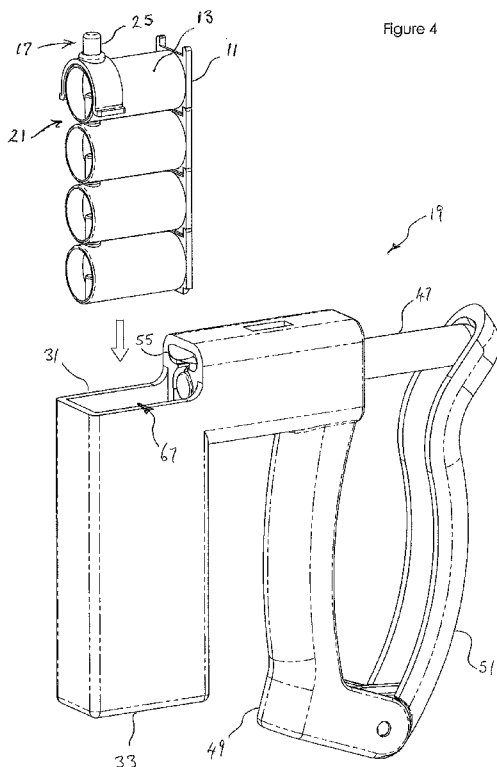




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[Continued on next page]

(54) Title: DOSING APPARATUS



(57) Abstract: Dosing apparatus comprising a cartridge (11), the cartridge having: • a body (13) with a cavity holding at least one product to be dosed, • a nozzle (17) which is in communication with the cavity and which is configured for channelling the product to an orifice of an animal, and • a recess (21) which is adapted to, or actually does, receive and provide a cover for the nozzle of an identical or similar cartridge.

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TITLE

Dosing Apparatus

FIELD OF THE INVENTION

This invention relates to a dosing apparatus. A particularly preferred form of the
5 invention relates to a cartridge for use with a dispenser, for dosing therapeutic and
preventative agents into the teat canal of cows udders.

BACKGROUND

Mastitis is a significant animal health problem affecting global dairy production. Dosing
a herd of dairy cows to treat or protect against mastitis can be a very labour intensive
10 exercise. For example, the organisation *Dairy NZ* suggests a treatment procedure
estimated to take approximately 3 minutes per cow. It is important that scrupulous
hygiene is observed to ensure the treatment is successful. But with an average time of 3
minutes, it means that to give blanket dry cow treatment to all cows in the average New
Zealand herd of say 400 cows, over 20 hours of time would be expended. This indicates
15 just how time consuming the process can be. The problem can be accentuated in cases
where a new dosing syringe has to be obtained and manipulated for each cow.

A further issue with treating cows for mastitis is that the equipment used should be
scrupulously clean. It should not itself present a source of bacterial contamination.
However with many known dosing syringes it is necessary to remove a cover cap by hand
20 each time a cow is dosed. This presents an opportunity for bacterial infection to pass to
the syringe, and therefore to the cows.

Another issue is that often farmers wish to administer an antibiotic paste into the teat
canal followed by a teat sealant during the same treatment occasion. With some known
techniques this can require farmers to administer 8 syringes per cow, or 2400 syringes in
25 an average sized New Zealand herd.

It is an object of a preferred embodiment of the present invention to provide a dosing
apparatus which goes at least some way towards overcoming one or more of the above

problems. While this object applies to a preferred embodiment, it should not be seen as a limitation on the scope of the invention as claimed. The object of the invention *per se* is simply to provide the public with a useful choice.

5 The term “comprising” or derivatives thereof (eg “comprises”), if and when used herein, should be interpreted non-exclusively – eg if used in relation to a specific combination of features it should not be taken to exclude the possibility of there also being additional unspecified features.

INTERPRETATION

10 The terms “comprising” and “comprises”, or similar, if and when used herein, should not be interpreted exclusively. When used in relation to a combination of features they should not be taken to exclude the option of there being further unspecified features.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided dosing apparatus comprising a cartridge, the cartridge having:

- 15
- a body with a cavity holding at least one product to be dosed,
 - a nozzle (eg a cannula) which is in communication with the cavity and which is configured for channelling the product to an orifice of an animal, and
 - a recess which is adapted to, or actually does, receive and provide a cover for the nozzle of an identical or similar cartridge.

20 Optionally the recess seals the nozzle of the second mentioned cartridge.

Optionally the nozzle comprises a tubular section sized to fit within the teat orifice of a dairy cow.

Optionally wherein the nozzle of the second mentioned cartridge includes a resilient collar section at a base thereof which is in sealing contact with a complimentary shaped portion
25 of the recess of the first mentioned cartridge.

Optionally the nozzle is at an angle to the body of 70°-90° (preferably approximately 90°).

Optionally the cavity is cylindrical.

Optionally each cartridge has at least one piston configured to push the product from its cavity.

Optionally each cartridge has a first piston configured to expel the product from its cavity,
5 and a second piston configured to expel a second product from the cavity.

Optionally each cartridge is configured to expel the first mentioned product through the nozzle, and, only after that, to expel the second mentioned product such that it flows past the first piston and exits the cartridge via the nozzle.

Optionally the cavity of each cartridge is configured to allow the second product to flow
10 past the first piston when the first piston has travelled to the limit of its range of travel after dispensing the first mentioned product.

Optionally the cavity of each cartridge includes a section having a greater cross sectional area at the location where the first piston sits when it has travelled to the limit of its range after dispensing the first mentioned product.

15 Optionally the cavity of each cartridge includes a section having a reduced radius at a location where the first piston sits when it has travelled to the limit of its range of travel after dispensing the first mentioned product.

Optionally the first piston of each cartridge has a uni-directional seal which is configured to prevent the first mentioned product from travelling past the first piston and toward the
20 second piston and to allow the second mentioned product to flow past the first piston.

Optionally the dosing apparatus incorporates a dispenser loaded with the cartridges and adapted to dispense product from each cartridge, one after the other.

Optionally the dispenser comprises a hand held dispenser gun.

Optionally there are at least 3 of the cartridges loaded in the dispenser.

25 Optionally the dispenser has a plunger arranged to drive the piston(s) of one of the cartridges before the piston(s) of another of the cartridges.

Optionally the dispenser has a magazine which receives the cartridges in a stack, the magazine having a spring which biases the cartridges towards a breach of the dispenser for engaging the plunger.

Optionally the dispenser incorporates a squeeze handle for powering movement of the plunger and has a spring for biasing the handle to a non-squeezed disposition.

Optionally the dispenser has a slide which prevents one of the cartridges, which is in the breach, from being released from the dispenser until that cartridge has had its contents expelled via its nozzle.

Optionally the slide is automatically withdrawn during a reloading sequence of the dispenser.

Dosing apparatus according to any one of the preceding claims, having a piece which moves with, or as part of, a/the plunger to push between the cartridges and assist in separating them when one of the cartridges in the a/the breach has been used.

Optionally the dosing apparatus is arranged to push a plunger thereof to dispense product from the cartridges one after the other and wherein the plunger is:

hand powered;
pneumatically powered;
electrically powered; or
hydraulically powered.

20

DESCRIPTION OF THE DRAWINGS

Some preferred forms of the invention will now be described by way of example and with reference to the accompanying drawings, of which:

FIGURE 1 is a perspective view of a dosing cartridge for use with a dispenser gun,

25 **FIGURE 2** is an alternative perspective view of the dosing cartridge,

- FIGURE 3** is a perspective view showing a stack of four of the dosing cartridges in an assembled state,
- FIGURE 4** is a perspective view showing the stack of cartridges about to be fitted into the magazine of a dispenser gun,
- 5 **FIGURE 5** is a cross sectional view of the dispenser gun with the stack of cartridges in the magazine,
- FIGURE 6** is a further cross sectional view of the dispenser gun and stack of cartridges, during a dispensing action,
- FIGURE 7** is a cross sectional view of the of the dispenser gun and stack of cartridges, showing a plunger being withdrawn after expelling the contents of the top cartridge,
- 10
- FIGURE 8** is a cross sectional view of the of the dispenser gun and stack of cartridges, showing the first cartridge being ejected and the remaining cartridges being pushed upwards within the magazine,
- 15 **FIGURE 9** is a sequence of cross sectional views of a second example of a dosing cartridge,
- FIGURE 10** is a sequence of cross sectional views of a third example of a dosing cartridge,
- FIGURE 11** is a sequence of cross sectional views of a fourth example of a dosing cartridge,
- 20
- FIGURE 12** is a sequence of cross sectional views of a fifth example of a dosing cartridge,
- FIGURE 13** is a perspective view showing a stack of four of the dosing cartridges being fitted into a magazine of a dispenser gun, the top cartridge having an alternative style of sealing cap,
- 25
- FIGURE 14** is a cross sectional view of a sixth example of a dosing cartridge;

FIGURE 15 is a perspective view of an alternative dosing cartridge; and

FIGURE 16 is a perspective view of an alternative dispenser gun loaded with a stack of cartridges, powered other than by hand.

DETAILED DESCRIPTION

5 With reference to **Figures 1 to 8**, a first example of a dosing cartridge (11) according to the present invention will now be described. The dosing cartridge (11) has a body (13) with a cavity (15) for holding a product to be dosed. The dosing cartridge (11) also has a nozzle in the form of a cannula (17) which is in communication with the cavity (15), and which is configured for channelling the product within the cavity (15) into an orifice of an
10 animal.

