a controller may for example included but is not limited to at least one or more of or a computer, including but not limited to a PC (personal computer), a server, a minicomputer, a cellular telephone, a smart phone, a PDA (personal data assistant), a pager, a robot, an android or the like. Most preferably communication with controller may be provided with at least one or more selected from the group comprising of wired, wireless, cellular, optical, IR, RF or the like communication devices and protocols as is known in the art. Optionally controller may communicate through an association with an appropriate communication module.

[0034] An optional embodiment of the present invention provides a method for improving livestock growth, livestock feed utilization, quality of meat, quality of life, vitality, increasing metabolism, reducing disease, increase livestock yield and optimizing livestock care most preferably by providing for fine control of feed volume and frequency with respect to at least one and more preferably a plurality of parameters.

[0035] Optionally parameters utilized for improving livestock growth may for example include but is not limited to environmental parameters, livestock parameters, market parameters, feed parameters, livestock behavioral parameters, livestock psychological parameters, livestock eating demand, livestock drinking, livestock cleaning behavior, livestock social activity, pavlovian behavior or the like alone or in any combination thereof.

[0036] Optionally livestock psychological and/or behavioral parameters comprises flock migration and/or movement within housing, flock migration and/or movement relative to productions lines, eating demand in response to the system, imprinting behavior in response to the system, pavlovian behavior with respect to the system, or the like.

[0037] Optionally livestock psychological and or behavioral parameters may be monitored to determine flock eating demands and/or individual flock member eating demand as it varies at different points during the growth period, most preferably in order to optimize the available growth periods.

[0038] Optionally the system may determine the changes in feed demand and or eating demand based on location within livestock housing. Optionally the system and method of the present invention may provide for sensing livestock behavior, environmental conditions, for example particular affinity to a location within housing or a particular feed dispenser or type of dispenser, in order to adjust the automatic feeding system to accommodate and/or change such behavior, most preferably to control, maintain, and/or improve livestock growth and/or flock uniformity, relative to expected growth curve, optionally and preferably established by variably controlling the feed volume and feed frequency within the livestock housing and about the individual production lines.

[0039] Optionally and preferably the actuating device of the present invention provides for controlling feed frequency and feed volume in an inversely proportional manner, such that high frequency feed delivery is provided for smaller feed portion, and low frequency feed delivery is provided for larger feed portions.

An optional embodiment of the present invention provides for a feed volume and feed delivery frequency actuating device for controlling the feed volume and feed frequency of feed delivered to livestock through an automatic feed dispenser system wherein the actuating device may be retrofit and/or integrated with a feed dispenser about a feed drop zone, the actuating device comprising: a divider for dividing the feed drop zone internal to the feed dispenser and along the horizontal cross-section of the drop zone, into at least two size controllable zones, including a feed delivery closed zone; and a feed delivery open zone; and wherein the divider may be displaced along a distance equal to about the horizontal cross-section of the drop zone for defining the at least two size controllable zones; and wherein the divider may be displaced about the drop zone with an actuator, wherein the actuator may be associated with the divider through at least one driving shaft; and wherein the upper edge of the divider may be further removably associated with a hinged cover for defining the feed delivery closed zone.

[0040] Optionally the hinged cover may be coupled with an external face of the feed dispenser with a hinge.

[0041] Optionally the actuator may be disposed on an external surface of the feed dispenser.

[0042] Optionally the actuator may be provided in the form for example including but not limited to a manual actuator, a mechanical actuator, an electronic actuator, an automatic actuator or any combination thereof.

[0043] Optionally the automated actuating device may be controllable from at least one for example including but not limited to a remote location, wirelessly, cellular, optical, IR, RF or any combination thereof.

[0044] Optionally and preferably the automated actuating device may be controlled by a controller.

[0045] Optionally, the feed dispenser may preferably comprise at least one actuating device, may be a master feed dispenser or slave feed dispenser; and wherein the hinged cover may be coupled with an external face of the feed dispenser with a hinge; and wherein the actuator may be disposed on the external surface.

[0046] Optionally a feed dispenser according to the present invention may including at least two actuating devices, wherein the feed dispenser may be a master or slave feed dispenser and wherein a first actuating device may be associated with a first face of the feed dispenser and wherein a second actuating device may be associated with a second face of the feed dispenser wherein the first and second face are disposed on opposite faces of the feed dispenser, therein defining at least three size controllable zones comprising one central feed delivery open zone and two feed delivery closed zone on either side of the central feed delivery open zone.

[0047] Optionally the feed dispenser may further comprise at least one sensor for example including but not limited to a volume sensor, level sensor or weight sensor, or the like.

[0048] An optional embodiment of the present invention provides for an apparatus for controlling the feed volume and feed frequency of feed delivered to a plurality of feed dispensers as part of an automatic livestock feed dispenser system, the apparatus comprising:

a feed volume and feed delivery frequency actuating device optionally and preferably associated with at least one feed dispenser; and at least one sensor for example including but not limited to a volume sensor, level sensor or weight sensor; wherein the sensor may be disposed internally to the feed dispenser.

[0049] Optionally the apparatus may further comprise a controller for controlling the actuating device based on data optionally and preferably obtained and processed with a data processing module and wherein the data may optionally and preferably be communicated to the controller with a commu-

nication module. Optionally the communication module may provide for communication between the controller and the actuating device.

