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(54) METHOD AND DEVICE FOR DEBEAKING FOWLS

(57) The apparatus comprises a supporting plate (10) with an opening (10a) through which the beak of a fowl (1) is inserted so that a portion of the beak (1a) protrudes therefrom; measurement means to carry out the measurement of the protruding portion of the beak (1a) and to generate an electrical signal representative of the result of said measurement; driving means operatively connected to effect a relative movement between a trimming instrument and the protruding portion of the beak (1a) to trim at least a beak segment of said protruding portion of the beak (1a); and electronic control means for automatically controlling the actuation of said driving means based on said electrical signal so as to trim said beak segment in accordance with the measured size of the protruding portion of the beak (1a).

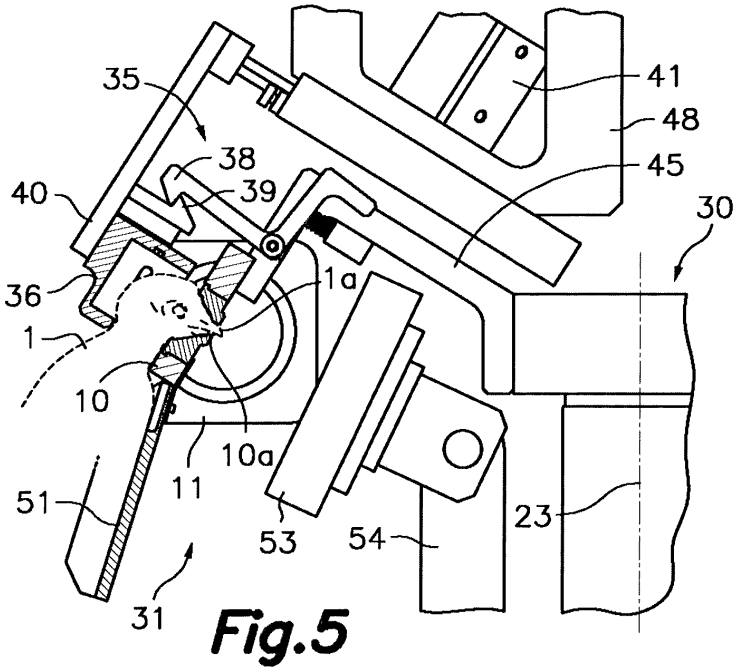

Fig.5

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Description

Field of the art

[0001] The present invention relates generally to a method and apparatus to carry out the beak trimming of poultry and, more particularly, to the beak trimming of young individuals of domestic fowl, such as baby chickens, turkeys, etc.

Background of the invention

[0002] In the field of poultry husbandry the practice of debeaking -also known as beak trimming or cutting- is known, consisting in carrying out the partial removal of the beak of fowl. The fowl that most commonly undergo this operation are young chickens and turkeys, often just a few days old. Although the effect of debeaking is permanent, a regrowth of beaks can sometimes occur, depending on the method chosen for the beak trimming.

[0003] The reasons for debeaking fowl, and more specifically chickens, are the avoidance of cannibalism, fights between individuals and feather pecking. Cannibalism is the most serious problem that breeders have to face, and it is the main cause of mortality in poultry. Fights and pecking in poultry can go so far as to degenerating into cannibalism if the problem is not dealt with in a timely manner. The fight between animals occurs because fowl raised in cages have aggressive tendencies due to the reduced space they live in. Feather pecking is a disease of poultry consisting of an individual's plucking its own feathers. Although the main consequences are merely aesthetic, important lesions or haemorrhage can occur sometimes that are conducive to the animal's death. This vice or habit can lead to individuals' plucking each other's feathers, which can lead to an increase in aggressiveness and to cannibalism.

[0004] Through beak trimming, fowl are literally disarmed, which improves the quality of the fowl and their plumage, since pecking cannot be as violent. In addition, beak trimming affords a uniform consumption of food and nutrients, since the fowl cannot select food, which favours a balanced diet. Beak trimming also reduces the loss of eggs in laying chicken and turkey hens, since it avoids the occurrence of egg pecking when the fowl reach the laying season.

[0005] Patent US-A-2501283, published in 1950, describes a poultry beak trimming apparatus comprising a body of a good thermal insulating material from which a core, electrically heated to a temperature of approximately 870°C, protrudes. An operator grasps the fowl one by one by their head and neck, pushes their lower beak downwards and momentarily applies their upper beak against the heated core so as to burn-trim the tip of the upper beak to a desired range. Carbonised tissue is formed in the burnt area that prevents haemorrhage and helps the operator to determine when the beak segment trimmed by the burn is sufficient. One disadvantage of this device is that the amount of beak tissue burnt in each individual is subjectively determined by the operator and it does not guarantee a proportionately equivalent trimming for all individuals in accordance with their size.

[0006] Patent GB-A-837141, published in 1960, describes an apparatus to carry out the beak trimming of fowl chicks comprising a supporting plate with an opening through which the beak of a fowl is inserted, so that a beak portion protrudes from the opposite side thereof, and a blade that, through a movement parallel to the supporting plate and adjacent thereto, shears the protruding beak portion. The blade is actuated manually or through a pedal, and it is electrically heated to a temperature high enough to cauterise the wound, for which the blade must remain in contact with the cut area of the beak for several seconds. The apparatus may include several interchangeable supporting plates with differently sized openings adapted to batches of fowl of different ages or sizes.

[0007] One disadvantage of the apparatus described in said patent GB-A-837141 is that it is hard-pressed to provide uniformity in the cuttings because, since the entire process is carried out manually, the operation is influenced by the person carrying it out. Another disadvantage is that it does not take into account the differences in beak size that can occur in one same batch of fowl of the same age. This way, depending on each individual's beak size, the beak portion protruding from the plate will be different and, as a result, the beak segment trimmed off the smaller-sized fowl will be proportionately larger than the beak segment trimmed off the larger-sized fowl.

[0008] Patent US-A-5651731, to Nova-Tech Engineering, Inc., published on 23 June, 1995, discloses a poultry beak trimming method and apparatus. The method comprises irradiating a high-intensity infrared beam on an area of the beak of the fowl for a predetermined time period. As a result of the radiation, the irradiated beak area becomes weakened and, after a period of 10 to 21 days, it falls off because of the animal's natural activity. The apparatus is adapted to carry out the process in a semiautomatic manner and comprises a carousel with several stations. In a first station, an operator takes the chicks that arrive on a conveyor belt and places them in carousel halters with their beak inserted in an opening of the supporting plate and a beak portion protruding from the opposite side thereof. Once they are placed in the halter, the latter closes and it allows the fowl to travel across all stations without the need of the operator's further involvement in the operation. In another station the beak portion is irradiated. One disadvantage is that the halters do not distinguish among the different beak lengths or sizes, whereby the applied radiation will not be proportionately comparable in the different individuals.

Disclosure of the invention

[0009] According to a first aspect, the present invention provides a poultry beak trimming method comprising, as

is conventional, inserting, first of all, the beak of a fowl through an opening of a supporting plate so that a portion of the beak protrudes from the opposite side of said supporting plate, and, next, trimming at least a beak segment of said protruding portion of the beak by means of a relative movement between a trimming instrument and the protruding portion of the beak. The method of the present invention is characterised in that it further comprises carrying out a measurement of the protruding portion of the beak before said trimming step, then generating an electrical signal representative of the result of said measurement, and then automatically controlling said relative movement between said trimming instrument and the protruding portion of the beak based on said electrical signal applied to driving means so as to trim said beak segment in accordance with the size of the measured protruding portion of the beak.