The dosing cartridge (11) is designed for use with a dispenser gun (19), and is primarily intended for dosing small quantities of antibiotic paste and/or teat sealant material into the teat canals of the udders of cows or similar milk producing animals.

A unique feature of the cartridge (11) is that it includes a sealing recess (21) that is
15 configured for use as a sealing cap for the nozzle (17) of a similarly configured dosing cartridge (11). It can be seen that the nozzle (17) comprises a short tube. The nozzle (17) is about six to eight millimetres long, a diameter of about two to three millimetres and is sized to fit within the teat canal of a dairy cow. The recess (21) comprises a cylindrical hole, and short length of tube closed at its innermost end, both sized to fit over the nozzle
20 of an adjacent cartridge with a slight interference fit. In this way, the nozzle (17) of an adjacent cartridge (11) can be kept clean prior to use of the adjacent cartridge (11). The nozzle (17) also includes a collar section (23) at a base of the nozzle (17) configured to mate in sealing contact with a correspondingly shaped tapered portion of the sealing recess (21) of a similarly configured dosing cartridge (11).

25 With reference to **Figure 3** it can be seen that when four of the cartridges (11) are stacked, the nozzles (17) of three of the cartridges (11) are covered by the recess (21) of the respective adjacent cartridge (11). A separate cap (25) is provided for the nozzle (17) of the top cartridge (11). In this example the cap (25) includes a "C" shaped clamp (27) which is used to hold it onto the cartridge body (13). The cap (25) also includes wings

(29) which extend outwardly from each side of the clamp (27) and which are configured to contact a top edge (31) of a magazine (33) of the dispenser gun (19). When the assembled stack of four cartridges is inserted into the magazine (33), the wings (29) will contact the top edge (31) of a magazine (33) and in this way the cap (25) will automatically be pushed from the nozzle (17) of the top cartridge (11), minimising the possibility of accidentally touching the nozzle (17) and contaminating it during cap (25) removal.

Referring to **Figure 2**, a helpful feature of the cartridge (11) is that the principal longitudinal axis (35) of the nozzle (17) is at an angle to the principal longitudinal axis (37) of the body section (13). Ideally the longitudinal axis (35) of the nozzle is at an angle of between seventy and ninety degrees to the longitudinal axis (37) of the body section (13), and in this example the axis (35) of the nozzle is at an angle of about ninety degrees to the axis (37) of the body section (13).

This right angled configuration of the nozzle (11) allows the user of the dispenser gun (19) and cartridges (11) to apply the dose of product vertically upwards and into the teat canals without unduly twisting his or her hands to orientate the nozzle (11) to suit the orientation of the teats. It can be seen that in this example that the cavity (15) of the body (13) is cylindrical, and that the longitudinal axis of the cylindrical shaped cavity (15) is aligned with the longitudinal axis (37) of the body section (13). Referring to **Figure 6**, a short passage (39) connects the inner end of the cylindrical shaped cavity (15) with the nozzle (17). The dosing cartridge (11) also includes a piston (41). In this example the piston has piston skirts (43) which keep the piston (41) aligned with the cylindrical shaped cavity (15). The piston (41) also includes a cup seal (45) about its periphery. The forward end of the cup seal (45) faces the product within the cartridge (11). For this reason, as the piston (41) is pushed further into the cylindrical shaped cavity (15), the pressure within the product acts to push the outer lips of the cup seal (45) outwards to help maintain a seal between the piston and the inner wall of the cylindrical shaped cavity (15).

It can also be seen in the figures that each cartridge (11) includes a substantially square interlocking tab (46) at the end opposite the end having the nozzle (17). The tabs (46) are

configured to facilitate interlocking between adjacent cartridges (11), and the straight sides of the interlocking tabs (46) help to keep the cartridges (11) aligned when situated within the magazine (33).

With reference to **Figures 4 to 8** it can be seen that the dispenser gun (19) includes a
5 plunger (47) for engaging with, and pushing, the piston (41) to dispense product held within the dosing cartridges (11). The magazine (33) of the dispenser gun (19) holds the four dosing cartridges (11) and presents them to the plunger (47) one after the other.

A handle (49) of the dispenser gun (19) includes a lever style trigger mechanism (51) which is configured to push the plunger (47) when the handle (49) is squeezed by hand.
10 A spring (53) returns the trigger (51) and plunger (47) to a withdrawn position when a hand squeeze action is relaxed.

The dispenser gun (19) also includes a cartridge retaining means or latch in the form of a movable slide (55). The slide (55) is normally held in an extended position by a latch spring (57). In the extended position, the slide (55) extends into the path of the cartridges
15 (11) which are situated in the magazine (33) and which are urged upwards within the magazine by a magazine spring (59). In this extended position, the slide (55) prevents cartridges (11) from exiting the magazine.

The plunger (47) includes a barb (61) situated on a flexible arm (63). The barb (61) is configured to catch on a corresponding slide barb (65) when the plunger (47) is moving
20 back to its withdrawn position during a cartridge reloading sequence. When the plunger barb (61) catches on the slide barb (65), the plunger (47) momentarily retracts or withdraws the slide (55) and allows the spent cartridge (11) to be ejected. Continued withdrawal of the plunger (47) causes the plunger barb (61) to detach from the slide barb (65) and to allow the slide (55) to return to its extended position under the action of the
25 latch spring (57). During this sequence the magazine spring (59) loads the next cartridge (11) into the breach (67) of the dispenser gun (19).

The dispenser gun (19) also includes a cartridge separating means configured to separate adjacent cartridges (11) from one another. The cartridge separating means is in the form of a wedge shaped blade (69) that runs parallel to the plunger (47) and is physically

connected to the plunger (47) by a short arm (71). When the plunger (47) is advanced to push product from the cartridge (11) that is situated within the breach (67), the blade (69) advances at the same time. The blade (69) is aligned with the joint between the cartridge (11) that is in the breach (67) and the cartridge (11) immediately below it. As the blade
5 (69) advances the wedge shape of the blade (69) causes the two cartridges (11) to separate, facilitating release of the nozzle (17) of the lower cartridge (11) from the sealing recess (21) of the upper cartridge (11). This allows the upper cartridge (11) to be ejected easily when the slide (55) is withdrawn as described above.

With reference to **Figures 9 to 12**, examples of cartridges which are configured to hold
10 more than one product formulation will now be described. These figures show four examples of cartridges designed to hold and dispense two product formulations, one after the other, for example to dispense an antibiotic paste into the teat canal, followed by a teat sealant material. In each case, the dosing cartridge includes two pistons, a first piston configured to expel a first product from the cavity, and a second piston configured to
15 expel a second product from the cavity. In addition, the dosing cartridges are all configured to dispense the first product through the nozzle first, and, when the first product has been dispensed, to allow the second product to flow past the first piston and be dispensed through the nozzle.

As shown in **Figure 9**, a second example of a dosing cartridge (75) includes a first piston
20 (77) and a second piston (79). A first compartment (81) is defined between the first piston (77) and the forward end of the cartridge cavity (85). A second compartment (83) is defined between the first piston (77), the second piston (79) and the inner diameter of the cartridge cavity.

In use, the plunger (47) pushes against the second piston (79). This causes both pistons to
25 move and for product to be discharged from the first compartment (81). Product continues to be discharged from the first compartment (81) until the first piston (77) has travelled to the limit of its range, that is, until it butts up against the inner end of the cavity (81).

The cavity (85) is configured to allow the second product to flow past the first piston (77)
30 when the first piston (77) has travelled to the limit of its range, as shown in the second of

the views in Figure 9. The forward end of the cavity (85) has a slightly larger diameter, or a short channel, and this slightly larger localised cross sectional area allows product from the second compartment (83) to by-pass the first piston (77), and to exit via the nozzle (87), when the first piston (77) has contacted the inner end of the cavity (85). Product
5 continues to be discharged from the second compartment (83), and out through the nozzle, until the second piston (79) butts up against the first piston (77).

The first piston (77) includes a central shaft (89) which engages with a bore (91) in the centre of the second piston (79). The central shaft (89) helps to stabilise the first piston (77) and to prevent it skewing within the cavity (85). In this example, the central shaft
10 (89) has a sealing fit with the bore (91).

It could also be said that the first piston (77) includes a uni-directional seal, that is a cup seal, which is configured to prevent the first product from travelling past the first piston (77) and toward the second piston (79), but which will allow the second product to flow past the first piston (77) when the first piston (77) butts up against the inner end of the
15 cavity (85), as shown in the second of the views in Figure 9.

A third example of a dosing cartridge (95) is shown in Figure 10. The third example of a dosing cartridge (95) is similar to the second example except that the bore (91) has a closed end, eliminating the need for the sealing fit between the central shaft (89) and the bore (91).

20 A fourth example of a dosing cartridge (99) is shown in Figure 11. This is similar to the third example of a dosing cartridge (95) except that instead of a larger diameter at the forward end of the cavity (85), this example has a reduced radius which causes the lips of the cup seal about the periphery of the first piston (77) to collapse inwards, allowing product from the second compartment (83) to by-pass the first piston (77), and to exit via
25 the nozzle (87), when the first piston (77) has contacted the inner end of the cavity (85).

A fifth example of a dosing cartridge (103) is shown in Figure 12. This is similar to the fourth example of a dosing cartridge (99) except that the first piston (77) includes a skirt to help keep it stable within the cavity, and it no longer includes a central shaft. In addition, the second piston (79) has a reduced diameter and fits within the skirt of the first

piston (77). Also, the skirt of the first piston (77) is provided with at least one transfer orifice which allows product to be transferred from within the second compartment (83) to the outside diameter of the first piston (77) and then past the seal of the first piston (77) and toward the nozzle (87).

