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(54) SPRAYER ACTUATOR, SPRAYER, AND METHOD OF MAKING THE SAME

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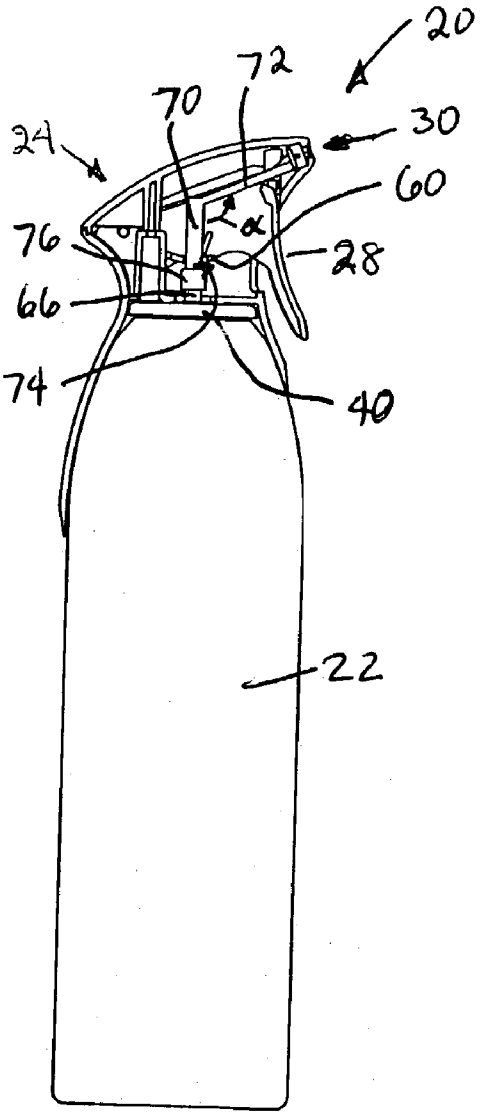
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(57) **ABSTRACT**

A sprayer actuator, a sprayer, and a method of making the same are disclosed. In one embodiment, the sprayer includes an ergonomic sprayer actuator with a housing having an upper portion, a lower portion for fitting over a can, and a narrowed waist portion between the upper portion and the lower portion.



