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(71) Applicant *(for all designated States except US)*: **VETECH LABORATORIES INC.** [CA/CA]; 131 Malcolm Road, Guelph, Ontario N1K 1A8 (CA).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **LEE, Eng-Hong** [CA/CA]; 131 Malcolm Road, Guelph, Ontario N1K 1A8 (CA).

(74) Agent: **MOFFAT & CO.**; P.O. Box 2088, Station D, Ottawa, Ontario K1P 5W3 (CA).

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(54) Title: PORTABLE SOFT GEL DROPLET DELIVERY DEVICE FOR TREATING POULTRY

(57) Abstract: Embodiments of the present invention are directed to a method of treating any flock of poultry, which may be in a barn floor, in a cage in a barn, at a free range farm or in a hatchery. The embodiments of the present invention are also directed to a dispensing apparatus comprising a hand-held dispenser for dispensing a therapeutic agent in a flowable soft gel onto any flock of poultry.

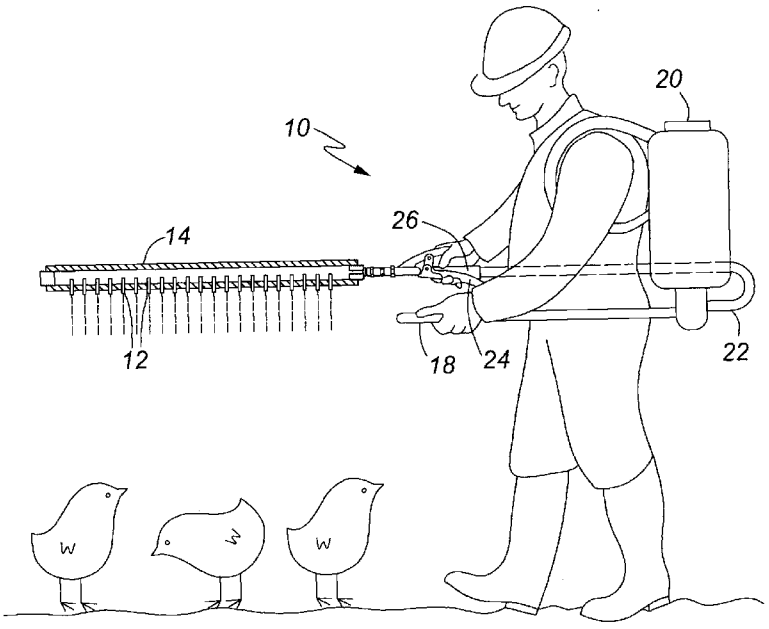

FIG. 1

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PORTABLE SOFT GEL DROPLET DELIVERY DEVICE FOR TREATING POULTRY

[0001] **Field of the Invention**

[0002] The present invention relates to a portable soft gel droplet delivery device for treating any flock of poultry. The soft gel delivery system can be used to treat a flock of poultry in a barn, in a hatchery, or in a free range farm. In particular, the present invention relates to a delivery system for delivery of a therapeutic agent to poultry.

[0003] **BACKGROUND OF THE INVENTION**

[0004] There are many therapeutic agents which are used in the raising of poultry: vaccines, competitive exclusion products, vitamins, minerals, medicaments and many others. A number of such therapeutic agents must be protected from environmental effects while being delivered to the poultry.

[0005] Most chicken and turkey hatchlings only remain in the hatchery for a number of hours, where they are sorted, boxed and shipped. Maternal antibodies against many diseases stay inside the chicken hatchlings and turkey hatchlings for about the first 10 days of life, although the variation in this number can be considerable. For example, some maternal antibodies can be maintained within turkey hatchlings for as long as four weeks. When the maternal antibodies are present within the chicks and turkey poults, the birds' immune response to vaccinations is stifled. This is because the maternal derived antibodies (MDA) are

clearing away those vaccinal organisms. As a result, these young birds are not allowed to develop their own immune response to the diseases that they are vaccinated against. Vaccinating in barns is a necessity because the maternally derived antibodies are present and remain effective for some of the viral diseases for at least the first week or ten days of these young birds' lives. Therefore, it is necessary to wait until these MDA wane or disappear before vaccinating.

[0006] Hemmorhagic enteritis is a case where maternally derived antibodies are maintained for a long period within turkey poults, because one cannot effectively vaccinate against this disease until a poult is four weeks or older. Therefore one cannot effectively vaccinate turkey poults against hemmorhagic enteritis in the hatchery.

[0007] Some diseases require repeated vaccinations to be protective. These repeated vaccinations can only be carried out in a barn, as the birds grow.

[0008] The nature of the disease organism, the age of the bird and the bird's environment influence the method of administration or dosage form of any vaccine against that organism.

[0009] Currently in the art, poultry in barns are treated with vaccines by using fogging or spraying with water based (not gel based) vaccines. Currently, none of the vaccines for administration in a barn are gel based for birds that are one week or ten days old or older.

[0010] Vaccine may also be administered through the use of drinking water systems or through water proportioning systems including automatic fountains and automatic water medicator or proportioners. However, given the susceptibility of viral vaccines to chlorine and other disinfectants commonly used in poultry barns, the water lines have to be cleaned or flushed before administration of the vaccine. Additionally, administration of the vaccine through the water lines requires that after administration, the water lines must remain chlorine free sometimes for up to 24 hours to allow the safe consumption of the rest of the vaccine.

[0011] Another currently used method of administering vaccines in barns are fogging systems, which involve use of a very small droplet size to provide a fine mist, such as with Newcastle disease. It is intended for respiratory tract inhalation (not oral administration).

[0012] Newcastle Disease vaccine can be administered through drinking water or later one can use fogging when the birds are too big for administration through drinking water.

[0013] ILT (Infectious Laryngotracheitis) vaccine can be administered via drinking water.

[0014] There are two live vaccines that cannot be given in drinking water or spraying: 1) Pox and 2) Marek's disease. Pox vaccine is administered through scratching or dermis, winged web method. Marek's

disease vaccination is administered through *in ovo* injection.

[0015] Eye drop vaccination: Newcastle disease virus or IBV can be administered by eye drop vaccination. However this method is tedious and one must handle every bird. This method is very labour intensive.

[0016] Examples of live vaccines that are used to immunize poultry orally include viral vaccines such as Hemorrhagic Enteritis Virus (HE), Infectious Bursal Disease Virus (IBD) and Newcastle Disease Virus (ND). Such vaccines are, at present, comprised of an attenuated strain of the virus in a suitable carrier for administration. Other oral viral vaccines include Infectious Bronchitis, Infectious Laryngotracheitis, Mycoplasma sp., and Pneumoviruses. Live bacterial vaccines, such as Salmonella vaccine, and protozoan vaccines, such as coccidiosis vaccine, are also used to immunize poultry orally.

[0017] There is a delivery system for use in a hatchery described in WO 2005/099617 (the '617 system) that can be used to administer a soft gel vaccine to poultry hatchlings in a hatchery. This delivery system was designed for use in a hatchery for hatchlings that are in shipping boxes or trays.

[0018] Thus, there remains a need for a simplified means for administration of therapeutic agents in soft gel form to any flock of poultry particularly in the barn, on a floor or in cages, or in the free range farm, which provides adequate exposure of the flock to the

therapeutic agent while reducing potential problem areas.

[0019] **SUMMARY OF INVENTION**

[0020] The present invention provides a portable delivery device and methods for administering oral vaccines to poultry in a barn, in a free range farm or even in a hatchery.

[0021] In a first aspect, the present invention relates to a hand held dispenser adapted to be coupled to a pump for dispensing a predetermined volume of flowable soft gel under pressure wherein the pump is connected to a reservoir for containing the flowable soft gel, the flowable soft gel having a therapeutic agent dissolved or suspended therein, to form a portable apparatus for dispensing the flowable soft gel onto a flock of poultry, the hand held dispenser comprising: a header provided with a plurality of nozzle openings of approximately uniform size and of approximately uniform spacing therebetween and wherein the approximately uniform size permits the flowable soft gel to pass therethrough and thereby be dispersed in the form of small beadlets when the flowable soft gel is placed under pressure.

[0022] In another aspect, the present invention relates to a portable dispensing apparatus for dispensing a flowable soft gel onto a flock of poultry, the apparatus comprising: i) a hand held dispenser comprising a header provided with a plurality of nozzle openings of

approximately uniform size and of approximately uniform spacing therebetween and wherein the approximately uniform size permits the flowable soft gel to pass therethrough and thereby be dispersed in the form of small beadlets when the flowable soft gel is placed under pressure, ii) a pump, and iii) a reservoir, wherein the hand held dispenser is connected to the pump and the pump is for dispensing a predetermined volume of the flowable soft gel under pressure, and wherein the pump is connected to the reservoir and the reservoir is for containing the flowable soft gel, the flowable soft gel having a therapeutic agent dissolved or suspended therein.

[0023] In another aspect, the present invention relates to a hand held dispenser or dispensing apparatus as described herein further comprising a spacer tubing, wherein a flowable soft gel outlet end of the spacer tubing is connected to the header and a flowable soft gel inlet end of the spacer tubing is adapted to be coupled to the pump.

[0024] In yet another aspect, the present invention relates to a hand held dispenser, dispensing apparatus or method as described herein wherein the nozzle openings are small tubings.

[0025] In another aspect, the present invention relates to a hand held dispenser or dispensing apparatus as described herein wherein the hand held dispenser further comprises a trigger that when actuated, allows dispensing of the flowable soft gel.

[0026] In another aspect, the present invention relates to a hand held dispenser or dispensing apparatus as described herein wherein the header is provided with at least 10 nozzle openings spaced apart about 0.25 cm to 1.5 cm along the length of the header.

[0027] In yet another aspect, the present invention relates to a hand held dispenser or dispensing apparatus as described herein further comprising a connector, wherein a flowable soft gel outlet end of the connector is connected to the flowable soft gel inlet end of the spacer tubing and a flowable soft gel inlet end of the connector is adapted to be coupled to the pump, and wherein the connector and the trigger together serve as a handle.

[0028] In another aspect, the present invention relates to a dispensing apparatus as described herein wherein the reservoir is in a backpack.

[0029] In yet another aspect, the present invention relates to a method of treating a flock of poultry, the method comprising: providing a flowable soft gel capable of being dispensed through a nozzle opening, the flowable soft gel having a therapeutic agent dissolved or suspended therein, providing a portable dispensing apparatus having a pump for delivering a predetermined volume of the flowable soft gel as a plurality of small beadlets through a plurality of nozzle openings of approximately uniform size arranged with approximately uniform spacing therebetween on a header on a hand held dispenser, dispensing the predetermined volume of the flowable soft gel as small beadlets onto the poultry

while swinging the hand held dispenser along a substantially horizontal plane from one side of the user to the other side of the user and above the poultry while walking through the flock, and allowing the poultry to consume the beadlets.

[0030] In another aspect, the present invention relates to a method as described herein wherein the apparatus further comprises a spacer tubing, wherein the spacer tubing lowers the header closer to the backs of the poultry.

[0031] In yet another aspect, the present invention relates to a method as described herein wherein the flowable soft gel contains a therapeutic agent which is a therapeutically effective amount of at least one therapeutic agent selected from the group consisting of a) a live organism selected from the group consisting of Hemorrhagic Enteritis Virus (HE), Infectious Bursal Disease Virus (IBD), Newcastle Disease Virus (ND), Salmonella, Infectious Bronchitis, Infectious Laryngotracheitis, mycoplasma sp., a Pneumovirus, coccidiosis, and a competitive exclusion product, such as probiotics, lactobacillus or bacillus species, b) vitamins, c) minerals, and d) electrolytes.

[0032] In another aspect, the present invention relates to a method as described herein wherein the live organism is Infectious Bursal Disease Virus (IBD).

[0033] In yet another aspect, the present invention relates to a method as described herein wherein the predetermined volume of the flowable soft gel is between about 0.15

ml and about 0.5 ml per hatchling and about 0.25 ml and about 1.5 ml per chick or turkey poult in the barn.

[0034] In another aspect, the present invention relates to a method as described herein wherein the spacer tubing lowers the header to allow a user to hold the apparatus about 5 cm to 10 cm above the backs of the poultry.

[0035] **BRIEF DESCRIPTION OF THE DRAWINGS**

[0036] The embodiments of the present invention will now be described by reference to the following figures, in which identical reference numerals in different figures indicate identical elements and in which:

[0037] **FIGURE 1** is a side elevation view in cross section of a header 14 with small tubings 12 together with a side view of other components of an embodiment of the dispensing apparatus of the present invention.