5 Each of these dosing cartridges (75), (95), (99) and (103) can be used in place of the first dosing cartridge (11) in the dosing apparatus (19) subject to appropriate modifications of the forward end of the plunger (47) to achieve the required engagement between the second piston (79) of each cartridge. For example, the centre of the forward end of the plunger (47) will require an appropriately sized hole, when used with the second cartridge
10 (75), to allow engagement with the second piston (79) only, and to allow the plunger (47) to push the second piston (79) toward the first piston (77) without contacting the central shaft (89) of the first piston (77).

All the examples shown and described above are designed primarily for injecting material into teat canals. It is envisaged that with minor variations the cartridges and apparatus
15 could be used to inject products into other cavities.

In the examples described above, the dispenser gun (19) is designed to dispense four cartridges prior to reloading the magazine. It is envisaged that variations of the gun (19) could be adapted to dispense fewer or more cartridges as desired.

With reference to **Figure 13**, an alternative top sealing cap (107) is shown, the sealing cap
20 (107) having tabs (109) which allow the cap (107) to be removed manually, for example by gripping the tab (109) with the fingers and 'tearing' the tab (109) and, therefore the cap (107) overall, from the nozzle (17) of the top cartridge (11).

With reference to **Figure 14**, an alternative sealing arrangement for the nozzles (17) of
25 each of the lower cartridges, of a stack of cartridges, is shown. In this alternative configuration, the sealing recesses each have a cap (111) for the nozzles (17) of a lower one of the cartridges. Each of the sealing caps (111) are held or retained within a recess (113) in the adjacent cartridge body (115). The sealing caps (111) are held within the adjacent cartridge body (115) such that they are removed from the nozzles (17) as each cartridge body (115) is separated from the adjacent cartridge body (115).

Figure 15 illustrates a particular alternative embodiment of the cartridge. It is configured for use in a modified dispenser gun where there is no top moving slide (55) for retaining the cartridge in the magazine as described above, but rather where the gun has a side moving slide or slides (not shown) which engage shoulders (119) at the rearward end of the cartridge.

Referring to **Figure 16**, in a further embodiment of the invention the cartridges are in a stack as described above, but the dispenser gun is other not hand powered. The gun rather relies on pneumatic (eg compressed air) or electrical (eg battery) power to drive the plunger.

In summary, it will be understood that some embodiments of the invention enable a dosing cartridge and a dispenser gun combination which:

- facilitates reduction in the total volume of plastic packaging used to store the formulations, ie because one gun may have multiple cartridges, while still ensuring each dose is still in its own separate package,
- is simple to load, use and operate with a very comfortable ergonomic design,
- does not require the user to undertake secondary actions to remove the cap of each cartridge; this procedure is automatically accomplished at the same time as the user is delivering the dose of the cartridge preceding the dose from which the cap is being removed, and/or
- enables the packaging and delivery of dual product formulations from a single cartridge.

However, it should be understood that these advantages may not apply to every embodiment of the invention. It should not be inferred or otherwise taken that the invention per se is limited to embodiments which have such advantages.

While aspects and embodiments of the invention have been described by way of example only and it should be appreciated that modifications and improvements may be made without departing from the scope of the following claims.

CLAIMS

1. Dosing apparatus comprising a cartridge, the cartridge having:
 - a body with a cavity holding at least one product to be dosed,
 - a nozzle which is in communication with the cavity and which is configured for channelling the product to an orifice of an animal, and
 - a recess which is adapted to, or actually does, receive and provide a cover for the nozzle of an identical or similar cartridge.
2. Dosing apparatus according to claim 1, wherein the nozzle comprises a cannula.
3. Dosing apparatus according to claim 1 or 2, wherein the recess seals the nozzle of the second mentioned cartridge.
4. Dosing apparatus according to claim 1, 2 or 3, wherein the nozzle comprises a tubular section sized to fit within the teat orifice of a dairy cow.
5. Dosing apparatus according to any one of the preceding claims, wherein the nozzle of the second mentioned cartridge includes a resilient collar section at a base thereof which is in sealing contact with a complimentary shaped portion of the recess of the first mentioned cartridge.
6. Dosing apparatus according to any one of the preceding claims, wherein the nozzle is at an angle to the body of 70°-90°.
7. Dosing apparatus according to claim 6, wherein the angle is approximately 90°.
8. Dosing apparatus according to any one of the preceding claims, wherein the cavity is cylindrical.
9. Dosing apparatus according to any one of the preceding claims, wherein each cartridge has at least one piston configured to push the product from its cavity.
10. Dosing apparatus according to any one of the preceding claims, wherein each cartridge has a first piston configured to expel the product from its cavity, and a second piston configured to expel a second product from the cavity.

11. Dosing apparatus according to claim 10, wherein each cartridge is configured to expel the first mentioned product through the nozzle, and, only after that, to expel the second mentioned product such that it flows past the first piston and exits the cartridge via the nozzle.
- 5 12. Dosing apparatus according to claim 10 or 11, wherein the cavity of each cartridge is configured to allow the second product to flow past the first piston when the first piston has travelled to the limit of its range of travel after dispensing the first mentioned product.
- 10 13. Dosing apparatus according to claim 10, 11 or 12, wherein the cavity of each cartridge includes a section having a greater cross sectional area at the location where the first piston sits when it has travelled to the limit of its range after dispensing the first mentioned product.
- 15 14. Dosing apparatus according to claim 10, 11 or 12, wherein the cavity of each cartridge includes a section having a reduced radius at a location where the first piston sits when it has travelled to the limit of its range of travel after dispensing the first mentioned product.
- 20 15. Dosing apparatus according to any one of claims 10 to 14, wherein the first piston of each cartridge has a uni-directional seal which is configured to prevent the first mentioned product from travelling past the first piston and toward the second piston and to allow the second mentioned product to flow past the first piston.
16. Dosing apparatus according to any one of the preceding claims, incorporating a dispenser loaded with the cartridges and adapted to dispense product from each cartridge, one after the other.
- 25 17. Dosing apparatus according to claim 16, wherein the dispenser comprises a hand held dispenser gun.
18. Dosing apparatus according to claim 16 or 17, wherein there are at least 3 of the cartridges loaded in the dispenser.

19. Dosing apparatus according to claim 16, 17 or 18, wherein the dispenser has a plunger arranged to drive the piston(s) of one of the cartridges before the piston(s) of another of the cartridges.
20. Dosing apparatus according to any one of claims 16 to 19, wherein the dispenser has a magazine which receives the cartridges in a stack, the magazine having a spring which biases the cartridges towards a breach of the dispenser for engaging the plunger.
21. Dosing apparatus according to any one of claims 16 to 20, wherein the dispenser incorporates a squeeze handle for powering movement of the plunger and has a spring for biasing the handle to a non-squeezed disposition.
22. Dosing apparatus according to any one of claim 20, or claim 21 when read back on claim 20, wherein the dispenser has a slide which prevents one of the cartridges, which is in the breach, from being released from the dispenser until that cartridge has had its contents expelled via its nozzle.
23. Dosing apparatus according to claim 22, formed such that the slide is automatically withdrawn during a reloading sequence of the dispenser.
24. Dosing apparatus according to any one of the preceding claims, having a piece which moves with, or as part of, a/the plunger to push between the cartridges and assist in separating them when one of the cartridges in the a/the breach has been used.
25. Dosing apparatus according to claim 1, having a hand squeeze mechanism configured to push a plunger to dispense product from the cartridges one after the other.
26. Dosing apparatus according to claim 1, having a the plunger configured to push a plunger to dispense product from the cartridges one after the other and wherein the plunger is:
- pneumatically powered;
 - electrically powered; or
 - hydraulically powered.

27. Dosing apparatus according to claim 1, substantially as herein described with reference to the accompanying drawings.

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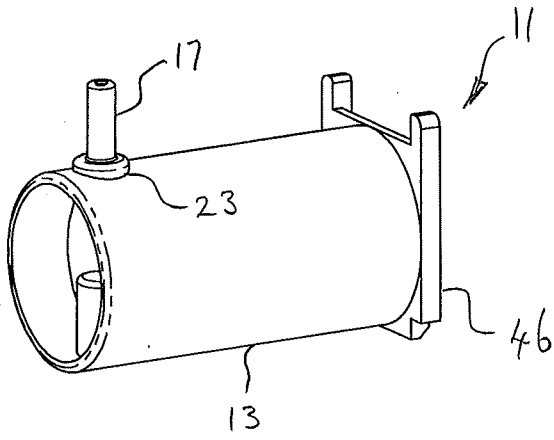