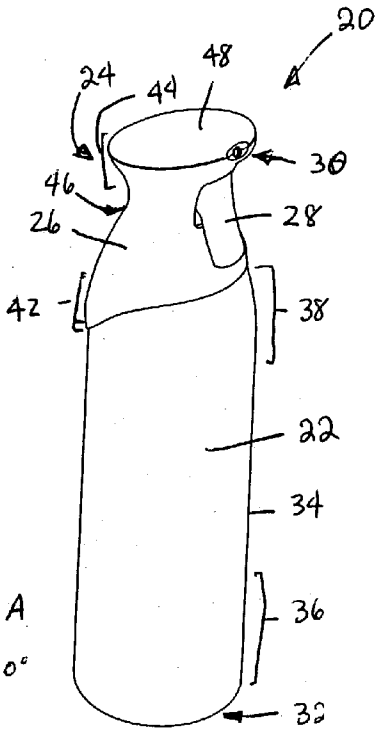


FIG. 1

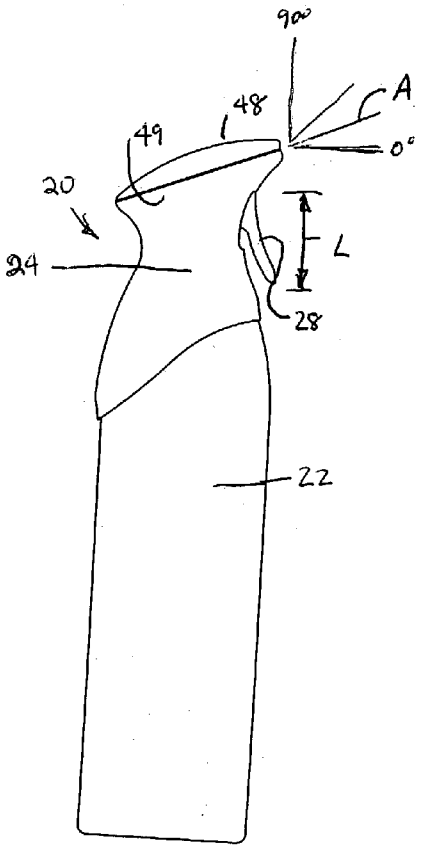


FIG. 2

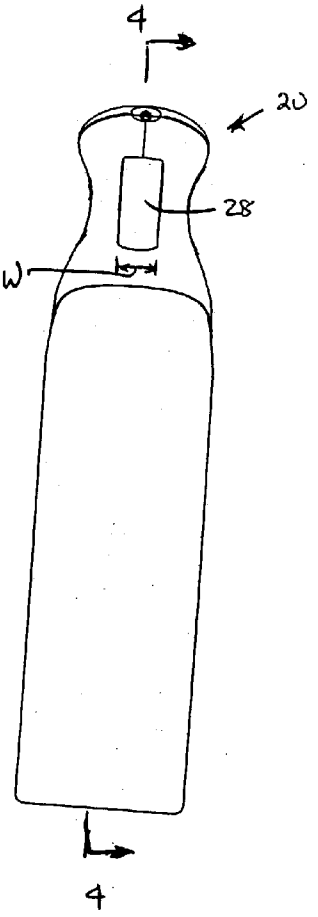


FIG. 3

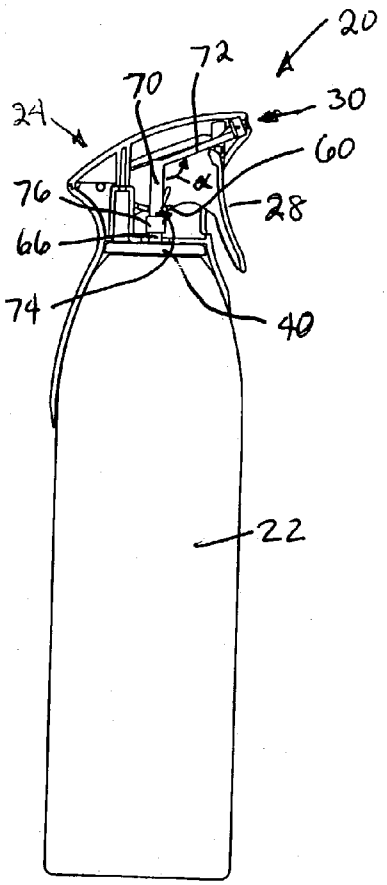


FIG. 4

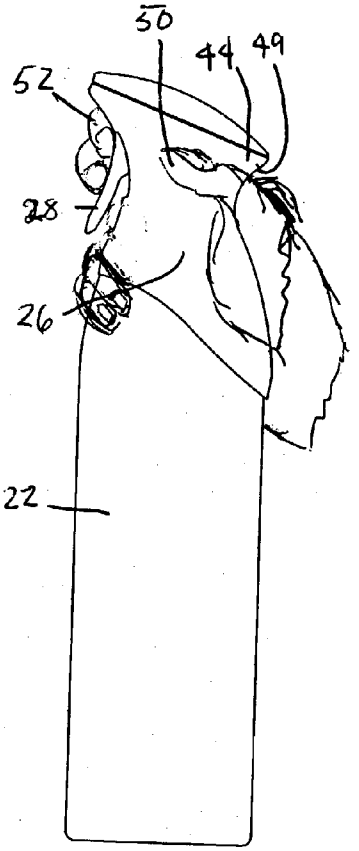


FIG. 5

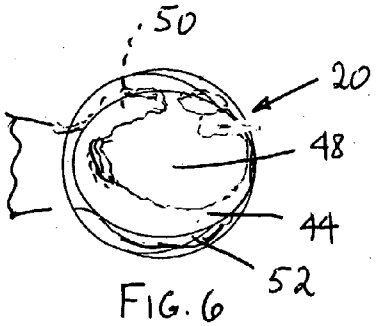


FIG. 6

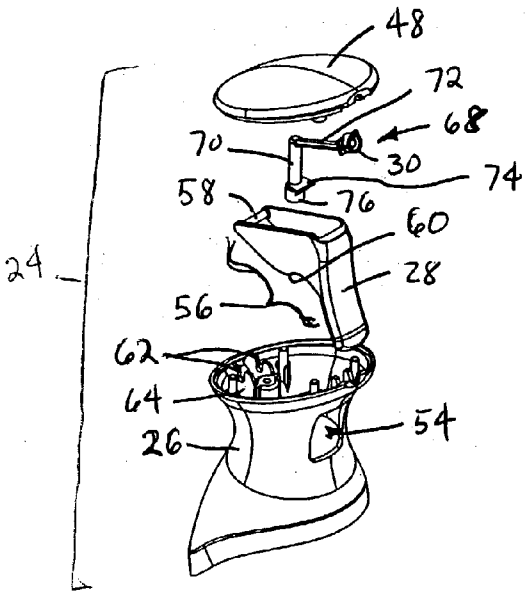


FIG. 7

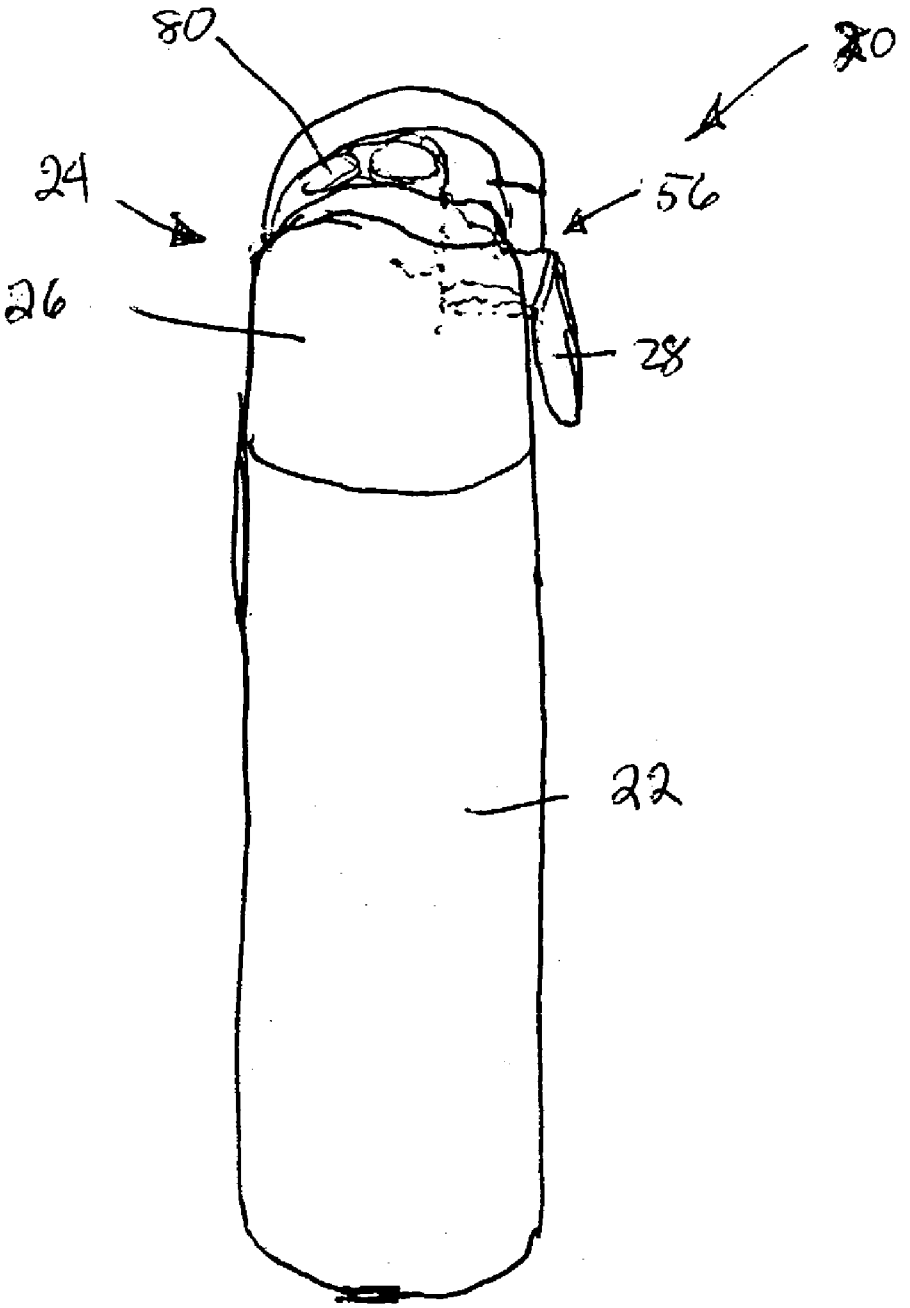


FIG. 8

SPRAYER ACTUATOR, SPRAYER, AND METHOD OF MAKING THE SAME

FIELD OF THE INVENTION

[0001] The present invention relates to a sprayer, a sprayer actuator, and a method of making the same.

BACKGROUND OF THE INVENTION

[0002] Pressurized containers of the aerosol type have been traditionally equipped with an actuating button or cap, which button or cap defines a product duct through which the product passes to the discharge orifice situated within the button or cap. To discharge product from the container, the user grasps the container and with one finger of the grasping hand depresses the button or a portion of the cap to release the contents of the container.

