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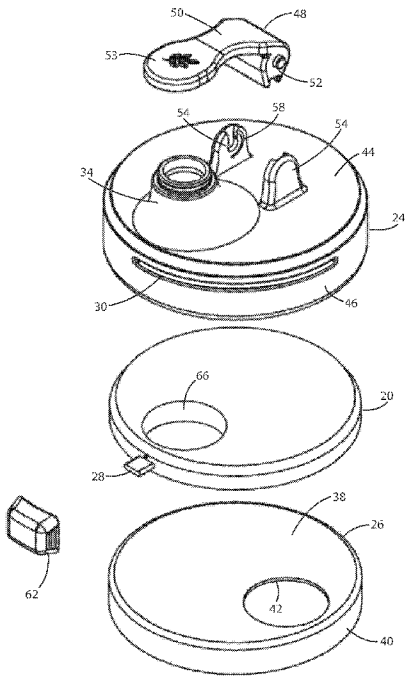


Fig. 3

(57) Abstract: A power dispensing closure capable of being retrofitted to existing powder containers to allow metered dispensing of powder from conventional powder containers. The closure may include a metering disk enclosed within an interior space, and movable between a closed position in which the metering disk may be loaded with powder material from the container and a dispense position in which the metering disk is capable of dispensing the loaded material from the closure. The closure may include a metering disk actuator extending from the metering disk through a slot in the housing. The closure may include a bottom housing configured to install on a powder container in place of a conventional cap. The housing may include a load opening for loading the metering disk and a spout for dispensing the loaded powder. The load opening and spout may be radially offset no more than about ninety degrees.

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METERING POWDER DISPENSER

BACKGROUND OF THE INVENTION

[0001] The present invention relates to material dispensers and more specifically to container closures having an integral dispenser for dispensing a metered amount of material from a container.

[0002] There are a wide variety of applications in which it is desirable to dispense a metered amount of a powder. For example, in the context of diet, health and nutrition, it is common to prepare diet, health and nutritional shakes from a bulk supply of a nutritional powder. To illustrate, it is common to prepare protein shakes by combining of a specific amount of protein powder with one or more additional ingredients, such as water, milk or other fluids. As a result, it is common for the suppliers of nutritional powders, such as protein powder, to provide a mechanism for dispensing the appropriate volume of powder. In some applications, the powder is sold in a bulk container with a measuring cup, such as a scoop or a spoon, placed loosely inside. The loose measuring cup is helpful, but suffers from a number of disadvantages. For example, the use of a loose measuring cup requires the user to put his or her hands into the powder container to grab the measuring cup. Because the measuring cup is loose, it will often be covered with powder and have the potential to create a mess. Further, powder can easily spill from the measuring cup because the measuring cup will generally be filled to the top with powder when transporting and pouring powder into a shaker or other separate container. Additionally, the loose measuring cup can be lost or misplaced.

[0003] In other applications, a container is provided with an integrated metering system. For example, one prior art container includes metering system integrated into one end of a container body opposite the container closure. With this prior art system, a divider is rotatably seated between proximal and distal ends. The divider is secured by an axle extending through an interconnecting the proximal and distal ends. The divider has an exposed circumferential edge that can be rotated to operate the metering system. In use, the divider is

rotated approximately 180 degree between a first position in which the divider is capable of being loaded with powder and a second position in which the loaded powder is capable of being poured from the container through a spout. The container has a removable lid that is fitted to the open end of the container opposite the metering system. When it is desirable to open the container, the container is rotated so that the metering system is on the bottom and the removable lid is on the top. Because the metering system is not flat, the container cannot simply be set down when in this inverted position. As a result, some embodiments of this prior art container include a removable lid that is specially configured to function as a stand for the inverted container. To use the removable lid as a stand, the container may be inverted, the lid may be removed from the inverted container, the lid may be placed on a surface and the metering system may be seated in a saddle-like structure in the removable lid.

SUMMARY OF THE INVENTION

[0004] The present invention provides a powder dispensing closure capable of being retrofitted to existing powder containers to allow metered dispensing of powder from conventional powder containers. The closure may include a metering disk rotatably enclosed within an interior space defined between a bottom housing and a top housing. The metering disk may be rotatably movable between a closed position in which the metering disk may be loaded with material from the container, and a dispense position in which the metering disk is capable of dispensing the loaded material from the closure.

[0005] In one embodiment, the bottom housing may be configured to allow the closure to be installed on a conventional powder container in place of a conventional cap. To facilitate this feature, the bottom housing may include an attachment structure intended to interface with the pre-existing cap attachment structure on the powder container. For example, many conventional powder containers include a neck with external threads that allow the container to be closed by a cap with mating internal threads. For use with these types of containers, the bottom housing may include internal threads configured to mate with the pre-existing external

threads on the neck of the powder container. The present invention may be readily adapted for use with powder containers that include other types of cap attachment structures. For example, the bottom housing may be configured to be snap-fitted onto powder containers that are designed to be closed by a snap-fit cap.

[0006] In one embodiment, the bottom housing defines a load opening that allows powder to pass from the interior of the powder container through the bottom housing into the metering disk when the metering disk is in the closed position. The load opening may be offset from the center of the bottom housing.

[0007] In one embodiment, the top housing includes a closure spout that provides a flow path from the interior space through the top housing to allow powder to be poured from the closure. The closure spout may be radially offset from the load opening in the bottom housing.

[0008] In one embodiment, the top housing and bottom housing cooperatively define the interior space in the shape of a cylindrical void configured to closely receive the metering disk. The inner height and diameter of the interior space may be only slightly greater than the height and diameter of the metering disk.

[0009] In one embodiment, the metering disk includes a finger that extends from the interior space through a slot in the closure, for example, through the top housing and/or bottom housing. The metering disk may be rotated between open and closed positions through manual manipulation of the finger back and forth along the slot. The slot may be configured to control the range of motion of the metering disk and to define the open and closed positions. For example, in operation, the metering disk may be in the closed position when the finger is at one end of the slot and the dispense position when the finger is at the other end of the slot. A button may be fitted onto the finger from the outside to provide a larger and more comfortable structure for operating the metering disk. The slot may include small protrusions near opposite ends that cause the finger to snap into the closed and dispense positions.

[0010] In one embodiment, the metering disk is generally cylindrical and is fitted into the interior space with the outer surfaces of the metering disk interfacing with the interior surfaces defining the interior space. The tolerances between the metering disk and the interior surfaces of the interior space may be selected to control the amount of force required to move the metering disk and to limit the potential for powder to pass into the space between the metering disk and interior surfaces (where it may interfere with operation). For example, the metering disk may be configured to fit closely within the interior space with just enough clearance to allow the metering disk to rotate between closed and dispense positions.

[0011] In one embodiment, the metering disk defines a metering void corresponding in size with the desired volume of material to be dispensed. The metering void may extend through the metering disk between opposite end surfaces of the disk so that powder can be loaded into the metering disk from one side and dispensed from the metering disk on the opposite side. In one embodiment, the metering disk is configured so that, as the metering disk rotates, the metering void moves from a position in alignment with the load opening (when the metering disk is in the closed position) to a position in alignment with the closure spout (when the metering disk is in the dispense position). In one embodiment, the closure is configured so that the metering disk is moved about 90 degrees or less between the closed position and the dispense position.

[0012] In one embodiment, the metering disk, top housing and/or bottom housing may be provided with slides or wipers that help to prevent powder from passing into the space between the metering disk and interior surfaces and/or to clean away powder that does manage to enter that space. For example, a slide or wiper may extend around the load opening and/or the metering void.

[0013] In one embodiment, the closure may be configured to allow dispensing of two different volumes of powder. In one embodiment, the closure is configured to allow one volume of powder to be dispensed by movement of the metering disk away from the closed

position in one direction and a second volume of powder by movement of the metering disk away from the closed position in the opposite direction. To provide this feature, the metering disk may define two metering voids of different sizes and the bottom housing may define two load openings of different sizes. The slot may be extended to provide the metering disk with a greater range of motion. The metering disk may be in the closed position when the finger is at the center of the slot. In this position, both metering voids are aligned with corresponding load openings in the bottom housing so that both metering voids can be loaded when the metering disk is closed. To dispense one volume, the metering disk is rotated away from the closed position in a clockwise direction to bring the first metering void into alignment with the closure spout. To dispense the alternative volume, the metering disk is rotated away from the closed position in a counterclockwise direction to bring the alternative metering void into alignment with the closure spout.

[0014] In one embodiment, the closure may be configured to vary the dispensing volume by providing a mechanism for varying the volume of the metering void. For example, in one embodiment, the closure may include one or more adapters that can be fitted into the metering void to occupy space and thereby change its volume. The adapter may be a ring-shaped component that is capable of being fitted (e.g. snap-fitted) into the metering void to reduce its effective diameter. The closure may be provided with a variety of different ring-shaped adapters with different internal diameter to allow essentially any desired reduction in dispensing volume. In an alternative embodiment, the metering disk may include a shutter or other selectively movable structure that allows the volume of the metering disk to be varied.

[0015] In one embodiment, the closure may be provided with a biasing component for urging the metering disk into the closed position. For example, the closure may be fitted with a spring that extends between the metering disk and at least one of the top housing and bottom housing to bias the metering disk. The spring may be a torsion spring, a coil spring or

essentially any other biasing component capable of biasing the metering disk in the closed position.

[0016] In one embodiment, the top housing may include a cap configured to selectively close the open end of the closure spout. In one embodiment, the cap is a flip-type cap that is configured to remain attached to the closure and is pivotally movable between open and closed positions. The flip cap may have a fixed end that is rotatably fitted between a pair of mounting posts. The flip cap may be configured to lock in the open position, for example, by a friction fit between the flip cap and the mounting posts. In one embodiment, the flip cap includes a small nub that travels through a corresponding slot in one of the mounting posts. The slot is shaped to lock the flip cap open so that it does not interfere when the powder container is inverted.

[0017] In one embodiment, the present invention includes a powder dispensing closure and a shaker combination in which the powder dispensing closure and the shaker are configured with alignment features that facilitate proper alignment between the closure and the shaker during dispensing. The alignment features may include a friction fit or a snap-fit that help to retain the shaker and the closure in alignment. In one embodiment, the closure spout and the shaker spout are configured to be mechanically interfitted. For example, the shaker spout may fit over the closure spout (or vice-versa). Additionally, the dispenser cap and the shaker cap may include interfitting features that are exposed when the caps are opened. The interfitting features may provide alignment and/or may include a friction fit or snap fit that helps to hold the shaker and closure together during dispensing.

[0018] The present invention provides a method for preparing a mixture in a shaker including the general steps of: (a) remove the conventional closure from the powder material container to expose the container opening; (b) install the powder metering closure over the container opening in place of the original closure; (c) position the metering disk in the closed position; (d) open the cap of the metering closure; (e) open the cap of the shaker; (f) invert the

material container and place the closure spout in communication with the shaker spout; (g) move the metering disk into the dispense position to allow powder to flow from the metering disk through the closure spout and shaker spout into the interior of the shaker; (h) move the metering disk back into the closed position; (i) remove the material container from the shaker; (j) close the cap on the material container; (k) add fluid to the shaker; (l) close the cap on the shaker; and (m) shake the shaker to mix powder and fluid.

[0019] The present invention provides a simple and effective powder metering closure that can be easily retrofitted to a wide range of conventional powder containers in place of the conventional container closure. The enclosed metering disk provides the closure within enhanced structural integrity. It also provides a large interface between the metering disk and the housing, which has the potential to provide more controlled and uniform movement of the metering disk. The tolerances between the metering disk and the housing can be carefully controlled to reduce the likelihood of unwanted powder build-up between the metering disk and the housing. Further, the range of travel of the enclosed metering disk can be effectively and easily controlled by a slot in the closure. In some applications, the range of motion of the metering disk between closed and dispensed positions is about 90 degrees or less. This reduces travel and therefore reduces the risk of powder infiltration into the space between the metering disk and the house, as well as reducing powder grind if powder infiltration does occur. The metering disk may be provided with multiple metering voids to allow multiple different dispense volumes, or with mechanical structure for varying the size of the metering void. Additionally, the mechanical interfit between the closure and the shaker help to facilitate dispensing from the container into the shaker. Providing mechanical interconnection at the spout and the flip caps helps to ensure proper rotational alignment between the powder container and the shaker, thereby improving balance of the inverted combination.

[0020] These and other objects, advantages, and features of the invention will be more fully understood and appreciated by reference to the description of the current embodiment and the drawings.

[0021] Before the embodiments of the invention are explained in detail, it is to be understood that the invention is not limited to the details of operation or to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention may be implemented in various other embodiments and of being practiced or being carried out in alternative ways not expressly disclosed herein. Also, it is to be understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use of "including" and "comprising" and variations thereof is meant to encompass the items listed thereafter and equivalents thereof as well as additional items and equivalents thereof. Further, enumeration may be used in the description of various embodiments. Unless otherwise expressly stated, the use of enumeration should not be construed as limiting the invention to any specific order or number of components. Nor should the use of enumeration be construed as excluding from the scope of the invention any additional steps or components that might be combined with or into the enumerated steps or components. Any reference to claim elements as “at least one of X, Y and Z” is meant to include any one of X, Y or Z individually, and any combination of X, Y and Z, for example, X, Y, Z; X, Y; X, Z ; and Y, Z.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Fig. 1 is a top perspective view of a metered powder dispensing closure in accordance with an embodiment of the present invention installed on a powder container.