[0038] **FIGURE 2** is a side elevation view in cross section of a header 14 with small tubings 12 together with a side view of other components of an embodiment of the dispensing apparatus of the present invention.

[0039] **FIGURE 3** is a side elevation view in cross section of a header 14 with small tubings 12 and a side view of other components of an embodiment of the hand held dispenser of the present invention.

[0040] **FIGURE 4** is a side elevation view in cross section of a header 14 with small tubings 12 and a side view of other components of an embodiment of the hand held dispenser of the present invention.

[0041] **FIGURE 5A** is a side elevation view of a header 14 with small tubings 12, a spacer 28, and other components of an embodiment of the hand held dispenser of the present invention.

[0042] **FIGURE 5B** is a photograph of a side elevation view of a header 14 with small tubings 12, a spacer 28, and other components of an embodiment of the hand held dispenser of the present invention.

[0043] **FIGURE 6A** is a side elevation view of a header 14 with small tubings 12, a spacer 28, and other components of an embodiment of the hand held dispenser of the present invention.

[0044] **FIGURE 6B** is a photograph of a side elevation view of a header 14 with small tubings 12, a spacer 28, and other components of an embodiment of the hand held dispenser of the present invention.

[0045] **FIGURE 7A** is a drawing showing the distribution pattern of the flowable soft gel droplets formed when the flowable soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto chicken.

[0046] **FIGURE 7B** is a photograph showing the distribution pattern of the flowable soft gel droplets formed when the flowable soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto chicken.

[0047] **FIGURE 8A** is a drawing showing the distribution pattern of the flowable soft gel droplets formed when the

flowable soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto chicken.

[0048] **FIGURE 8B** is a photograph showing the distribution pattern of the flowable soft gel droplets formed when the flowable soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto chicken.

[0049] **FIGURE 9A** is a drawing showing the distribution pattern of the flowable soft gel droplets formed when the flowable soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto a piece of cardboard.

[0050] **FIGURE 9B** is a photograph showing the distribution pattern of the flowable soft gel droplets formed when the flowable soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto a piece of cardboard.

[0051] **FIGURE 10A** is a drawing showing the distribution pattern of the flowable soft gel droplets formed when the flowable soft gel is passed through a header arrangement embodiment of the present invention

[0052] **FIGURE 10B** is a photograph showing the distribution pattern of the flowable soft gel droplets formed when the flowable soft gel is passed through a header arrangement embodiment of the present invention.

[0053] **DETAILED DESCRIPTION OF THE INVENTION**

[0054] The present invention includes portable delivery devices and methods for administering oral vaccines to poultry in a barn or free range farm. These devices provide a single limited time exposure to a biological vaccine agent.

[0055] The present invention is directed to a method and portable apparatus for delivering a flowable soft gel (soft gel in a flowable form or soft flowable gel) to poultry for treating the poultry in a barn or free range farm. In a preferred embodiment, the flowable soft gel contains a uniform suspension of a therapeutic agent and in a particularly preferred embodiment, the therapeutic agent is a vaccine and the delivery system delivers the vaccine in beadlets of the flowable soft gel to the poultry for the purpose of immunizing the poultry in the barn or free range farm. The flowable soft gel is capable of being pumped and delivered directly to the poultry. The flowable soft gel is dispensed as a plurality of small beadlets which may contain a therapeutic agent and which are easily capable of being ingested by the poultry. The gel beadlets retain their moisture content to maintain the viability and/or efficacy of any therapeutic agent contained in the soft gel during the dispensing and consumption of the soft gel. The beadlets help to prevent the moisture from escaping and minimize the potential wetting of the birds.

[0056] The flowable soft gel utilizes a suitable gelling agent that can form the soft gel at relatively low

concentrations to allow the soft gel to contain mostly water. Preferably at least 90% by weight of the gel is water, more preferably at least 95% by weight and most preferably about 97-98% by weight. The suitable gelling agent is preferably a polysaccharide gelling agent which gels rapidly to maintain the therapeutic agent in a relatively uniform dispersion throughout the flowable soft gel. More preferably the gelling agent is a carrageenan or alginate gelling agent. Most preferably, the gelling agent is a kappa or lambda carrageenan gelling agent. Most preferably, the gelling agent is a water soluble lambda-type carrageenan extracted from the red algae Eucheuma cottonii.

[0057] The flowable soft gel provides for an easy to handle method of treating poultry in the barn and is, therefore, suitable for general barn workers without any special expertise required.

[0058] The portable devices and methods embodied by the present invention can use the flowable soft gel containing xanthan or another sticky gum, as claimed in PCT application number PCT/CA2010/001156 filed on July 27, 2010, although other soft gels can also be used. Soft gels containing xanthan or other sticky gums are preferred for use with the delivery device embodiments of the present invention because the gel beadlets made with xanthan or other sticky gums adhere to the bird feathers better than other gels. An example of such a soft gel is where about 0.5 to 2.5%w/v of a soft gel is made from one or more gelling agents provided as a dry powder comprising a mixture containing 20-30%w/w

maltodextrin, 60-70% carrageenan, 2-5% carboxymethyl cellulose and 2-6% xanthan gum (60/40 gel diluent of Vetech Laboratories Inc. to which xanthan gum was added).

[0059] The flowable soft gel is prepared by dissolving the gel powder in water to effect dissolution of the polysaccharide powder. The powder is added to the water at a concentration such that, when mixed with any therapeutic agent and allowed to gel, a flowable soft gel results. Typically, for gels containing therapeutic agents, the dissolved gel powder and therapeutic agent are mixed at a ratio of gel powder to therapeutic agent sufficient to produce the flowable soft gel having the therapeutic agent uniformly suspended therein. For highly soluble agents administered at low doses the ratio may be as high as 1,000: 1 (V/V) of dissolved gel powder to therapeutic agent. For large particulate therapeutic agents, such as organisms used for immunization or competitive exclusion products, the ratios will generally be in the range of dissolved gel powder to the therapeutic agent of about 1: 1 (V/V) to about 20:1 (V/V). Suitable flowable soft gels have been found to have a final concentration of the edible polysaccharide in the gel form of between about 0.5 and 2.5 percent, preferably between about 0.5 and 1.5 percent, preferably between about 0.6 and 1.5 percent, more preferably between about 0.6 and 1 percent, even more preferably between about 0.8 and 1.0 percent and most preferably about 1.0 percent. Thus preferably, where the ratio of dissolved gel powder to therapeutic agent is about 100:1 (V/V), a dissolved polysaccharide

gel solution of about 0.6 and 1.5 percent, preferably between about 0.6 and 1 percent, more preferably between about 0.8 and 1.0 percent and most preferably about 1.0 percent, is mixed with a suspension of therapeutic agent and the mixture is allowed to gel.

[0060] The flowable soft gel when used as a vaccine, has sufficient levels of the immunizing organisms to provide immunization to the flock. It has been found that for the method embodiments of the present invention about 15 to 50 ml of gel for every 100 birds is used, for chicken hatchlings, preferably about 20 to 30 ml, more preferably about 20 to 25 ml, most preferably about 25 ml of the gel while for turkey hatchlings, preferably about 20 to 40 ml, more preferably 25 to 35 ml, most preferably 35 ml. In a barn, the birds are larger and it has been found that for method embodiments of the present invention about 25 ml to 50 ml of gel for chicks, and 50 ml to 150 ml of gel for turkey poults, for every 100 birds is needed.

[0061] The use of the edible polysaccharide gels results in a gel which gels rapidly, generally at the completion of mixing, in about 5 minutes or less. This maintains any therapeutic agents such as vaccine organisms in uniform suspension and allows for more uniform exposure of the poultry to the therapeutic agents. Unlike suspension in water, the therapeutic agents in the soft gel, after preparation with a mixer can remain suspended without further agitation for up to 24 hours.

[0062] The low content of the edible gum in the soft gel means that preferably 95% by weight or more of the gel is water which, when used with or without therapeutic agents, can aid in the hydration of the bird and induce the feeding response. The soft gel has other properties compared with liquid suspensions in that the gel will not wet the bird as much and therefore will not affect the health of the birds, particularly in winter when, if the bird becomes wet through exposure to aqueous solution, the exposure may cause death of the bird, particularly hatchlings.

[0063] The therapeutic agent utilized with the flowable soft gel administered using the delivery device embodiments of the present invention may be one or more of vitamins, minerals, vaccines, competitive exclusion products, etc. The flowable soft gel of the present invention is particularly useful for administration of live organisms, such as those used in competition exclusion products or vaccines. Competitive exclusion products are probiotics, for example, such as Lactobacillus acidophilus, which are utilized to populate the gut of the poultry and help minimize the potential infection of the poultry with pathogenic organisms, such as Salmonella, Clostridia, etc. One example of such a competitive exclusion product is sold by Orion Corp., Finland under the tradename Broilact™.

[0064] In a preferred embodiment, the delivery device embodiments of the invention are used to administer therapeutic agents suspended in the soft gel, particularly viral vaccines to poultry in the barn.

Examples of therapeutic agents in a soft gel which may be delivered using the delivery device embodiments of the invention include live vaccines that are used to immunize poultry including viral vaccines such as Hemorrhagic Enteritis Virus (HE), Infectious Bursal Disease Virus (IBD) and Newcastle Disease Virus (ND). Such vaccines are, at present, comprised of an attenuated strain of the virus in a suitable carrier for administration. Other vaccines for delivery in a soft gel include Salmonella, Infectious Bronchitis, Infectious Laryngotracheitis, mycoplasma sp., Pneumoviruses and coccidiosis. The soft gel can also be used to deliver therapeutic agents such as probiotics, lactobacillus or bacillus species, competitive exclusion products such as Broilact, vitamins, minerals, electrolytes or water. In one embodiment, any organisms added to the soft gel must be live organisms. One can also use the delivery device embodiments to wet the floor with soft gel for coccidial oocyst sporulation purposes, where the therapeutic agent is water.

[0065] The use of the edible polysaccharide gel which gels rapidly is also suitable for adding nitrogen nutrients and other additives such as vitamins to the flowable soft gel. This is especially useful with heat sensitive nutrients which, if exposed to temperatures over about 50 °C, are denatured or inactivated.

[0066] The amount of the therapeutic agent utilized in the flowable soft gel is adjusted to provide for the optimum therapeutic dose to the poultry based upon the

amount of gel being delivered to the poultry. It has been found that typically each hatchling will ingest between about 0.15 and 0.5 ml of gel within about 5 minutes and the concentration of the therapeutic agent is adjusted to provide the optimum therapeutic dose in this volume of gel. It has been found that typically each larger bird in a barn, such as chicks and turkey poults, will ingest between about 0.25 and 1.5 ml of gel within about 5 minutes and the concentration of the therapeutic agent is adjusted to provide the optimum therapeutic dose in this volume of gel.

[0067] The rapid uptake of the therapeutic agents in 5 minutes or less allows the barn administration to be accomplished in as short as a couple of hours: one hour of water starvation each before and after the administration of the therapeutic agents instead of the 24 hours or more sometimes required by the prior art method of water administration.

[0068] The amount of the polysaccharide gelling agent is selected to form a flowable soft gel. If too much gelling agent is used the gel is not easily flowable and thus is difficult to pump through the delivery system.

[0069] If too little gelling agent is used the gel form may not maintain any therapeutic agent contained in the gel such as immunizing organisms in a relatively uniform suspension. In addition, too little gelling agent may also not trap the moisture properly and may allow the water to escape, which can result in reduced viability

of the immunizing organisms as well as causing wetting of the birds.

[0070] The embodiments of the present invention can be used in place of drinking water vaccinations. The Applicant's device is intended for oral administration, not respiratory administration, and therefore, does not replace vaccines that are administered through fogging. There is no oral live viral vaccine that cannot be used in the delivery system embodiments of the present invention. For example, viral vaccines that can be used in the delivery system embodiments of the present invention include Hemorrhagic Enteritis Virus (HE), Infectious Bursal Disease Virus (IBD) and Newcastle Disease Virus (ND).

[0071] The delivery device embodiments of the present invention deliver a more uniform exposure of immune inducing organisms because the system is portable and intended to move with the person delivering the vaccine. The person can move with the delivery system to where the birds are and administer the vaccine directly to the birds. At least a portion of the delivery system is intended to be hand-held and administration is done by hand.