[0003] While achieving substantial commercial success, finger actuated buttons or caps have the disadvantage of inducing finger fatigue for some users. Moreover, with the prior systems of actuation, the aiming of the discharged product to the desired surface area suffers somewhat due to the relatively awkward gripping and finger placement. A more natural grasping and actuation of the container is achieved through the use of a trigger mechanism. Examples of prior trigger actuated aerosol containers are disclosed in U.S. Pat. Nos. 3,189,232, 3,580,432; 3,987,942; 5,862,960; and 6,494,349 B1. In addition, some prior spray containers are only held by a few of the user's fingers. These may result in a less than adequately secure grip, and supporting the weight of the sprayer may place an undue strain on the user's fingers. Therefore, the search for improved sprayers has continued.

SUMMARY OF THE INVENTION

[0004] The present invention relates to a sprayer, a sprayer actuator, and a method of making the same. There are numerous embodiments of the sprayer, sprayer actuator, and method described herein, all of which are intended to be non-limiting examples, and there are numerous aspects thereof that may constitute inventions in their own right.

[0005] In one embodiment, an ergonomic sprayer actuator is disclosed. The sprayer actuator comprises a housing having an upper portion, a lower portion for fitting on or over a can or other container, and a narrowed waist portion between said upper portion and said lower portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description taken in conjunction with the accompanying drawings in which:

[0007] **FIG. 1** is a perspective view of one non-limiting embodiment of a container having a sprayer actuator thereon.

[0008] **FIG. 2** is a side view of the spray container shown in **FIG. 1**.

[0009] **FIG. 3** is front view of the spray container shown in **FIG. 1**.

[0010] **FIG. 4** is a cross-sectional view of the spray container taken along line **4-4** of **FIG. 3**.

[0011] **FIG. 5** is a side view of the spray container showing a user's hand holding the same.

[0012] **FIG. 6** is a view of the sprayer container from above showing a user's hand holding the same.

[0013] **FIG. 7** is an exploded perspective view showing the assembly of the components of the sprayer actuator.

[0014] **FIG. 8** is a perspective view of another embodiment of a sprayer which has a trigger disposed outside at least a portion of the actuator housing.

DETAILED DESCRIPTION OF THE INVENTION

[0015] The present invention relates to a sprayer, a sprayer actuator, and a method of making the same. **FIG. 1** shows one non-limiting embodiment of a sprayer **20**. As shown in **FIG. 1**, the sprayer (or "spray container") **20** comprises a container **22** and a sprayer actuator (or "actuator") **24**. The sprayer actuator **24** comprises a housing **26**, a trigger **28**, and a nozzle **30**. The sprayer **20** can be a pressurized container sprayer, such as an aerosol sprayer, or a non-aerosol trigger sprayer, or any other suitable type of sprayer which can benefit from the features described herein.

[0016] The container **22** can be any suitable type of container for holding a product to be dispensed by the sprayer. In some embodiments, it is desirable for the container **22** to be capable of holding contents that are under pressure and/or a propellant. The design of such containers in the form of metal cans is well known. The container **22** can be of any suitable shape. The container **22** has a base **32**, sides **34**, a lower portion **36**, an upper portion **38**, and a top **40** (shown in **FIG. 4**). In the embodiment shown, the container **22** is generally cylindrical, but the sides **34** of the container taper inwardly with a slightly convex curvature on the upper portion **38** of the container. The container **22** is, thus, narrower at its upper portion **38**. The container **22** can have numerous other shapes in different embodiments.

[0017] The container **22** can contain any suitable product that is capable of being sprayed by the sprayer **20**. The product can be in any suitable form, including liquids, and other compositions. Examples of products include, but are not limited to: air freshening compositions, fabric freshening compositions, ironing aids such as spray starches, insecticides, paints, and other industrial, commercial, household, automotive, and/or garden compositions.

[0018] The container **22** can also include a propellant for dispensing the product therein. Any suitable propellant can be used. Suitable propellants include, but are not limited to: hydrocarbon propellants such as: isobutene, butane, isopropane, dimethyl ether (DME), or non-hydrocarbon propellants such as compressed gases which include, but are not limited to compressed air, nitrogen, inert gases, carbon dioxide, and mixtures thereof. In certain embodiments, such as in the case of air freshening compositions, it may be desirable for the propellant to be substantially free of hydrocarbon propellants.

[0019] The actuator housing **26** in the embodiment shown, has a lower portion **42**, an upper portion **44**, a waist portion **46**, and a top **48**. The lower portion **42** fits on or over the

container **22**. As shown in **FIG. 1**, in this embodiment, the waist portion **46** is located between the lower portion **42** and the upper portion **44**. The waist portion **46** is narrower than the widest portions of the upper and lower portions. The waist portion **46** provides the sprayer actuator **24** with an ergonomic design. Specifically, as shown in **FIG. 5**, in this embodiment, actuator housing **26** is configured so that a user can wrap at least their thumb **50** and forefinger **52** around the narrowed waist portion **46**. In this embodiment, the sprayer actuator housing **26** is also provided with a configuration that permits it to comfortably fit the natural contour of the user's palm, such as in the crease in the user's palm. As shown in **FIG. 6**, when viewed from above, at least a part of the upper portion **44** extends outward beyond the portion of the user's thumb **50** and forefinger **52** that are in contact with the narrowed waist portion **46** to form a ledge.