Figure 1

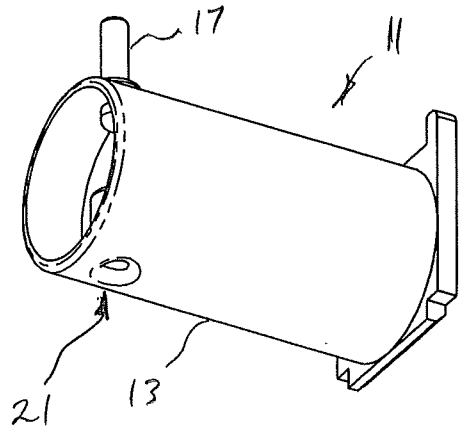


Figure 2

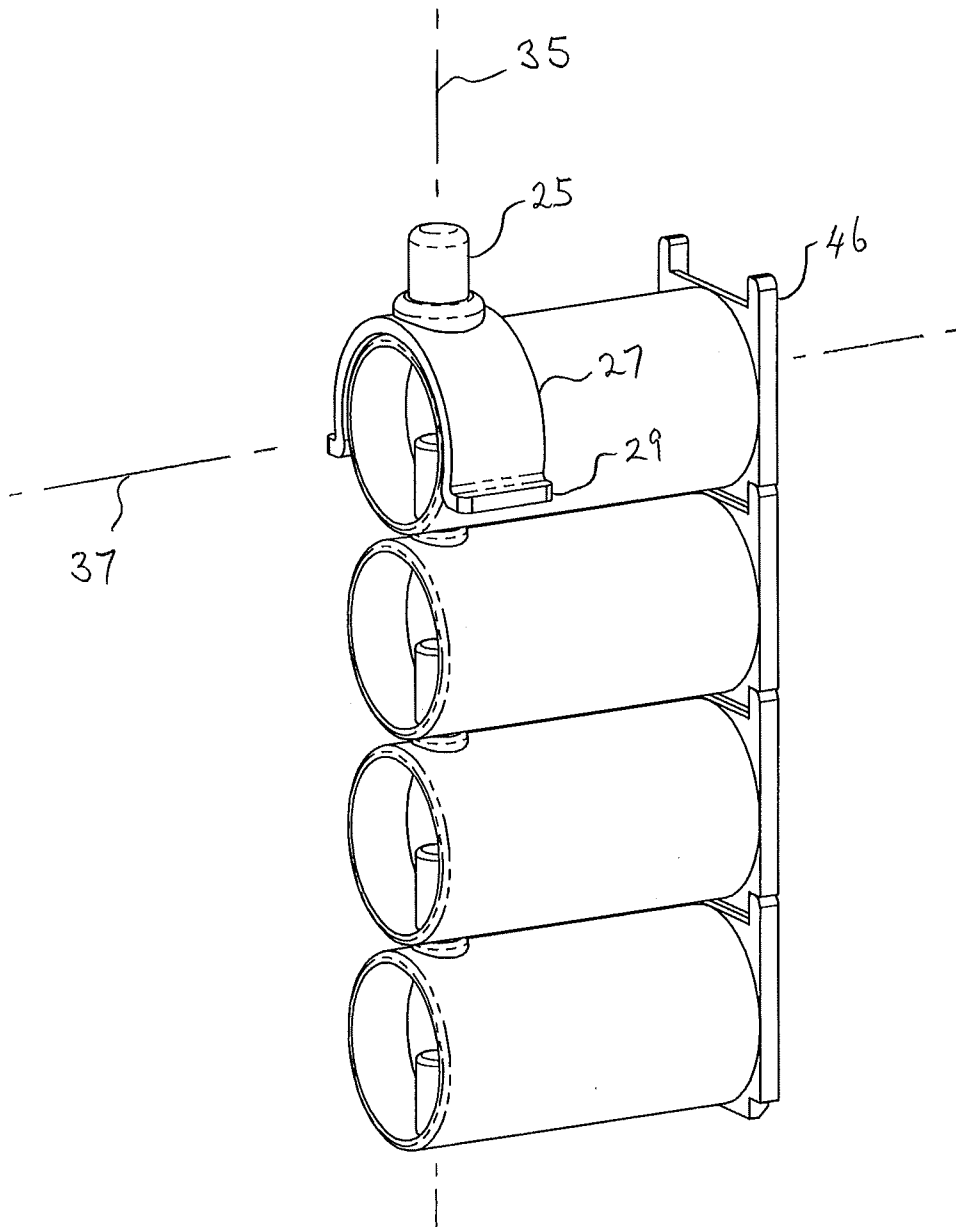


Figure 3

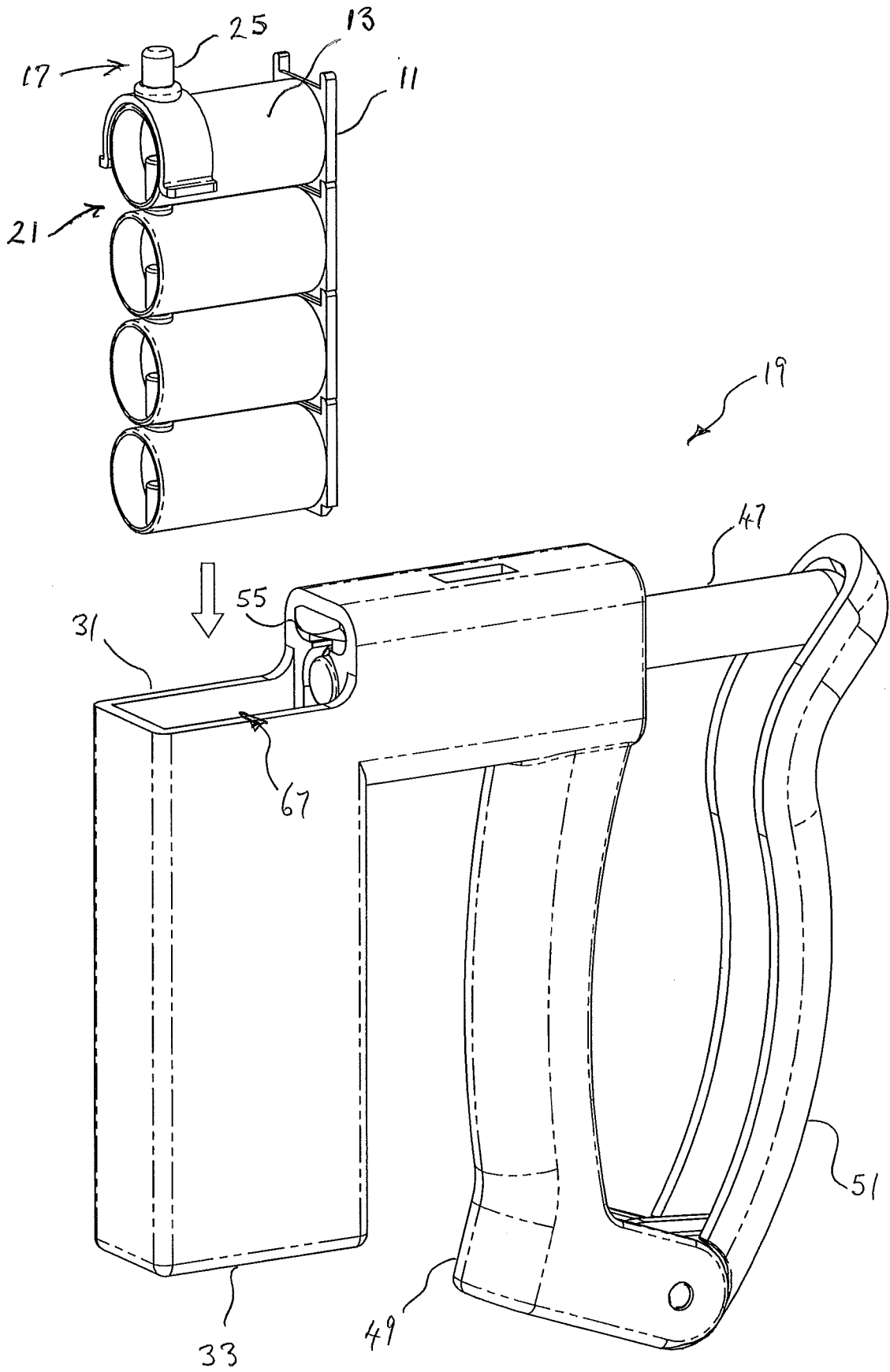


Figure 4

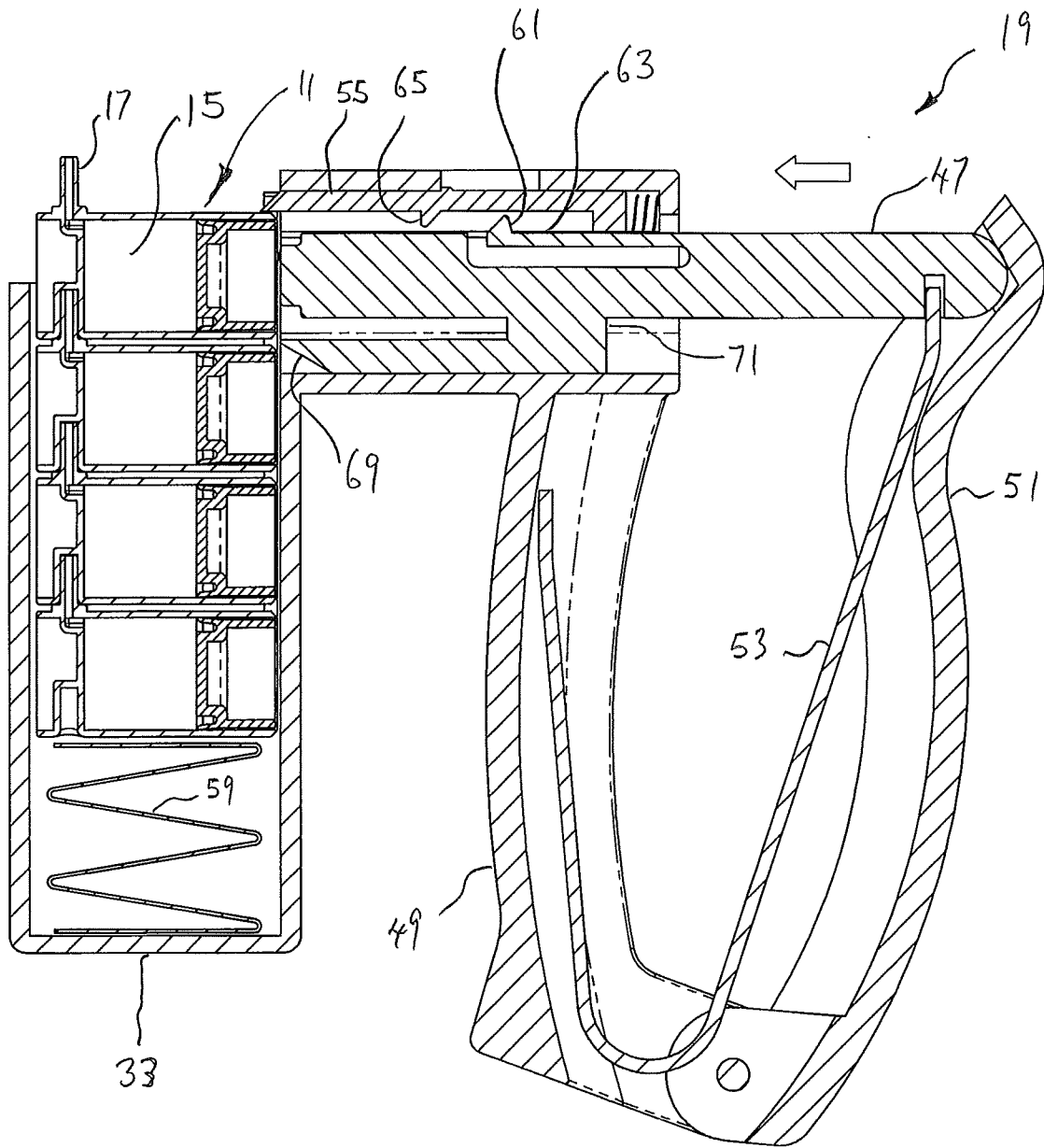