[0050] Optionally the data processing module may provide for obtaining and processes data for example including but not limited to livestock data, feed data, environmental data, market data, livestock psychological data, livestock behavioral data, livestock housing data, livestock eating frequency, livestock metabolic data, or the line in any combination thereof.

[0051] An optional embodiment of the present invention provides for an automatic livestock feed delivery system for automatically dispensing feed to livestock, being raised within a livestock housing, the system comprising: feed supply infrastructure to convey livestock feed from a central feed supply to a plurality of feed dispensers, wherein each of the feed dispensers are disposed about a feed outlet point; a feed volume and feed delivery frequency actuating device for controlling the feed volume and frequency of delivering the feed volume to livestock; and at least one sensor for example including but not limited to a volume sensor, level sensor or weight sensor; wherein the sensor may optionally and preferably be disposed internally with the feed dispenser; and a controller for controlling the actuating device based on data obtained and processed with a data processing module and wherein the data may be communicated to the controller with a communication module.

[0052] Optionally the communication module may provide for communication between the controller and the actuating device.

Optionally the data processing module may obtain and processes data for example including but not limited to livestock data, feed data, environmental data, market data, livestock psychological data, livestock behavioral data, livestock housing data, livestock eating frequency, livestock metabolic data, and any combination thereof.

[0053] Optionally the actuating device may be associated with the feed dispenser or with the infrastructure system at feed outlet points.

[0054] Optionally a plurality of feed dispensers may be provided in the form of master feed dispensers including a feed level sensor and the feed supply infrastructure may be a closed loop system for circulating the feed.

[0055] Optionally at least two actuating devices may be associated with at least two or more individual master feed dispenser within at least one or more production line, providing for at least one or more sub-production line within the at least one or more production line.

[0056] An optional embodiment provides for a method for optimizing livestock yields and livestock parameters by utilizing a feed volume and feed delivery frequency actuating device within an automatic feed delivery system, the method comprising:

[0057] Obtaining data selected from the group consisting of livestock data, environmental data, livestock housing data, grower data, marketing data, environmental data, weather data, feed data, livestock growth chart or any combination thereof; and

[0058] Integrating and analyzing the obtained data to determine optimal growing conditions according to the available data; and

[0059] Adjusting controllable conditions associated with the automatic feeding system for example including but not limited to feeding frequency, meal size, livestock housing environmental conditions, livestock system activation frequency, to optimize feed frequency, livestock metabolism and livestock distribution about the feed supply infrastructure within livestock housing; wherein feed frequency and feed volume are controlled in an inversely proportional manner; and

[0060] Continuously monitoring and analyzing livestock growing rate and adjust the controllable conditions until the livestock reach market size target weight.

[0061] Unless otherwise defined the various embodiment of the present invention may be provided to an end user in a plurality of formats, platforms, and may be outputted to at least one of a computer readable memory, computer readable media, a computer display device, a printout, a computer on a network or a user.

[0062] Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. The materials, methods, and examples provided herein are illustrative only and not intended to be limiting. Implementation of the method and system of the present invention involves performing or completing certain selected tasks or steps manually, automatically, or a combination thereof. Moreover, according to actual instrumentation and equipment of preferred embodiments of the method and system of the present invention, several selected steps could be implemented by hardware or by software on any operating system of any firmware or a combination thereof. For example, as hardware, selected steps of the invention could be implemented as a chip or a circuit. As software, selected steps of the invention could be implemented as a plurality of software instructions being executed by a computer using any suitable operating system. In any case, selected steps of the method and system of the invention could be described as being performed by a data processor, such as a computing platform for executing a plurality of instructions.

[0063] Although the present invention is described with regard to a "computer" it should be noted that optionally any device featuring a data processor and/or the ability to execute one or more instructions may be described as a computer, including but not limited to a PC (personal computer), a server, a minicomputer, a cellular telephone, a smart phone, a PDA (personal data assistant), a pager, a robot, an android or the like. Any two or more of such devices in communication with each other, and/or any computer in communication with any other computer or device comprising a processor, may optionally comprise a "computer network".

BRIEF DESCRIPTION OF THE DRAWINGS

[0064] The invention is herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only, and are presented in order to provide what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

[0065] In the drawings:

[0066] FIG. **1** is a schematic block diagram of prior art automatic poultry feed delivery system;

[0067] FIG. **2**A-C are schematic illustrative diagrams of prior art poultry feed dispenser as part of an automatic poultry feeder delivery system; FIG. **2**A depicts prior art feed dispenser with a central feed guide; FIG. **2**B depicts a prior art slave feed dispenser and FIG. **2**C depicts a prior art master feed dispenser.

[0068] FIG. **3**A-C are schematic block diagram of feed dispenser comprising a feed volume and feed delivery frequency device according to an optional embodiment of the present invention; FIG. **3**A-B depict optional master feed dispensers associated with optional feed actuating device according to optional embodiments of the present invention; FIG. **3**C depicts an optional master feed dispenser associated with the actuating device of the present invention in the middle of a feed production line (FIG. **6**B), while FIG. **3**A-B depict the dispenser at the end of the feed production line (FIG. **1**);

[0069] FIG. **4**A-B are schematic block diagrams of optional apparatus and/or kits for retrofitting a feed volume and feed frequency actuating device according to an optional embodiment of the present invention with an automatic feed delivery system dispenser comprising, FIG. **4**A depicts a manually controllable feed volume and feed frequency device, FIG. **4**B depicts an automatic controllable feed volume and feed frequency device according to an optional embodiment of the present invention;

[0070] FIG. **5**A-B are schematic block diagrams of optional automatic poultry feed delivery system comprising a feed volume and feed frequency device according to optional embodiments of the present invention;

[0071] FIG. **6**A-B are schematic block diagrams of an optional closed loop automatic poultry feed delivery system comprising a feed volume and feed frequency device according to optional embodiments of the present invention;

[0072] FIG. **7** is an optional method according to the present invention for improving livestock yields.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0073] The present invention overcomes the deficiencies of prior art livestock automatic feed system by providing a kit, apparatus, device, system and method for fine control of livestock automatic feed systems providing for improved livestock production yield.