[0010] Preferably, for carrying out said measurement and generating said electrical signal, the method comprises using a digital image acquisition device in cooperation with an electronic image processing device. As said trimming instrument, a hot body is preferably used, at a temperature high enough to burn the beak of said fowl by contact. A suitable temperature may be, for instance, approximately 800°C. In addition, the wound produced by the burn-trimming is cauterised by the hot body in the same operation.

[0011] The operation of burn-trimming the predetermined beak segment and cauterising the wound is carried out by firstly positioning a buffer at some distance from the supporting plate determined based on said electrical signal and, next, moving said hot body in the forward direction towards the supporting plate and towards the protruding portion of the beak until a sliding support carrying the hot body comes into contact with said buffer and is stopped thereby.

[0012] This way, the method of the present invention makes it possible to automatically and objectively trim a fowl beak segment in accordance with the beak size of each individual.

[0013] According to a second aspect, the present invention provides a poultry beak trimming apparatus of the type comprising a supporting plate with an opening through which the beak of a fowl is inserted, said supporting plate having a thickness suitable for a protruding portion of the beak to protrude from the opposite side thereof, a trimming instrument and driving means operatively connected to effect a relative movement between said trimming instrument and the protruding portion of the beak to trim at least a beak segment of said protruding portion of the beak. The apparatus of the present invention is characterised in that it further comprises measurement means to carry out the measurement of the protruding portion of the beak and to generate an electrical signal representative of the result of said measurement, and electronic control means for automatically controlling the actuation of said driving means based on said electrical signal so as to trim said beak segment in accordance with the size of the measured protruding portion of the beak.

[0014] In an embodiment, said measurement means comprise a digital image acquisition device, such as, for instance, a digital photographic camera, in cooperation with an electronic image processing device. Preferably, said digital image acquisition device is associated with a lighting device arranged to light up the protruding portion of the beak.

[0015] Preferably, the trimming instrument comprises a hot body heated by an electric current to a temperature high enough to burn the beak of said fowl by contact and to cauterise the wound produced. For this operation, a temperature of approximately 800°C is considered suitable. The hot body is supported by means of one or more heat-sink supports provided with with fins for dissipating heat to the surrounding atmosphere.

[0016] In an embodiment, said driving means comprise a positioning actuator, for instance an electric stepper motor, that is controlled by said electronic control means for moving a buffer until it is positioned at some distance from the supporting plate, said distance being determined based on said electrical signal, and a driving actuator, such as an air-operated cylinder, to move a sliding support on which said hot body is installed in the forward direction towards the supporting plate and towards the protruding portion of the beak until it contacts said buffer and is stopped thereby, so that the hot body burntrims only the predetermined beak segment.

[0017] Since the speed at which the air-operated cylinder rod that forms the driving actuator cannot be adjusted, the buffer or sliding support preferably comprises a shock absorber to reduce the speed of the hot body in the last stretch of its travel, where it contacts the protruding portion of the beak.

[0018] It is to be observed that the technical characteristics of the apparatus according to the second aspect of the present invention make it possible to implement the method according to the first aspect of the present invention.

[0019] To carry out the different sequential operations in a semiautomatic manner, the beak trimming apparatus of the present invention comprises a frame wherein a carousel is rotatably installed supporting a number of halters placed round thereof, for instance in a star arrangement. Each halter has a restraining device including one of said supporting plates with its corresponding opening for the insertion of the beak of the fowl. Driving means are operatively connected to cause said carousel to rotate with sequential stops of said halters in several stations.

[0020] Said stations comprise a loading station, wherein the fowl is restrained by an operator in said restraining device with its beak inserted through the opening, a trimming station, wherein the beak segment is trimmed by the trimming instrument, and an unloading station, wherein the fowl is released from the restraining device. Optionally, the apparatus may include additional stations

previous to said unloading station and the carousel may effect sequential stops of the halters in said additional stations. For instance, in one embodiment, the apparatus comprises a vaccination station between said trimming station and the unloading station.

[0021] In the loading station, said digital image acquisition device is installed on said frame in a stationary position suitable to take a picture of the protruding portion of the beak when the fowl is restrained by said restraining device in the corresponding halter. Optionally, the digital image acquisition device may be installed on a moving support driven by a camera actuator, so that it can be moved between a working position and a withdrawn position in order not to interfere with the halters during the rotation of the carousel. A lighting device, which can, for instance, comprise one or more light-emitting diodes (LEDs) or one or more lamps of another type, is arranged to light up the protruding portion of the beak while the digital image acquisition device takes a picture thereof.

[0022] According to one embodiment, in each halter the restraining device comprises said supporting plate in a fixed position relative to the carousel and a rear plate installed so that it can move along rails relative to the supporting plate between an open position, wherein it provides enough room to place the fowl, and a closed position, wherein the head of the fowl is trapped between the supporting plate and the rear plate with its beak inserted through the opening. Elastic means are arranged to push the rear plate towards said open position, and a pawl is arranged to automatically engage a tooth of the rear plate when the latter reaches said open position, thereby keeping the rear plate in the closed position.

[0023] In the loading station there is a pushing arm actuated by a third actuator installed in a stationary position on the frame. When this third actuator is actuated, the pushing arm moves the rear plate from the open position to the closed position and, next, it retreats, leaving the rear plate held in the closed position by the engagement of the pawl in the tooth. Once the fowl is restrained in the halter by the restraining means, the carousel conveys the fowl from one station to another, wherein the different operations are carried out. In the last station, i.e., in said unloading station, there is a releasing element actuated by a fourth actuator for releasing said pawl from its engagement with the tooth, whereby the elastic means automatically move the rear plate towards its open position and the fowl is released from the restraining device and falls down an exit chute.

Brief description of the drawings

[0024] The above and other characteristics and advantages will be more fully understood from the following detailed description of an exemplary embodiment with reference to the attached drawings, wherein:

Fig. 1 is a perspective general view of a poultry beak trimming apparatus according to an embodiment of the present invention;

Fig. 2 is a plan view of the apparatus of Fig. 1 where the protective covering has been omitted in order to better show the carousel and several operating stations;

Fig. 3 is a partial perspective view of a carousel halter in interaction with a loading station;

Fig. 4 is a partially sectioned side view of the halter with restraining means in an open position and in interaction with the loading station;

Fig. 5 is a partially sectioned side view of the halter with restraining means in a closed position restraining a fowl in interaction with the loading station;

Fig. 6 is a partial perspective view of the carousel halter in interaction with a trimming station;

Fig. 7 is a partially sectioned side view of the halter with restraining means in a closed position restraining the fowl in interaction with the trimming station in an idle position;

Fig. 8 is a cross-sectional view taken along a vertical longitudinal plane of a buffering mechanism associated with driving means arranged in the trimming station to move a trimming instrument;

Fig. 9 is a partially sectioned side view of the halter with restraining means in a closed position restraining the fowl in interaction with the trimming station in a trimming position;

Fig. 10 is a partially sectioned side view of the halter with restraining means in an open position after releasing the fowl in interaction with an unloading station; and

Fig. 11 is a perspective view of an alternative embodiment of the trimming instrument arranged in the trimming station.

Detailed description of an exemplary embodiment

[0025] With reference, first of all, to Figs. 1 and 2, the poultry beak trimming apparatus according to one embodiment of the present invention comprises a frame 20 supporting a table 22 on which there is a carousel 30 rotatably installed driven by an electric motor 44 located under the table 22 to rotate relative to a vertical shaft 23 in the direction indicated by an arrow D in Fig. 2. Said carousel 30 carries four halters 35 placed at equal angular intervals round said vertical shaft 23, and each halter 35 comprises a restraining device to restrain the fowl, as will be explained below.