[0020] The narrowness of the waist portion **46** makes the sprayer **20** easier to grip. In addition, since the upper portion **44** comprises at least portions that are wider when viewed from above than the portion of the user's hand that at least partially encircles the waist portion **46**, the ledge formed by these portions of the upper portion **44** can rest on a portion of the user's thumb and forefinger to at least partially support the weight of the sprayer **20** during use. This can relieve the pressure on the user's fingers and/or wrist, particularly when the sprayer **20** is used for a prolonged period.

[0021] The upper portion **44** may comprise portions at the front, sides, and rear of the sprayer that are wider than the portions of the user's hand that are in contact with the narrowed waist portion **46**. In other embodiments, the upper portion **44** need not have portions that are wider all the way around the sprayer than the portions of the user's hand that are in contact with the narrowed waist portion **46**. Any suitable portion(s) of the upper portion **44** may extend laterally outward beyond the portions of the user's hand that are in contact with the narrowed waist portion **46**. Such suitable portions include, but are not limited to on at least one of the sides, preferably both sides, and/or in the back of the sprayer.

[0022] In the embodiment shown in the drawings, the lower portion **42** of the actuator housing **26** is larger and extends downward further toward the base **32** of the container **22** in the back of the sprayer **20** than in the front of the sprayer. In other embodiments, the lower portion **42** of the actuator housing **26** may have a different configuration. For example, in other embodiments, all parts of the lower portion **42** of the actuator housing **26** can be of uniform length.

[0023] As shown in the drawings, in this embodiment, the upper portion **44** of the actuator housing **26** has a front, a back, and an underside **49**. In the embodiment shown, both the underside **49** and the top **48** of the actuator housing **26** are angled or tilted upward from the back of the sprayer to the front of the sprayer. The fact that the underside **49** of the upper portion **44** is tilted so that the underside of said upper portion is higher in front than in the back allows the sprayer to be held more comfortably by a user without bending the user's wrist. In other embodiments, the top **48** (and/or the underside **49**) of the housing can have a different configuration (e.g., flat, tilted downward, etc.). In some embodiments, it may even be possible to eliminate the top **48** of the housing **26** altogether.

[0024] In the embodiment shown in the drawings, the top **48** of the actuator housing **26** is tilted upward because the sprayer nozzle **30** is oriented so that liquid sprayed from the nozzle **30** will be directed at an angle of greater than 0° and less than 90°. That is, the liquid is not sprayed out parallel to the base **32** (that is, horizontally when the base is placed on a horizontal surface), nor is it sprayed out vertically (straight upward in the direction of the axis of the container). In other embodiments, the liquid sprayed from the nozzle **30** is directed at an angle of greater than or equal to about 30° and less than or equal to about 60°. In other embodiments, the liquid sprayed from the nozzle **30** is directed at an angle of about 45°. In other embodiments, the liquid sprayed from the nozzle **30** is directed at an angle of between about 20°-25°.

[0025] In other embodiments, however, it may be desirable for the liquid sprayed from the nozzle **30** to be sprayed horizontally (0°) or vertically (90°). In still other embodiments, such as in the case of an ironing aid, it may be desirable for the liquid sprayed from the nozzle **30** to be directed downward toward a surface (at an angle of between 0° and −90°). It is appreciated, however, that spray patterns are typically in the form of dispersions, and the spray emitted from a nozzle will form a dispersed spray pattern angle when viewed from the side. The angles of spray referred to herein are the central axis, A, as shown in **FIG. 2**, that bisects such a spray pattern. It is understood that portions of the spray pattern will typically be distributed on either side of this central axis.

[0026] The nozzle **30** may be configured to spray droplets of any suitable size. In one non-limiting embodiment, the nozzle **30** is configured to spray a plurality of droplets wherein at least some of the spray droplets have a diameter in a range of from about 0.01 μm to about 500 μm, or from about 5 μm to about 400 μm, or from about 10 μm to about 200 μm. The mean particle size of the spray droplets may be in the range of from about 10 μm to about 100 μm, or from about 20 μm to about 60 μm. These size droplets may be useful in the case of air freshening compositions in which it is desired to suspend the droplets in the air for prolonged periods.