[0074] More specifically the prior art does not provide for fine control of the down pipe area **150** where the delivered feed is of a set volume for the entire production line **50***a-c*, and sometimes for an entire poultry housing **60**. Furthermore the automatic feeding systems of the prior art has a uniform feed delivery frequency within a poultry housing **60**.

[0075] Some of the problems with prior art poultry automatic feed system is lack of flock uniformity where some birds will be significantly larger than others, competition for feed between birds, high flock morality rate, disease spread amongst weaker birds, variable feed demand, uneven bird market size, underutilization of feed, waste of feed, unpredictable bird market size and uneven production line distribution.

[0076] Embodiments of the present invention provide for improvement in a number of parameters associated with livestock production and in particular with respect to poultry for example providing for improved flock vitality, reduced flock stay period, ability to reach targeted market weight faster, more even flock weight distribution, reduced competitions among flock members, reduced cost of production, improved flock health, reduced mortality within flock, faster time to market, increased feed consumption, increased feed utilization, improved flock uniformity, increased growth, increased flock members metabolism, higher quality meat, and a more equitable utilization of all production lines.

[0077] The present invention overcomes the deficiencies of the background by providing a kit, apparatus device, system and method for fine control of livestock automatic feed systems providing for improved livestock production yield. Optional embodiment of the present invention provides fine control over the feed volume and feed frequency delivered to the livestock, for example at individual lines and optionally customizing feed volume and frequency according to a plurality of parameters.

[0078] The principles and operation of the present invention may be better understood with reference to the drawings and the accompanying description. The following reference labels listed below are used throughout the drawings to refer to objects having similar function, meaning, role, or objective.

[0079] **10** livestock member;

[0080] **40** central feed supply;

[0081] **42** central feed distributors;

[0082] **44**,**46**, **48** line specific distributors;

[0083] **50** feed supply infrastructure;

[0084] **50***a,b,c* poultry production lines;

[0085] **52** closed loop feed supply infrastructure;

[0086] **60** livestock housing;

[0087] **70** Automatic livestock feeding system;

[0088] **90** feed dispenser;

[0089] **90***m* master feed dispenser;

[0090] **90***s* slave feed dispenser;

[0091] **92** feed dispenser plate;

[0092] **94** feed dispenser guide;

[0093] **96** feed dispenser level sensor and switch;

[0094] **100**,**100**L, **100**R feed volume controlling device;

[0095] **102**, **102**L, **102**R down pipe feed volume divider;

[0096] **104**, **104**L, **104**R down pipe feed volume actuator cover;

[0097] **106**, **106**L, **106**R cover hinge;

[0098] **110**, **110**L, **110**R feed volume actuator;

[0099] **112**, **112**L, **112**R feed volume driver shaft;

[0100] **130** sensor module;

[0101] **132** volume sensor;

[0102] **134** level sensor;

[0103] **150** down pipe;

[0104] **151** down pipe horizontal cross section

[0105] **152** feed delivery zone;

[0106] **154** down pipe closed area;

[0107] **154**L down pipe left closed area;

[0108] **154**R down pipe right closed area;

[0109] **155** volume control area;

[0110] **160** feed outlet;

[0111] **200** retrofit kit and/or apparatus

[0112] **202** automatic retrofit kit and/or apparatus

[0113] **210** controller;

[0114] **215** communication module;

[0115] **220** data processor module;

[0116] **222** livestock data module;

[0117] **224** feed data module;

[0118] **226** environmental data module;

[0119] **228** market data module;

[0120] **300**, **302**, **304** Automatic livestock Feeding system;

[0121] Referring now to the drawings, FIG. **3**A is schematic block diagram of an optional master feed dispenser **90***m* comprising one feed volume and feed delivery frequency device **100**, according to an optional embodiment of the present invention. Device **100** most preferably comprises actuator **110**, shaft **112**, divider **102**, hinge **106** and cover **104**

[0122] Most preferably actuator **110** provides for moving divider **102** along shaft **112** within the cross-section of drop tube **150** as depicted by arrow **151**. Most preferably use of actuator **110** provides for defining a dispenser volume zone **155** defined as the zone between divider **102** and level sensor **96**, as shown.

[0123] Most preferably hinge **106** and actuator cover **104** are provided to prevent feed from falling behind divider **102** as defined by arrow **154** while ensuring that feed is dispensed into the feed delivery zone **152**. Most preferably the movement of divider **102** is associated with cover **104** such that as divider **102** is displaced within zone **151** so does cover **104** to ensure that feed does not enter zone **154**.

[0124] Most preferably sensor **96**, optionally and preferably in the form of a level sensor and/or a volume sensor, is provided to time and activate food delivery into plate **92**, by activating feed delivery through infrastructure **50**, along a production line **50***a* or **50***b* or **50***c*. For example as feed is consumed by poultry **10** the feed level gradually drops to a level that is below sensor **96** causing a trigger. Most preferably, sensor **96** then activates infrastructure **50** to release circulate feed about production line **50***a,b,c* and delivery feed into drop zone **150**, and more specifically zone **152**.