Figure 5

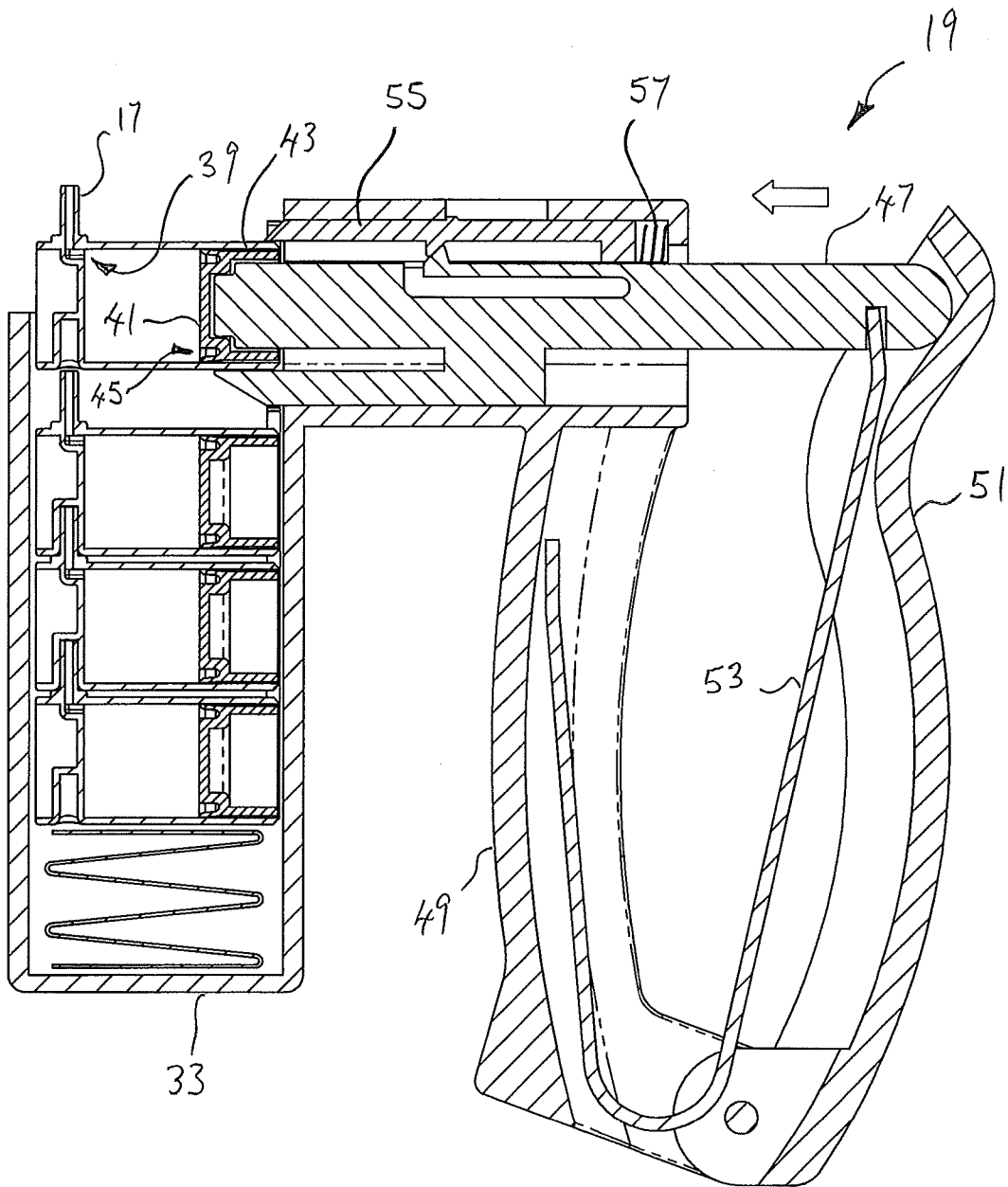


Figure 6

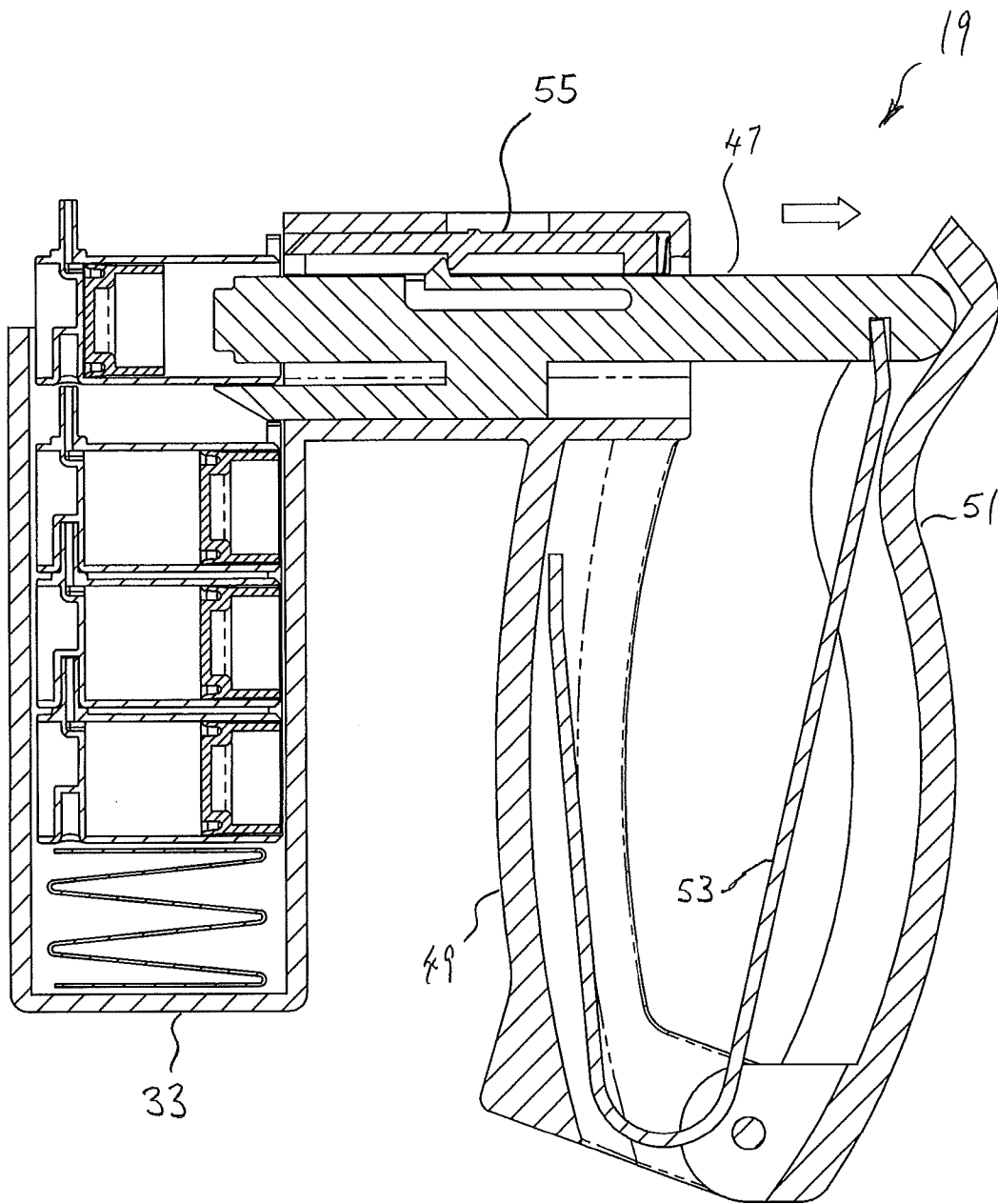


Figure 7

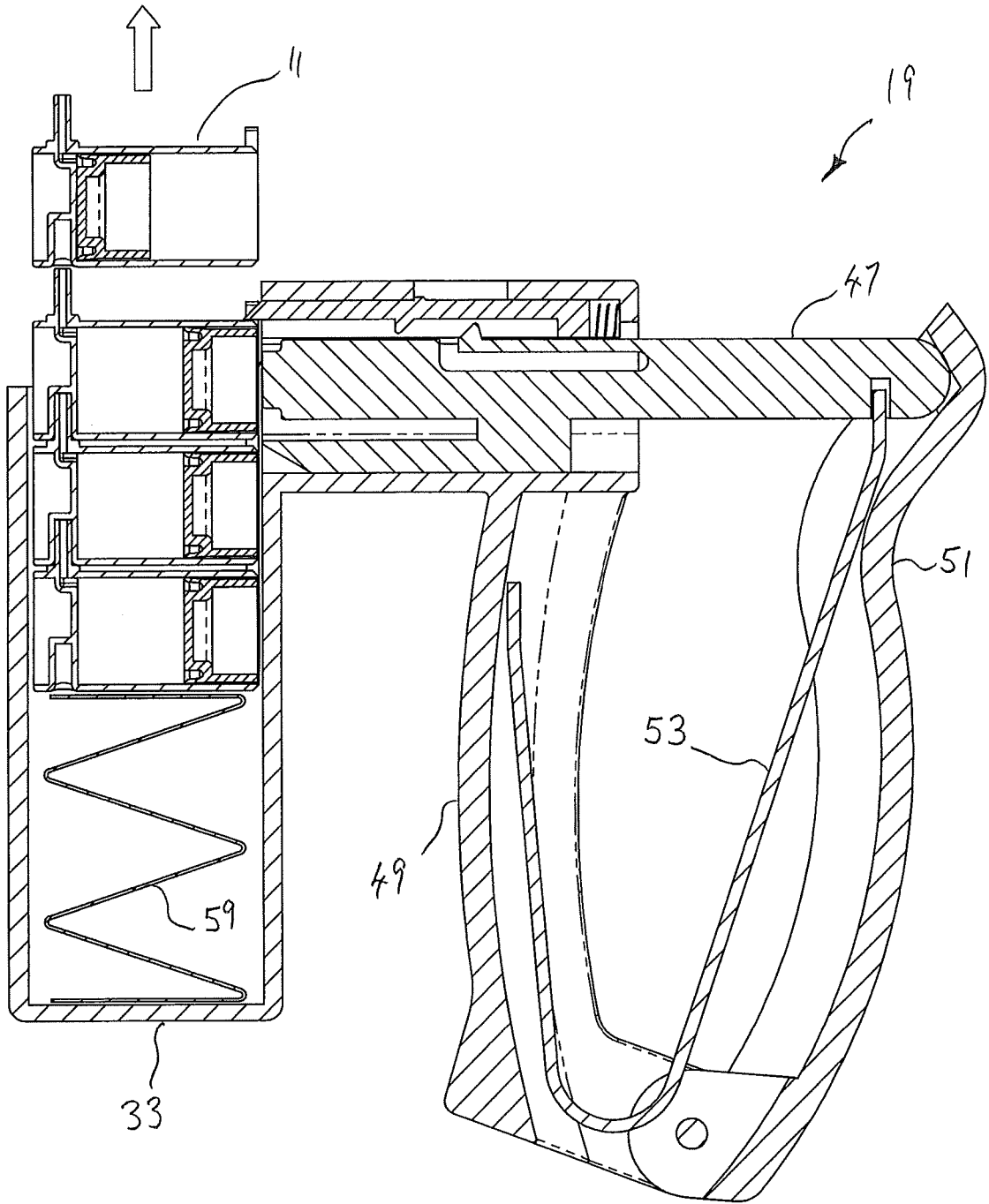


Figure 8

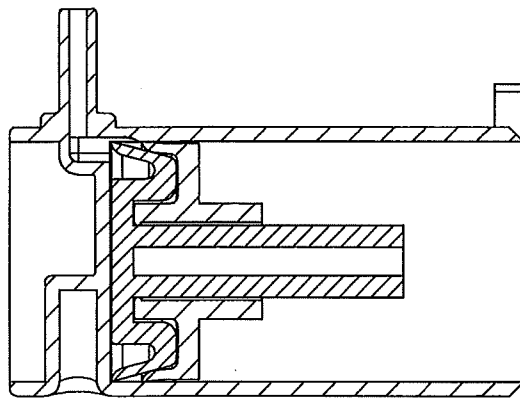