[0026] Frame 20 likewise supports, above said table 22, a loading station 31, a trimming station 32, an auxiliary station 33 and an unloading station 34. For the purposes of the present invention, only the loading, trimming and unloading stations 31, 32, 34 are indispensable, so that said auxiliary station 33, which may be a vaccination station or the like, is optional and may be left vacant, may be omitted or may be replaced by one or more stations of another type. In fact, there is no limitation for the number of stations nor for the number of halters. In gen-

eral, there will be a number of halters equal to the number of stations, although, optionally, there may be more than one halter per station. The carousel will effect indexed stops of all the halters in all the stations.

[0027] Below said table 22 there is a box 29 supported on the frame 20 in which electronic control means are housed for automatically controlling the operation of the apparatus. Said electronic control means are generally programmable and may optionally have a user interface and a display screen associated therewith (not shown) to let the operator change control and programming parameters.

[0028] In operation, the carousel 30 is rotated by said electric motor 44 with sequential stops wherein each of the halters 35 firstly interacts with the loading station 31, wherein a fowl 1 is restrained in a semiautomatic manner by an operator in said restraining device, next with the trimming station 32, wherein a beak segment of the fowl is automatically trimmed, next with the auxiliary station 33, wherein the fowl may be, for instance, automatically vaccinated, and, lastly, with the unloading station 34, wherein the fowl 1 is automatically released from the restraining device, so that it falls down an exit chute 23 and the cycle begins again.

[0029] As shown in Fig. 1, the carousel 30 is protected by a protective covering 25 including a structure 25a and a plurality of transparent panels 25b. Said protective covering 25 has an access port 26 opposite the loading station 31 and an exit port (not shown) opposite the unloading station 34. Said access port 26 is associated with a safety barrier device 27 of a conventional type. As will be described below, the trimming station 32 includes means for burn-trimming the beak segment of the fowl. As a result, in the upper part of the protective covering 25, and above the trimming station 32, an extractor fan 28 of a conventional type is installed so as to evacuate the fumes produced by said burn.

[0030] Figures 3, 4 and 5 show a loading station 31 and a halter 35 of the carousel 30 in interaction therewith. Said restraining means built into the halter 35 comprise a supporting plate 10 firmly attached to the carousel 30 by a supporting arm 45. The supporting plate 10 has an opening 10a through which the beak of a fowl 1 is inserted (Fig. 5). The opening 10a is configured according to the thickness of the supporting plate 10 so that the beak of the fowl 1 will present a protruding beak portion 1 a from a side thereof opposite the side where the fowl 1 is located. Preferably, the opening 10a is formed in an interchangeable auxiliary member 46. This makes it possible to have several auxiliary members 46 available with openings 10a of different sizes.

[0031] The restraining means further comprise a rear plate 36 installed by means of rails 47, so that they can move relative to the supporting plate 10 between an open position (Fig. 4), wherein enough room is provided to place the fowl 1, and a closed position (Fig. 5), wherein the head of the fowl 1 is trapped between the supporting plate 10 and the rear plate 36 with its beak inserted through the opening 10a. Elastic means 37, such as helical springs, are arranged to push the rear plate 36 towards said open position. A pawl 38 installed on the supporting arm 45 that can tilt round a hinging pin 61 against a biasing spring 38a, and a tooth 39 is attached in the rear plate 36.

[0032] The loading station 31 comprises a pushing arm 40 installed so that it can be moved between an outstretched position (Fig. 4) and a retracted position (Fig. 5) relative to a supporting member 48 attached in a stationary manner in an upper part of the structure 25a of the protective covering 25, which, in turn, is attached to the frame 20. When it is in said outstretched position, the pushing arm makes it possible for the halter 35, with the rear plate 36 in the open position, to be positioned in interaction with the loading station 31 by an indexed rotation of the carousel 30. A closing actuator 41, such as an air-operated actuator, is operatively connected so as to move the pushing arm 40 towards the retracted position.

[0033] This way, once the fowl 1 has been manually placed by the operator with its beak inserted through the opening 10a of the supporting plate 10, the activation of the closing actuator 41 moves the pushing arm towards the retracted position and the latter pulls the rear plate 36 from the open position to the closed position. When the rear plate 36 reaches its closed position, the pawl 38 automatically engages the tooth 39, thereby maintaining the rear plate 36 held in the closed position. The halter 35 includes a protective plate 51 attached to the supporting plate 10 to help support the fowl 1 and protect it against several components located in the different stations.

[0034] A digital image acquisition device 11, such as a digital camera, is located in the loading station arranged to take a picture in profile of the protruding portion of the beak 1a of the fowl 1 when the latter is restrained by the restraining means of the halter 35 in the loading station 31. A lighting device 53, such as a device of light-emitting diodes (LEDs), is carried on a support 54 fixed relative to the frame 20 and arranged to light up the protruding portion of the beak 1 a at the time the picture is taken. The digital picture taken by said digital image acquisition device 11 is processed by an electronic image processing device built into, for instance, the electronic control means to obtain a measurement of the protruding portion of the beak 1 a of the fowl 1 and to generate the electrical signal representative of the result of said measurement.

[0035] If the picture taken by the digital image acquisition device 11 does not reveal the presence of the protruding portion of the beak 1a or if the result of the measurement thereof is considered unacceptable, the electronic control means activate the actuator 62 arranged to cause the pawl 38 to tilt against the biasing spring 38a, thereby releasing the tooth 39 and causing the elastic means 37 to push the rear plate 36 to the open position. This way, if a fowl 1 was restrained by the restraining means, the fowl 1 is released and it falls on a backtracking

chute 52. For instance, the mechanism to release the pawl 38 from the tooth 39 can be similar to the one described below in relation to Fig. 9.

[0036] In the illustrated embodiment, the digital image acquisition device 11 is supported by a tilting support 49 installed so that it can pivot relative to a horizontal shaft 49a supported in a stationary position over the table 22 attached to said frame 20. A camera actuator 50, such as an air-operated actuator, is operatively connected to cause the digital image acquisition device 11 to tilt between a working position (Fig. 3), wherein it is arranged to take the picture of the protruding portion of the beak 1 a of the fowl, and an idle position (not shown), wherein the digital image acquisition device 11 is away from the path of the halters 35 so as not to interfere therewith during the indexing movements of the carousel 30.

[0037] It is to be understood that the digital image acquisition device 11 may alternatively be arranged in any convenient fixed position that will allow the carousel 30 to move freely. Optionally, the digital image acquisition device 11 may be associated with an optical device, such as one or more mirrors, one or more lenses or a combination of both, located in a fixed or movable position, for obtaining an image with the necessary quality and characteristics to carry out the measurement of the fowl's beak.

[0038] Once the fowl 1 has been restrained in the restraining means of the halter 35 and the protruding portion of the beak 1a has been measured, the carousel 30 effects an indexing movement, keeping the fowl 1 restrained, to arrange the corresponding halter 35 in interaction with the trimming station 32, wherein the beak of the fowl 1 will be trimmed.

[0039] Figures 6, 7 and 9 show the trimming station 32 and a halter 35 of the carousel 30 in interaction therewith. The trimming station 32 comprises a rail member 55 attached to the table 22 and a sliding support 21 slidingly attached to said rail member 55. A hot body 12 is installed on the sliding support 21 that is heated by an electric current to a temperature high enough to burn the beak of the fowl 1 by contact and to cauterise the wound produced. Said hot body 12 has the shape of a rod with a square cross section supported on its ends by heat-sink supports 56 provided with with cooling fins to keep, as far as possible, the heat of the hot body 12 from being transmitted to the sliding support 21.