[0125] Optionally sensor **96** may optionally be provided in the form a level sensor as shown, volume sensor and/or weight sensor, or the like. Optionally the sensor may be based on at least one or more sensor technology for example including but not limited to acoustic, optical, piezoelectric, mechanical, capacitance, magnetic, RF, MEMS or the like technology sensor technology for determining weight and/or volume and/or level of a substance.

[0126] Optionally device **100** may be provided in a manual form where divider **102** is set within zone **151** by manually displaced divider **102** about shaft **112**. Optionally and most preferably manual manipulation and/or control of divider **102** is provided on the external surface of dispenser **90***m* for example by displacing shaft **112** backwards.

[0127] Optionally and more preferably device **100** may be provided in an automatic and/or semi-automatic form where divider **102** is automatically displaced about shaft **112** within zone **151** utilizing actuator **110**. Optionally actuator **110** may be provided in the form of a motor, actuator or the like that may controllably manipulate the movement of divider **102** within zone **151**. Optionally actuator **110** may be controlled via wired, wireless, cellular means.

[0128] FIG. **3**B is schematic block diagram of an optional master feed dispenser **90***m* comprising a feed dispersion guide **94**, and at least two feed volume and feed delivery frequency devices **100**, disposed about at least two opposite faces of dispenser **90***m*. Optionally and most preferably dispenser **90***m* comprises a level and/or volume sensor **96**.

[0129] A first actuating device **100**L may be disposed on the left inner face of dispenser **90***m* and a second actuating device **100**R may be on the right inner face of dispenser **90***m*, as shown. Most preferably each actuating device **100**L and **100**R comprises actuator **110**, shaft **112**, divider **102**, hinge is **106** and cover **104**. For example actuating device **100**R comprises actuator **110**R, shaft **112**R, divider **102**R, hinge **106**R and cover **104**R while actuating device **100**L comprises actuator **110**L, shaft **112**L, divider **102**L, hinge **106**L and cover **104**L.

[0130] Optionally and preferably the use of at least two actuating device provides for directing feed delivery centrally through zone **152**, for example to allow feed delivery above feed dispersion guide **94**. Most preferably the size and volume of feed to be delivered in zone **152** is determined by adjusting the relative respective locations of divider **102**R and **102**L relative to one another.

[0131] Most preferably feed dispenser **90***m* of FIG. **3**B comprises at least one or more level and/or volume sensor **96** provided for most preferably sensing the level of feed disposed within dispenser **90***m*. Optionally sensor **96** may be disposed on a third (not shown) and/or fourth face (not shown) within dispenser **90***m*.

[0132] As described above in FIG. **3**A with respect to actuating device **100**, actuating device **100**L and/or **100**R may be provided in a manual, semi-automatic and/or automatic form to provided for a controlled feed volume and feed delivery frequency. Optionally and preferably device **100**L and/or **100**R may be individually controlled, where for example, one device (**100**L for example) is manipulated, adjusted and/or moved while the other device (**100**R for example) remains stationary. Optionally devices **100**L and **100**R may be controlled relative to each other and most preferably essentially simultaneously, where for example both devices **100**L and **100**R are displaced by the same amount in opposite direction so as to expand and/or reduce feed delivery zone **152**.

[0133] Most preferably the timing, size, shape, volume of feed delivery zone **152** may be controlled by manipulating devices **100**L and/or **100**R in a symmetric and/or asymmetric manner. Optionally and preferably control of feed delivery zone may be related to at least one and more preferably a plurality of parameters for example including but not limited to growth curve, feed demand, environmental parameters, livestock parameters, market parameters, feed parameters, livestock behavioral parameters, livestock psychological parameters, livestock eating demand, livestock drinking, livestock cleaning behavior, livestock social activity, pavlovian behavior or the like alone or in any combination thereof.

[0134] Optionally and more preferably the actuating device **100** provides for controlling feed frequency and feed volume in an inversely proportional manner, such that high frequency feed delivery is provided for smaller feed portion, and low frequency feed delivery is provided for larger feed portions.

[0135] Most preferably fine control of the feed delivery zone **152** and/or **155** by use of at least one or more feed actuating device **100**, for example as described and shown in FIGS. **3**A-B, provide control both in term of the frequency of feed delivery and the size of the dispensed feed provide distinct improvement and control in livestock yield, livestock metabolism, livestock vitality, reduced livestock mortality, livestock stay period, livestock growth rate, livestock size uniformity, time to market, livestock health, optimize feed utilization, optimize feed utilization based on, optimization of production lines, optimization of cost of production, opti-

mization of energy consumption and utilization used in the livestock growth process or the like parameters contributing to improved livestock yields.

[0136] FIG. **4**A depicts an apparatus and/or kit **200** according to an optional embodiment of the present invention for retrofitting an existing and/or working automatic livestock feeder system **70**, as described with respect to FIG. **1**, with at least one or more feed sizing actuating device **100** according to an optional embodiment of the present invention. Optionally apparatus and/or kit **200** comprise a feed actuating device **100** (as described in FIG. **3**A-B) and at least one or more sensor for example including but not limited to a volume sensor and/or weight sensor and/or level sensor or the like sensor for sensing the feed level within feed dispenser **90**. Optionally and preferably actuating device **100** is associated with at least one feed dispenser **90**, optionally a slave dispenser **90***s* and more preferably but optionally a master feed dispenser **90***m*. Most preferably actuating device **100** is associated, installed and/or otherwise coupled with a master feed dispenser **90***m* associated in at least one and most preferably all production lines **50***a,b,c* associated with feed supply infrastructure **50**.