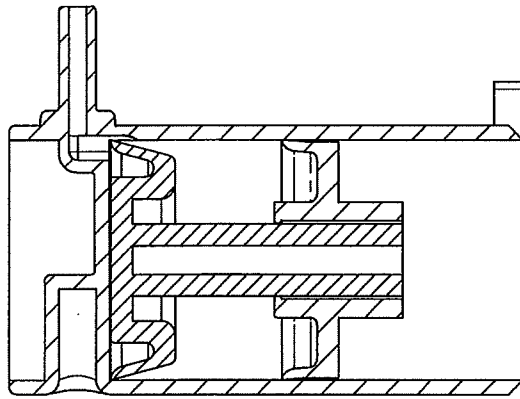
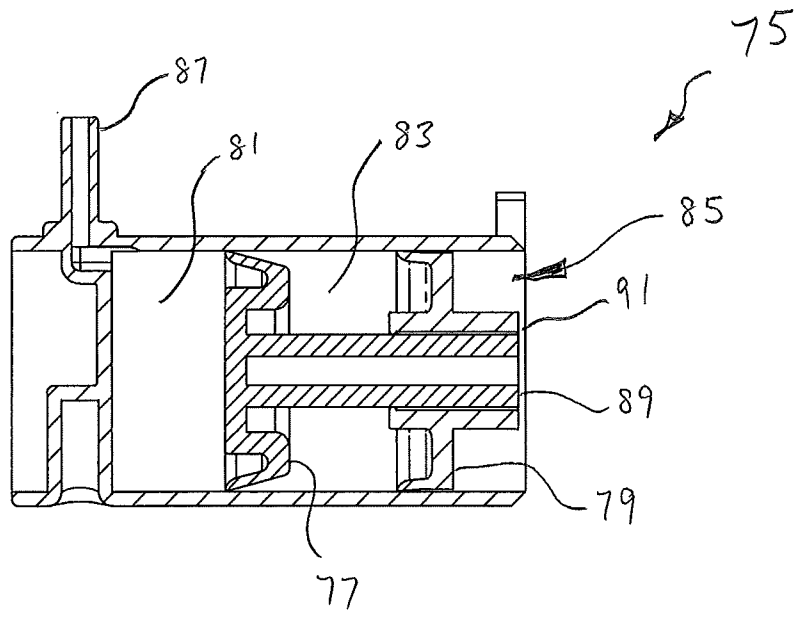


Figure 9

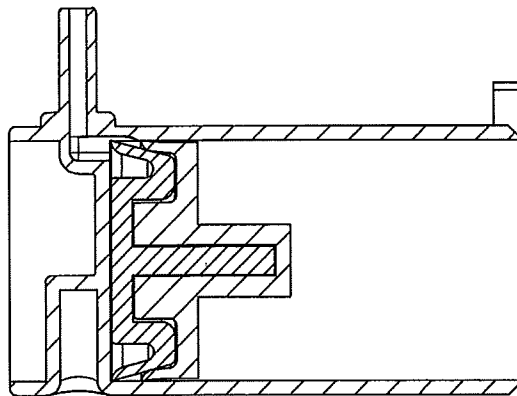
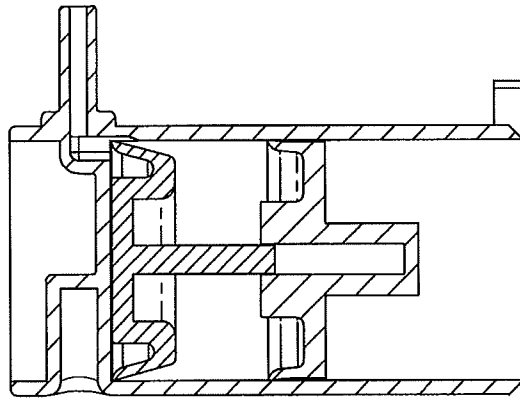
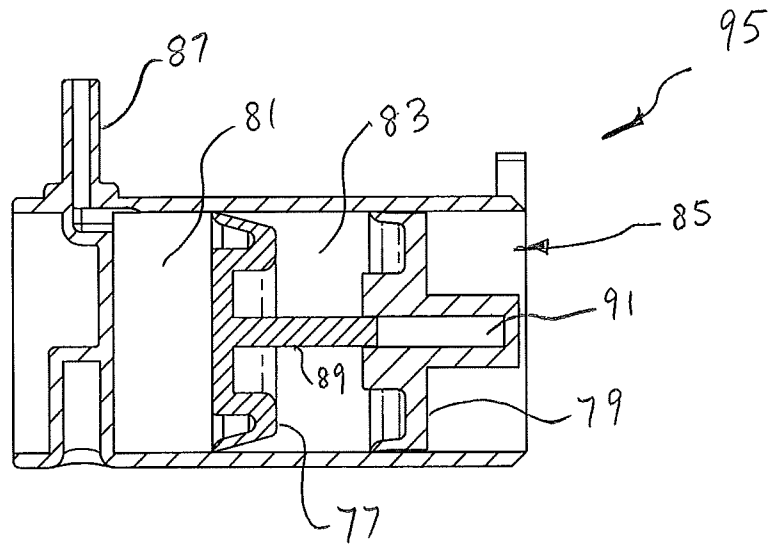