[0023] Fig. 2 is a bottom perspective view of the closure.

[0024] Fig. 3 is a top exploded view of the closure.

[0025] Fig. 4 is a bottom exploded view of the closure.

[0026] Fig. 5 is a front view of the closure.

[0027] Fig. 6 is a right side view of the closure.

[0028] Fig. 7 is a top perspective view of the top housing.

[0029] Fig. 8 is a perspective view of the closure flip cap.

[0030] Fig. 9 is a sectional view of the closure.

[0031] Fig. 10 is a perspective view of the shaker.

[0032] Fig 11 is a side view of a combination of a powder container with the dispensing closure inverted and interfitted with a shaker.

[0033] Fig. 12 is a partially exploded view of the combination of the powder container, dispensing closure and shaker.

[0034] Fig. 13 is an enlarged sectional view showing a portion of the powder container and the shaker.

[0035] Fig. 14 is an exploded view of closure in accordance with a first alternative embodiment showing a metering void adapter.

[0036] Fig. 15 is an exploded view of closure in accordance with a second alternative embodiment with two metering voids.

[0037] Fig. 16 is a top exploded view of a closure in accordance with a third alternative embodiment with two metering voids and integrated electronics capable of electronically monitoring and reporting on use of the dispensing closure.

[0038] Fig. 17 is a bottom exploded view of the closure of Fig. 16.

DESCRIPTION OF THE CURRENT EMBODIMENT

[0039] A. OVERVIEW.

[0040] A powder dispensing closure 10 in accordance with an embodiment of the present invention is shown in Figs. 1 installed on a powder container 12. The powder dispensing closure 10 includes an integral metering system that allows a fixed volume of powder to be easily dispensed through the closure 10. In this embodiment, the powder dispensing closure 10 is configured for installation on a powder container 12 (See Figs. 1, 11

and 13), for example, in place of a conventional cap. The closure 10 may be configured to interface with a shaker 14 so that the contents of the powder container 12 can be precisely metered into the shaker 14, where it can be combined with one or more other ingredients, such as fluids or other powders. In one example application, the powder container 12 may include a nutritional powder and the shaker 14 may be used to combine the appropriate amount of nutritional powder with water, milk or other fluid to make a protein shake. In this embodiment, the powder dispensing closure 10 generally includes a metering disk 20 rotatably enclosed within a housing 22. The illustrated housing 22 includes a top housing 24 and a bottom housing 26 that closely receive the metering disk 20. The metering disk 20 is rotatably movable in sequence between a closed position in which the metering disk 20 may be loaded with a defined volume of powder from the powder container 12 and a dispense position in which the metering disk 20 may dispense the loaded volume of powder from the closure 10, for example, into the shaker 14. In this embodiment, the metering disk 20 includes an actuator, such as finger 28, that protrudes from the housing 22 through a slot 30. The illustrated metering disk 20 is rotatable within the housing 22 through manual movement of the finger 28 along the slot 30. The slot 30 may be configured to control the range of motion of the metering disk 20 and to dictate the closed and dispense positions. For example, the metering disk 20 of the illustrated embodiment is in the closed position when the finger 28 is at one of the slot 30 and in the dispense position when the finger 28 is at the opposite end of the slot 30.

[0041] For purposes of disclosure, the present invention is described in the context of a powder dispensing closure used to dispense a nutritional powder into a shaker for purposes of preparing nutritional shakes. This may include the dispensing of protein powder into a shaker for making protein shakes. It should be noted that the present invention is not limited to use in connection with nutritional powders, but may instead be in connection with the dispensing of essentially any powder or powder-like material from a bulk container. Further, the present invention is not limited to use in dispensing powder directly into a shaker, but

instead may be used in dispensing powder or powder-like materials into essentially any container or into no container.

[0042] Directional terms, such as "vertical," "horizontal," "top," "bottom," "upper," "lower," "inner," "inwardly," "outer" and "outwardly," are used to assist in describing the invention based on the orientation of the embodiments shown in the illustrations. The use of directional terms should not be interpreted to limit the invention to any specific orientation(s).

[0043] B. POWDER DISPENSING CLOSURE.

[0044] As noted above, an embodiment of the present invention shown in Figs. 1-9 provides a powder dispensing closure 10 intended for installation on a powder container 12 to allow a metered volume of powder to dispensed from the powder container 12, for example, into a shaker 14. The illustrated powder dispensing closure 10 generally includes a metering disk 20 and a housing 22. The metering disk 20 is rotatably seated in the housing 22 and is movable between a first, closed position in which the metering disk 20 is capable of being loaded with powder from the bulk supply of powder contained with the powder container 12, and a second, dispense position in which metering disk 20 is capable of dispensing the loaded volume of powder from the closure 10.

[0045] As perhaps best shown in the exploded views of Figs. 3-4, the housing 22 generally includes a top housing 24 and a bottom housing 26 that are joined together to enclose the metering disk 20. Referring now to Fig. 9, the top housing 24 and bottom housing 26 cooperatively define an internal space 32 that rotatably seats the metering disk 20. In this embodiment, the top housing 24 forms the top of the closure 10 and includes a closure spout 34 that allows powder to be poured from the closure 10. The bottom housing 26 is configured to allow the closure 10 to mount to a powder container 12. The internal space 32 may be configured to correspond in shape with and closely receive the metering disk 20. In the illustrated embodiment, the bottom housing 26 is nested into the top housing 24 as described in more detail between. The housing 22 of the illustrated embodiment is merely exemplary

and the housing may manufactured from essentially any alternative construction capable of retaining the metering disk 20 and allowing its movement between closed and dispense position. For example, the housing 22 need not be manufactured from top and bottom housings, but may instead be manufactured from essentially any number of housing parts.

[0046] Fig. 1 shows the closure 10 installed on powder container 12. In the illustrated embodiment, the powder dispensing closure 10 is configured so that it can be installed on a conventional powder container 12 in place of a conventional cap (not shown). For example, the closure 10 may be installed on the powder container 12 by the original supplier or it may be retrofitted on a powder container 12 that was purchased or otherwise obtained with a simple, non-metering cap. To facilitate this function, the bottom housing 26 may include an attachment structure intended to interface with the pre-existing cap attachment structure on the powder container 12. For example, the closure 10 of the illustrated embodiment is configured for use with conventional powder containers include a neck with external threads that allow the container to be closed by a cap with mating internal threads. As shown in Fig. 12, the powder container 12 includes a neck 80 having external threads 82. Given its intended use with powder container 12, the bottom housing 26 include internal threads 36 configured to mate with the pre-existing external threads 82 on the neck 80 of the powder container 12. It should be understood that this particular attachment structure is merely exemplary. The present invention may alternatively be adapted for use with powder containers that include other types of cap attachment structures. For example, the present invention may be configured for use with a powder container having a snap-on cap by providing the bottom housing 26 with a mechanical feature, such as an annular ring of material, intended to operatively interact with the snap-fit features on the neck of the alternative powder container. As another example, the powder container and closure may include a quarter-turn fitting, such as a bayonet fitting. Although the illustrated embodiment includes a mechanical connection structure, it may in some

applications be desirable to secure the powder dispensing closure to the powder container using other methods, such as cement, adhesive or welding.

[0047] Referring now to Figs. 3 and 4, the bottom housing 26 of the illustrated embodiment is generally disk-shaped having a planar, circular body 38 with a downwardly extending skirt 40. The circular body 38 is sized to cover the opening in the neck 80 of the powder container 12 and to nest inside the bottom of the top housing 24. The circular body 38 defines a load opening 42 that allows powder to pass from the interior of the powder container 12 through the bottom housing 26 into the metering disk 20 when the metering disk 20 is in the closed position. The load opening 42 of this embodiment is offset from the center of the circular body 38 in a position that is along the path of the metering void 66 (as described in more detail below). More specifically, in this embodiment, the load opening 42 is configured to align with the metering void 66 when the metering disk 20 is in the closed position. The size and shape of the load opening 42 in this embodiment corresponds with the size and shape of the metering void 66. As shown, the metering void 66 and the load opening 42 of this embodiment are generally circular and have substantially the same diameter. The size and shape of the loading opening and the metering void may vary from application to application and they do not necessarily need to correspond with one another in size and shape.

[0048] In the illustrated embodiment, the skirt 40 extends around the circumference of the circular body 38 and is configured to have an inner diameter that is slightly larger than the outer diameter of the neck 80 of the powder container 12. The height of the skirt 40 in this embodiment is selected to correspond with the height of the external threads 82 on the neck 80 of the powder container 10. The internal threads 36 are disposed on the inner surface of the skirt 40 as appropriate to interface with the external threads 82 on the neck 80.

[0049] As noted above, the top housing 24 forms the top of the powder dispensing closure 10 and includes the closure spout 34 to allow a metered amount of powder to be poured from the closure 10. The closure spout 34 of the illustrated embodiment is a funnel-like

structure that defines a flow path from the interior space 32 through the top housing 24 to allow powder to be poured from the closure 12. The closure spout 34 may, however, vary in size, shape and configuration from application to application, as desired. In this embodiment, the closure spout 34 is radially offset from the load opening 42 in the bottom housing 26 in a position that lies along the path of the metering void 66 when the metering disk 20 is rotated. More specifically, in this embodiment, the closure spout 34 is configured to align with the metering void 66 when the metering disk 20 is in the dispense position and not to align with the metering void 66 when the metering disk 20 is in the closed position. The size and shape of the bottom, open end of the closure spout 34 in this embodiment corresponds with the size and shape of the metering void 66. More specifically, the bottom, open end of the closure spout 34 may be circular and may have the same diameter as the metering void 66. The size and shape of the bottom, open end of the closure spout 34 and the metering void 66 may vary from application to application and they do not necessarily need to correspond with one another in size and shape.

[0050] In the illustrated embodiment, the top housing 24 includes a cap 48 configured to selectively close the open upper end of the closure spout 34. In this embodiment, the cap 48 is a flip-type cap that is configured to remain attached to the top housing 24 and is pivotally movable between open and closed positions. The illustrated flip cap 48 has an arm 50 with a fixed end 52 that is pivotally fixed to the closure 10 and a free end 53 configured to frictionally interfit with the top, open end of the closure spout 34 when the flip cap 48 is closed. In this embodiment, the fixed end 52 of the arm 50 is fitted between a pair of mounting posts 54 extending upwardly from the circular body portion 44. In this embodiment, the flip cap 48 is configured to lock in the open position, for example, by a friction fit between the arm 50 and the mounting posts 54. In the illustrated embodiment, the arm 50 includes a small nub 56 (See Fig. 8) that travels through a channel 58 (See Fig. 7) in one of the mounting posts 54. The depth of the channel 58 is varied to control resistance to movement of the arm 50. More

specifically, the depth is reduced through a small section near the end of the channel 58 to form a catch 60 adjacent to the open position. As the flip cap 48 is rotated toward the open position, the nub 56 travels freely along the channel 58 with unfettered movement. When the nub 56 approaches catch 60, interference between the nub 56 and catch 60 provides some resistance to further movement of the flip cap 48 toward the open position. As the resistance is overcome and the flip cap 48 is moved into the fully open position, the nub 56 passes the catch 60, thereby eliminating the resistance and positioning the nub 56 on the opposite side of the catch 60. Once in the fully open position, the catch 60 and the nub 56 provide interference that resists motion of the flip cap 48 out of the fully opened position. When locked open in this manner, the flip cap 48 will stay open and not interfere when the powder container 12 is inverted. The nub and catch arrangement is merely exemplary and alternative mechanical features can be used to dictate the movement characteristics of the flip cap 48. For example, resistance to movement of the flip cap 48 may be provided by providing a tight fit between the arm 50 and the mounting posts 54.

[0051] The top housing 24 is joined with the bottom housing 26 to define an internal space 32 that rotatably seats the metering disk 20 (See Fig. 9). Like the bottom housing 26, the top housing 24 generally includes a circular body portion 44 and a skirt 46. The circular body portion 44 of the top housing 24 is slightly larger in diameter than the circular body portion of the bottom housing 26. The skirt 46 extends downwardly from the circular body portion 44 and has an inner diameter that corresponds with the outer diameter of the skirt 40 of the bottom housing 26. The skirt 46 defines a slot 30 configured to receive a metering disk actuator, such as finger 28, extending from the metering disk 20. The metering disk 20 may be rotated between open and closed positions through manual manipulation of the finger 28 back and forth along the slot 30. The slot 30 may be configured to control the range of motion of the metering disk 20 and to define the open and closed positions. In this embodiment, the slot 30 extends through approximately 90 degrees of the circumference of the skirt 40. In use, the

metering disk 20 may be moved into the closed position by moving the finger 28 to one end of the slot 30 or to the dispense position by moving the finger 28 to the opposite end of the slot 30. The slot 30 may include small protrusions 64 near opposite ends that function as catches to cause the finger 28 to snap into the closed position and the dispense position. The finger 28 (or other actuator) may be integrally formed with the metering disk 20 or may be separately manufactured and subsequently affixed to the metering disk 20. For example, the finger 28 may be frictionally fitted into a finger seat (not shown) in the metering disk 20 by a friction fit, adhesive or other suitable method.