[0137] FIG. **4**B depicts an apparatus and/or kit **202** according to an optional embodiment of the present invention for retrofitting an existing and/or working automatic livestock feeder system **70**, as described with respect to FIG. **1**, with at least one or more feed sizing actuating device **100** according to an optional embodiment of the present invention. Optionally apparatus and/or kit **202** comprises an automatic feed actuating device **100**, controller **210**, sensor **130**, communication module **215**, and data processor module **220**.

[0138] Optionally and preferably a controller **210** is provided to control the activity of automatic feed actuating device **100** and integrate its activity with respect to sensor module **130** and data processor module **220**. For example, controller **210** may activate device **100** based on sensed parameters associated with sensor module **130** while the sensed data is processed with data processor module **220**, which is communicated with communication module **215**.

[0139] Optionally sensor module **130** may comprises at least one or more sensor associated with the feed dispenser **90** for example including but not limited to feed volume sensor, feed level sensor or weight sensor levels. Optionally sensor module **130** may further comprise a temperature sensor, motion sensor, or the like sensor that may be disposed within livestock housing **60**, to determine livestock behavior and/or parameters. For example, a motion sensor may be placed near a production line **50***a-c* to determine the level of activity about the production line so as to determine, most preferably with controller **210** and data processing module **220**, how to adjust feed is volume and feed frequency with device **100** so as to optimize the overall functionality of the production line.

[0140] Optionally communication module **215** may provide wireless, wired, cellular, radio, optical communication between controller **210**, actuating device **100**, sensor module **130** and data processing module **220**.

[0141] Optionally communication module **215** may further provide communication with automatic feeder system **70**.

[0142] Optionally data processor module **220** may comprise at least one and more preferably a plurality of data repositories and/or parameter, and provide for data analysis, data abstraction and decision making capabilities with respect to the available data and sensed events optionally and preferably sensed with at least one sensor comprising sensor module **130**.

[0143] Data processor module **220** may obtain data with respect to and/or comprise a plurality of data repositories, for example including but not limited to livestock data **222**, feed data **224**, environmental data **226**, market data **228**, or the like.

[0144] Optionally livestock data **222** may for example include but is not limited to livestock growth charts, health history, age, livestock welfare data, vitality data, metabolic data, timing data or the like data specific and associated with the livestock.

[0145] Optionally feed data **224** may for example include but is not limited to expiration date, behavior at different temperatures, quality of product, expected consumption data, real consumption data, volume, availability, stock or the like.

[0146] Optionally market data **228** may for example include but is not limited to data associated with the marketing information associated with the livestock. For example data may include, preferred market size, livestock prices, growth curves, feed prices, length of stay data or the like.

[0147] Optionally environmental data **226** may for example include any data associated with the internal environment that the livestock are exposed to or external environmental data that may affect the livestock or feed. For example environmental data may include but is not limited to weather information, outdoor temperature, indoor temperature, humidity, livestock housing specific temperature, livestock housing environmental data, data relating to livestock circadian rhythms or the like.

[0148] Optionally communication module **215** may provide for uploading and or downloading information from the internet, a server, an intranet or the like using communication protocols.

[0149] Optionally at least one or more of controller module **210**, communication module **215** and data processing module **220**, sensor module **130** may be for example be realized through a device comprising a processor for example including a computer, laptop computer, PDA, smart phone, android phone, a mobile telephone, server, a dedicated device or the like.

[0150] Apparatus and/or kit **202** may optionally actuating device **100** may be associated with a feed dispenser **90**, optionally a slave unit and more preferably a master unit, while controller and data processor and communication module may be a stand alone device and/or unit or incorporated, coupled and/or otherwise associated with automatic feeder system **70**, for example with wired, wireless, cellular, optical, acoustic or the like communication protocols.

[0151] FIG. **5**A provide optional automatic feeder systems **300** comprising a feed actuating device **100**. FIG. **5**A shows automatic livestock feeder system **300**, according to an optional embodiment of the present invention comprising central feed supply **40**, feed supply infrastructure **50**, a plurality of feed dispensers **90**, feed size and frequency actuating device **100**, data processor module **220**, communication module **215**, sensors module **130** and controller module **210**.

[0152] System **300** optionally comprises sensor module **130** that is incorporated with and/or associated with or at least one or more feed dispensers **90**, optionally at least one master dispenser **90***m* or slave dispenser is **90***s*.

[0153] Optionally and preferably feed supply infrastructure **50** may be directly or indirectly be coupled, connected to, associated with and or otherwise incorporated with a feed actuation device **100**, optionally at feed outlet point **160**. For example feed supply actuating may be incorporated into the piping utilized as part of the feed supply infrastructure **50** at feed outlet **160**.

[0154] FIG. **5**B depicts and optional embodiment of the present invention for an automatic livestock feeder system **302** comprising central feed supply **40**, feed supply infrastructure **50**, a plurality of feed dispensers **90**, feed size and frequency actuating device **100**, data processor module **220**, communication module **215**, sensors module **130** and controller module **210**.

[0155] System **302** may optionally and preferably provide for an actuating device **100**, as previously described, that is associated with a feed dispenser **90** and sensor module **130**.