[0072] One embodiment of the delivery apparatus (device) of the present invention is used as follows. First a user should manually actuate the pump with one hand to release the soft gel from the reservoir. Then the user should squeeze the trigger on the hand held dispenser with the other hand to allow the soft gel to flow into the spacer and to the header nozzle arrangement. Then

as the soft gel droplets are flowing through the small tubings along the header, the user should swing the header from side to side. The reservoir is preferably in a backpack, worn by the user, such as a garden backpack sprayer. Backpack sprayers can be manually operated or may use a motorized pump, such as a diaphragm pump. A backpack sprayer is a convenient way for one to apply the soft gel in the barn, with the header nozzle arrangement embodiment. One can hold from about three to six gallons of soft gel in the backpack, making it easier than carrying around a 30 lbs. tank.

[0073] The delivery system embodiments of the present invention can easily be used in a hatchery and may be particularly useful to avoid having to use and maintain a conveyor belt system to administer vaccines in the hatchery.

[0074] All documents referred to in this application are hereby incorporated by reference in their entirety.

[0075] The following examples are utilized to illustrate preferred embodiments of the present invention but are not to be construed as limiting the scope of the invention to the specific examples.

Example 1

[0076] The parts of the dispensing apparatus embodiments of the present invention include a reservoir, a pump, and a header with a nozzle arrangement. The apparatus may also include a spacer to lower the header closer to the birds. The apparatus may comprise hoses or tubes to

connect various parts. The reservoir is preferably a backpack sprayer, such as a garden backpack sprayer.

[0077] A first embodiment of a delivery apparatus of the present invention is illustrated in the figures generally indicated by the numeral 10. The apparatus 10 has a header 14 having a plurality of nozzle openings 12 (such as small tubings) along the length of the header 14 to enable spraying (dispensing) of the gel onto poultry on a barn floor, in cages or poultry on the ground on a free range farm. The delivery apparatus 10 has a pump 18 to enable the flowable soft gel to be pumped through tubing 22 and dispensed onto the poultry on the barn floor through the nozzle openings 12 located in the header 14. The pump 18 is preferably a pump from a backpack sprayer. The tubing 22 from the connector 26 is connected to an outlet of a pump 18 and the inlet of the pump is connected to a container or reservoir 20 containing the flowable soft gel. The trigger 24, may be connected to the header 14 (Figure 1), or the trigger 24 may be connected to a spacer 28 (Figure 2), which spacer 28 is connected to the header 14. A connector 26, is similarly connected to the header 14 (Figure 1), or the connector 26 can be connected to a spacer 28 (Figure 2), which spacer 28 is connected to the header 14. The connector 26 and trigger 24 can together serve as a handle.

Figures 3 and 4 show a cross section of a hand held dispenser having a header 14 connected to a connector 26 and the connector 26 together with the trigger 24 form a type of handle. A drawing and photograph of the

hand held dispenser wherein the connector 26 and trigger 24 are being held by hand is found in Figures 6A and 6B. The connector 26 connects the header 14 to the pump 18, such as by a tube 22.

[0078] Figures 2, 4, 5A, 5B, 6A and 6B also show a spacer 28, which lowers the header 14 to be closer to the birds. One embodiment of the delivery apparatus looks like an invisible dog walking device, when it includes a spacer 28.

[0079] Figures 1 and 2 show a reservoir 20, which is the preferred backpack reservoir, such that a user can wear the reservoir 20 on his back and direct the motion of the hand held dispenser containing the header 14 by hand with a swinging motion while walking through the flock to try to cover each bird with beadlets once and can deliver the soft gel by actuating the dispenser trigger 24 by hand. The user should dispense the soft gel while swinging the hand held dispenser containing the header 14 in a substantially horizontal direction side to side while walking through the flock and holding the hand held dispenser over the poultry in order to uniformly dispense the soft gel beadlets onto the poultry beside and below him. In this manner, the droplets or beadlets form a semi circle type of spray pattern below, encircling the user.

[0080] The size and spacing of the nozzle openings or tubings of the header is selected to produce a pattern of small beadlets of the soft gel. It has been determined that a header containing 30 to 40 nozzle openings along the length of the header are preferred. Most preferred is

a header which is a manifold containing 33 or 34 nozzle openings along the length of the header or manifold. Practically, a header having 12 to 50 nozzle openings or tubings will work. A header with 10 to 100 nozzle openings or tubings will also work, however, any tubing number that is not within the preferred range may either not deliver enough droplets to be practical at the lower range, or else if there are too many tubings, the header may be too heavy to handle. However, it may be possible to design the header with lighter materials to overcome the weight difficulties. The spacing between the nozzle openings along the length of the header is spaced 0.25 cm to 1.5 cm apart, more preferably spaced 0.5 cm to 1 cm apart, and most preferably spaced 1 cm apart. A single row of nozzle openings or tubings along the length of the header is effective to cover the whole flock of birds with sufficient beadlets with one passing over each part of the flock. It is possible to use multiple rows, however, this would waste material. Preferably, to allow for delivery of small beadlets of gel, the inner diameter of the nozzle openings or small tubings is preferably 0.5 mm to 1.5 mm, more preferably about 0.8 mm to 1 mm and most preferably about 0.8 mm. A diameter of 0.8 mm will deliver droplets or beadlets ranging usually from 20 to 50 microlitres. It is preferred to have beadlet sizes of 20 to 50 microlitres because smaller sizes are less visible to the bird and therefore less likely to be eaten, and sizes larger than 50 microlitres can easily fall off of the birds' feathers onto the floor. It has been found that providing the nozzles as small tubings (small tubes)

extending slightly into the header, helps in the dispensing of the soft gel as beadlets and reduces the liklihood of the gel dripping from the nozzles when the pump is not operating. The device can use plastic tubing for the header with small metal tubings (see Figures 5A, 5B, 6A and 6B). This plastic header with metal tubings embodiment works well, and works better than the metal header tubing with little metal tubings. The metal header tubing with little metal tubings was used in the hatchery method described in WO 2005/099617, and the manifold described in that hatchery method can also be used in embodiments of the present device as well. The header or manifold can be a square rod or a round rod. Other shapes for the header are also possible, as long as the header serves the same function as described herein.

[0081] A spacer tubing can move the header to a closer distance to the birds, otherwise the beadlets or droplets falling from the header at a higher height, just like any liquid when falling from a greater height, tend to splash when they hit a solid surface. Beadlets falling from a higher height have a greater velocity and tend to splash off of the birds' feathers onto the floor. The spacer tubing, by moving the header closer to the birds, provides a gentler deposition of the beadlets onto the birds' feathers, and the beadlets are more likely to stick to those feathers and thus the spacer tubing increases the availability of the beadlets and its contents to the birds' for their consumption. Therefore, any

therapeutic agent contents of the beadlets also have greater availability when the spacer tubing is used.

[0082] In a preferred embodiment, the spacer tubing should lower the header, so that the device is only about 5-10 cm above the backs of the birds. The spacer tubing lowers the header to as close to the backs of the birds as possible, to avoid splashing of the soft gel. The length of the spacer tubing chosen for use will vary according to the height of the poultry backs and the height of the user.

[0083] In another embodiment, a handle can be connected to the header 14 at any point along the header 14, for example, at the centre of the header 14 or at the soft gel inlet of the header 14 where the connector 26 is attached. A handle can be continuous with the header 14, or it can be a separate part. In a preferred embodiment, the apparatus has a handle. A handle facilitates gripping of the apparatus so that the user can have control over the movement of the header, to better dispense gel beadlets onto the poultry uniformly.

[0084] A "dispenser" is an apparatus or a portion of an apparatus for dispensing a volume of soft gel. Preferably, a dispenser dispenses a predetermined volume of soft gel. A predetermined volume signifies predetermined doses.

[0085] A "header" is a portion of an apparatus that is the tube or chamber that holds the soft gel immediately

before it passes through the nozzle openings or tubings as droplets.

[0086] A "pump" as described herein, includes a manual pump, actuated by hand, and an automated pump, such as a diaphragm pump. In a preferred embodiment, the pump is a manual pump that is actuated by hand, such as a pump with a handle for actuation.

[0087] In one embodiment, the pump causes the soft gel to be dispensed through the header and the nozzle openings as soft gel beadlets.

[0088] In another embodiment, actuation of the pump causes the soft gel to be dispensed towards the header, but the soft gel beadlets are not dispensed until a trigger is actuated.

[0089] A "trigger" can include a hand actuated trigger, which includes a manual trigger that can be squeezed or an electronic trigger, such as a button on an automated electronic dispenser. Actuation of the trigger causes the soft gel to be dispensed through the header and the nozzle openings as soft gel beadlets. A "trigger" can also include a solenoid electronic eye which detects motion and dispenses soft gel when it detects motion.

[0090] EXAMPLE 2

[0091] **FIGURE 7A** and **7B** are a drawing and a photograph, respectively, showing the distribution pattern of the soft gel droplets 50 formed when the soft gel is passed

through an embodiment of the dispensing apparatus of the present invention onto chicken.

[0092] **FIGURE 8A** and **8B** are a drawing and a photograph, respectively showing the distribution pattern of the soft gel droplets 50 formed when the soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto chicken.

[0093] **FIGURE 9A** and **9B** are a drawing and a photograph, respectively, showing the distribution pattern of the soft gel droplets 50 formed when the soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto a piece of cardboard.

[0094] **Figure 10A** and **10B** are a drawing and a photograph respectively, showing the distribution pattern of the soft gel droplets 50 formed when the soft gel is passed through an embodiment of the dispensing apparatus of the present invention onto chicken.

[0095] EXAMPLE 3

[0096] NEWCASTLE DISEASE GEL DROPLETS VACCINATION

[0097] A hand sprayer device (dispensing apparatus) embodiment of the invention was used to administer soft gel droplets containing Newcastle Disease vaccine.

[0098] **Experimental chickens.** Broiler chicks were hatched in our laboratory from SPF eggs obtained from Sunrise Farm Inc. and was used throughout the experiments. These

chicks were placed in single-use cardboard boxes and housed in a disinfected isolated quarter. Feed and water were supplied *ad libitum*. At day 9, 25 chicks were divided into three groups. Two groups of 10 chickens were either vaccinated by water or by gel droplets method. Five chicks served as unvaccinated controls.

[0099] **The gel diluent.** The Gel-sprayed vaccines (gel droplet method) were delivered with 1.3% of the Water diluent of Vetech Laboratories Inc. to which 0.1% of Xanthan gum was added. Red food color was added to the mixture as an indicator for vaccine take. The gel was made with a water diluent reconstituted from a dry powder mixture containing 20-30%w/w carrageenan (lambda carrageenan), 60-70% maltodextrin, 2-5% carboxymethyl cellulose and 2-6% xanthan gum (Water diluent of Vetech Laboratories Inc. to which xanthan gum was added, where the carrageenan is lambda carrageenan).

[00100] **NDV Vaccination:** Vaccine stabilizer was prepared by suspending 3 g/ litre of skim milk powder in distilled water (Bermudez and Stewart-Brown, 2003). The lyophilized 1000 doses NDV vaccine (B1 type, Fort Dodge) was first dissolved in 4 ml of the vaccine stabilizer, and 3 ml (750 doses) were added to 375 ml of the gel diluent (0.5 ml/ chicken). The remaining of the reconstituted vaccine (250 doses) was added to 2.5 litres of the stabilizer, and 10 ml/ chicken was used for the water vaccination and given in a gallon-jar drinker.

[00101] For Gel Curtain Droplets Vaccination (Gel-sprayed vaccines/Gel droplet method), a delivery device embodiment of the present invention, chickens were placed in a cardboard disposable box and sprayed from the top, and left to preen the sprayed vaccine. The reconstituted ND vaccine in the gel was delivered using a hand held dispenser with a header nozzle arrangement attached to it. For example, in this case the "RL-PROFLO" Backpack Sprayer was used with a hand held dispenser to form a dispensing apparatus embodiment of the invention. It has a capacity of 4 U.S. gallons.

[00102] Water was withdrawn from chickens of the two groups, for about 2 hours before vaccination.

[00103] **Blood sampling:** Blood samples were withdrawn from jugular vein using 1 ml syringes and sera were separated by centrifugation after incubation for 30-60 minutes at 37°C. Samples were collected at 3, 14 and 21 days post vaccination.

[00104] Sera were sent to the Animal Health Laboratory, University of Guelph, to test for the presence of antibody response to Newcastle Disease virus using the ELISA method.