[0040] The sliding support 21 is moved by driving means along the rail member 55 in a positioning movement in the forward direction towards the supporting plate 10 of a halter 35 of the carousel 30 arranged in interaction with the trimming station 32 and wherein the fowl 1 has been previously restrained in the loading station 31 with its beak inserted through the opening 10a. Said driving means comprise a positioning actuator 14, such as, for instance, an electric stepper motor (see also Fig. 8), controlled by said electronic control means for moving a buffer 13 until it is positioned at some distance from the supporting plate 10 determined based on said electrical signal representative of the result of the measurement, previously carried out in the loading station 31, of the protruding portion of the beak 1 a of the fowl 1 restrained in the halter 35.

[0041] As best shown in Fig. 8, the buffer 13 is slidingly installed on a base body 57 attached to the table 22 and it has a threaded hole 13a coupled to a worm 63 rotatably installed in said base body 57 by means of one or more bearings. The positioning actuator 14 is located below the table 22 and connected to the worm by a belt drive 14a and pulleys 68, 69 in order to move the buffer 13 in a direction parallel to the rail member 55. A support 70 is attached on the base body 57 supporting an end-of-travel detector 65 that interacts with a detectable element 71 attached to the buffer 13 in order to detect an end-of-travel position of the buffer 13.

[0042] The sliding support 21 has an auxiliary support 66 attached, which, in turn, supports a plunger buffer 21 a opposite the buffer 13. This plunger buffer 21 a is movable relative to the auxiliary support 66 and is connected to a shock absorber 16 attached to the auxiliary support 66. Consequently, the shock absorber 16 moves together with the sliding support 21. In the illustrated embodiment, the shock absorber 16 comprises a spring 67 opposite the plunger buffer 21a. Alternately, the shock absorber might be based on the compression of a gas or the friction of a fluid.

[0043] The driving means further comprise a driving actuator 15 (Figs. 6, 7 and 9), such as an air-operated cylinder, operatively connected to move the sliding support 21, on which said hot body 12 is installed, along the rail member 55 towards the supporting plate 10, starting from an idle, detached position of the halter 35 (Fig. 7), until the plunger buffer 21 a is stopped by said buffer 13 in accordance with the result of the measurement previously carried out in the loading station 31.

[0044] The shock absorber 16 operates so as to gradually reduce the speed of the hot body 12 up to its complete stop in the last stretch of the travel of the moving support 21, along which the hot body 12 comes into contact with the protruding portion of the beak 1a. The stroke of the plunger buffer 21 a in the shock absorber 16 is well defined and is included in the distance the moving support 21 must travel to carry out the trimming operation according to the detected beak size.

[0045] This way, electronic control means automatically control the actuation of the driving means of the hot body 12 based on said electrical signal representative of the result of the measurement of the protruding portion of the beak 1a so as to trim said beak segment of the fowl in accordance with the size of the previously measured protruding portion of the beak 1a. The positioning of the buffer 13 may be continuous or rank-correlated. For instance, the positioning of the buffer 13 may be selected so as to allow 25%, 50%, 75% or 100% of the maximum possible travel of the hot body 12, wherein a 25%-travel would correspond to beaks of very large size and a 100%-travel would correspond to beaks of very

small size.

[0046] As shown in Fig. 6, the trimming station 32 includes safety detectors 64, 72 arranged to detect the absolute positions of the end of travel of the sliding support 21.

[0047] Figure 11 shows one further alternative embodiment for the trimming instrument in the trimming station 32, said trimming instrument comprising a hot wire 74 heated by an electrical resistance. Reference numeral 80 designates, as a whole, a set of hot wire support and actuator mounted on a support member 81, which is intended to be attached to a sliding support similar to the sliding support 21 described above in relation to Figs. 6 to 9 and endowed with equivalent movements and actuations.

[0048] The hot wire 74 is supported in a position perpendicular to the beak of the fowl and parallel to the supporting plate 10 by a wire support 75 in the shape of a bow. A reciprocating air-operated or electrical actuator 76 moves the wire support 75 in a reciprocating movement along reciprocating rails 77 supported on the support member 81 in a position parallel to the longitudinal direction of the hot wire 74. An air-operated or electrical trimming actuator 78 moves the wire support 75 in a trimming movement along trimming rails 79 perpendicular to the longitudinal direction of the hot wire 74 and to the rail member 55 of the sliding support 21.

[0049] In the embodiment of Fig. 11, the trimming rails 79 are linear, so that the reciprocating rails 77 and the trimming rails 79 jointly define a cutting plane according to which the hot wire 74 carries out a straight cut. The trimming rails 79, however, may alternatively be configured to carry out a curved, swerving or winding movement, which provides the possibility of carrying out other types of cut with the hot wire 74, such as a curved cut, a V-cut or any other curved or swerving cuts. Alternately, instead of the trimming rails 79, the set of hot wire 80 support and actuator may include a copying system and a template serving as a model, or a numeric control system, which allows any shape of cut with an entirely programmable system.

[0050] Alternatively, the trimming instrument may be different from the hot body 12 and the hot wire 74. In another alternative embodiment, not shown, the trimming instrument comprises a blade or the like, which actuates following a movement substantially parallel to the supporting plate 10, optionally against a wear surface, and positioning and actuation means controlled by the electronic control means based on said electrical signal representative of the result of the measurement of the protruding portion of the beak 1a of the fowl 1 to position and actuate said blade so as to trim the beak of the fowl.

[0051] The essential elements for the purposes of the present invention are restraining means for restraining the fowl 1 with a protruding portion of the beak 1 a protruding from a supporting plate 10, electronic measurement means for measuring the size of said protruding portion of the beak 1 a, a trimming instrument and driving means operatively connected to effect a relative movement between said trimming instrument and the protruding portion of the beak 1a so as to trim at least one beak segment of said protruding portion of the beak 1a suitable to the beak size according to the result of the measurement carried out by the electronic measurement means.

[0052] Once the beak of the fowl has been trimmed in the trimming station 32, the carousel 30 effects an indexing movement to arrange the corresponding halter 35, keeping the fowl 1 restrained by the restraining means, in interaction with the vaccination station 33, where the fowl 1 can be vaccinated. Generally, in the vaccination station 33 there are automatic vaccination means known *per se* that will not be described, since they are not a part of the present invention. Optionally, in case carrying out the vaccination of the fowl is deemed of no interest, the vaccination station 33 may be left vacant or may be adapted to carry out automatic operations of a different type related to fowl.

[0053] Following the vaccination station 33, the carousel 30 effects an indexing movement to arrange the corresponding halter 35, keeping the fowl 1 restrained by the restraining means, in interaction with the unloading station 34, where the fowl 1 will be released.

[0054] Figure 10 shows the halter 35 of the carousel 30 stopped in the unloading station 34. The latter comprises an exit chute 24 carried on supports 58 attached to the table 22, which, in turn, will be attached to the frame 20. This exit chute 24 is located below the restraining means and the protective plate 51 installed in the halter 35 when the latter remains stationary in the unloading station 34. The unloading station 34 further comprises a releasing element 42 actuated by an opening actuator 43, such as an air-operated actuator, supported on a support member 59 attached in a stationary manner in an upper part of the structure 25a of the protective covering 25, which, in turn, is attached to the frame 20.