[0156] Optionally at least one or more actuating device **100** may be installed, integrated or otherwise coupled with at least one or feed dispenser **90** for example including but not limited to a master feed dispenser **90***m* and/or a slave feed dispenser **90***s*.

[0157] Optionally at least one or more actuating device **100** may be installed, integrated or otherwise coupled with at least one master feed dispenser **90***m* and a plurality of slave feed dispensers **90***s*.

[0158] Optionally at least one or more actuating device **100** may be installed, integrated or otherwise coupled with at least one or more master feed dispenser **90***m* per production line **50** *a,b,c* within the automatic feed dispensing system **302**.

[0159] Optionally at least one actuating device **100** may be installed, integrated or otherwise coupled with at least one or more production line **50***a,b,c* of the automatic feed dispensing system **302** through at least one feed dispenser **90**.

[0160] Optionally at least one or more actuating device **100** may be installed, integrated or otherwise coupled with each production line of the automatic feed dispensing system **302** through at least one feed dispenser.

[0161] Optionally at least one or more actuating device **100** may be installed, integrated or otherwise coupled with each production line of the automatic feed dispensing system **302** within one master feed dispenser **90***m* and a plurality of slave feed dispensers **90***s*.

[0162] Optionally at least one or more actuating device **100** may be installed, integrated or otherwise coupled with all feed dispensers **90** associated with each production line of the automatic feed dispensing system **302**.

[0163] Optionally at least one or more actuating device **100** may be installed, integrated or otherwise coupled with at least one or more master feed dispenser **90***m* per production line within the automatic feed dispensing system **302**, therein preferably producing independently controllable sub-production lines segments within a production line. Optionally sub-production lines within system **302** may be provided such that a sub-group utilizing system **302** is provided with its own customized sub-production line based on individual control of feed delivery frequency and feed volume with device **100** according to the present invention.

[0164] For example a flock comprising male and female birds of two different poultry breeds for example, fryers and broilers, may utilize system **302** according to an optional embodiment of the present invention by providing individual sub-production lines for each poultry type grown with system **302**. A first production line may be set up for the fryers and a second broiler. Within each first and second production line two sub production lines may be set up for the male and female member. Most preferably each production line is and sub-production line is provided with customizable feed volume and feed frequency. For example a sub-production line of broiler male members may be provided with a low frequency feed delivery and a large volume feed at each delivery; a sub-production line of broiler female members may be provided with a medium frequency feed delivery and a medium volume feed at each delivery; a sub-production line of fryer male members may be provided with a high frequency feed delivery and a medium volume feed at each delivery; a sub-production line of fryer female members may be provided with high frequency feed delivery and a small volume feed at each delivery.

[0165] FIG. **6**A-B depict an optional embodiment of the present invention for an automatic livestock feeder system **304** comprising central feed supply **40**, a closed loop feed supply infrastructure **52**, a plurality of master feed dispensers **90***m*, feed size and frequency actuating device **100**, data processor module **220**, communication module **215**, sensors module **130** and controller module **210**. FIG. **6**A provides a schematic block diagram of system **304** while FIG. **6**B provides an illustrative schematic floor plan of system **304** according to an optional embodiment of the present invention.

[0166] System **304** preferably provides for a closed loop feed supply infrastructure where so as to minimize feed waste while proving each feed dispenser with master control **90***m*, for example to provide the entire livestock flock with individualized control over their own dispenser plate **92**.

[0167] FIG. **7** shows a flowchart of an exemplary method according to an optional embodiment of the present invention for optimizing livestock yields and parameters by utilizing a device and system for controlling livestock feed volume and feed delivery frequency. Most preferably livestock feed volume and feed delivery frequency are controlled in relation to at least one and more preferably a plurality of parameters for example including but not limited to environmental parameters, livestock parameters, market parameters, feed parameters, livestock behavioral parameters, livestock psychological parameters, livestock eating demand, livestock drinking, livestock cleaning behavior, livestock social activity, pavlovian behavior, flock migration and/or movement within housing, flock migration and/or movement relative to productions lines, eating demand in response to the system, imprinting behavior in response to the system, pavlovian behavior with respect to the system or the like alone or in any combination thereof.

[0168] In stage **700**, livestock are introduced to the livestock housing **60**. Next in stage **702** all data associated with data processing module **220** is uploaded for example with communication module **215**, searched for and or otherwise attained. For example data associated with the livestock, environment, housing, the grower, market data, weather, feed data are obtained and associated with data processor **220** and/or controller **210**. For example livestock data may for example include the genotype, livestock growth chart, number of member in the flock, expected weather forecast over the growing period.

[0169] Next in stage **704**, that data obtained or otherwise gathered in stage **702** is processed to integrate all aspects of the growing process, so as to optimize the growing process and to optimize livestock yields on a number of parameter.

Optionally and preferably data processing may be performed by controller **210** and/or data processing module **220**. Most preferably, all available data is integrated to optimize at least one or more parameters that may optionally be selected by a user. For example a user may select to optimize the length of stay to reduce the stay from 42 days to 37 days. For example a user may elect to optimize flock size and weight, or the like. Most preferably all controllable parameters for example feed meal size and frequency of feed delivery are determined in order to optimize at least one or more user selected parameters.

[0170] Next in stage **706**, all adjustable parameters are adjusted accordingly to optimize livestock yield and/or uniformity. Most preferably feed supply system is adjusted to optimize feed volume and frequency of feed delivery to provide continuous and/or constant feed demand about all production lines (**50***a,b,c*) and to increase livestock metabolism.