Table 1. Detection of antibodies to Newcastle Disease vaccine (B1) delivered by gel droplets method in chicken sera by ELISA

Groups	**3 days PV***	**2 weeks PV**	**3 weeks PV**
Water drinker***	0/3 **	6/10	8/9
Gel droplets	0/3	8/10	9/10
Controls	0/3	1/5	1/5

- * post vaccination**Number positive/ Number tested. *** gallon-jar drinker

Table 2. Mean ELISA titres of the three vaccinated groups at different time post vaccination

Groups	**3 days PV***	**2 weeks PV**	**3 weeks PV**
Water drinker***	1	2141(3275**)	2946(3487)
Gel droplets	1	788(642)	2305(2346)
Controls	26	122(242)	159(311)

- * Post vaccination ** Standard deviation. *** gallon-jar drinker

[00105] These results show that a live Newcastle Disease vaccine could be successfully delivered by the Gel-Spray delivery device to chicks in the barn.

[00106] The flowable soft gel of the present invention allows for an easy to use system for treating poultry in a barn. In one embodiment, the treating of the poultry involves maintaining hydration of the poultry during holding and transport. In this embodiment, the soft gel would comprise the suitable gelling agent and water, with at least 90% of the weight of the gel being water, more preferably be at least 95% by weight and most preferably about 97-98% by weight.

[00107] In a preferred embodiment, the soft gel is used for administering therapeutic agents particularly to poultry in the barn. In particular, the flowable soft gel of the present invention is of most use when administering live organisms, such as found in competitive exclusion products and vaccines to the poultry. This is particularly the case where the live organisms are relatively large and are required to be maintained in suspension to allow for each of the birds to be exposed to the optimal immunizing dose of the organism.

[00108] The use of the flowable soft gel vaccine also allows for the preparation of multivalent vaccines containing more than one species within a vaccine, such as coccidiosis, and/or combinations of related vaccines, such as coccidiosis and Salmonella, and other poultry diseases can be combined, such as the respiratory diseases Newcastle disease virus and bronchitis. The vaccines can be given together simultaneously in the hatchery or together or separately in the barn using the device embodiments of the invention. The use of gel allows organisms of different sizes to be suspended uniformly, which result cannot be achieved using only water.

[00109] The method and soft gel vaccine of the present invention provides for an easy to use means of immunizing a large number of poultry by gel spraying the vaccine on the poultry in a barn, free range farm or hatchery.

[00110] Example 4: Multiple vaccinations within the first cycle

[00111] For a live vaccine to be able to control coccidiosis, the period of time before protective immunity takes hold, has to be shorter than the first appearance of disease after the parasites gain entry into the host. Otherwise, the vaccine itself is hazardous if the vaccine strains are virulent or unattenuated field strains. Conversely, all live vaccines of parasites capable of evoking protective immunity before the emergence of disease, should provide similar

immunological protection against the same constituent species or strains of parasites in the vaccines.

[00112] This principle is likely correct as evidenced by the fact that all commercial live coccidial vaccines work, including vaccines with field strains that were shown to be highly virulent or highly drug resistant to most anticoccidials.

[00113] In poultry, the number days required for protective immunity to emerge *is* the same or less than the number of days of the incubation period of disease. Poultry require about 9 days to complete a first cycling of coccidiosis, which will provide at least partial immunity, and coccidiosis does not appear as a disease until day 13 for turkeys, and day 14 for chicken. Therefore, poultry vaccinated against coccidiosis at day 1 are protected from challenges otherwise lethal to non-vaccinated birds by about day 9, well before the appearance of disease, around day 13 or day 14. Among the apicomplexan parasites, none are as lethal as coccidiosis. If the time for emergence of protective immunity is shorter than the incubation period of the disease, early immunization will be successful, no matter how virulent the organism.

[00114] Likely, the same principle can be extended not only to other Apicomplexan parasites but also to all diseases which exhibit the phenomenon of "infection immunity".

[00115] For example, malaria and *Leishmania major*.

[00116] Example 4 shows the second dose of coccidiosis vaccine can be given *before* the end of the first cycle resulting from the first dose of vaccine. This means that the second cycle, necessary to development of full immunity in poultry, can begin earlier than the end of the first cycle. This speeds up the development of immunity in the animal. This concept was tested in broiler chicken, as described in this Example.

[00117] Coccidiosis vaccination is typically given at Day 1 in the life of the poultry for economic reasons, and coccidia is typically recycled every 7 days, as the poultry pick up future doses of coccidia from the barn floor. With prior art methods, it was very difficult and costly to revaccinate after Day 1, because it would cost more to vaccinate in a barn. Delivery through the enclosed water lines in barns currently widely used in the industry is nearly impossible.

[00118] However, the delivery device embodiments of the present invention can be used to vaccinate in a barn at Day 2 or Day 3, which is both practical and cost effective. The Applicant has also tested revaccination against coccidiosis at Day 4.

[00119] Applicant has now tested vaccinating poultry at Day 1, Day 2 and Day 3 in the life of the poultry (see Table 3). If such vaccination schedule is combined with medication at Day 10, this will mitigate the effects of the vaccine. If waiting for two full cycles can be shortened to slightly more than a single cycle to protective immunity, this will provide better protection

for birds, close to complete protection for the whole population, in just about one week.

[00120] In the experiment (see Table 3), one group of poultry was vaccinated twice (Droplets) and one group of poultry was vaccinated three times (Droplets + Gavage).

[00121] The Droplets + Gavage (D+G) group of birds was able to achieve full immunity without having to face the high numbers of cocci faced in the natural recycling occurring in the barn, where birds pick up large numbers of cocci from feces on the barn floor. The D+G group was vaccinated with coccidiosis vaccine on Day 1, Day 2 and Day 3, that is, with three doses. On Day 1 the droplet vaccination method was used, which involves the use of the hatchery device described in the patent application published as WO 2005/099617, with water diluent, described above. This method is intended to allow the birds to achieve full immunization without adverse effects because the doses used are mild doses (which are the usual vaccine doses), which are much milder doses than they would face in the natural recycling in the barn. This method of vaccinating three times in the first cycle resulted in no mortality for the birds, and fewer lesions compared with a single vaccination against coccidiosis. Both vaccination groups had no mortality, whereas the control group had significant mortality.

[00122] In practice, the hatchery system, described in WO 2005/099617, or other coccidiosis vaccination systems designed for a hatchery could be used to vaccinate the hatchlings against coccidiosis at the hatchery on Day 1.

Poultry hatchlings are usually shipped to barns on Day 1, after vaccinations have been given. Once the birds are placed in the barn, then the dog walking device can be used to vaccinate the birds against coccidiosis on Day 2 and Day 3. Alternatively, all three doses, on Day 1, Day 2 and Day 3, could be given in the barn. In another embodiment, two doses could be used, for example, one dose on each of Day 1 in the hatchery and Day 2 in the barn. In yet another embodiment, two doses of coccidiosis vaccine can be given, one dose on each of Day 1 and Day 2 in the barn.

Table 3: Performance of broiler chickens vaccinated with coccidiosis vaccine (*IMMUCOX*© II) starting at day old and challenged at:

[B] **9 days of age**

Treatment Groups	No. Dead birds/total (% Mort.)	Averaged lesion scores[C]		Averaged body weight (g)		
		Duodenal	Cecal	Day 0 PC	Day 6 PC	Change %
Control	7/20 (35%)	3.3[a]	3.34[a]	91.65	106.7[D]	16.4[a]
Droplets	0/20	2.15[b]	2.61[b]	90.95	101.2	11.3[b]
Droplets + gavage[A]	0/20	2.0[c]	1.98[c]	90.2	107	18.6[a]

[B]12 days of age - (Controls and Droplets not done)

Treatment Groups	No. Dead birds/total (% Mort.)	Averaged lesion scores[C]		Averaged body weight (g)		
		Duodenal	Cecal	Day 0 PC	Day 6 PC	Change %
Droplets + gavage[A]	0/20	1.71	1.61	108.95	140.25	28.7

[B]14 days of age

Treatment Groups	No. Dead birds/total (% Mort.)	Averaged lesion scores[C]		Averaged body weight (g)		
		Duodenal	Cecal	Day 0 PC	Day 6 PC	Change %
Control	2/20 (10%)	2.78[a]	3.04[a]	145.85	162.3 [E]	11.3[a]
Droplets	0/19	1.32[b]	1.58[b]	118.1	159.7	35.2[b]
Droplets + gavage[A]	0/18	1.17[b]	1.51[b]	119.8	164.0	37.2[b]

[A] Gavaged with 50µl/bird on day 1 and day 2 of age
[B] Challenged with a culture of *Eimeria acervulina* at 2.5 x 10^5/bird and *E. tenella* at 5 x 10^4/bird
[C] Scored from 0 to 4, with 0 as normal and 4 as maximum lesion, on birds 6 days post challenge (PC) except dead bird at 5 days PC
[D] Averages of 14 birds (1 dead) at 6 days PC and 6 birds at 5 days PC
[E] Both dead birds died on day 6 PC.
[a,b,c] : Values with different lower case letters are significantly different to a probability level of $P < 0.05$.

[00123] The first dose of coccidiosis vaccine is ideally given within the hatchery on day 1 in the life of a flock of poultry. Poultry are generally shipped to barns on day 1.

[00124] When the birds are first placed in the barn, they are kept either within brooder rings or smaller closed off areas of the barn, where the poultry are kept closer together for about the first 7 days. The temperature in the barn must be kept high initially in order to keep the young birds from being chilled, and either the brooder ring or half a house brooding area used are meant to conserve energy. The birds are kept close together within the brooder period, which facilitates uniform distribution of therapeutic agents through the dog walking device. Once the birds are opened to the whole barn, there is more space between them and much more space for them to disperse throughout the barn,

making it more difficult for the user to dispense therapeutic agents through the dog walking device.

[00125] Therefore, therapeutic agents should ideally be dispensed to poultry within the barn during the brooding period when they are confined, which is during the first 7 days. As a result, any doses of coccidiosis vaccine should ideally be given once, twice or three times on separate days on and including day 1 to day 7 of age of the poultry flock.

[00126] For other diseases, if the optimal time for dispensing the therapeutic agent is outside of the first 7 days, the device embodiments of the present invention can still be used, however, the dispensing of the therapeutic agent will not be as uniform as in the first 7 days.

[00127] Farmers do not usually vaccinate unhealthy birds. If a bird is unhealthy, vaccination is usually not advised, instead medication is recommended. However, some birds are grandparents and are very valuable: worth about $30 each. Many times, when they arrive from elsewhere, as there are only a few sources in the world, the grandparents become sick with *E. coli* and other diseases, or react to other vaccinations such as the New Castle disease vaccination, or they have other problems. When they come to Canada and when vaccinated with Immucox (coccidiosis vaccine), the birds cannot tolerate the vaccination because they are sick already, so the farmers lose some of the birds due to coccidiosis. However, farmers have to vaccinate because one cannot

afford not to vaccinate against coccidiosis for long term health.

[00128] The purpose of this method of multiple vaccinations during the first cycle is to achieve immune protection a few days earlier, instead of requiring two weeks. In this way, when the birds face recycled oocysts in the barn, they will have better immunity and will not succumb as often. It is a method particularly for protecting unhealthy birds, particularly high value birds. This method is not practical for all birds because it is too expensive. Breeders cost $2-4 each. It could be practical for breeder farms to use two or three doses, for example on the basis of better survival.

[00129] Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

Having thus described the invention, what is claimed as new and secured by Letters Patent is:

1. A hand held dispenser adapted to be coupled to a pump for dispensing a predetermined volume of flowable soft gel under pressure wherein the pump is connected to a reservoir for containing the flowable soft gel, the flowable soft gel having a therapeutic agent dissolved or suspended therein, to form a portable apparatus for dispensing the flowable soft gel onto a flock of poultry, the hand held dispenser comprising:

a header provided with a plurality of nozzle openings of approximately uniform size and of approximately uniform spacing therebetween and wherein the approximately uniform size permits the flowable soft gel to pass therethrough and thereby be dispersed in the form of small beadlets when the flowable soft gel is placed under pressure.

2. A hand held dispenser according to claim 1 further comprising a spacer tubing, wherein a flowable soft gel outlet end of the spacer tubing is connected to the header and a flowable soft gel inlet end of the spacer tubing is adapted to be coupled to the pump.

3. A hand held dispenser according to claim 2 wherein the nozzle openings are small tubings.

4. A hand held dispenser according to claim 3 wherein the hand held dispenser further comprises a trigger that when actuated, allows dispensing of the flowable soft gel.

5. A hand held dispenser according to claim 4 wherein the header is provided with at least 10 nozzle openings spaced apart about 0.25 cm to 1.5 cm along the length of the header.