[0052] As perhaps best shown in Figs. 5-6, the powder dispensing closure 10 may include a button 62 disposed on the outer end of the finger 28 to provide a larger and more convenient structure for operating the metering disk 20. For example, the button 62 may be fitted onto the outer end of the finger 28 from the outside. The button 62 may be frictionally fitted on the finger 28 or may be otherwise secured, for example, by cement or adhesive. Alternatively, the button 62 and finger 28 may be integrally formed, and the combination may be installed on the metering disk 20 by fitting the finger 28 through the slot 30 into a finger seat in the metering disk 20.

[0053] In the illustrated embodiment, the housing 22 is assembled by fitting the bottom housing 26 upwardly into the top housing 24. The top housing 24 and bottom housing 26 are intersecured with the circular body portion 38 of the bottom housing 26 spaced apart from the circular body portion 44 of the top housing 24 a distance approximately equal to the height of the metering disk 20. The inner surface of the skirt 46, the bottom surface of the circular body portion 44 and the upper surface of the circular body portion 38 cooperatively define the interior space 32. As can be seen, the interior space 32 of the illustrated embodiment is a generally cylindrical void closely corresponding in size and shape with the metering disk 20. In this embodiment, the height and diameter of the interior space 32 are slightly greater than the height and diameter of the metering disk 20. The design and configuration of the housing

22 may vary from application to application. For example, in alternative embodiments, the skirt may be eliminated from the bottom housing and the attachment structure may be integrated into the skirt of the top housing.

[0054] In the illustrated embodiment, the metering disk 20 is generally cylindrical and is fitted into the interior space 32 with the outer surfaces of the metering disk 20 interfacing with the interior surfaces defining the interior space 32. The metering disk 20 includes a pair of opposed planar end surfaces that are joined by a circumferential wall. The spacing between the metering disk 20 and the interior surfaces of the interior space 32 may be selected to provide the desired amount of force required to move the metering disk 20 and to limit the potential for powder to pass into the space between the metering disk 20 and interior surfaces (where it may interfere with operation). For example, the metering disk 20 may be configured to fit as closely as possible within the interior space 32 without creating excessive resistance to rotation. In the illustrated embodiment, the upper circumferential edge of the metering disk 20 and the inner space 32 may be chamfered and the chamfered surfaces may follow a gradual curve (See Fig. 9).

[0055] Referring now to Figs. 3 and 4, the metering disk 20 defines a metering void 66 corresponding in size with the desired volume of powder material to be dispensed. The metering void 66 may extend through the metering disk 20 between opposite end surfaces so that powder can be loaded into the metering disk from one side of the disk 20 and then dispensed from the metering disk 20 on the opposite side. The metering disk 20 of the illustrated embodiment is configured so that, as the metering disk rotates, the metering void 66 moves from a position in alignment with the load opening 42 (when the metering disk is in the closed position) to a position in alignment with the bottom, open end of the closure spout 34 (when the metering disk is in the dispense position). In this embodiment, the powder dispensing closure 10 is configured so that the metering disk 20 is moved about 90 degrees or

less between the closed position and the dispense position. The closure spout 34 and the load opening 42 are offset by about 90 degrees or less to provide this feature.

[0056] Although not shown, the metering disk 20, top housing 24 and/or bottom housing 26 may be provided with slides or wipers that help to prevent powder from passing into the space between the metering disk 20 and interior surfaces 32 and/or to clean away powder that does manage to enter that space. For example, a slide or wiper (not shown) may extend around the load opening 42 and/or the metering void 66. The slide or wiper may be formed by a small ridge of flexible plastic that is integral formed with (or affixed to) the metering disk 20 and/or the bottom housing 26.

[0057] In alternative embodiments, the powder dispensing closure may be configured to allow dispensing of different volumes of powder. The closure may be configured to vary the dispensing volume by providing a mechanism for varying the volume of the metering void. For example, in an alternative embodiment shown in Fig. 14, the closure 10' is provided with one or more adapters 90' that can be fitted into the metering void 66' to occupy space and thereby change the volume of the metering void 66' and consequently the volume of metered powder. Except as otherwise described, the embodiment of Fig. 14 is essentially identical to the embodiment of Figs. 1-13, and the components of closure 10' use like reference numerals followed by the " ' " symbol. In the embodiment of Fig. 14, the adapter 90' is ring-shaped and is capable of being removably fitted (e.g. snap-fitted) into the metering void 66' to reduce its effective diameter. For example, the interior circumferential wall 67' of the metering void 66' and the external circumferential wall 92' of the adapter 90' may include a channel and a rib that interfit to snap-lock the adapter 90' in place. In the illustrated embodiment the adapter 90' including an annular channel 94' and the metering void wall 67' includes an annular rib 69'. When the adapter 90' is fitted into the metering void 66' the rib 69' snap-locks into the channel 94' to hold the adapter 90' in place. For example, the cross-sectional view of Fig. 13 shows the optional adapter 90' installed in the metering void. The powder dispensing closure 10'

may be provided with a variety of different ring-shaped adapters with different internal diameters to allow essentially any desired reduction in dispensing volume. The illustrated ring-shaped adapter 90' is merely exemplary and the adapter may have essentially any alternative shape capable of occupying space in the metering void 66'.

[0058] In another alternative embodiment shown in Fig. 15, the powder dispensing closure 10" may be configured to provide two different dispensing volumes by rotating the metering disk 20" in opposite directions. Except as otherwise described, the embodiment of Fig. 15 is essentially identical to the embodiment of Figs. 1-13, and the components of closure 10" use like reference numerals followed by the " " "symbol. In this alternative embodiment, the metering disk 20" defines two metering voids 66a" and 66b" of different sizes and the bottom housing 26" defines two load openings 42a" and 42b" of different sizes. For example, void 66a" may have a greater diameter than void 66b" to accommodate a greater volume of powder. In this embodiment, the metering voids 66a" and 66b" are configured to align with the load openings 42a" and 42b", respectively, when the metering disk 20" is in the closed position. This allows both metering voids 66a" and 66b" to be loaded simultaneously. In this embodiment, the slot 30" is extended to provide the metering disk 20" with a greater range of motion. To allow the metering disk 20" to rotate from the closed position in both clockwise and counterclockwise directions, the metering disk 20" and bottom housing 26" are configured so that the metering disk 20" is in the closed position when the finger 28" is in the approximate center of the slot 30". As noted above, both metering voids 66a" and 66b" are aligned with corresponding load openings 42a" and 42b" when the metering disk 20" is in the closed positioned. To dispense the volume contained in metering void 66a", the metering disk 20" is rotated away from the closed position in a clockwise direction to bring the metering void 66a" into alignment with the open, bottom end of the closure spout 34". To dispense the alternative volume from metering void 66b", the metering disk 20" is rotated away from the closed position in a counterclockwise direction to bring the alternative metering void 66b" into

alignment with the open, bottom end of the closure spout 34". This embodiment may be provided with one or more adapters 90' to allow customization of the volume of the metering voids 66a-b".

[0059] If desired, the powder dispensing closure may be fitted with electronics that allow the closure to monitor dispensing of the powder. The electronics may include one or more sensors capable of determining various metrics associated with use of the closure and/or the powder and a wireless communication system for communicating with a remote computer. For example, the electronics may include a magnet and a hall-effect sensor capable of determining each time the metering disk is rotated from the closed position to the dispense position so that the volume of consumed powder can be determined. To improve reliability, the electronics may also include an accelerometer, gravity switch or other similar sensor/switch capable of determining when the closure is inverted so that actuations of the metering disk 20 are counted only when the closure 10 is inverted. The data collected by the electronics may be communicated to a remote computer or other electronic device using a wired or wireless communication schemed. For example, the electronics may include a WiFi, Bluetooth or other wireless transmitter or transceiver. The data collected by the electronics may be used to track consumption, to create a history of product use or to determine/track any other associated statistics. If desired, consumption data may be used to determine when the powder material should be re-ordered. For example, the usage information may be used to provide the user with a notification when reordering is recommended or to automatically initiate a reorder when appropriate. Figs. 16 and 17 show an alternative embodiment of the closure 10"' in which electronics are enclosed within a cavity in the metering disk 20"'. Except as otherwise described, the embodiment of Figs. 16 and 17 is essentially identical to the embodiment of Figs. 15, and the components of closure 10"' use like reference numerals followed by the " "' " symbol. As shown in Fig. 15, the metering disk 20"' defines a circular recess 21"' extending down from the top surface. The depth and diameter of the recess 21"' is selected to provide

enough space to accommodate the electronics 23'''. The electronics 23''' may be contained in a housing configured to be fitted tightly in the recess 21'''. Additionally or alternatively, the electronics 23''' may be cemented or otherwise secured in the recess 21'''. Although not shown, the electronics may include an electrical energy storage device, such as a battery or capacitor. The storage device may be replaceable, such as a single-use battery, or may be rechargeable, such as a rechargeable battery or a rechargeable capacitor. When the electrical energy storage device is rechargeable, it may be rechargeable using a wired connection or a wireless charging system.

[0060] The design and configurations of the electronics may vary from application to application. In applications in which the powder dispensing closure has a single dispense quantity (e.g. closure 10), an electronic module (e.g. electronic module 23''' of Figs. 16 and 17) containing a battery, a sensing mechanism, and a connectivity solution (e.g. wireless communications) can be embedded into the metering disk 20. This module can detect when a user has engaged the product for usage, and estimate how much product is being used over time. As noted above, enabling connectivity allows the data to be monitored for features like product reminders and re-ordering. In one embodiment, the sensing mechanism can be a hall effect or single axis magnetometer sensor that is used to detect a magnet in a stationary portion of the closure 10. Although not shown, the magnet may, by way of example, be affixed to the top housing 24 or the bottom housing 26. When the user operates the closure 10 by rotating the metering disk 20, the Hall Effect sensor is rotated into the presence of the magnetic field and the electronics module can record and store the event. Combining the hall affect sensor with a single axis accelerometer or tilt sensor can determine if a user has inverted the closure 10, which is generally done to place the unit on top of the shaker 14 in the correct orientation to dispense. Having both sensors helps to ensure that a user is actually dispensing product instead of simply opening and closing the dispense mechanism while not inverted on the shaker.

[0061] Similar electronics may be incorporated into a closure with more than one dispense volume, such as powder dispensing closure"' shown in Figs. 16 and 17. The electronics incorporated into the dual-volume closure'" of Figs. 16 and 17 generally includes an electronics module 23"' with battery, sensing mechanism, and connectivity solution to monitor and relay the usage of the product. In this application where there are two dispensing options, separate magnets 27a"' and 27b"' with opposite polar alignment can be embedded on each half of the closure with the opposing fields oriented towards the Hall Effect sensor or magnetometer. In the embodiment of Figs. 16 and 17, the magnets 27a"' and 27b"' are seated in recesses 29"' defined in the bottom surface 31"' of the top housing 24"'. The illustrated recesses 29"' are generally circular and of sufficient depth to allow the magnets 27a"' and 27b"' to be seated without interfering with motion of the metering disk 20"'. Fig. 17 shows only one of the two magnet recesses 29"' because the second recess is hidden by the skirt 46"'. In this embodiment, the hidden recess is essentially identical to the visible recess 29"', but disposed in a position radially opposite. The number and position of magnets may vary from application to application. For example, the magnets may alternatively be mounted to the bottom housing 26"'. In the case of using a Hall Effect sensor, an advanced sensor capable of determining pole direction may be used to allow the electronics to determine which dosage was selected and dispensed. Similar to the single dispense quantity, the Hall Effect sensor or magnetometer can be paired with a single axis accelerometer or tilt sensor (not shown) to help distinguish an actual dispense.

[0062] In both cases, the electronics (e.g. electronics module 23"' and magnet(s) 27a"' and 27b"') provides the ability to estimate usage based on product usage. By measuring the number of times the user has dispensed, the powder dispensing closure and/or associated device (i.e. phone), can estimate how much product is remaining based on the number of interactions. The embodiment described above is merely exemplary. The design and configuration of the electronics may vary from application to application. For example, in

alternative embodiments, the electronics module 23''' may be affixed to a stationary component in the closure 10''' and the magnet(s) 27a''' and 27b''' may be affixed to the metering disk 20''', the actuator or the button 62'''. As another example, the magnet-based sensor may be replaced by other types of sensors capable of sensing movement of the metering disk 20''', such as an optical sensor. As an alternative to sensing motion of the metering disk, a separate sensor could be embedded in the module to measure the fill level of the actual product. This could be an optical based (time of flight) or ultrasound based measurement to determine the distance of the product level from the cap. The sensor, when paired with an accelerometer or tilt sensor, can make fill measurements when the product is non-inverted (to ensure accurate fill level measurements are being made).

[0063] Although not shown, the powder dispensing closure may be provided with a biasing component for urging the metering disk into the closed position. For example, the closure may be fitted with a spring that extends between the metering disk and at least one of the top housing and bottom housing to bias the metering disk. The spring may be a torsion spring, a coil spring or essentially any other biasing component capable of biasing the metering disk in the closed position.