[0171] Optionally and preferably individual production lines **50***a,b,c* are individually controlled so as to provide optimal conditions for each of the production line and providing flock growth rate uniformity by accounting for flock member variability however optimizing overall flock uniformity and flock growth rate. For example production line **50***a* may have a high frequency small feed volume delivery accounting for smaller birds requiring continuous feeding; while production line **50***b* may have a medium frequency feed delivery and mediums feed volume delivered accounting for the average birds within the flock; while production line **50***c* may have low frequency feed delivery and large feed volume delivered so as to meet the variable needs of individual flock members within livestock housing.

[0172] Next in stage **708** continuous monitoring and feedback control is provided most preferably by continuously gathering data and adjusting according to optimizable conditions as determined by the user. Optionally the monitoring and relative adjustments may be done in Real time.

[0173] Lastly in stage **710** the flock is delivered to market. Optionally and preferably flock is delivered in a substantially uniform size so as to meet market needs for size uniformity due to other automatic livestock handing processes for example slaughtering.

Examples

[0174] The below tables depict results while utilizing the device and method of the present invention where, a manual actuating device **100** as described in FIG. **3**A was placed in three different poultry housing **60** with automatic feeding device **70** as described in FIG. **1**.

TABLE 1

Large flock chicken broilers

Large Coop	Control Coop	Test Coop	Percentage Difference	Equivalent Monetary Value
Avg. Weight	1871 g	2039 g	+9% (168 g)	45,000 NIS
Livestock death	2252	1905	−18% (347 animals)	4,247 NIS
Livestock feed	190121	181585	−5% (8536 Ton)	18,000 NIS
Totals				67,247 NIS

[0175] Table 1 reveals that the device, system and method of the present application lead to an increase in profit of about 2%. Other savings have also been reported with respect to reduced energy bills, reduced livestock housing heating, cleaning, upkeep, gas for powering infrastructure **50**, human resources have all shown vast improvement in terms of savings.

[0176] Statistical analysis further show that there was an increase in production line output where birds increased their weight gain by about 9% while reducing the mortality rate of the coop by 18%, all the while saving 5% of the used feed costs. Furthermore it was observed that birds reached market size 4 days earlier than expected.

TABLE 2

Small flock chicken broilers

Small Coop	Control	Test	Percentage	Equivalent Monetary Value
Avg. Weight	2250 g	2430 g	+8% (180 g per bird, 5.4 tones coop)	32,400 NIS
Livestock death	1423	1140	−24% (347 animals)	4,126 NIS
Livestock feed	190121	181585	−5% (8536 tone)	18,000 NIS
Totals				54,526 NIS

[0177] Table 2 reveals that the device, system and method of the present application lead to overall improved livestock yield as measured below, for example a net profit increase of about 1.5%. Other savings have also been reported with respect to reduced energy bills, reduced livestock housing heating, cleaning, upkeep, gas for powering infrastructure **50**, human resources have all shown vast improvement in terms of savings.

[0178] Further statistical analysis show that there was an increase in production line output where birds increased their weight gain by about 8% while reducing the mortality rate of the coop by 24%, all the while saving 5% of the used feed costs.

TABLE 3

Large flock chicken broilers

Large Coop	Control Coop	Test Coop	Percentage Difference	Equivalent Monetary Value
Avg. Weight	2290 g	2421 g	+5.5% (127 g avg per bird, 5.7 tone)	34,290 NIS
Livestock death			n/a Coop using antibiotics	
Livestock feed	213408	195450	−9%(17,958 Ton total)	18,000 NIS
Totals				62,290 NIS

Table 3 reveals that the device, system and method of the present application lead to overall improved livestock yield as measured below, for example a net profit increase of about 3%. Some of the increased profit has been attributed to savings with respect to reduced energy bills, reduced livestock housing heating, cleaning, upkeep, gas for powering automatic infrastructure system **50**; human resources have all shown vast improvement in terms of savings.

Further statistical analysis further show that there was an increase in production line output where birds increased their weight gain by about 5.5% while reducing the mortality rate of the coop by 24%, all the while saving 9% of the used feed

costs. The flock reached expected goal market weight on day 41, therefore allowing the flock to reach market size 4 days earlier than scheduled.

[0179] While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made.

What is claimed is:

1. A feed volume and feed delivery frequency actuating device (**100**) for controlling the feed volume and feed frequency of feed delivered to livestock through an automatic feed dispenser system (**70**) wherein said actuating device (**100**) is retrofit and/or integrated with a feed dispenser (**90**) about a feed drop zone (**150**), the actuating device comprising:

a. a divider (**102**) for dividing said feed drop zone (**150**) internal to said feed dispenser (**90**) and along the horizontal cross-section of said drop zone (**150**), into at least two size controllable zones, including

i. a feed delivery closed zone (**154**); and

ii. a feed delivery open zone (**152**); and wherein

b. said divider (**102**) may be displaced along a distance equal to about the horizontal cross-section of said drop zone (**150**) for defining said at least two size controllable zones (**152**,**154**); and wherein

c. said divider (**102**) is displaced about said drop zone (**150**) with an actuator (**110**), wherein said actuator (**110**) is associated with said divider (**102**) through at least one driving shaft (**112**); and wherein

d. the upper edge of said divider (**102**) is further removably associated with a hinged cover (**104**) for defining said feed delivery closed zone (**154**).