[0055] When the halter 35 remains stationary in the unloading station 34, said releasing element 42 is arranged above an extension 60 projecting from the pawl 38 installed in the halter 35 on a side opposite said hinging pin 61 around which the pawl 38 tilts. This way, the activation of the opening actuator 43 moves the releasing element 42 towards the extension 60 and presses thereupon to cause the pawl 38 pivot against the biasing spring 38a, whereby the pawl 38 is released from the tooth 39 attached to the rear plate 36, the elastic means 37 push again the rear plate 36 along the rails 47 towards the open position and the fowl 1 is released from the restraining means of the halter 35 and it falls on the exit chute 24.

[0056] Lastly, following the unloading station 34, the carousel 30 carries out an indexing movement to arrange the corresponding halter 35 with the restraining means in the open position again in interaction with the loading station 31, wherein another fowl 1 will be restrained in the restraining means of the halter 35 and the cycle begins again.

[0057] The apparatus according to one embodiment

of the second aspect of the present invention as has been described above in relation to Figs. 1 to 11 can be used to implement a poultry beak trimming method according to the first aspect of the present invention.

[0058] Essentially, the method comprises the following steps. Firstly, inserting the beak of a fowl 1 through an opening 10a of a supporting plate 10 so that a protruding portion of the beak 1 a protrudes from the opposite side of said supporting plate 10. Then, carrying out a measurement of the protruding portion of the beak 1 a and generating an electrical signal representative of the result of said measurement. Lastly, automatically controlling driving means based on said electrical signal to effect a relative movement between a trimming instrument and the protruding portion of the beak 1a so as to trim a beak segment in accordance with the size of the protruding portion of the beak 1a as previously measured.

[0059] From the exemplary embodiments shown and described, modifications, variations and combinations will occur to a skilled artisan without departing from the scope of the present invention as defined in the appended claims.

Claims

1. A poultry beak trimming method comprising the steps of:

   inserting the beak of a fowl (1) through an opening (10a) of a supporting plate (10) so that a protruding portion of the beak (1a) protrudes from the opposite side of said supporting plate (10); and
   trimming at least a beak segment of said protruding portion of the beak (1a) by means of a relative movement between a trimming instrument and the protruding portion of the beak (1a),

   characterised in that it comprises the steps of:

   carrying out a measurement of the protruding portion of the beak (1a) before said trimming step;
   generating an electrical signal representative of the result of said measurement; and
   automatically controlling said relative movement between said trimming instrument and the protruding portion of the beak (1a) based on said electrical signal applied to driving means so as to trim said beak segment in accordance with the size of the measured protruding portion of the beak (1a).

2. The beak trimming method according to claim 1 **characterised in that** it comprises using a digital image acquisition device (11) in cooperation with an electronic image processing device for carrying out said measurement and generating said electrical signal.

3. The beak trimming method according to claim 1 **characterised in that** it comprises positioning a buffer (13) at some distance from the supporting plate (10) determined based on said electrical signal and, next, moving a sliding support (21) on which said trimming instrument is mounted, in a positioning movement in the forward direction towards the supporting plate (10) until said sliding support (21) is stopped by said buffer (13).

4. The beak trimming method according to claims 1 or 2 **characterised in that** it comprises using as said trimming instrument a hot body (12), heated to a temperature high enough to burn the beak of said fowl (1) by contact and to cauterise the wound produced.

5. The beak trimming method according to claims 1 or 2 **characterised in that** it comprises using as said trimming instrument a hot wire (74) endowed with a reciprocating movement parallel to the longitudinal direction of said hot wire (74) and a trimming movement.

6. A poultry beak trimming apparatus comprising:

   a supporting plate (10) with an opening (10a) through which the beak of a fowl (1) is inserted, said supporting plate (10) having a thickness suitable for a protruding portion of the beak (1a) to protrude from the opposite side thereof;
   a trimming instrument; and
   driving means operatively connected to effect a relative movement between said trimming instrument and the protruding portion of the beak (1a) to trim at least a beak segment of said protruding portion of the beak (1a),

   characterised in that it further comprises:

   measurement means to carry out the measurement of the protruding portion of the beak (1a) and to generate an electrical signal representative of the result of said measurement; and
   electronic control means for automatically controlling the actuation of said driving means based on said electrical signal so as to trim said beak segment in accordance with the size of the measured protruding portion of the beak (1a).

7. The beak trimming apparatus according to claim 6 **characterised in that** said measurement means comprise a digital image acquisition device (11) in cooperation with an electronic image processing device.

8. The beak trimming apparatus according to claim 7 **characterised in that** said driving means comprise a positioning actuator (14) controlled by said electronic control means for moving a buffer (13) until it is positioned at some distance from the supporting plate (10) determined based on said electrical signal and a driving actuator (15) to move a sliding support (21) on which said trimming instrument is mounted, in a positioning movement in the forward direction towards the supporting plate (10) until said sliding support (21) is stopped by said buffer (13).

9. The beak trimming apparatus according to claim 8 **characterised in that** said positioning actuator (14) is an electric stepper motor and said driving actuator (15) is an air-operated cylinder.

10. The beak trimming apparatus according to claims 8 or 9 **characterised in that** said trimming instrument comprises a hot body (12) heated by an electric current to a temperature high enough to burn the beak of said fowl (1) by contact and to cauterise the wound produced.

11. The beak trimming apparatus according to claims 8 or 9 **characterised in that** said trimming instrument comprises a hot wire (74) heated by an electric current and endowed with a reciprocating movement parallel to the longitudinal direction of said hot wire (74) and a trimming movement.

12. The beak trimming apparatus according to any one of claims 8 to 11 **characterised in that** the driving means are associated with a shock absorber (16) to reduce the speed of the sliding support (21) in the last stretch of its travel.

13. The beak trimming apparatus according to any one of claims 6 to 12 **characterised in that** it comprises a frame (20) wherein a carousel (30) is rotatably installed supporting a number of halters (35) placed round thereof, each halter (35) having a restraining device including one of said supporting plates (10) with its corresponding opening (10a), and driving means operatively connected to cause said carousel (30) to rotate with sequential stops of said halters (35) in a loading station (31), wherein the fowl (1) is restrained in said restraining device with its beak inserted through the opening (10a), a trimming station (32), wherein the beak segment is trimmed by the trimming instrument, and an unloading station (34), wherein the fowl (1) is released from the restraining device.

14. The beak trimming apparatus according to claim 13 **characterised in that** said digital image acquisition device (11) is installed on said frame (20) to take a picture of the protruding portion of the beak (1a) when the fowl (1) is restrained by said restraining device in said loading station (31).

15. The beak trimming apparatus according to claims 13 or 14 **characterised in that** each restraining device comprises:

    a rear plate (36) installed so that it can move relative to the supporting plate (10) between an open position, wherein it provides enough room to place the fowl (1), and a closed position, wherein the head of the fowl (1) is trapped between the supporting plate (10) and the rear plate (36) with its beak inserted through the opening (10a);
    elastic means (37) arranged to push the rear plate (36) towards said open position; and
    a pawl (38) arranged to automatically engage a tooth (39) of the rear plate (36) when the latter reaches said open position, thereby keeping the rear plate (36) in the closed position.

16. The beak trimming apparatus according to claim 15 **characterised in that** said loading station (31) comprises a pushing arm (40) actuated by a closing actuator (41) for moving the rear plate (36) from the open position to the closed position, and said unloading station (34) comprises a releasing element (42) actuated by an opening actuator (43) for releasing said pawl (38).