6. A hand held dispenser according to claim 5 further comprising a connector, wherein a flowable soft gel outlet end of the connector is connected to the flowable soft gel inlet end of the spacer tubing and a flowable soft gel inlet end of the connector is adapted to be coupled to the pump, and wherein the connector and the trigger together serve as a handle.

7. A portable dispensing apparatus for dispensing a flowable soft gel onto a flock of poultry, the apparatus comprising:

i) a hand held dispenser comprising a header provided with a plurality of nozzle openings of approximately uniform size and of approximately uniform spacing therebetween and wherein the approximately uniform size permits the flowable soft gel to pass therethrough and thereby be dispersed in the form of small beadlets when the flowable soft gel is placed under pressure,

ii) a pump, and

iii) a reservoir,

wherein the hand held dispenser is connected to the pump and the pump is for dispensing a predetermined volume of the flowable soft gel under pressure, and

wherein the pump is connected to the reservoir and the reservoir is for containing the flowable soft gel, the flowable soft gel having a therapeutic agent dissolved or suspended therein.

8. A dispensing apparatus according to claim 7 wherein the hand held dispenser further comprises a spacer tubing, wherein a flowable soft gel outlet end of the spacer tubing is connected to the header and a flowable soft gel inlet end of the spacer tubing is adapted to be coupled to the pump.

9. A dispensing apparatus according to claim 8 wherein the nozzle openings are small tubings.

10. A dispensing apparatus according to claim 9 wherein the hand held dispenser further comprises a trigger that when actuated, allows dispensing of the flowable soft gel.

11. A dispensing apparatus according to claim 10 wherein the header is provided with at least 10 nozzle openings spaced apart about 0.25 cm to 1.5 cm along the length of the header.

12. A dispensing apparatus according to claim 11 wherein the reservoir is in a backpack.

13. A dispensing apparatus according to claim 12 further comprising a connector wherein a flowable soft gel outlet end of the connector is connected to the flowable soft gel inlet end of the spacer tubing and a flowable soft gel inlet end of the connector is adapted to be coupled to the pump, and wherein the connector and the trigger together serve as a handle.

14. A method of treating a flock of poultry, the method comprising:

providing a flowable soft gel capable of being dispensed through a nozzle opening, the flowable soft gel having a therapeutic agent dissolved or suspended therein,

providing a portable dispensing apparatus having a pump for delivering a predetermined volume of the flowable soft gel as a plurality of small beadlets through a plurality of nozzle openings of approximately uniform size arranged with approximately uniform spacing therebetween on a header on a hand held dispenser,

dispensing the predetermined volume of the flowable soft gel as small beadlets onto the poultry while swinging the hand held dispenser along a substantially horizontal plane from one side of the user to the other side of the user and above the poultry while walking through the flock, and

allowing the poultry to consume the beadlets.

15. A method according to claim 14 wherein the apparatus further comprises a spacer tubing, wherein the spacer tubing lowers the header closer to the backs of the poultry.

16. A method according to claim 15 wherein the nozzle openings are small tubings.

17. A method according to claim 16 wherein the flowable soft gel contains a therapeutic agent which is a therapeutically effective amount of at least one therapeutic agent selected from the group consisting of

a) a live organism selected from the group consisting of Hemorrhagic Enteritis Virus (HE), Infectious Bursal Disease Virus (IBD), Newcastle Disease Virus (ND), Salmonella, Infectious Bronchitis, Infectious Laryngotracheitis, mycoplasma sp., a Pneumovirus, coccidiosis, and a competitive exclusion product, such as probiotics, lactobacillus or bacillus species,

b) vitamins,
c) minerals,
and
d) electrolytes.

18. A method according to claim 17 wherein the live organism is Infectious Bursal Disease Virus (IBD).

19. A method according to claim 17 wherein the predetermined volume of the flowable soft gel is between about 0.15 ml and about 0.5 ml per hatchling in the hatchery or in the chick trays before the hatchlings are dumped onto the floor of the barn and about 0.25 ml and about 1.5 ml per chick or turkey poult in the barn.

20. A method according to claim 15 wherein the spacer tubing lowers the header to allow a user to hold the apparatus about 5 cm to 10 cm above the backs of the poultry.

21. A method according to claim 17 wherein the therapeutic agent is the live organism coccidiosis and wherein the method is used in a barn on at least two different days selected from day 1, day 2, day 3, day 4, day 5, day 6 and day 7 of age of the flock of poultry.

22. A method according to claim 17 wherein the flock of poultry were administered a coccidiosis vaccine in a hatchery at day 1 of age of the flock of poultry, wherein the therapeutic agent is the live organism coccidiosis and wherein the method is used in a barn on at least one day selected from day 2, day 3, day 4, day 5, day 6 and day 7 of age of the flock of poultry.