Figure 10

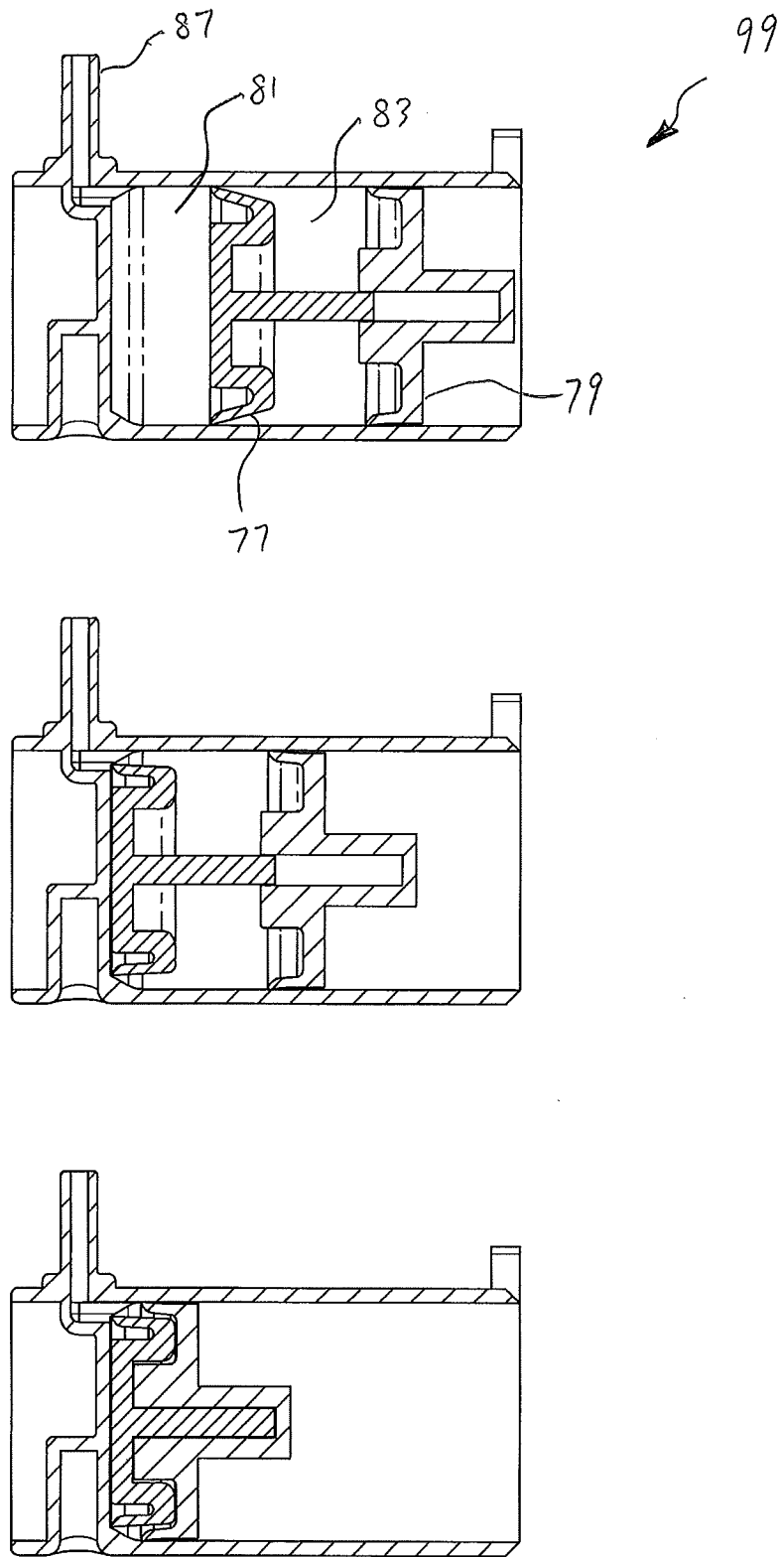


Figure 11

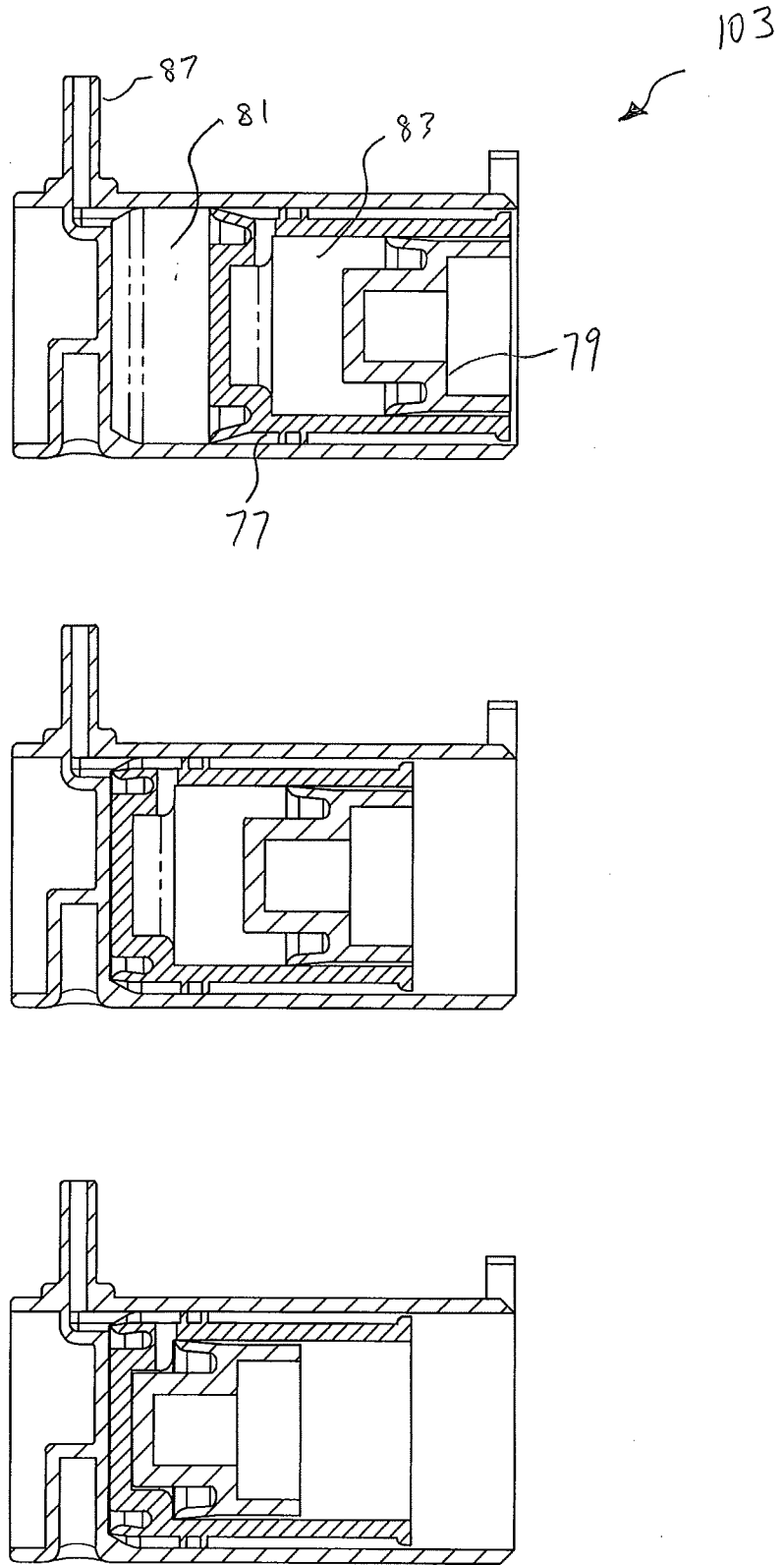


Figure 12

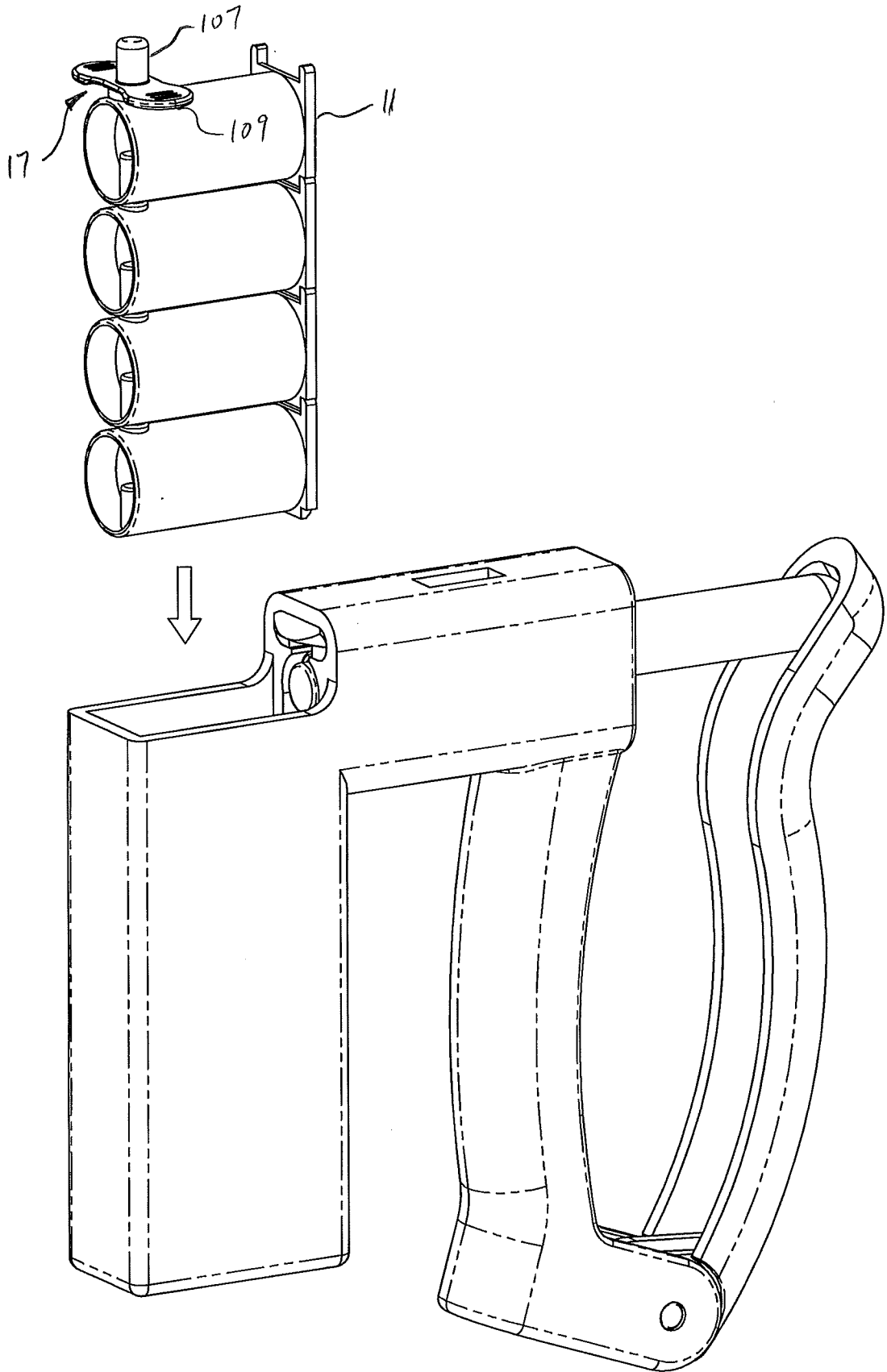


Figure 13

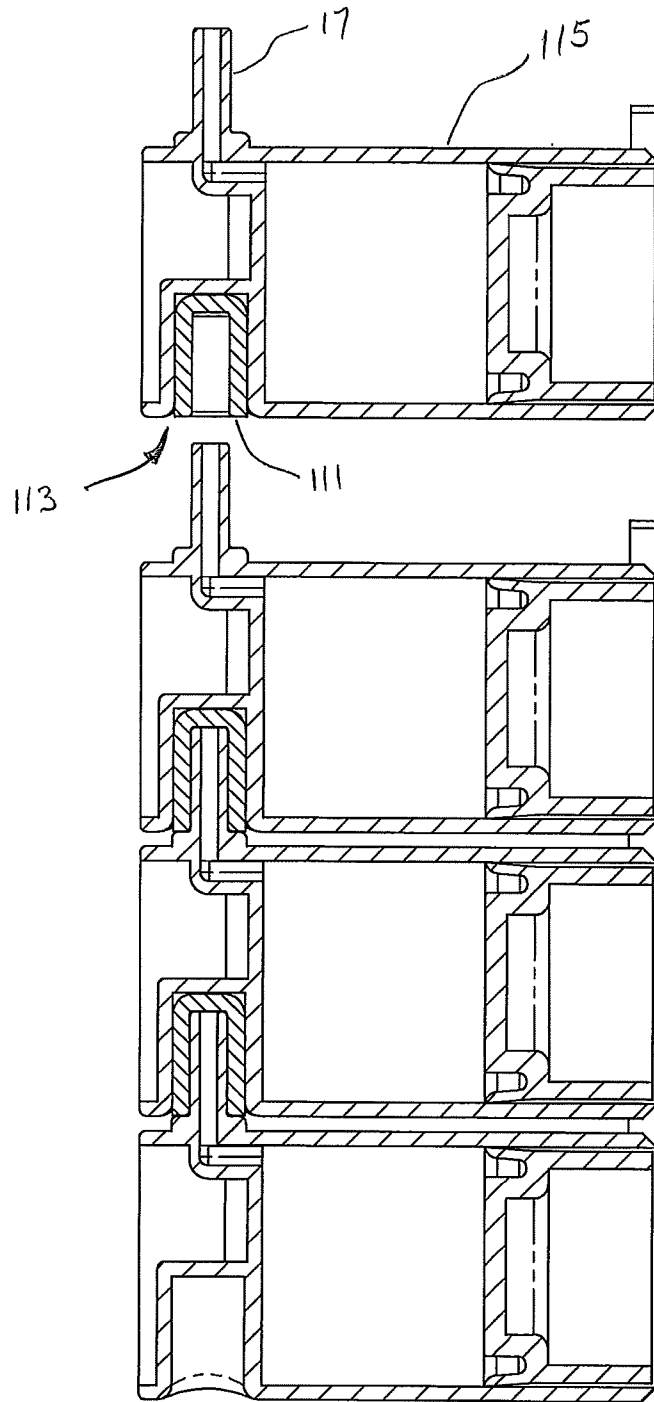


Figure 14

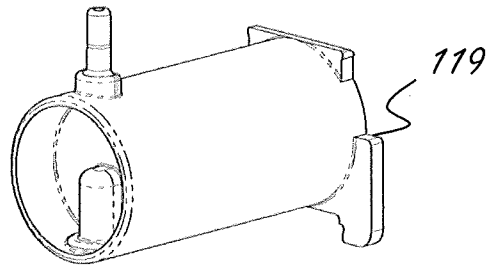


Figure 15

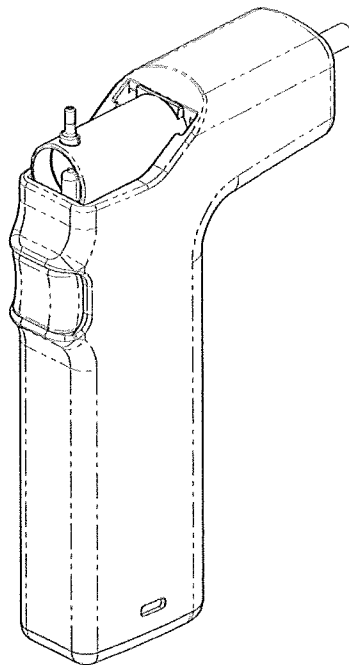


Figure 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2014/000162

A. CLASSIFICATION OF SUBJECT MATTER

A61D 7/00 (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)

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)

Searched in EPODOC and TXTE using the CPC marks A61D1/02, A61M2005/004, A61M2005/005, A61D7/00, A61M2250/00 and the keywords cartridge, magazine, mastitis, teat, clip, drug delivery, nozzle and the like.

Searched in Google Patents for the Applicant/Inventor and using the keywords drug delivery, cartridge, magazine, clip, mastitis, multiple, nozzle, teat and the like.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Documents are listed in the continuation of Box C		

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

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
4 November 2014Date of mailing of the international search report
04 November 2014

Name and mailing address of the ISA/AU

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Telephone No. 0262104084

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. PCT/NZ2014/000162