[0027] The sprayer actuator **24** comprises a trigger **28** operatively associated with the actuator housing **26** at the front of said sprayer. In the embodiment shown, the trigger **28** is also ergonomically designed. The trigger **28** is ergonomic in that it is relatively long, flat, and wide. This permits the user to not only activate the trigger with one finger, such as the user's index finger; it also allows the user to use two or more fingers (such as their index and middle fingers) to activate the trigger **28**. This reduces fatigue on the user's index finger in the case of prolonged spraying. The trigger **28** can have any suitable dimensions. In certain embodiments, the trigger can have a length, L, of greater than or equal to about 1.25 inches (about 30 or 32 mm). In certain embodiments, the trigger **28** can have a width, W, of greater than or equal to about 7/16 inch (about 10 or 11 mm). For example, the trigger **28** may have a width of about 10/16 inch (about 15 or 16 mm). In other embodiments, the trigger **28** need not be ergonomically designed, and can be of a more conventional design and size.

[0028] **FIGS. 4 and 7** show the details of the inside of the sprayer actuator **24**. As shown in **FIGS. 4 and 7**, this

embodiment of the sprayer **20**, the sprayer actuator **24** comprises the actuator housing **26** and trigger **28** described above. The actuator housing **26** has a hole or opening **54** in the front for the trigger **28**. The trigger **28** is part of a larger trigger piece **56**, and the rear of the trigger piece **56** has a bar **58** joined thereto, or integrally formed therewith. The trigger piece **56** also comprises a bearing portion **60**. The bar **58** is configured to fit into recesses or slots **62** in shelves **64** that are located on the inside of the actuator housing **26**, at the rear portion thereof. This allows the trigger piece **56** to rotate in a hinged fashion. The trigger **28**, thus, extends from the front of the sprayer **20**, and is operatively associated with the actuator housing **26**.

[**0029**] The container **22**, as shown in **FIG. 4**, can have a conventional valve stem **66** extending upward from the top **40** of the container. The sprayer actuator **24** further comprises a conduit **68**. The conduit **68** has a first end and a second end. The conduit **68**, in the embodiment shown, comprises several elements. These include: the nozzle **30** at the first end (or front) of the conduit **68**; a first upstanding conduit portion (or "segment" or "leg") **70**; a second angular conduit portion (or "segment" or "leg") **72**; a platform **74**; and a cap portion **76** at the second end of the conduit **68**. The second conduit portion forms an angle, α, with said first segment **72** greater than 0°. In the embodiment shown in **FIG. 4** where the sprayer is configured to direct the spray in at an upward angle, this angle α is greater than about 90° and less than about 180° In the embodiment shown in the drawings, the nozzle **30** is held in a fixed location in the front of the actuator housing **26**, and the cap portion **76** of the conduit **68** is fit over the valve stem **66** of the container **22**. The first conduit portion **70** of the conduit **68** in this embodiment, is more rigid than the second conduit portion **72** (the latter is preferably flexible). In this embodiment, the conduit **68** serves the dual purpose of channeling the contents of the container **22** to the nozzle **30** where they can be sprayed out of the container **22**, and also transmitting a downward force on the valve stem **66** to release the contents of the container **22**.

[**0030**] The sprayer actuator **24** works in the following manner. When the user pulls the trigger **28** inward toward the actuator housing **26**, this causes the bearing portion **60** of the trigger piece **56** to press down on the platform **74** on the conduit **68**. This causes the first conduit portion **70** of the conduit **68** to move downward and activates the valve stem **66** of the container. Since the nozzle **30** is in a fixed position, the flexible nature of the second conduit portion **72** of the conduit **68** bends and permits this downward movement to take place. The valve stem **66** permits the contents of the container **22** to be released. The contents of the container flow through the conduit **68** and out the nozzle **30**.

[**0031**] Numerous other embodiments having the features described herein are possible, a few of which are described below. In other embodiments, for example, the narrowed waist region can be formed by all, or a portion of, the container **22**, rather than being formed entirely as part of the actuator housing **26**. In various embodiments, the actuator **24** can be permanently affixed to the container **22**, or the actuator **24** can be removably affixed to the container **22**. The actuator **24** can be removably affixed to the container **22** in any manner known in the art for removably affixing an article to a container, including but not limited to by screw threads, bayonet fitments, and by a snap fit. In addition, rather than having the lower portion **42** of the actuator housing **26** overlap the outside of the upper portion **38** of the container, the actuator **24** and container **22** can be configured so that their outside surfaces are flush or form a substantially continuous surface.