23. An invention according to the attached document and figures.

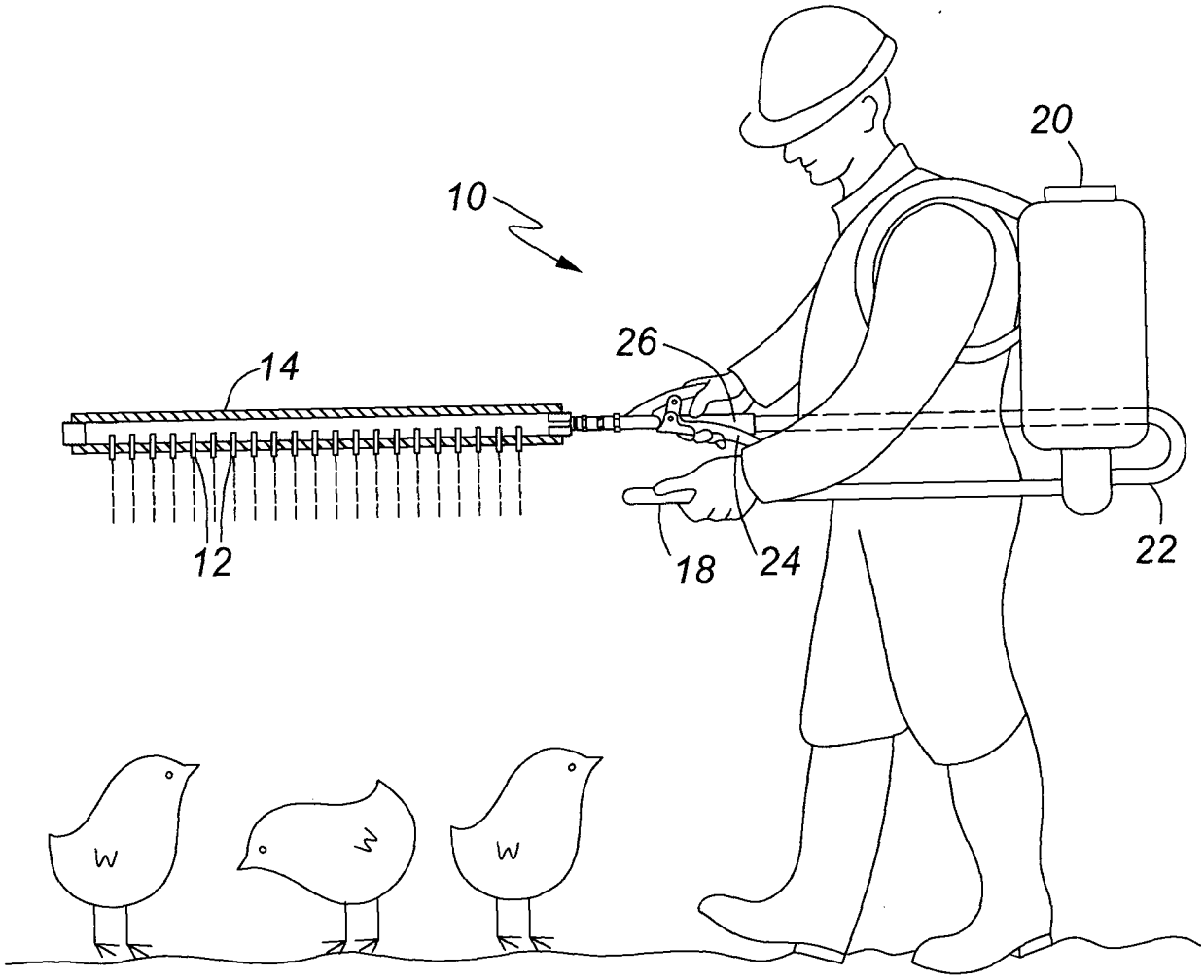

FIG. 1

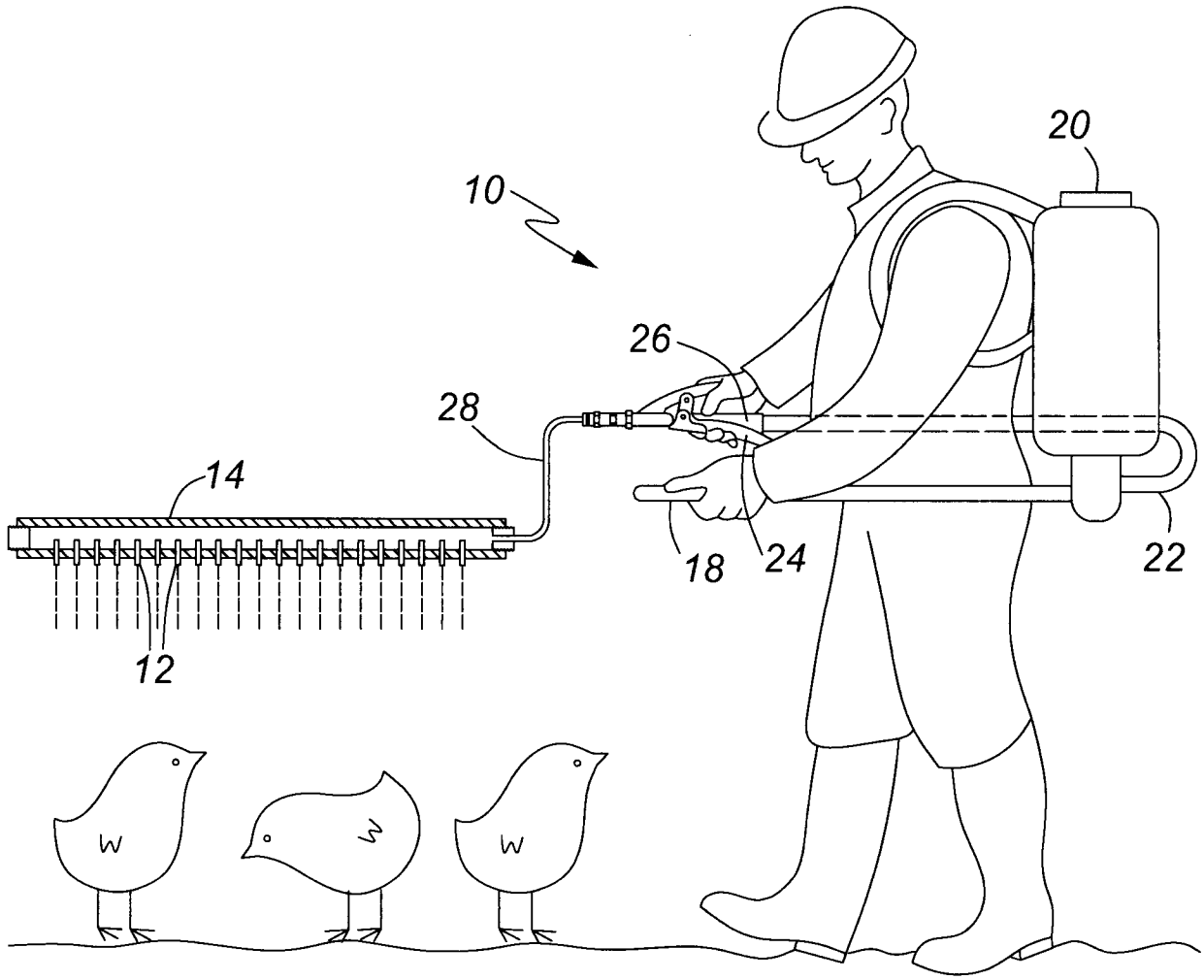

FIG. 2

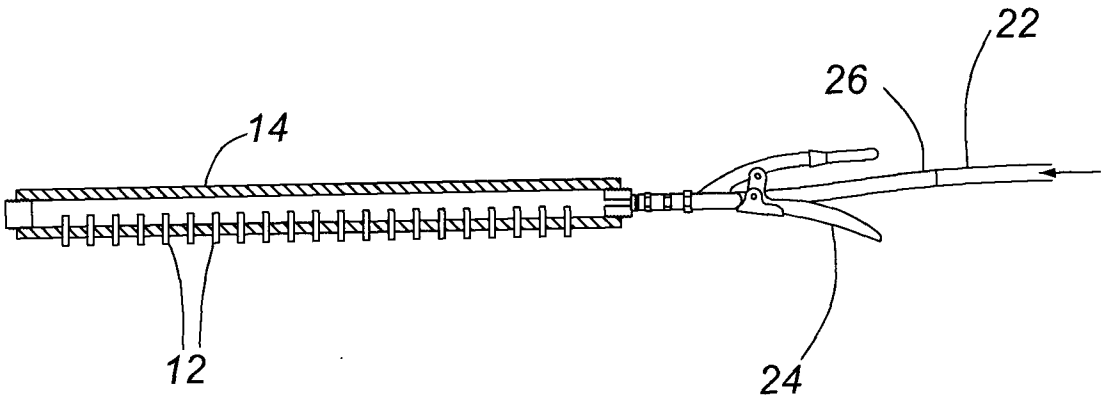

FIG. 3

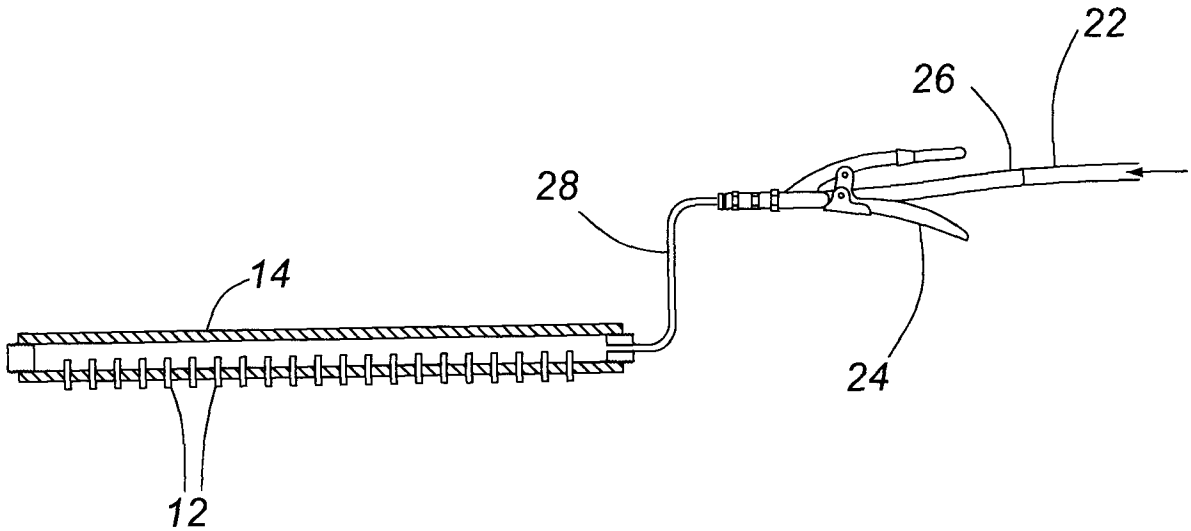

FIG. 4

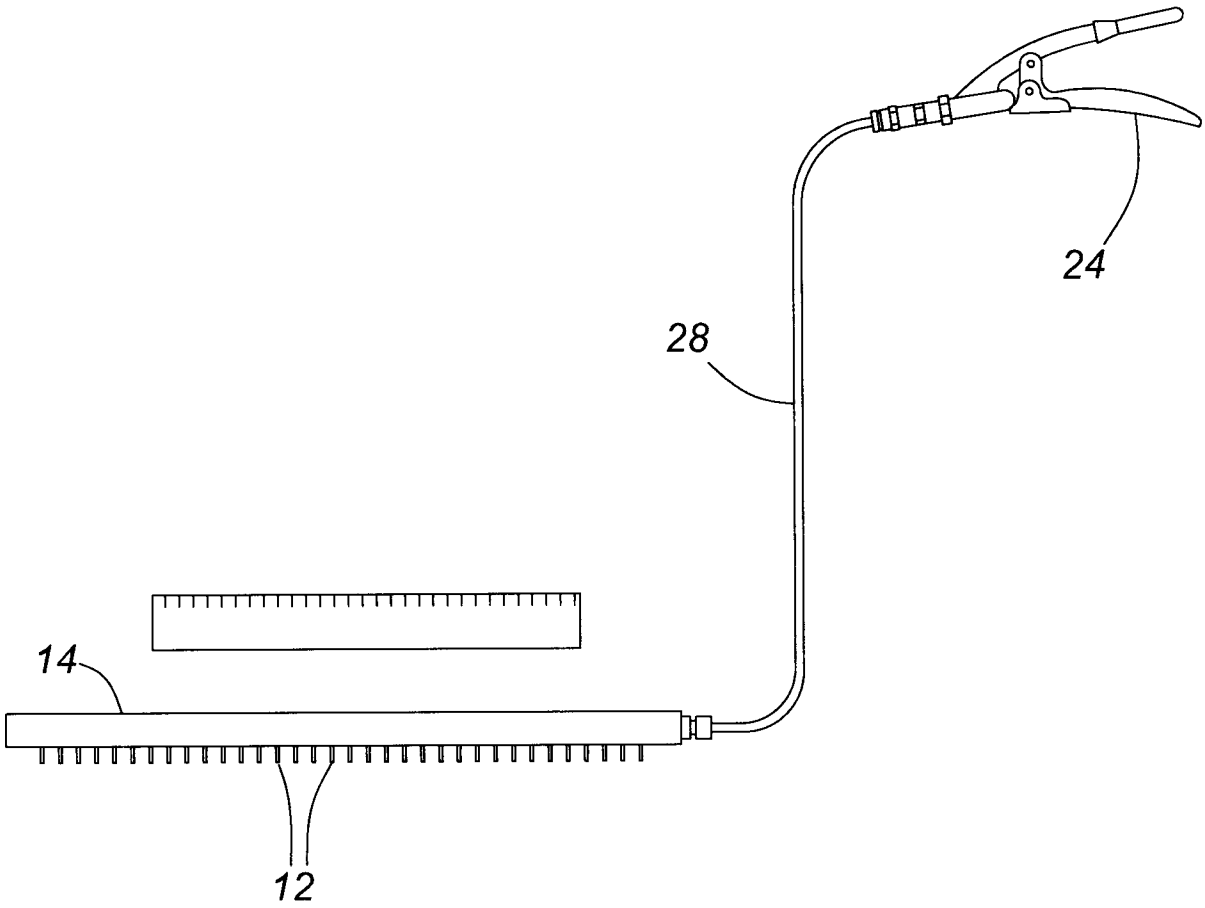

FIG. 5A

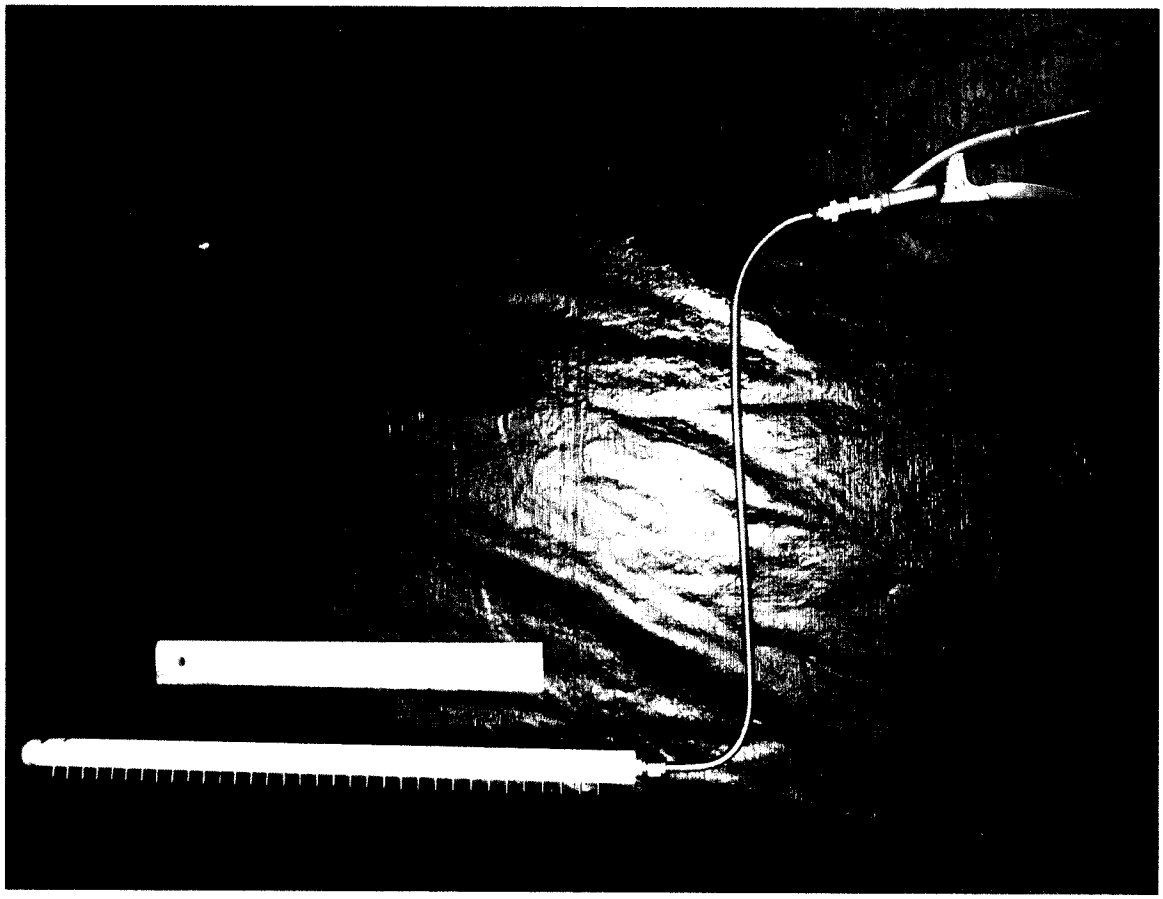

FIG. 5B

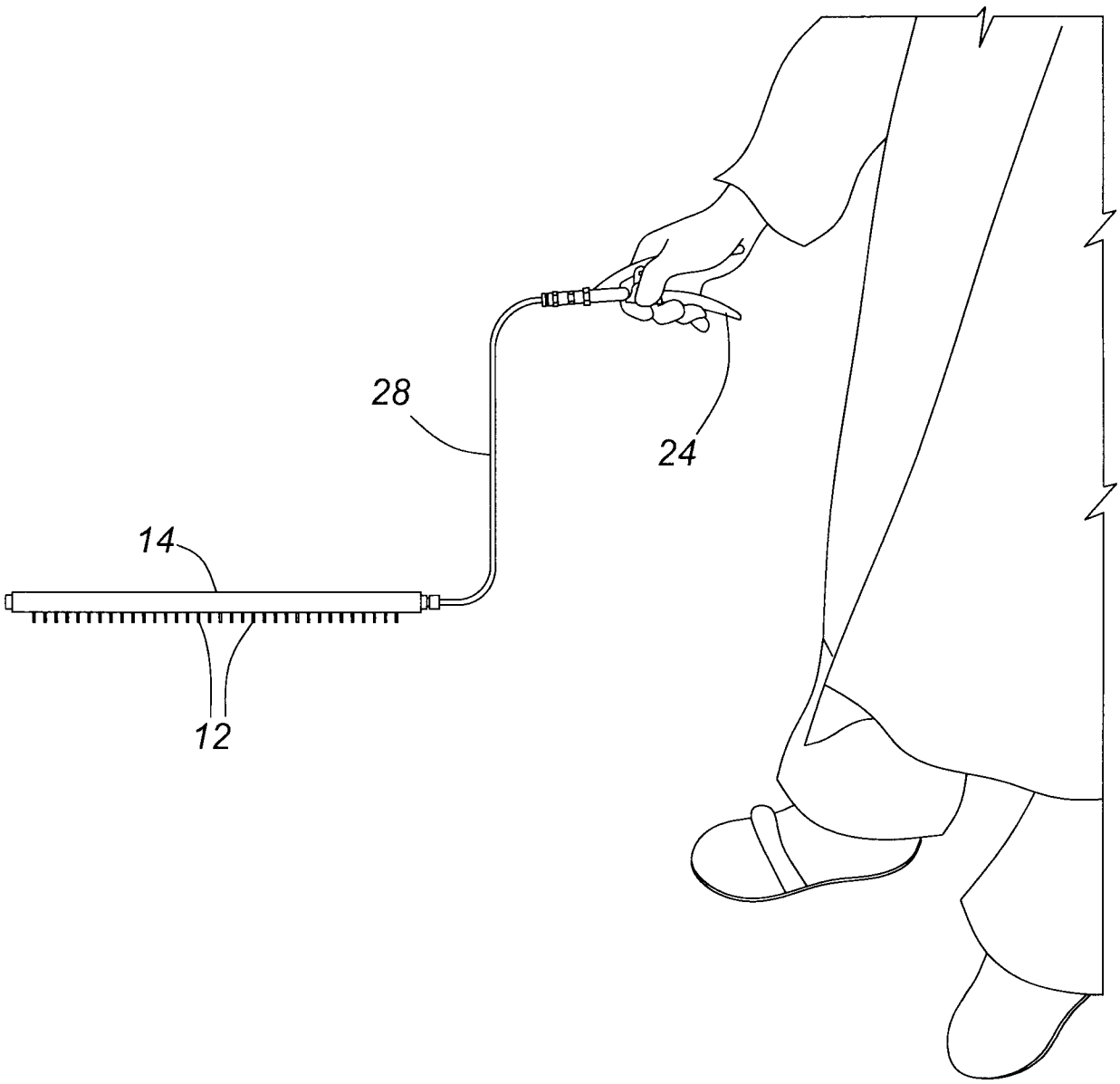

FIG. 6A

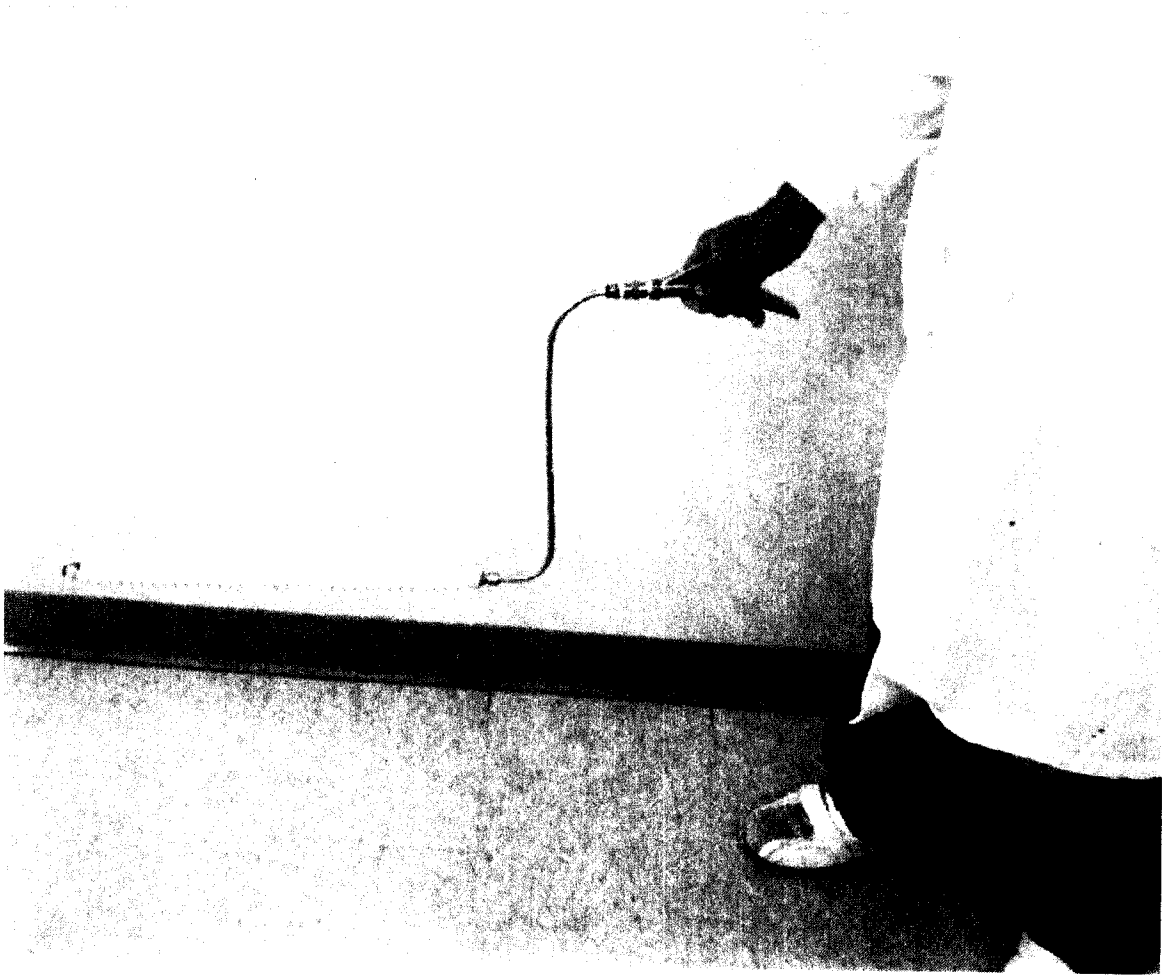

FIG. 6B

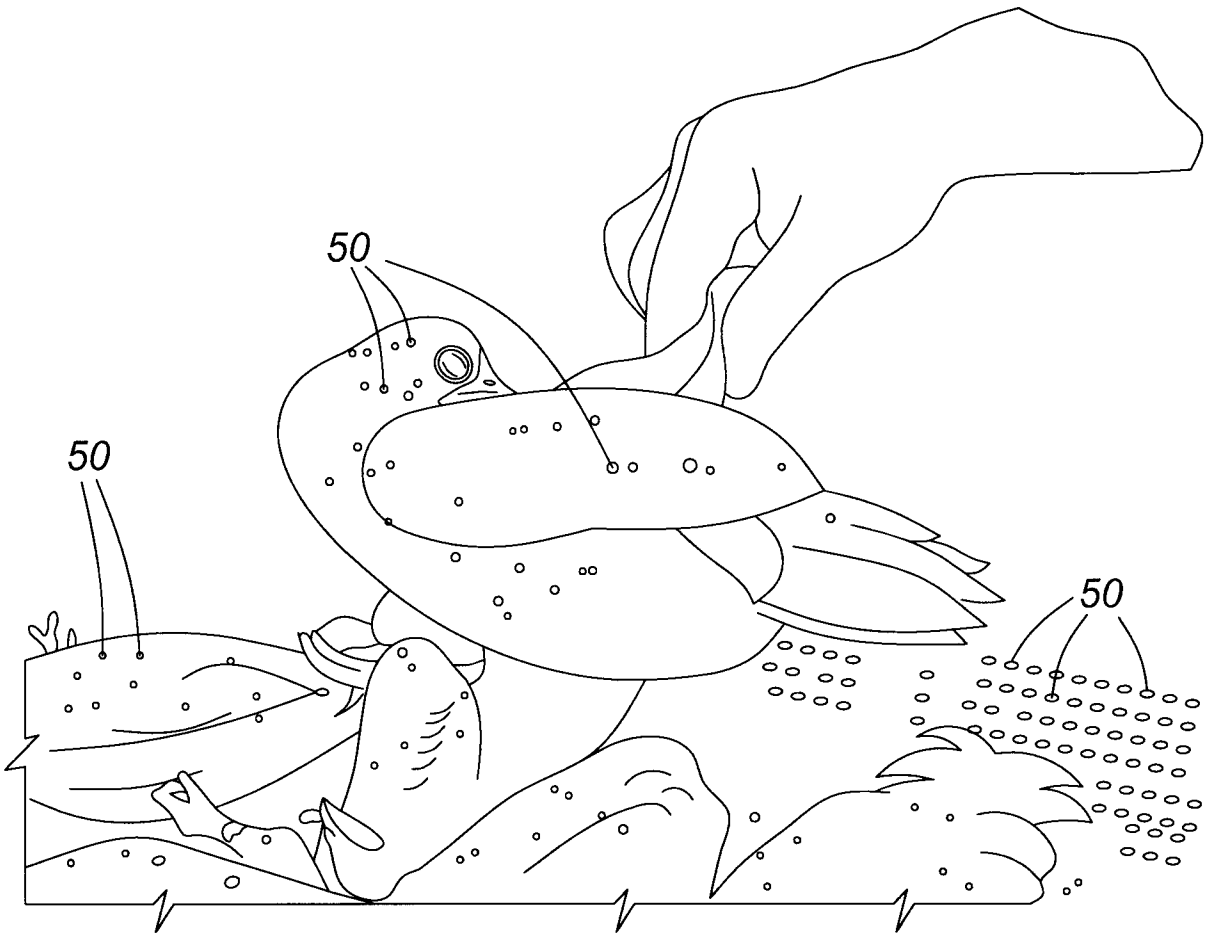

FIG. 7A

FIG. 7B

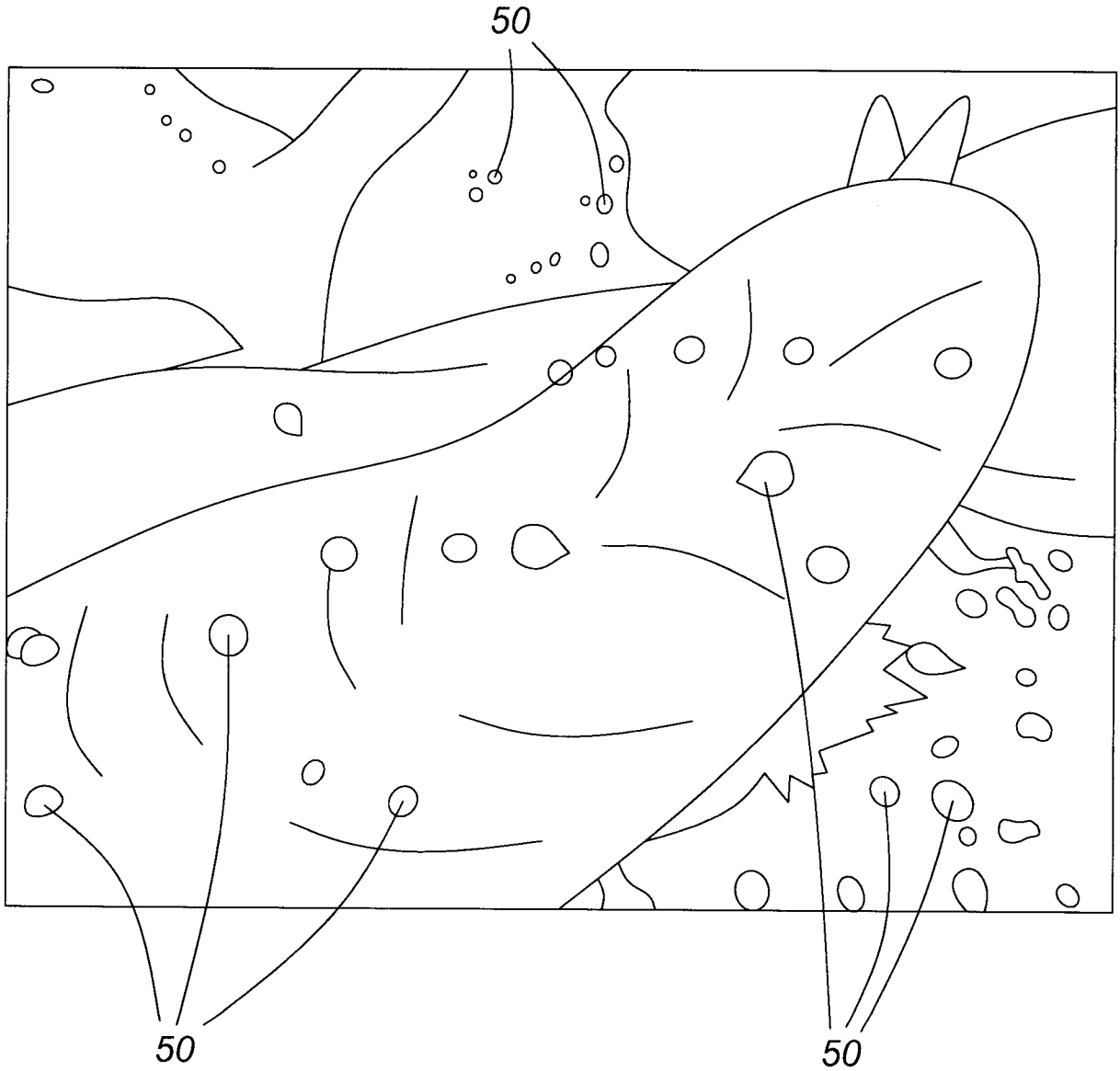

FIG. 8A

FIG. 8B

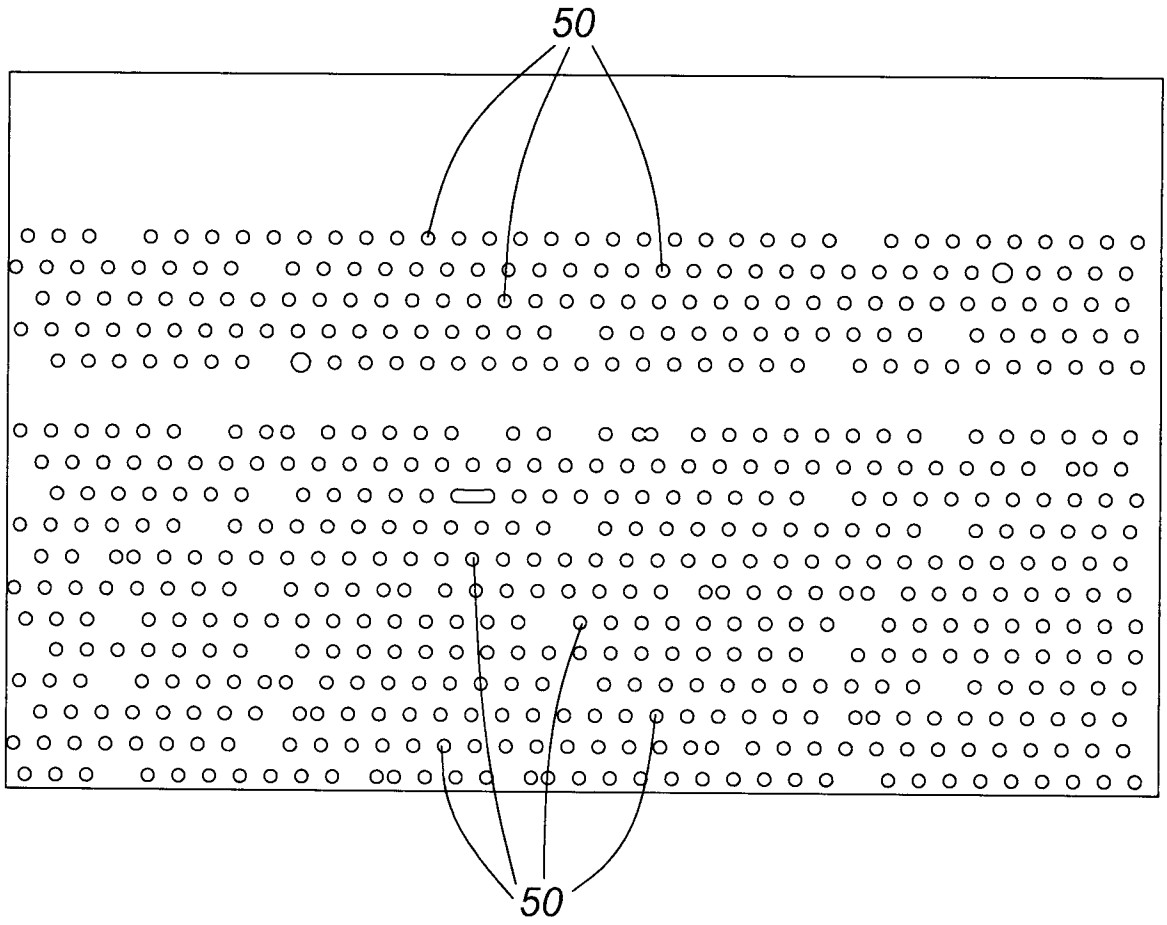

FIG. 9A

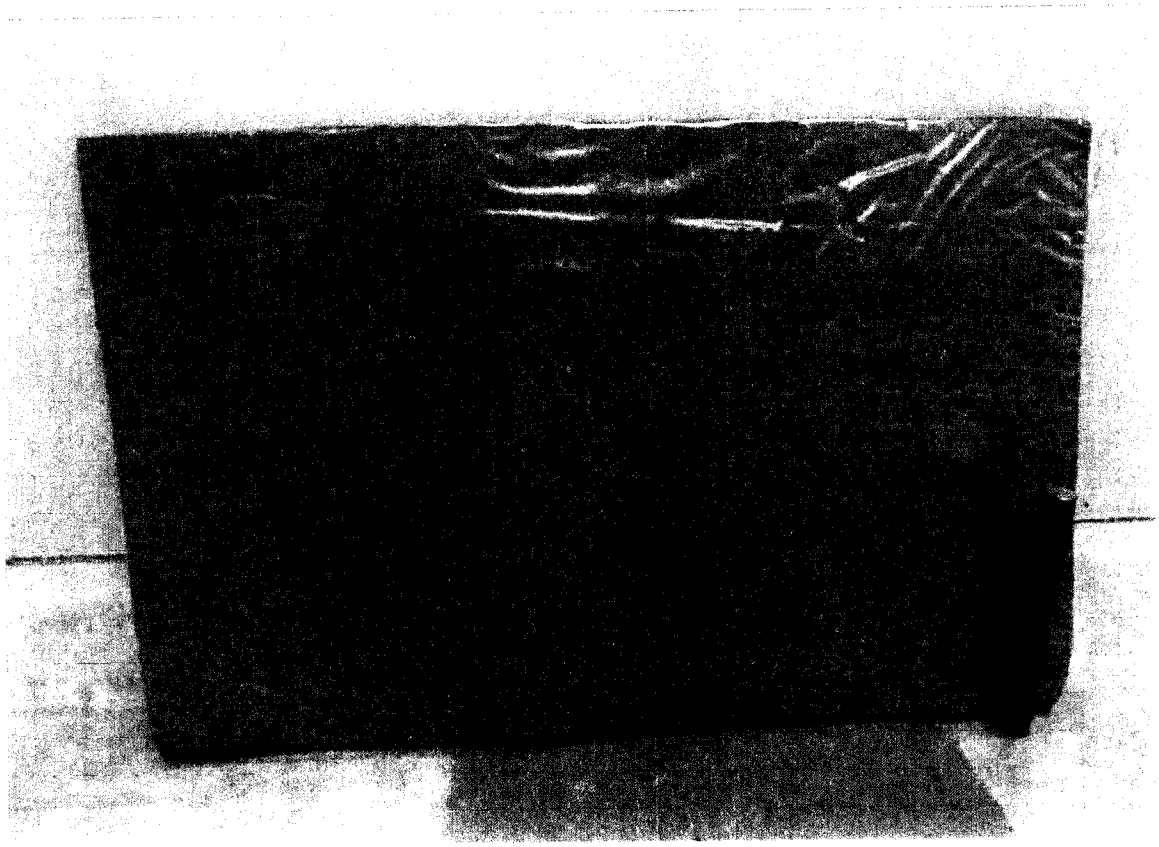

FIG. 9B

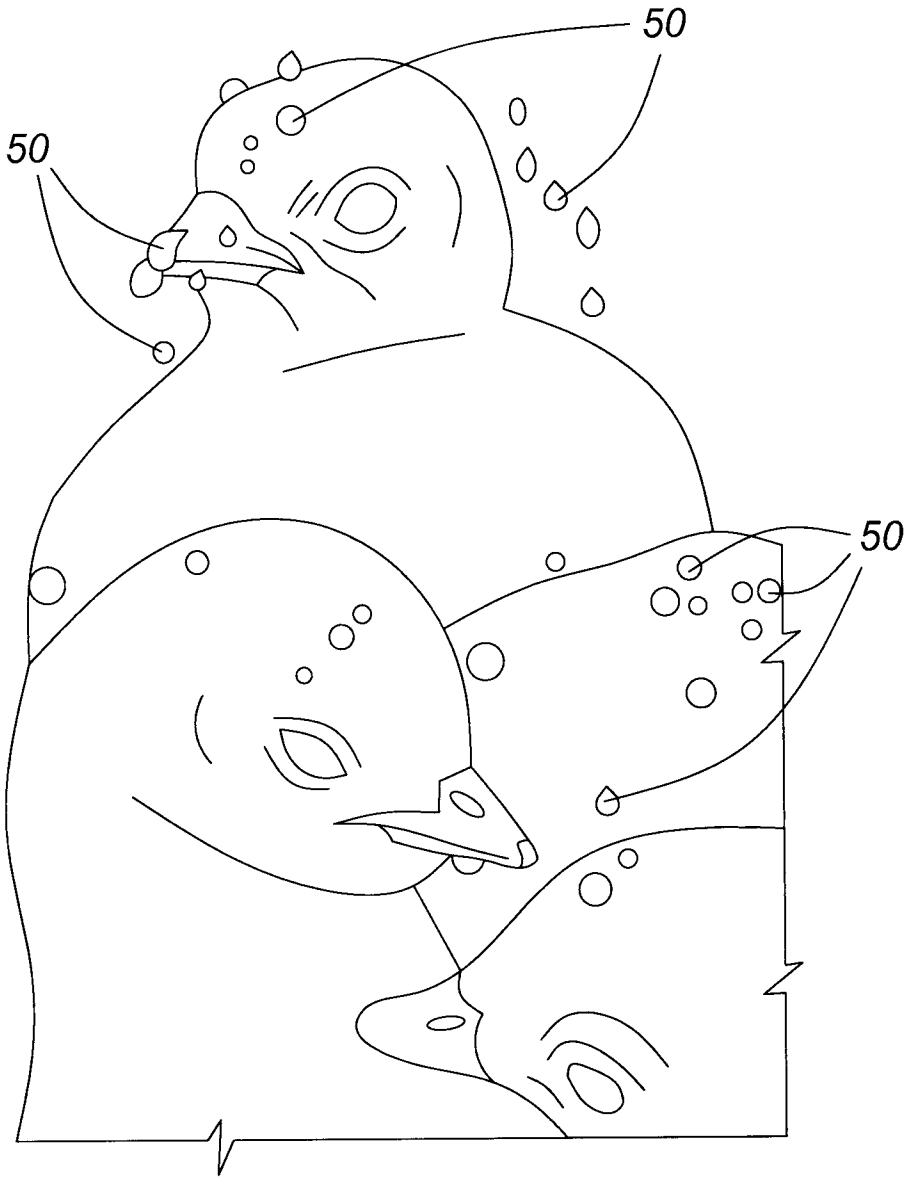

FIG. 10A

FIG. 10B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2011/000886