2. The actuating device of claim **1** wherein said hinged cover (**104**) is coupled with an external face of said feed dispenser with a hinge (**106**).

3. The actuating device of claim **1** wherein said actuator (**110**) is disposed on an external surface of said feed dispenser (**90**).

4. The actuating device of claim **1** wherein said actuator is provided in the form selected form the group consisting of a manual actuator, a mechanical actuator, an electronic actuator, an automatic actuator or any combination thereof.

5. The actuating device of claim **4** wherein said automated actuating device is controllable from at least one selected from the group consisting of a remote location, wirelessly, cellular, optical, IR, RF or any combination thereof.

6. The actuating device of claim **4** wherein said automated actuating device is controlled by a controller (**210**).

7. A feed dispenser including at least one actuating device (**100**) of claim **1** wherein the feed dispenser is a master or slave feed dispenser and wherein said hinged cover (**104**) is coupled with an external face of said feed dispenser with a hinge (**106**); and wherein said actuator (**110**) is disposed on said external surface.

8. A feed dispenser including at least two actuating device (**100**) according to claim **1** wherein said feed dispenser (**90**) is a master (**90***m*) or slave (**90***s*) feed dispenser and wherein a first actuating device (**100**L) is associated with a first face of said feed dispenser and wherein a second actuating device (**100**R) is associated with a second face of said feed dispenser wherein said first and second face are disposed on opposite faces of said feed dispenser therein defining at least three size controllable zones (**152**,**154**L, **154**R) including one central feed delivery open zone (**152**) and two feed delivery closed zone (**154**) on either side of said central feed delivery open zone (**152**).

9. The feed dispenser of claim **8** further comprising at least one sensor selected from the group consisting of volume sensor, level sensor or weight sensor.

10. An apparatus for controlling the feed volume and feed frequency of feed delivered to a plurality of feed dispensers (**90**) as part of an automatic livestock feed dispenser system (**70**), the apparatus comprising:

a. a feed volume and feed delivery frequency actuating device (**100**) of claim **1** associated with at least one feed dispenser; and

b. at least one sensor selected from the group consisting of volume sensor, level sensor or weight sensor; wherein said sensor is disposed internally to said feed dispenser (**90**).

11. The apparatus of claim **10** further comprising a controller (**210**) for controlling said actuating device (**100**) based on data obtained and processed with a data processing module (**220**) and wherein said data is communicated to said controller with a communication module (**215**).

12. The apparatus of claim **11** wherein said communication module (**215**) provides for communication between said controller (**210**) and said actuating device (**100**).

13. The apparatus of claim **11** wherein said data processing module (**220**) obtains and processes data for example including but not limited to livestock data, feed data, environmental data, market data, livestock psychological data, livestock behavioral data, livestock housing data, livestock eating frequency, livestock metabolic data, and any combination thereof.

14. An automatic livestock feed delivery system for automatically dispensing feed to livestock, being raised within a livestock housing, the system comprising:

a. feed supply infrastructure to convey livestock feed from a central feed supply to a plurality of feed dispensers (**90**) wherein each of said feed dispensers are disposed about a feed outlet points (**160**);

b. a feed volume and feed delivery frequency actuating device (**100**) for controlling the feed volume and frequency of delivering said feed volume to livestock; and

c. at least one sensor selected from the group consisting of volume sensor, level sensor or weight sensor; wherein said sensor is disposed internally with said feed dispenser (**90**); and

d. a controller (**210**) for controlling said actuating device (**100**) based on data obtained and processed with a data processing module (**220**) and wherein said data is communicated to said controller with a communication module (**215**).

15. The system of claim **14** wherein said communication module (**215**) provides for communication between said controller (**210**) and said actuating device (**100**).

16. The system of claim **14** wherein said data processing module (**220**) obtains and processes data for example including but not limited to livestock data, feed data, environmental data, market data, livestock psychological data, livestock behavioral data, livestock housing data, livestock eating frequency, livestock metabolic data, and any combination thereof.

17. The system of claim **14** wherein said actuating device is associated with said feed dispenser (**90**) or with said infrastructure system at feed outlet points (**160**),

18. The system of claim **14** wherein said plurality of feed dispensers are provided in the form of master feed dispensers (**90***m*) comprising a feed level sensor (**96**) and wherein said feed supply infrastructure is a closed loop system for circulating said feed.

19. The system of claim **17** wherein at least two actuating devices **100** are associated with at least two or more individual master feed dispenser (**90***m*) within at least one or more production line, providing for at least one or more sub-production line within said at least one or more production line.

20. A method for optimizing livestock yields and livestock parameters by utilizing a feed volume and feed delivery frequency actuating device (**100**) within an automatic feed delivery system, the method comprising:

a. Obtain data selected from the group consisting of livestock data, environmental data, livestock housing data, grower data, marketing data, environmental data, weather data, feed data, livestock growth chart or any combination thereof; and

b. Integrate and analyze said obtained data to determine optimal growing conditions according to said available data;

c. Adjust controllable conditions associated with said automatic feeding system selected from the group consisting of feeding frequency, meal size, livestock housing environmental conditions, livestock system activation frequency, to optimize feed frequency, livestock metabolism and livestock distribution about the feed supply infrastructure within livestock housing; wherein feed frequency and feed volume are controlled in an inversely proportional manner;

d. continuously monitor and analyze livestock growing rate and adjust said controllable conditions until livestock reaches market size target weight.

* * * * *