[0064] The present invention may include a powder dispensing closure 10 and a shaker 14 combination in which the powder dispensing closure 10 and the shaker 14 are configured with alignment features that facilitate proper alignment between the closure 10 and the shaker 14 during dispensing. The alignment features may include a friction fit, snap-fit or other mechanical interfit that helps to retain the shaker 14 and the closure 10 together and in alignment. A closure 10 and shaker 14 combination in accordance with an embodiment of the present invention are shown in Figs. 10-13. In this embodiment, the closure 10 includes a closure spout 34 and a flip cap 48, as discussed above. Similarly, the shaker 14 includes a spout 96 and a flip cap 98. The shaker flip cap 98 includes an arm 100 that is pivotally secured to the shaker 14 at mounting posts 102. The closure spout 34 and the shaker spout 96 are

configured to be mechanically interfitted. As shown in Fig. 13, the open end of the shaker spout 96 may be slightly larger than the open end of the closure spout 34 so that the open end of the shaker spout 96 may be fitted over the open end of the closure spout 34 (or vice-versa in alternative embodiments). Additionally, the closure flip cap 48 and the shaker flip cap 98 may include mechanically interfitting features that are exposed only when the flip caps 48 and 98 are opened. For example, as shown in Fig. 13, the closure flip cap 48 of the illustrated embodiment includes a channel 49 that is situated on the underside of the arm 50 when the flip cap 48 is closed, but rotates into an exposed position when the flip cap 48 is open. Likewise, the shaker flip cap 98 include a rail 104 defined in the arm 100 in a position where it is hidden when the flip cap 98 is closed and exposed when the flip cap 98 is open. The channel 49 and rail 104 are configured to interfit when the closure 10 is properly positioned on the shaker 14. The interfitting features (i.e. the closure spout 34, shaker spout 96, channel 49 and rail 104) may be configured to provide alignment and/or may include a friction fit, snap fit or other type of mechanical interfit that helps to hold the shaker 14 and closure 10 together during dispensing. For example, the closure spout 34 may be provided with a small annular external rib (not shown) and the shaker spout 96 may be provided with a small annular internal rib (not shown). The two ribs may be configured to interact to provide a snap-fit interconnection. As another example, the channel 49 may be provide with a narrow mouth (not shown) and the rail 104 may be provide with an enlarged head (not shown). The head may be configured to snap fit into the channel through the mouth to help retain the closure 10 and the shaker 14.

[0065] In another aspect, the present invention provides a method for preparing a mixture in a shaker. For example, the method may be used with the powder dispensing closure 10 installed on powder container 12 to dispense powder into shaker 14. With this example, the method includes the general steps of: (a) removing the conventional closure (not shown) from the powder material container 12 to open the container 12 and expose the threads 82 (or other attachment structure) on the exterior of the neck 80; (b) installing the powder dispensing

closure 10 on the neck 80 in place of the original closure to close the container 12; (c) positioning the metering disk 20 in the closed position, for example, by moving the finger 28 to one end of the slot 30; (d) opening the flip cap 48 of the closure 10, if present; (e) opening the flip cap 98 of the shaker 14, if present; (f) inverting the powder container 12 and interfitting the closure spout 34 with the shaker spout 96 and interfitting the closure flip cap 48 with the shaker flip cap 98 (inversion of the powder container and closure allowing powder from the container to pour through the load opening 42 into the metering void 66); (g) moving the metering disk 20 into the dispense position, for example, by moving the finger 28 to the opposite end of the slot 30, to allow powder to flow from the metering disk 20 through the closure spout 34 and shaker spout 96 into the interior of the shaker 14; (h) moving the metering disk 20 back into the closed position, for example, by moving the finger 28 to the opposite end of the slot 30; (i) removing the powder container 12 from the shaker 14; (j) closing the flip cap 48 on the closure 10, if present; (k) adding any desired additional contents to the shaker 14, such as a fluid; (l) closing the flip cap 96 on the shaker 14, if present; and (m) shaking the shaker 14 to mix the dispensed powder with any additional contents added to the shaker 14.

[0066] The above description is that of current embodiments of the invention. Various alterations and changes can be made without departing from the spirit and broader aspects of the invention as defined in the appended claims, which are to be interpreted in accordance with the principles of patent law including the doctrine of equivalents. This disclosure is presented for illustrative purposes and should not be interpreted as an exhaustive description of all embodiments of the invention or to limit the scope of the claims to the specific elements illustrated or described in connection with these embodiments. For example, and without limitation, any individual element(s) of the described invention may be replaced by alternative elements that provide substantially similar functionality or otherwise provide adequate operation. This includes, for example, presently known alternative elements, such as those that might be currently known to one skilled in the art, and alternative elements that may be

developed in the future, such as those that one skilled in the art might, upon development, recognize as an alternative. Further, the disclosed embodiments include a plurality of features that are described in concert and that might cooperatively provide a collection of benefits. The present invention is not limited to only those embodiments that include all of these features or that provide all of the stated benefits, except to the extent otherwise expressly set forth in the issued claims. Any reference to claim elements in the singular, for example, using the articles "a," "an," "the" or "said," is not to be construed as limiting the element to the singular.

CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A metering closure for dispensing powder comprising:

a housing having a spout and defining an internal space, said housing further defining a slot in communication with said internal space, a load opening in communication with said internal space, said spout defining a flow path in communication with said internal space;

a metering disk enclosed within said internal space, said metering disk defining a metering void and being movable within said internal space; and

an actuator extending from said metering disk through said slot to a position accessible from an exterior of said housing, said actuator manually movable along said slot to rotate said metering disk between a first position in which said metering void is in communication with said load opening and a second position in which said metering void is in communication with said spout.

2. The closure of claim 1 wherein said metering disk is cylindrical and is movably seated in said internal space for rotation about a central axis.

3. The closure of claim 2 wherein said internal space is cylindrical.

4. The closure of claim 3 wherein said housing includes a first housing part and a second housing part cooperatively defining said internal space, said first housing part including said spout, said spout defining a flow path in communication with said internal space.

5. The closure of claim 4 wherein said second housing part is configured to attach to a powder container, said second housing part defining said load opening, said load opening being in communication with said internal space, said load opening being in communication with an interior of the powder container when the closure is installed on the powder container.

6. The closure of claim 2 wherein said load opening and said spout are radially offset not more than about ninety degrees.

7. The closure of claim 2 wherein said housing includes a first housing part and a second part, said first housing part nested with said second housing part.

8. The closure of claim 7 wherein said first housing part has a central body and a skirt and said second housing part has a central body and a skirt, said central body of said first housing part being spaced apart from said central body of said second housing part second, said skirt of said first housing part being connected to said skirt of said second housing part.

9. The closure of claim 1 further including a flip cap pivotally connected to said housing, said flip cap being movable between a closed position in which said flip cap closes said spout and an open position in which said flip cap is disengaged from said spout, said flip cap including an alignment feature configured to engage with a corresponding alignment feature in a shaker.

10. The closure of claim 1 wherein said slot defines a range of motion of said metering disk, said metering disk being in said first position when said finger is at a first end of said slot, said metering disk being in said second position when said finger is at a second end of said slot.

11. The closure of claim 1 further including an adapter configured to be selectively fitted into said metering void to selectively vary the volume of said metering void.

12. The closure of claim 1 further including an electronics module capable of determining when powder is dispensed from the closure and wirelessly communicating at least one operating statistic to a remote computer, said electronics module being disposed in at least one of said housing and said metering disk.

13. A combination comprising:

a powder container;

a metered powder dispensing closure installed on said powder container, said closure having a housing and a metering disk rotatably enclosed within said housing, said closure having a closure spout for dispensing powder from said closure;

a shaker having a shaker spout, said shaker spout and said closure spout configured to mechanically interfit.

14. The combination of claim 13 wherein said shaker spout and said closure spout are configured to nest one inside the other.

15. The combination of claim 14 wherein said shaker spout and said closure spout are configured to be snap-fitted together.

16. The combination of claim 13 wherein said closure includes a flip cap and said shaker includes a flip cap, said closure flip cap configured to mechanically interfit with said shaker flip cap.

17. The combination of claim 13 wherein said closure includes a flip cap and said shaker includes a flip cap, said closure flip cap configured to mechanically interfit with said shaker flip cap when said closure flip cap and said shaker flip cap are in open positions.

18. The combination of claim 17 wherein said closure flip cap includes an alignment feature that is hidden when said closure flip cap is in a closed position and exposed when said closure flip cap is in an open position;

wherein said shaker flip cap includes an alignment feature that is hidden when said shaker flip cap is in a closed position and exposed when said shaker flip cap is in an open position; and

wherein said closure flip cap alignment feature and said shaker flip cap alignment feature cap be interfitted only when said closure flip cap and said shaker flip cap are both in open positions.

19. A metering powder dispenser for a powder container comprising:

a housing having a spout and defining an internal space, said spout defining a flow path in communication with said internal space, said housing further defining a slot in communication with said internal space, a first load opening in communication with said internal space and a second load opening in communication with said internal space;

a metering disk enclosed within said internal space, said metering disk defining a first metering void of a first volume and a second metering void of a second volume different from said first volume, said metering disk being rotatably movable within said internal space; and

an actuator extending from said metering disk through said slot to a position accessible from an exterior of said housing, said actuator manually movable along said slot to rotate said metering disk between:

a first position in which said first metering void is in communication with said first load opening and said second metering void is in communication with said second load opening,

a second \position in which said first metering void is in communication with said spout, and

a third position in which said second metering void is in communication with said spout.

20. The closure of claim 19 wherein said metering disk is cylindrical and is movably seated in said internal space for rotation about a central axis, said first metering void being radially offset from said second metering void no more than about one-hundred and eighty degrees.

21. The closure of claim 20 wherein said metering disk is in:

said first position when said actuator is at about a center position within said slot,

said second position when said actuator is adjacent a first end of said slot, and

said third position when said actuator is adjacent a second end of said slot opposite said first end.

22. The closure of claim 21 wherein said housing includes a first housing part and a second housing part cooperatively defining said internal space, said first housing part including said spout, said spout defining a flow path in communication with said internal space.

23. A method for preparing a nutritional powder shake in a shaker, comprising the steps of:

installing a metering closure on a powder container, the metering closure having a spout through which powder is dispensed, the metering closure having a metering disk with a metering void, the metering disk being movable from a closed position in which the metering void can be loaded with a volume of powder from the powder container and a dispense position in which the volume of powder contained in the metering void is dispensed from the closure through the spout;

moving the metering disk into the closed position in which the metering void is in communication with interior of the powder container;

inverting the powder container and the closure to allow a volume of powder from the powder container to pour into the metering void;

providing an upright shaker with a spout;

interfitting the closure spout with the shaker spout;

moving the metering disk into the dispense position in which the metering void is in communication with the closure spout to allow the volume of powder in the metering void to pour through the closure spout into the shaker;

moving the metering disk into the closed position;

removing the powder container and the closure from the shaker;

adding fluid to the shaker through the spout;

closing a lid on the shaker; and

shaking the shaker to mix the powder and the fluid.

24. The method of claim 23 wherein the closure include a flip cap for selectively closing the closure spout and the shaker includes a flip cap for selectively closing the shaker spout; and

further including the steps of:

opening the closure flip cap;

opening the shaker flip cap; and

wherein said interfitting step includes interfitting a portion of the closure flip cap with a portion of the shaker flip cap.

25. A metering closure for dispensing powder comprising:

a housing defining an internal space, said housing defining a first inlet for introducing powder into said internal space and an outlet for dispensing powder from said internal space;

a metering disk enclosed within said internal space, said metering disk defining a first metering void and being movable within said internal space between a first position in communication with said first inlet and a second position in communication with said outlet; and

an electronics module with a dispense sensor and a transmitter, said dispense sensor configured to sense movement of said metering disk relative to said housing, said transmitter configured to transmit to a remote electronic device data associated with said sensed movement.

26. The metering closure of claim 25 wherein said dispense sensor includes at least one magnet and at least one sensor capable of sensing a magnetic field, said at least one magnet mounted to one of said metering disk and said housing, said at least one sensor mounted to the other of said metering disk and said housing.

27. The metering closure of claim 26 wherein said at least one magnet is seated in a recess in said housing and said at least one sensor is seated in a recess in said metering disk.

28. The metering closure of claim 25 wherein said housing defining a second inlet and said metering disk includes a second metering void having a different volume than said first metering void, said metering disk being further movable within said internal space into a third position in which said second metering void is in communication with said outlet; and

wherein said dispense sensor is configured to sense movement of said metering disk relative to said housing between said first position, said second position and said third position,

said dispense sensor configured to differentiate between movement of said metering disk from said first position into said second position and from said first position into said third position.

29. The metering closure of claim 28 wherein said dispense sensor includes at least two magnets and at least one sensor capable of sensing a magnetic field, said at least two magnets being mounted to one of said metering disk and said housing, said at least one sensor mounted to the other of said metering disk and said housing.

30. The metering closure of claim 29 wherein said at least two magnets are arranged to emit different magnetic fields, said at least one sensor being capable of differentiating between said different magnetic fields to differentiate between movement of said metering disk from said first position into said second position and from said first position into said third position.