17. The beak trimming apparatus according to claim 15 **characterised in that** the carousel (30) further effects sequential stops of said halters (35) in at least an auxiliary station (33) previous to said unloading station (34).

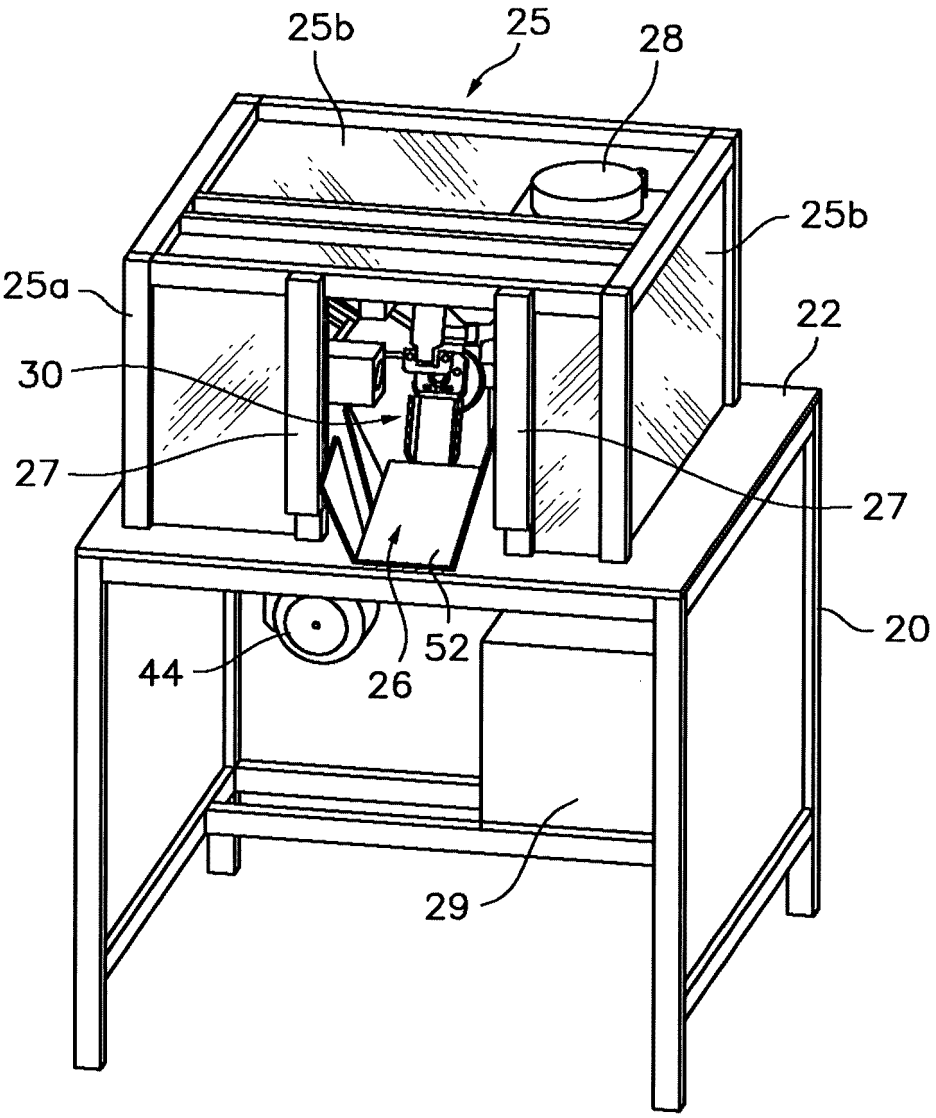

Fig. 1

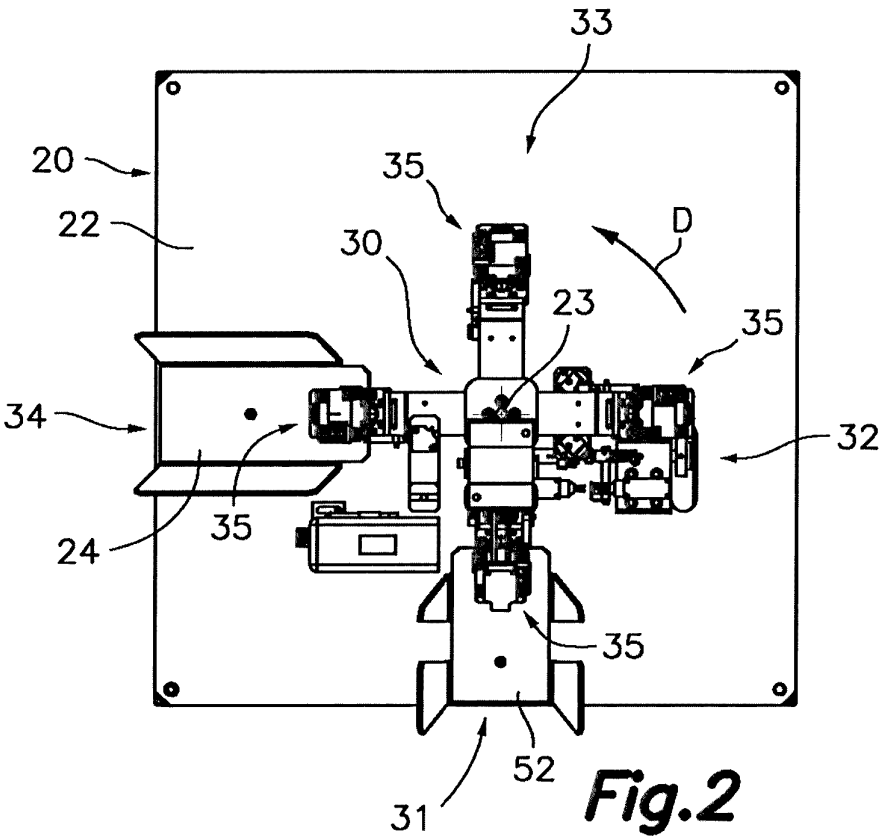
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Fig.2

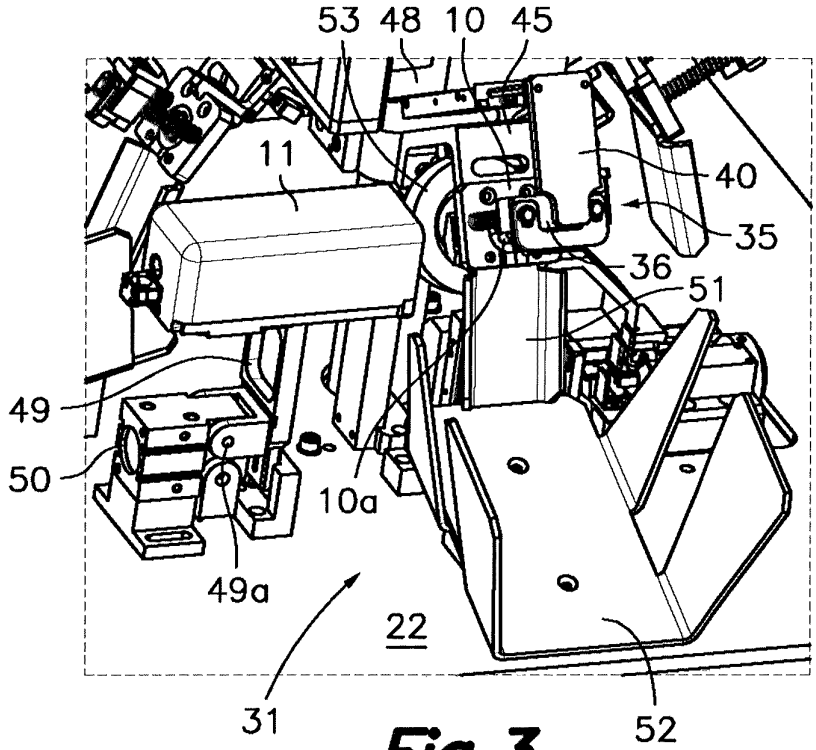
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Fig.3