[**0032**] In these or other embodiments, the conduit **68** need not comprise all of the elements described herein, and these elements can be provided as part of some other element of the sprayer actuator **24**. In other embodiments, the nozzle need not remain in a fixed position at the front of the actuator housing **26**. For example, it is possible for the nozzle **30** to be mounted so that it moves upward and downward when the trigger **28** is moved. In other embodiments, the conduit **68** need not comprise a first and second conduit portion in which one of the conduit portions is flexible and one is more rigid. In other embodiments, for example, the entire conduit **68** can be flexible, or the entire conduit can be rigid. However, this may change the way that the sprayer actuator functions.

[**0033**] In other embodiments, the trigger piece **56** can comprise a portion of the actuator housing **26**, or any other part of the actuator, rather than a separate component that is affixed to the actuator housing **26**. Such a sprayer actuator need not comprise all of the features of the sprayer described herein. For example, **FIG. 8** shows an example of a conventional sprayer **20** that has an actuating member, such as a push button **80** at the top of the actuator housing **26**. This push button **80** is formed as part of the actuator housing **26**, and is joined to the actuator housing **26** in a manner (such as with a living hinge that flexes) that permits the push button to move slightly downward and back upward. In the variation of the sprayer **20** shown in **FIG. 8**, a trigger piece **56** is joined to the front of the push button piece **80** to convert the sprayer into a trigger sprayer. In this embodiment, the trigger **28** resides outside of the front portion of the actuator housing **26**. The trigger piece **56** can be joined to the push button piece in any suitable manner, or it can be molded as an integral part of the push button piece **80** and/or the actuator housing **26**.

[**0034**] In still other embodiments, the trigger piece **56** and the conduit **68** can be formed as a single integral component.

[**0035**] **FIG. 7** shows one embodiment of a method for assembling of the components of the sprayer actuator **24**. As shown in **FIG. 7**, the sprayer actuator **24** is assembled as follows. The actuator housing **26** is provided in two portions comprising a side portion having a top that is at least partially open, a bottom that is at least partially open, and a front with an opening therein for the trigger, and a cap **48** for the actuator housing. The trigger piece **56** is inserted into said side portion of the actuator housing so that at least a portion of the trigger piece **56** extends outward through the opening in the front of the side portion of the housing to form a trigger **28**. The conduit **68** is inserted into the side portion of the actuator housing **26** so that it is in fluid communication with the container **22** and operatively associated with the trigger **28**. Finally, the cap forming the top **48** of the actuator housing **26** is placed on top of the side portion of the housing to form the sprayer actuator.

[**0036**] The disclosure of all patents, patent applications (and any patents which issue thereon, as well as any corresponding published foreign patent applications), and publications mentioned throughout this description are hereby

incorporated by reference herein. It is expressly not admitted, however, that any of the documents incorporated by reference herein teach or disclose the present invention.

[0037] It should be understood that every maximum numerical limitation given throughout this specification will include every lower numerical limitation, as if such lower numerical limitations were expressly written herein. Every minimum numerical limitation given throughout this specification will include every higher numerical limitation, as if such higher numerical limitations were expressly written herein. Every numerical range given throughout this specification will include every narrower numerical range that falls within such broader numerical range, as if such narrower numerical ranges were all expressly written herein.

[0038] While particular embodiments of the subject invention have been described, it will be obvious to those skilled in the art that various changes and modifications of the subject invention can be made without departing from the spirit and scope of the invention. In addition, while the present invention has been described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not by way of limitation and the scope of the invention is defined by the appended claims which should be construed as broadly as the prior art will permit.

What is claimed is:

1. An ergonomic sprayer actuator comprising a housing having an upper portion, a lower portion for fitting on a container, and a narrowed waist portion between said upper portion and said lower portion.

2. The ergonomic sprayer actuator of claim 1 wherein said actuator housing is configured so that a user can wrap at least their thumb and forefinger around the narrowed waist portion, and when viewed from above, at least a part of the upper portion extends outward beyond the portion of the user's thumb and forefinger that are in contact with the narrowed waist portion.

3. The ergonomic sprayer actuator of claim 2 wherein said actuator housing has a front, a rear, and sides, and the part of the upper portion that extends outward beyond the portion of the user's thumb and forefinger that are in contact with the narrowed waist portion is at least on the sides and rear of the housing.

4. The ergonomic sprayer actuator of claim 3 wherein the part of the upper portion that extends outward beyond the portion of the user's thumb and forefinger that are in contact with the narrowed waist portion also includes a portion at the front of the housing.

5. The ergonomic sprayer actuator of claim 1 wherein said upper portion is configured so that it rests on a portion of a user's thumb and forefinger to at least partially support the weight of the sprayer during use.

6. The ergonomic sprayer actuator of claim 1 wherein said upper portion has a front, a back, and an underside, and said upper portion is tilted so that the underside of said upper portion is higher in front than in the back.