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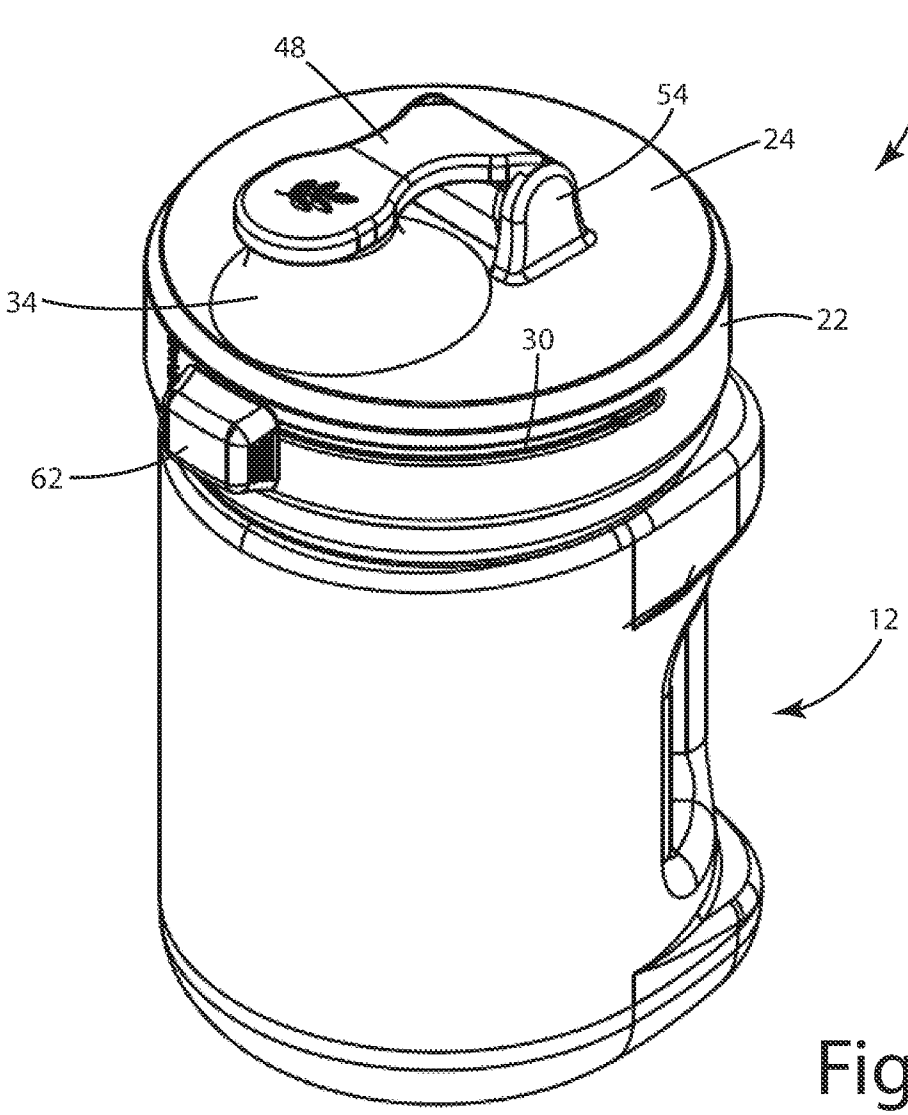