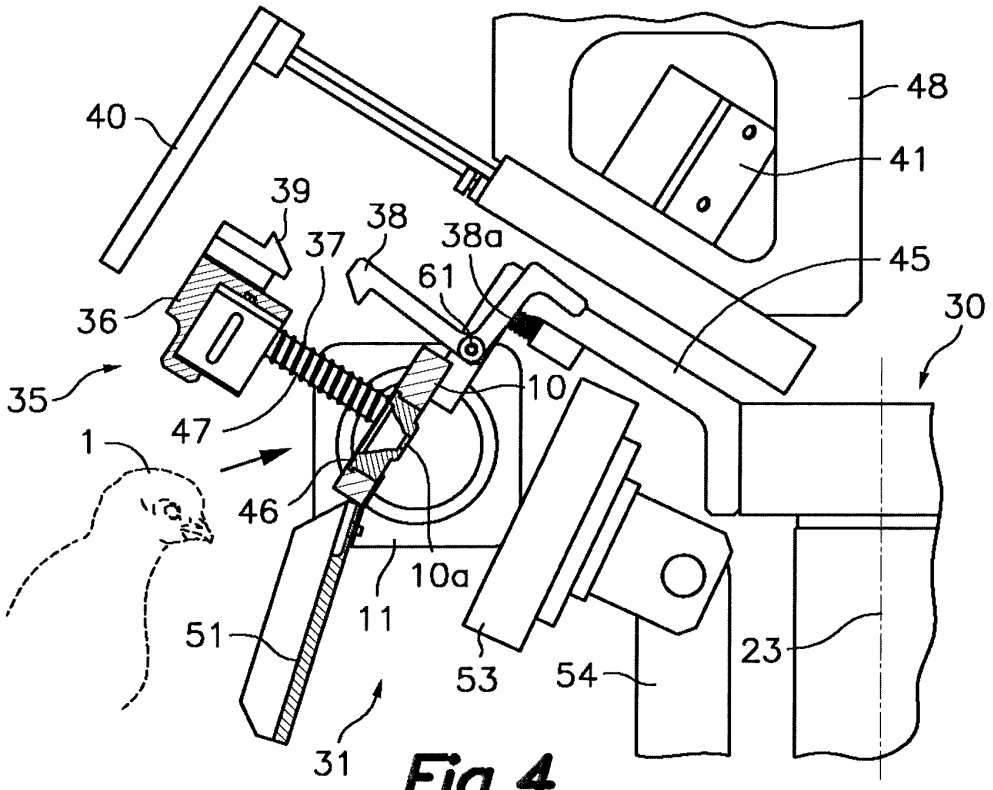
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Fig.4

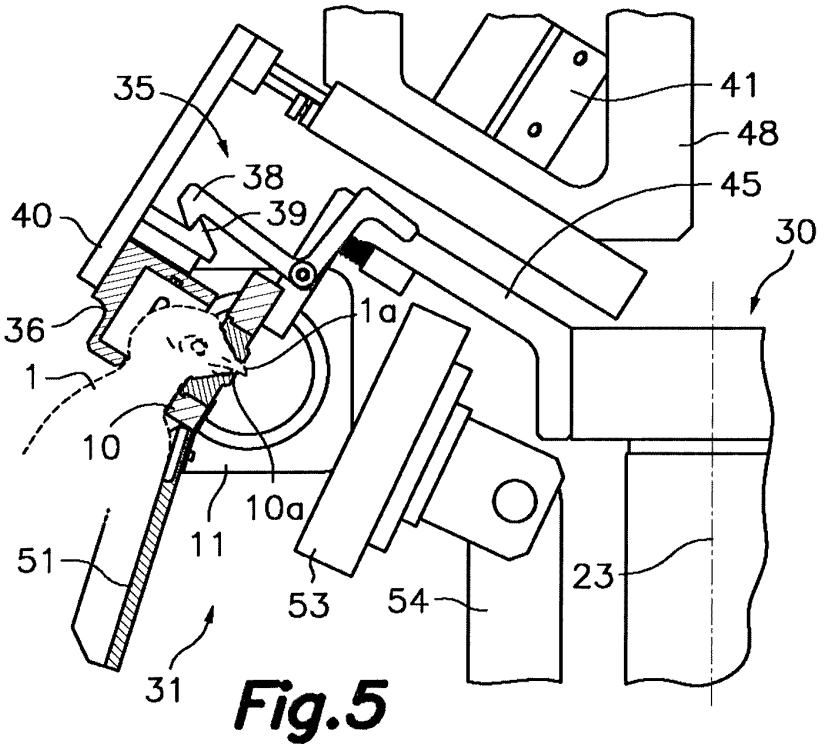
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Fig.5