7. The ergonomic sprayer actuator of claim 1 further comprising a nozzle at the front of said sprayer housing, wherein said nozzle is oriented so that liquid sprayed from said nozzle will be directed at an angle of greater than 0° and less than 90°.

8. The ergonomic sprayer actuator of claim 1 further comprising a nozzle at the front of said sprayer housing, wherein said nozzle is oriented so that liquid sprayed from said nozzle will be directed at a downward angle of less than 0° and greater than −90°.

9. The ergonomic sprayer actuator of claim 1 further comprising a trigger operatively associated with said sprayer housing at the front of said sprayer.

10. The ergonomic sprayer actuator of claim 9 wherein said trigger has a length that is sufficient to allow said trigger to be activated with two fingers.

11. The ergonomic sprayer actuator of claim 10 wherein the length of said trigger is greater than or equal to about 30 mm.

12. The ergonomic sprayer actuator of claim 9 wherein the trigger has a width, and the width of said trigger is greater than or equal to about 15 mm.

13. A sprayer comprising a non-pressurized container having a top and the ergonomic sprayer actuator of claim 1 which is joined to the top of the container.

14. A sprayer comprising a pressurized container having a top and the ergonomic sprayer actuator of claim 1 which is joined to the top of the container.

15. The sprayer of claim 14 wherein said pressurized container comprises a propellant, and at least a portion of said propellant comprises a compressed gas.

16. The sprayer of claim 15 wherein said compressed gas comprises one or more of the following: compressed air, nitrogen, one or more inert gases, and carbon dioxide.

17. The sprayer of claim 15 which is configured to provide a spray in the air in the form of a plurality of spray droplets, and at least some of the spray droplets have a diameter in a range of from about 0.01 μm to about 500 μm.

18. The sprayer of claim 15 which is configured to provide a spray in the air in the form of a plurality of spray droplets, and at least some of the spray droplets have a diameter in a range of from about 5 μm to about 400 μm.

19. The sprayer of claim 15 which is configured to provide a spray in the air in the form of a plurality of spray droplets, and at least some of the spray droplets have a diameter in a range of from about 10 μm to about 200 μm.

20. The sprayer of claim 17 wherein at least some of the spray droplets have a mean diameter by volume of between about 10-100 μm.

21. The sprayer of claim 17 wherein at least some of the spray droplets have a mean diameter by volume of between about 20-60 μm.

22. A sprayer actuator for fitting on a pressurized container having a valve stem, said sprayer actuator having a front, said sprayer actuator comprising:

a housing;

a trigger operatively associated with said housing at the front of said sprayer actuator; and

a conduit having a first end and a second end, wherein said first end of said conduit is configured to be positioned over the valve stem of a pressurized container, and the second end of said conduit has a nozzle operatively associated therewith, wherein said conduit is configured to provide fluid communication between a pressurized container and said nozzle.

23. The sprayer actuator of claim 22 wherein said conduit comprises two rectilinear segments that form an angle there between.

24. The sprayer actuator of claim 23 wherein said two rectilinear segments comprise a first segment that comprises

the first end of the conduit, wherein said first segment is disposed in a substantially vertical orientation when the first end of the conduit is positioned over the valve stem of a pressurized container, and a second segment that forms an angle with said first segment of greater than about 90° and less than about 180°.

25. The sprayer actuator of claim 22 wherein said conduit is curved.

26. The sprayer actuator of claim 22 wherein at least a portion of said conduit is flexible.

27. The sprayer actuator of claim 24 wherein the second segment is flexible.

28. The sprayer actuator of claim 22 wherein said conduit further comprises a bearing platform.

29. The sprayer actuator of claim 22 wherein said nozzle held in a fixed position when said trigger is activated.

30. The sprayer actuator of claim 22 wherein said nozzle is moveable when said trigger is activated.

31. A sprayer comprising:

a container having a valve stem; and

an actuator on said container actuator comprising a housing, said housing comprising an actuating member at least indirectly in mechanical contact with said valve stem, having a trigger that is integrally formed with at least a portion of said housing and operatively associated with said sprayer housing at the front of said sprayer actuator.

32. A method of making a sprayer actuator comprising:

providing a side portion for a housing of a sprayer actuator, said side portion having a top that is at least partially open, a bottom that is at least partially open, and a front with an opening therein for a trigger;

providing a trigger piece;

providing a conduit;

providing a cap for said sprayer housing;

inserting said trigger piece into said side portion of said housing so that at least a portion of said trigger piece extends outward through the opening in the front of said side portion of said housing to form a trigger;

inserting said conduit into said side portion of said housing so that it is operatively associated with said trigger; and

placing said cap on top of said side portion of said housing to form said sprayer actuator.

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