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011/0160674 A1 (HOLMES et al.) 30 June 2011	
A	DE 102008046205 A1 (RIEBEL) 19 February 2009	
A	US 4518384 A (TARELLO et al.) 21 May 1985	
A	EP 2514457 A1 (SANOFI-AVENTIS DEUTSCHLAND GMBH) 24 October 2012	
A	US 5964736 A (LANE) 12 October 1999	

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including
2. Claims Nos.: 27
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
See Supplemental Box
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

Supplemental Box**Continuation of Box II**

The claims does not comply with Rule 6.2(a) because it relies on references to the description and/or drawings.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NZ2014/000162

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
US 2011/0160674 A1	30 June 2011	AU 2009224052 A1	17 Sep 2009
		AU 2009224052 B2	19 Dec 2013
		CA 2718398 A1	17 Sep 2009
		CN 102036703 A	27 Apr 2011
		CN 102036703 B	03 Apr 2013
		CO 6251280 A2	21 Feb 2011
		CR 11674 A	08 Oct 2010
		DO P2010000275 A	30 Nov 2010
		EP 2280752 A1	09 Feb 2011
		HK 1155108 A1	17 Jan 2014
		JP 2011513026 A	28 Apr 2011
		JP 5543381 B2	09 Jul 2014
		KR 20110014568 A	11 Feb 2011
		MX 2010010007 A	10 Nov 2010
		WO 2009113883 A1	17 Sep 2009
DE 102008046205 A1	19 February 2009	None	
US 4518384 A	21 May 1985	None	
EP 2514457 A1	24 October 2012	None	
US 5964736 A	12 October 1999	None	

End of Annex