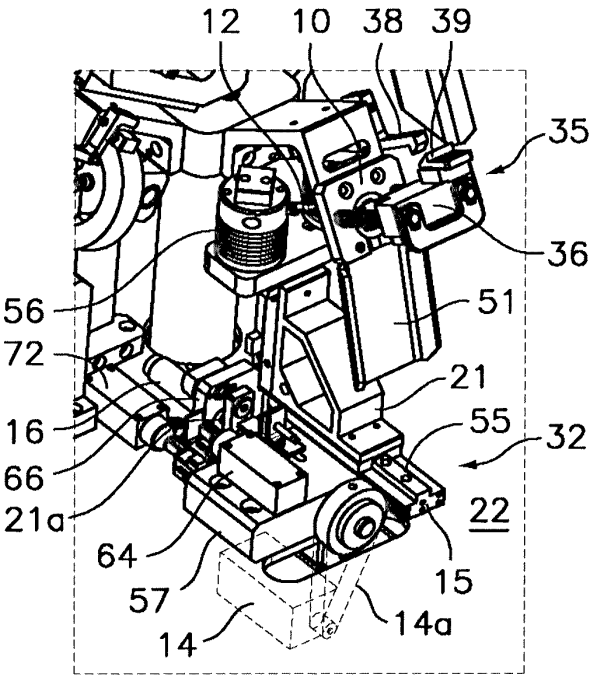

Fig.6

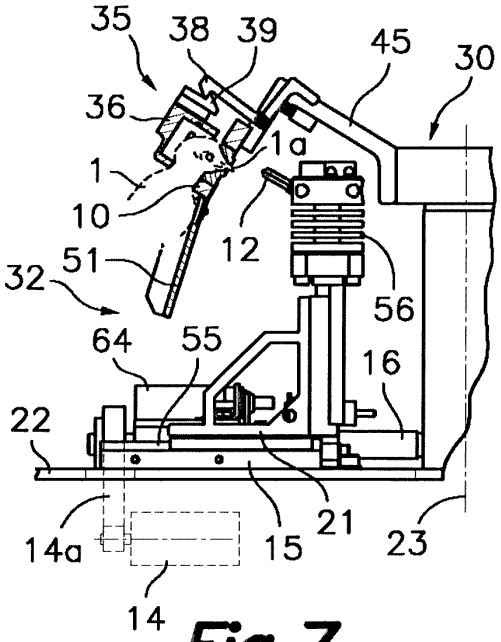

Fig.7

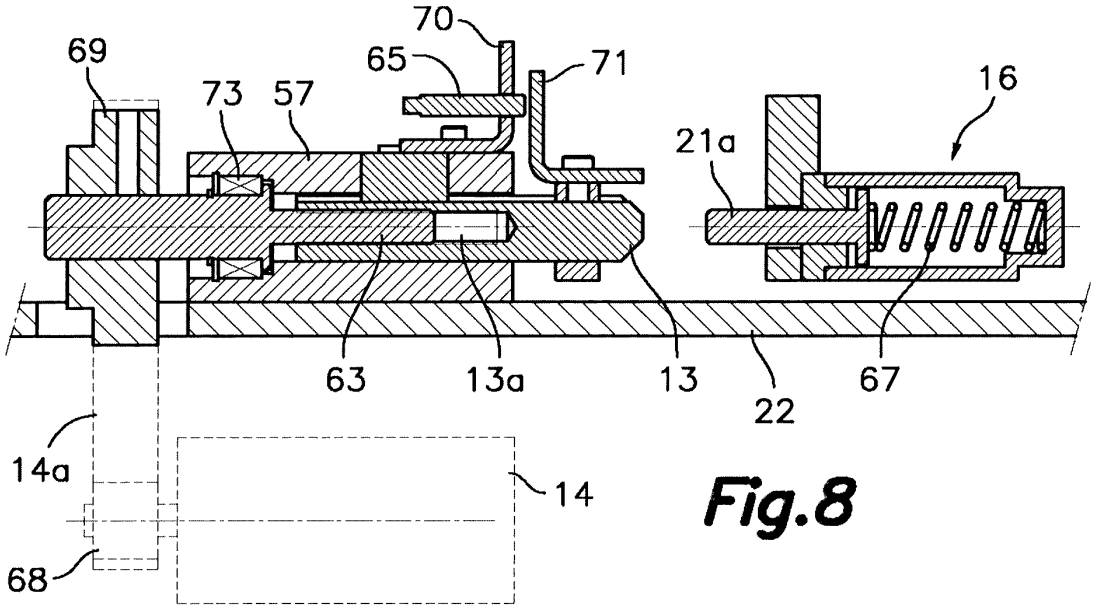

Fig.8

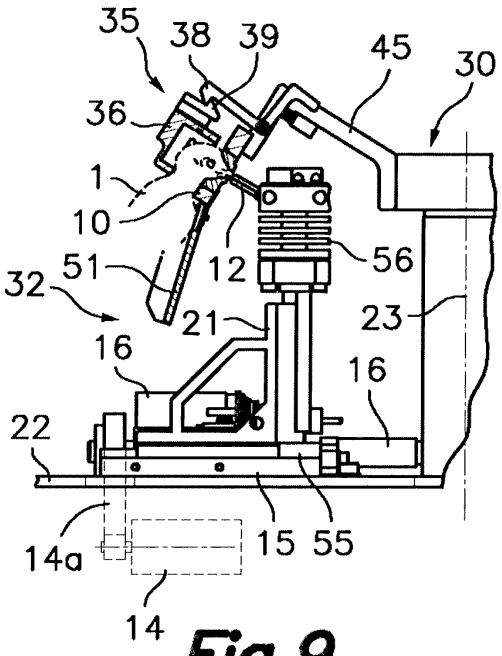

Fig.9

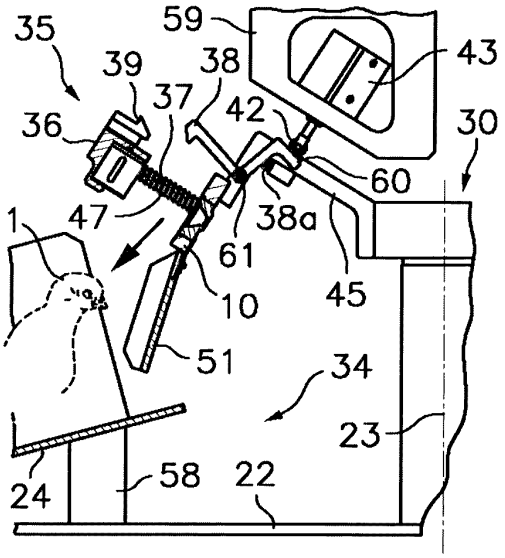

Fig.10

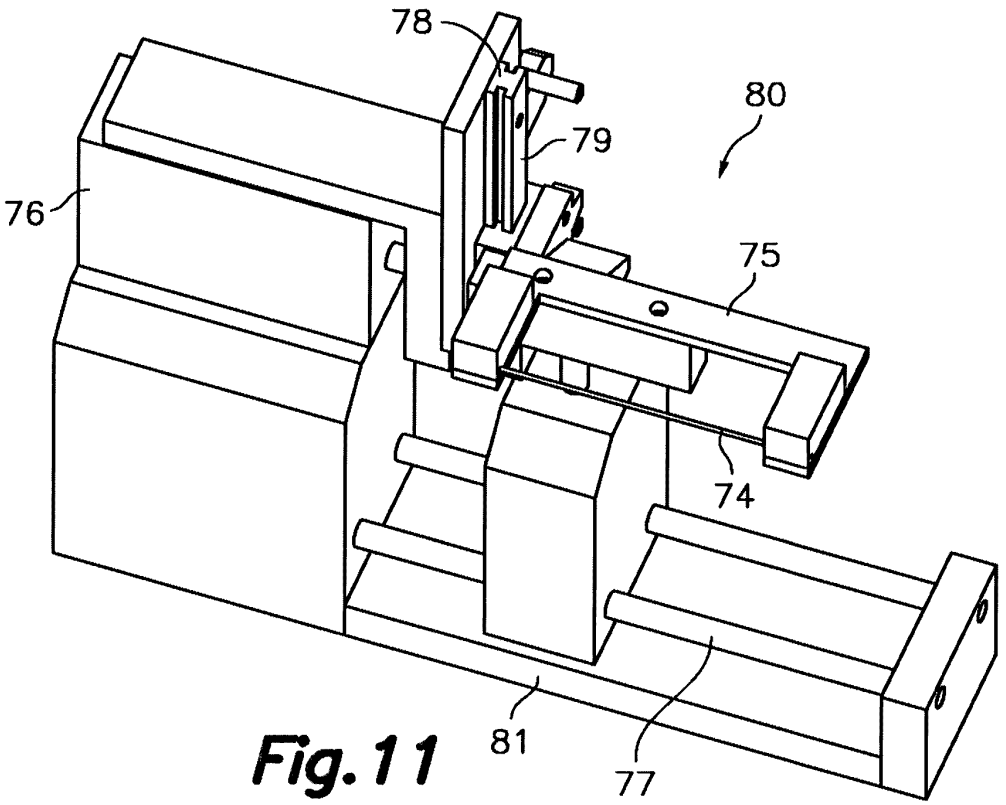

Fig.11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2012/000062

A. CLASSIFICATION OF SUBJECT MATTER

A61D1/00 (2006.01)
A01K65/00 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61D, A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 5651731 A (GORANS MARC S ET AL.) 29/07/1997, figure 1, claims 1-3;	1-5
A	GB 837141 A (COPE WHELON & COMPANY LTD) 09/06/1960, claims 1-2; figure 2	6-17

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05/07/2012	**(12/07/2012)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer T. Verdeja Matías Telephone No. 91 3493272

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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REFERENCES CITED IN THE DESCRIPTION

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- GB 837141 A **[0006] [0007]**
- US 5651731 A **[0008]**