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***A01K 45/00*** (2006.01) , ***A61K 39/00*** (2006.01) , ***A61K 39/12*** (2006.01) , ***A61P 31/12*** (2006.01) , ***A61P 33/00*** (2006.01) , ***A61P 37/04*** (2006.01) , ***B05B 15/00*** (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)

IPC(2006.01): A01K 45/00; A61K 39/00, 39/12; A61P 31/12, 33/00, 37/04; B05B 15/00

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

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

Epoque (Epodoc), Canadian Patents Database, Internet

Keywords: dispenser, sprayer+, hand+, poultry, chicken+, livestock, animal+, gel, spray+, equipment, nozzle, boom, backpack

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CA 2,464,522 A1 (LEE, ENG-HONG) 15 October 2005 (15-10-2005) *whole document*	1-22
Y	Knapsack spray operations. Rice Knowledge Bank. Copywrite 2008 International Rice Research Institute (IRRI). <http://www.knowledgebank.irri.org/ipm/index.php/knapsack-spray-operations>	1-22
Y	WO 2004/091293 A1 (POOLE, NORMAN et al.) 28 October 2004 (28-10-2004) *whole document*	1-22
A	US 5,785,245 A (TEDDERS, WALKER LOUIS, JR. et al.) 28 July 1998 (28-07-1998) *whole document*	
A	EP 2 071 948 A1 (FRIESSLEBEN, REINHARD, DR. et al) 24 June 2009 (24-06-2009) *abstract; drawings*	

[ ] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 October 2011 (24-10-2011)	2 November 2011 (02-11-2011)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Scott Jurgens (819) 953-0617

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2011/000886

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EP2071948A1	24 June 2009 (24-06-2009)	WO2009080238A1	02 July 2009 (02-07-2009)