Fig. 1

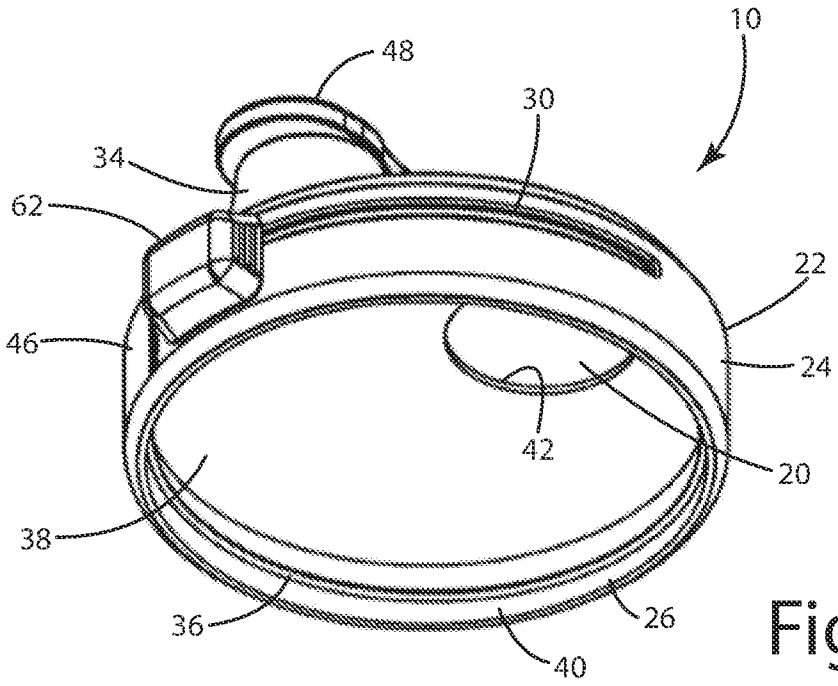


Fig. 2

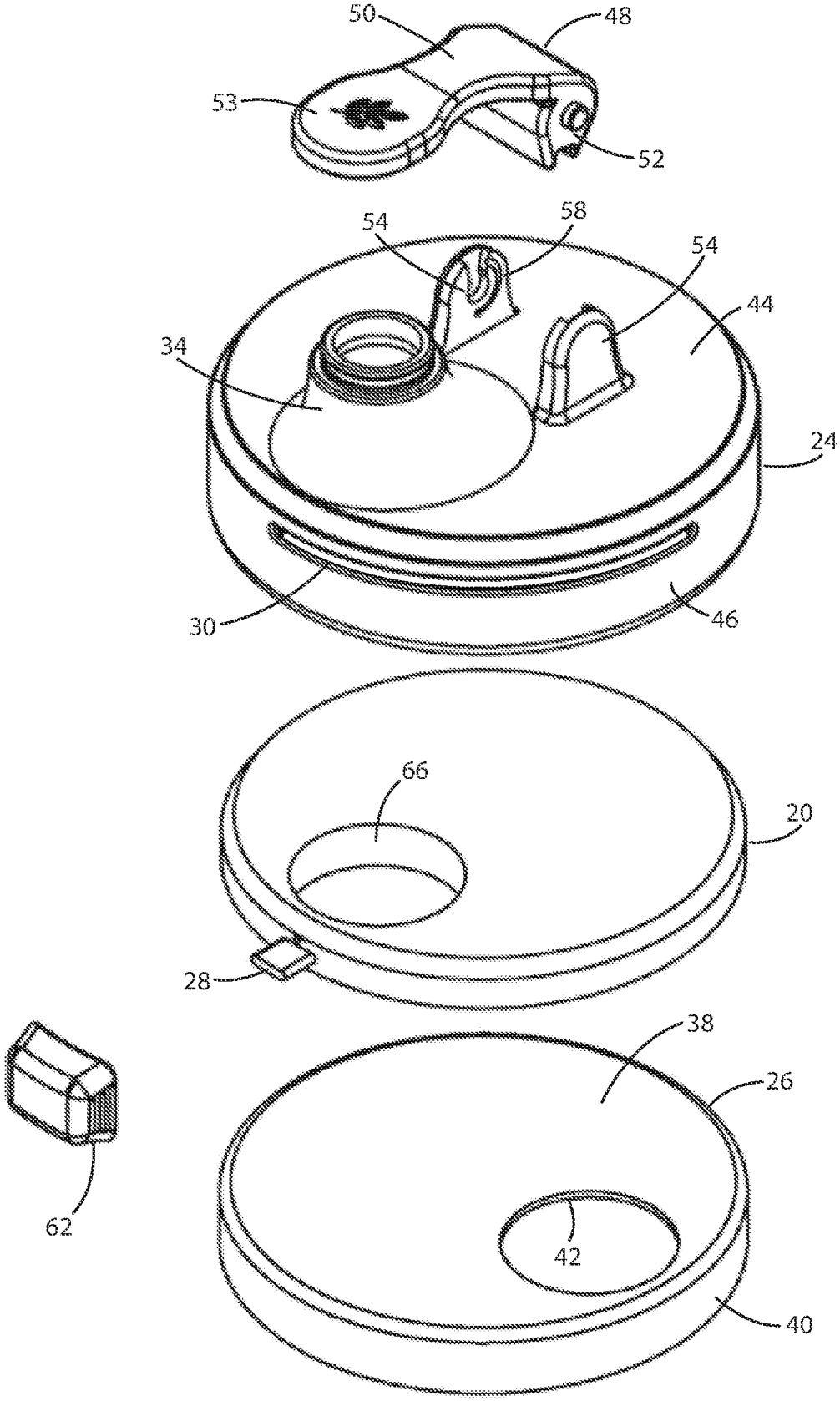


Fig. 3

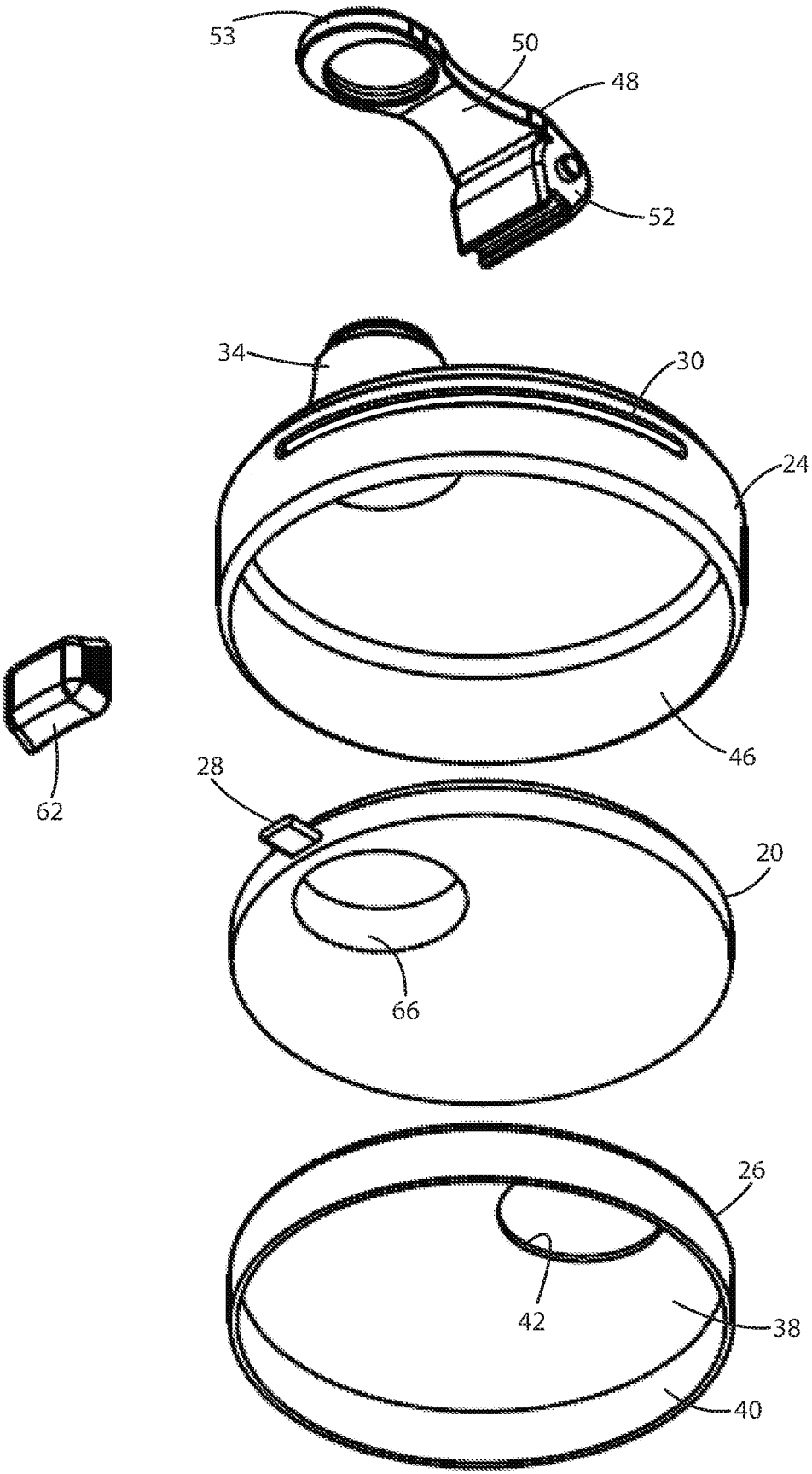


Fig. 4

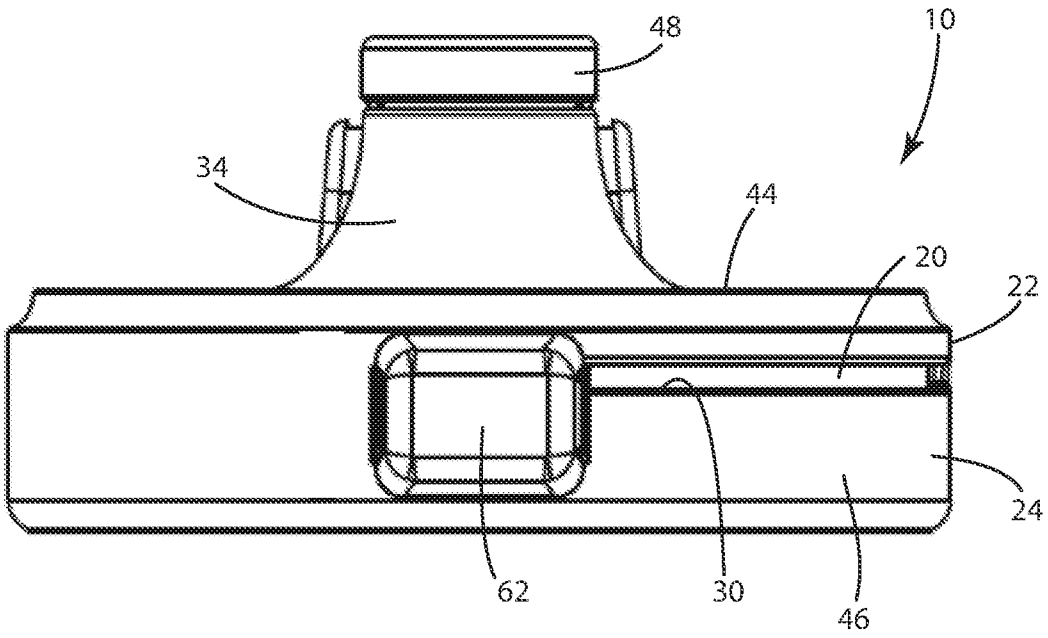


Fig. 5

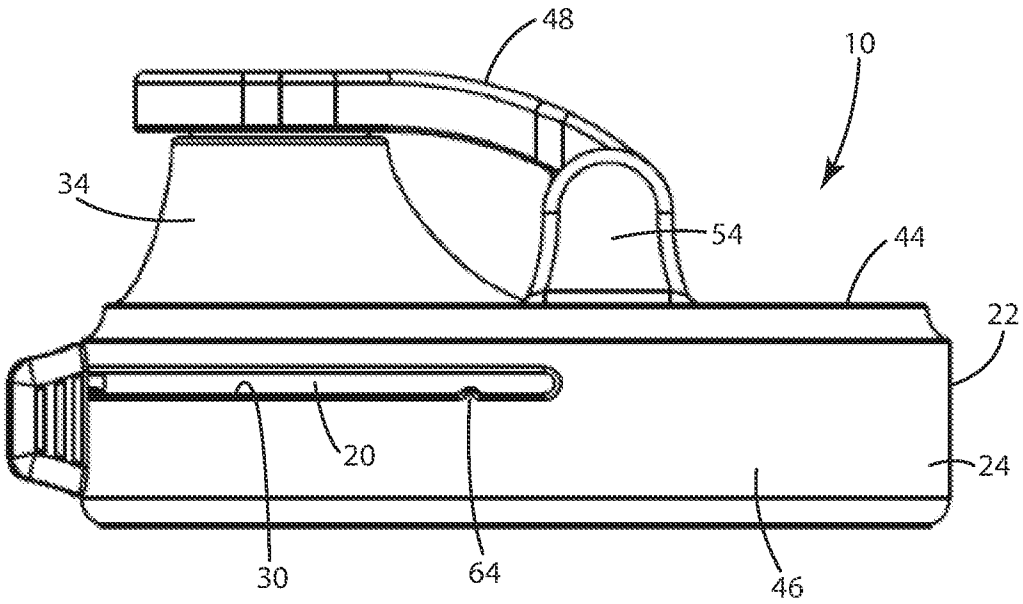


Fig. 6

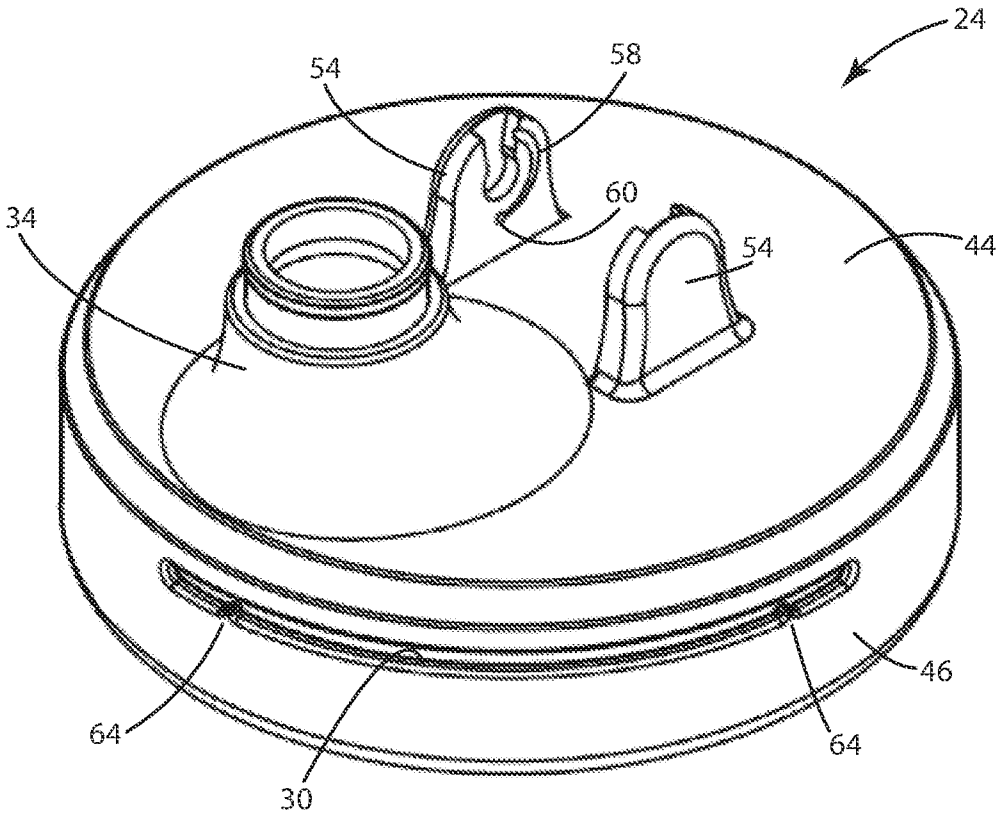


Fig. 7

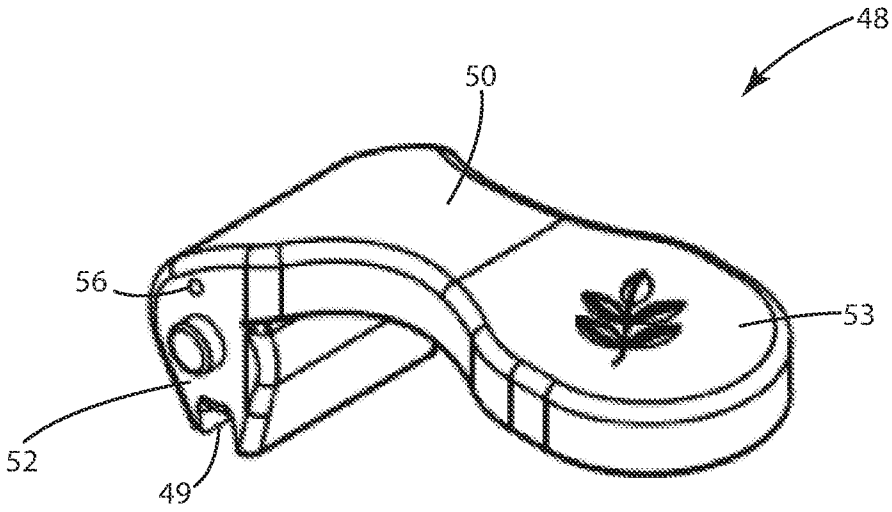


Fig. 8

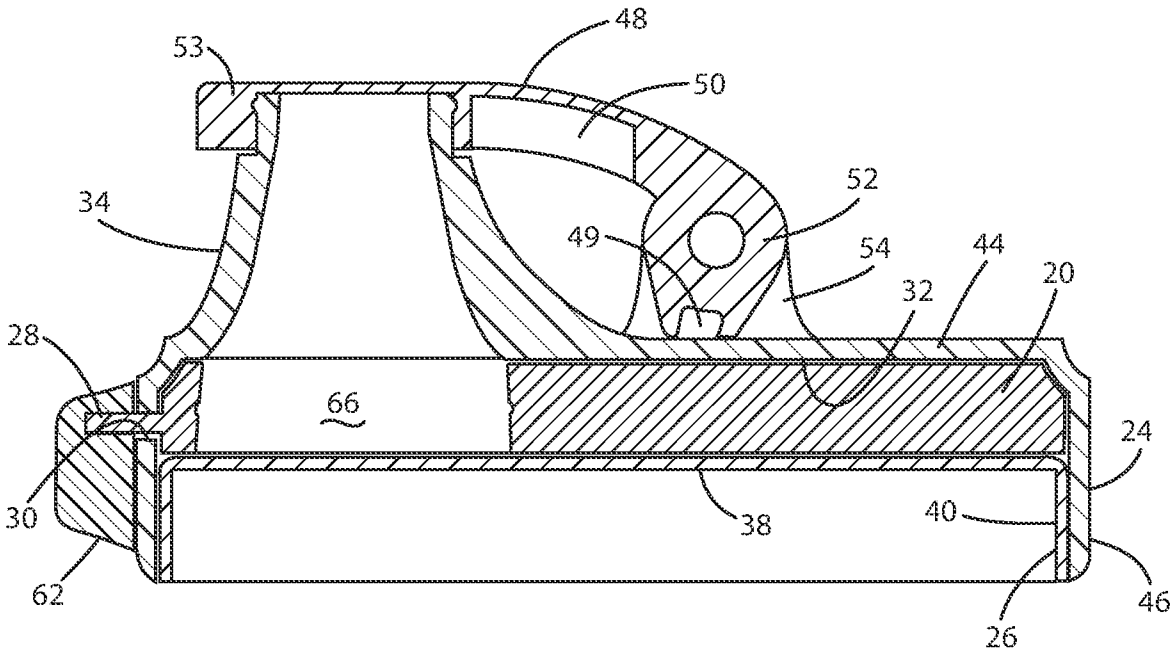

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Fig. 9

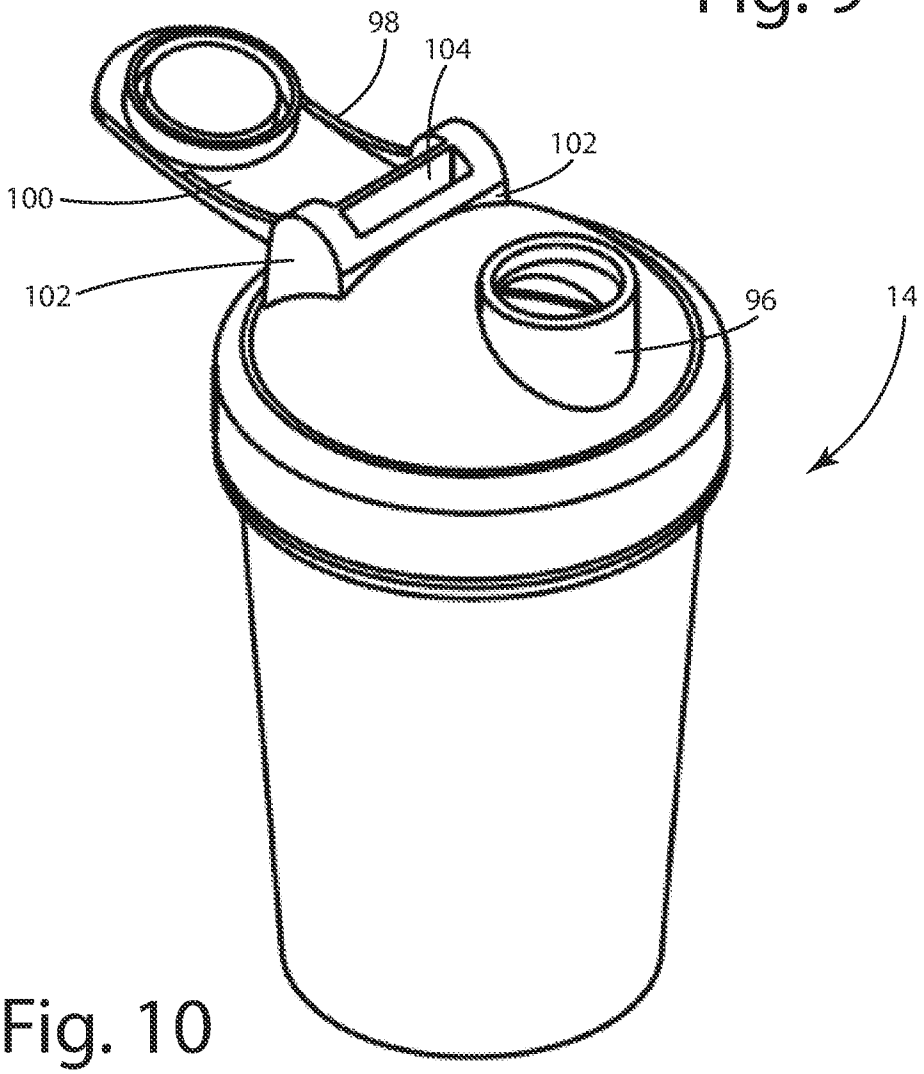

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Fig. 10

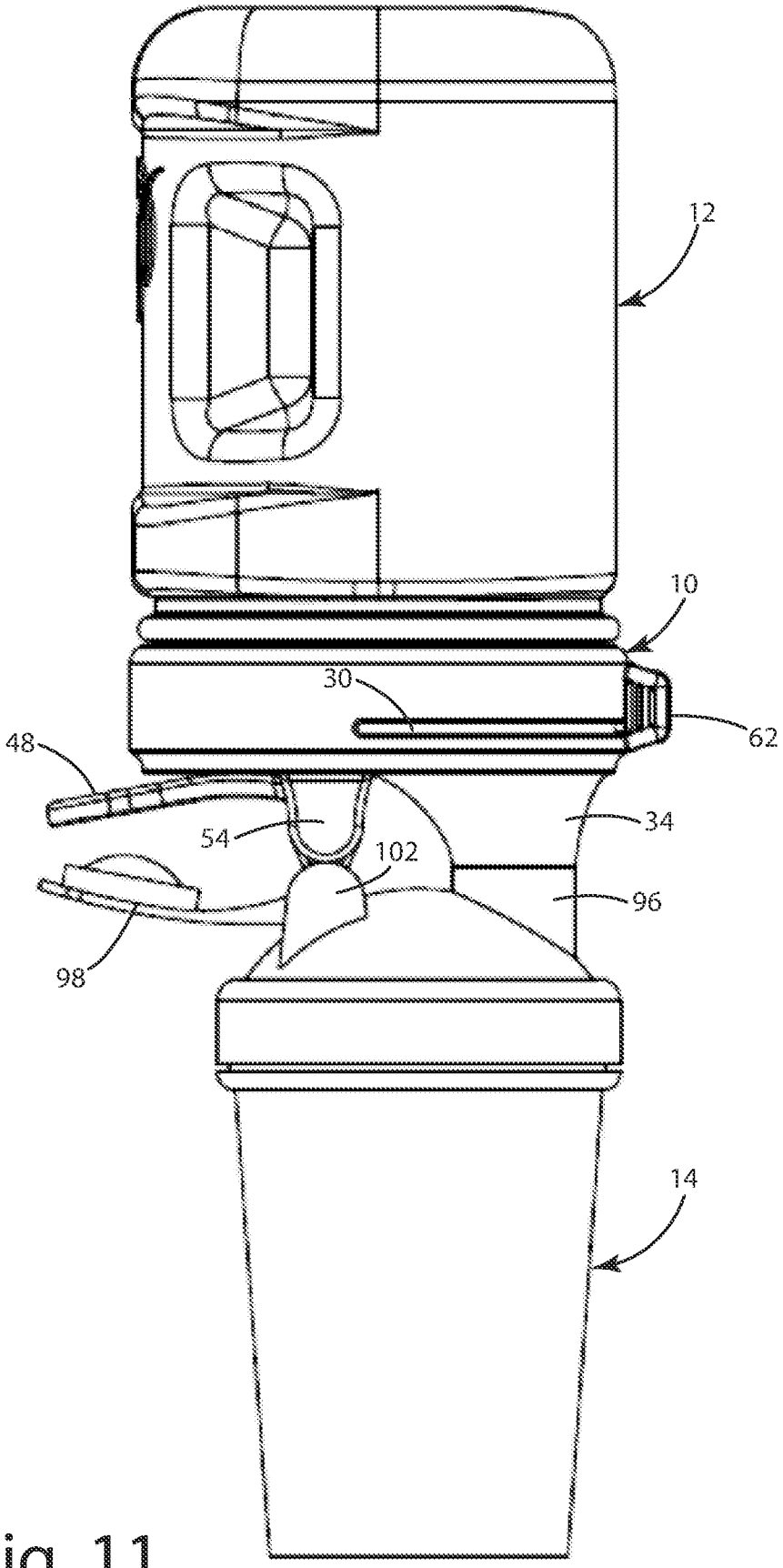


Fig. 11

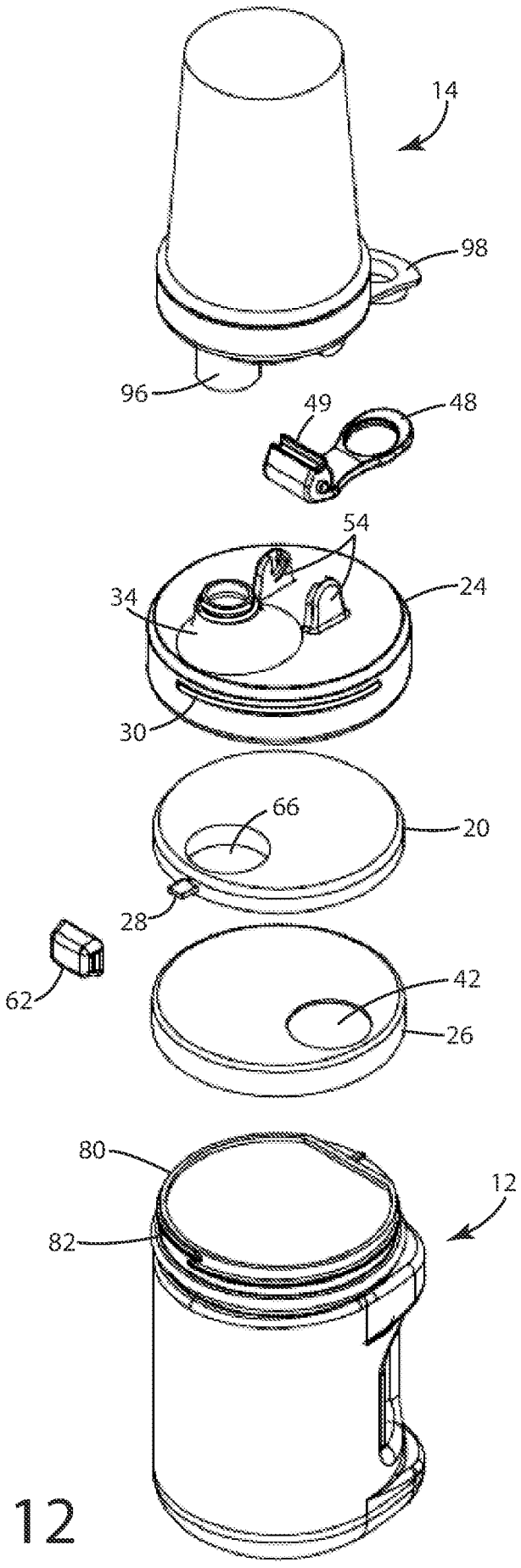


Fig. 12

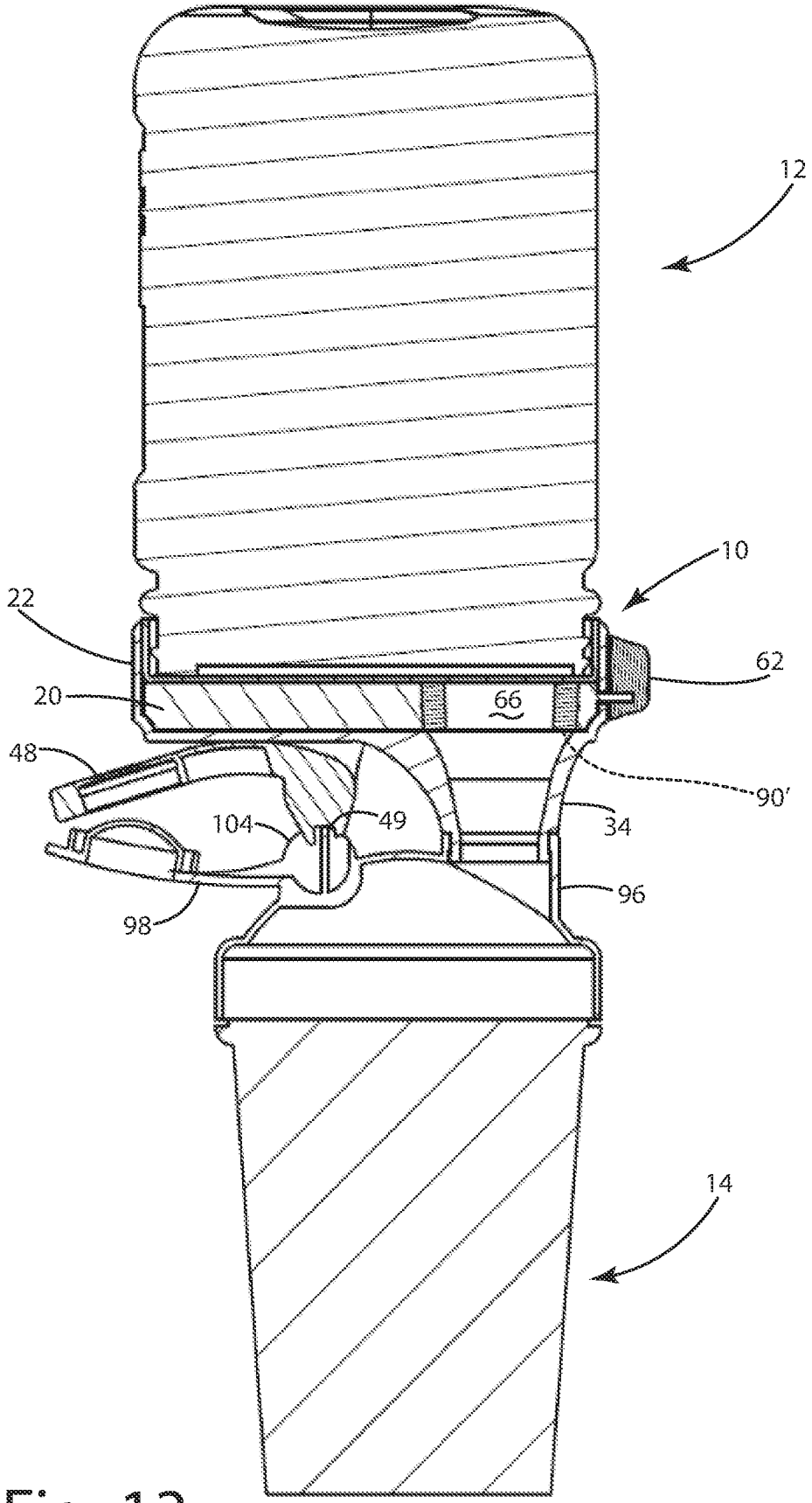


Fig. 13

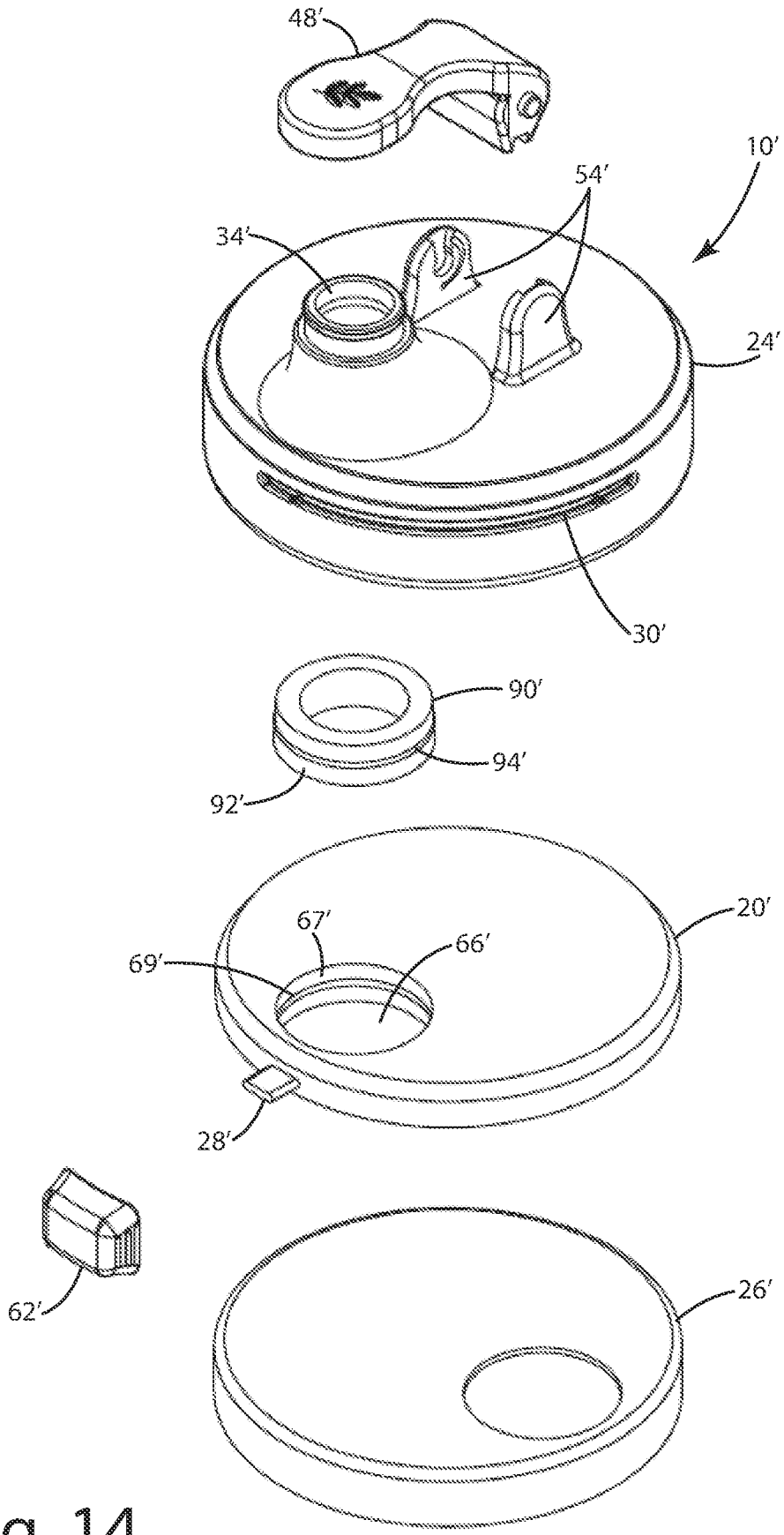


Fig. 14

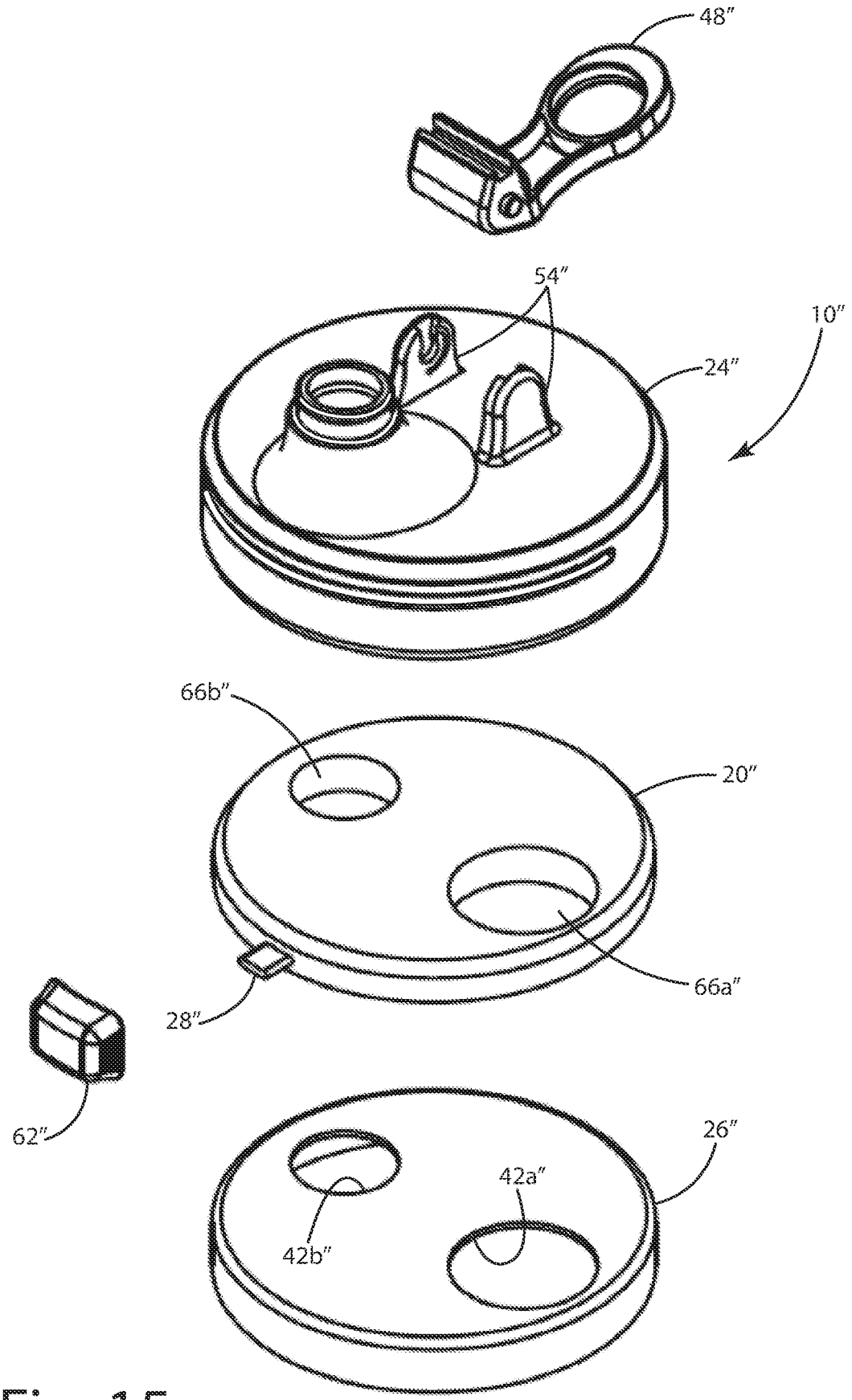


Fig. 15

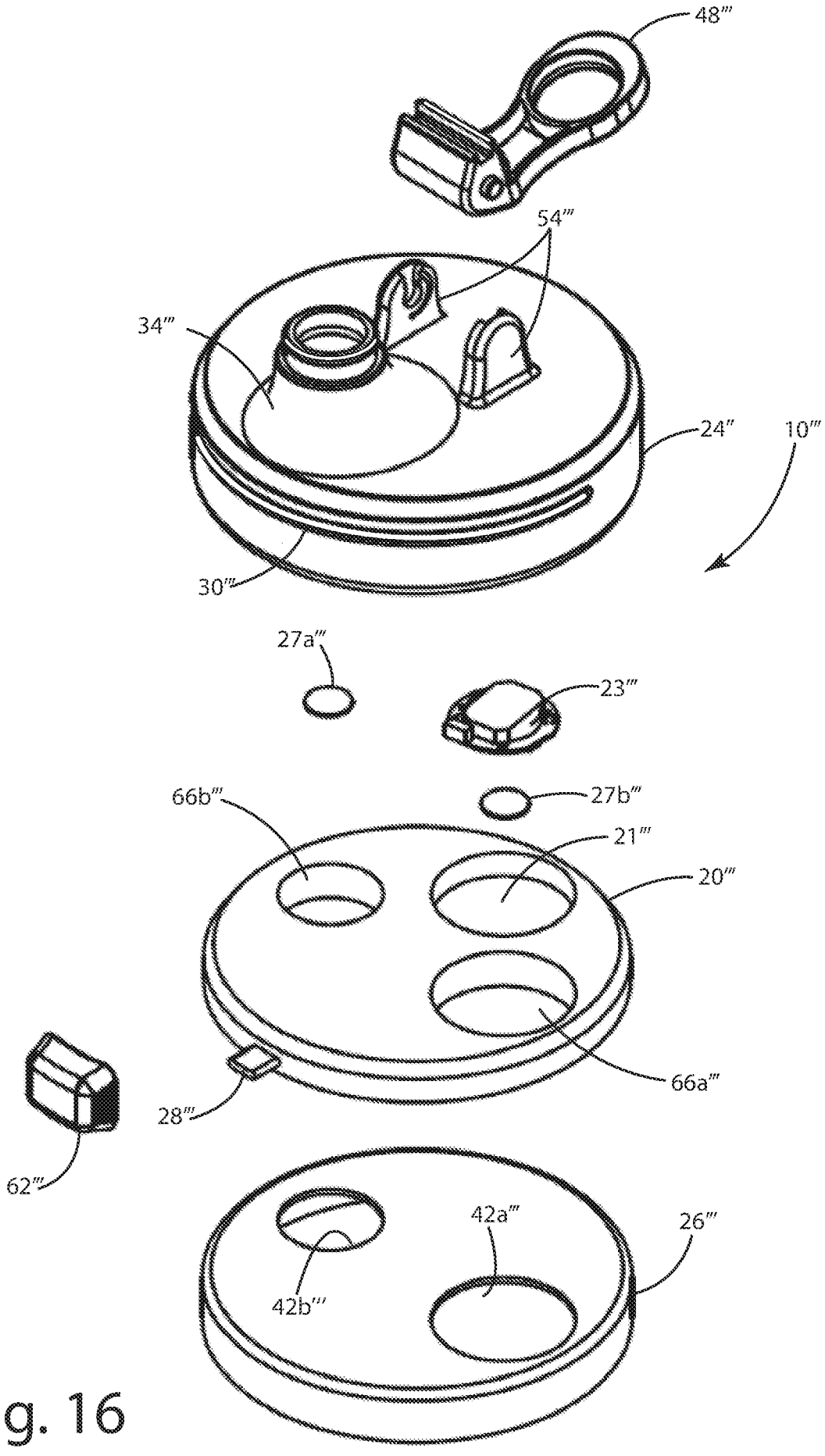


Fig. 16

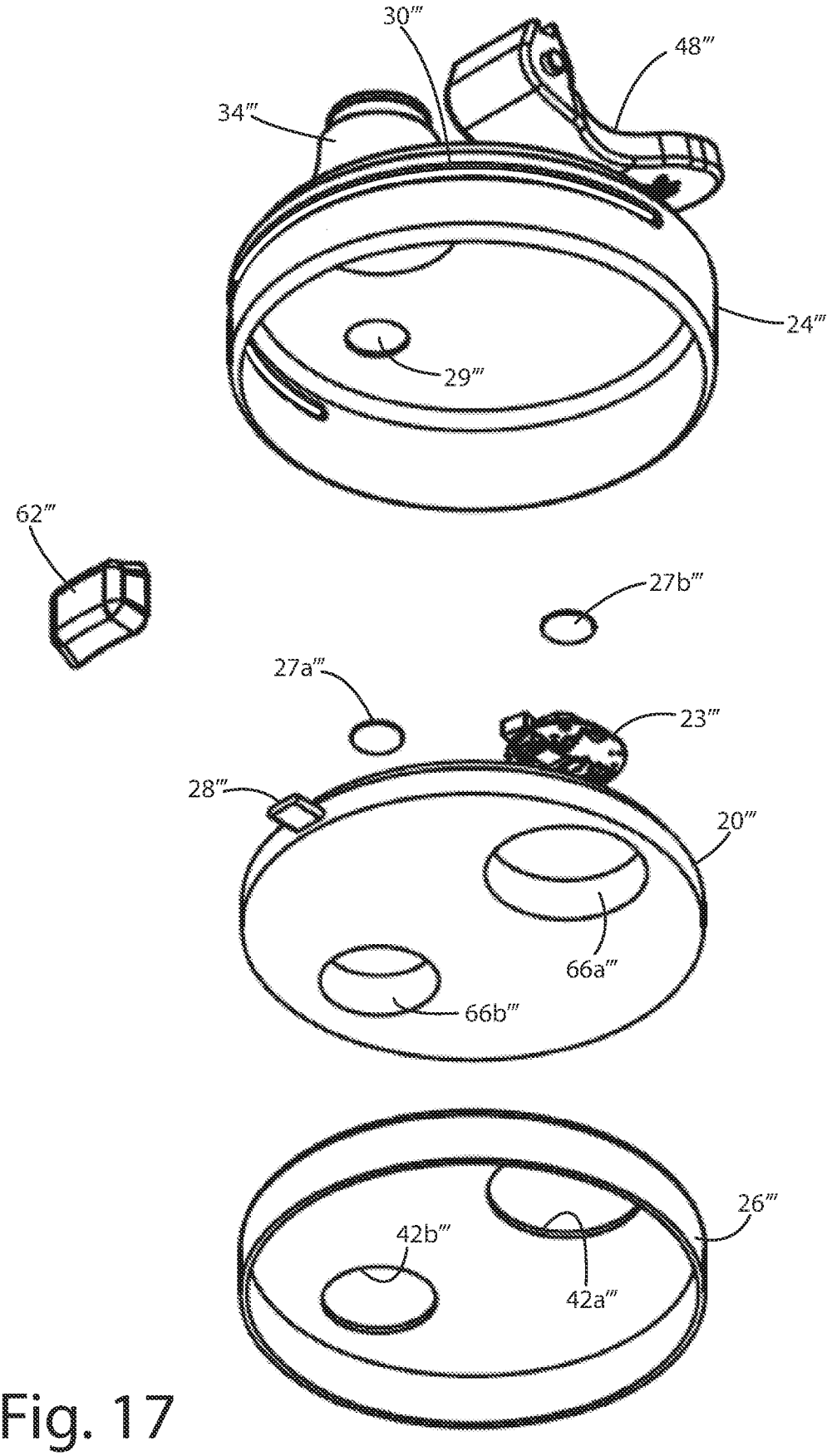


Fig. 17

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/062434

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01F11/24
ADD. G01F11/00

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)
G01F A47G A47J

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 249 266 A (LAWRENCE COLE RONALD ET AL) 3 May 1966 (1966-05-03) figures 1-5	1-12
A	KR 2013 0004796 A (NAN DA GYUM [KR]) 14 January 2013 (2013-01-14) figures 1-4	1-12
X	US 4 560 092 A (SOUZA DAVID W [US]) 24 December 1985 (1985-12-24) figures 6-10 column 3, line 43 - line 46 column 4, line 24 - line 27	1-12
A	US 4 832 235 A (PALMER WARREN C [US]) 23 May 1989 (1989-05-23) figure 1	9

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

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"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

"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

"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
19 February 2019	08/05/2019

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Rambaud, Patrick

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/062434

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2016/159636 A1 (ISMAIL MUHAMMAD SAMI [US]) 9 June 2016 (2016-06-09) figure 2 paragraph [0067] -----	9,11
A	EP 1 772 710 A1 (MAGIFAR LTD [MU]; MAGISING PTE LTD [SG]) 11 April 2007 (2007-04-11) paragraph [0063] -----	12

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/062434

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:

2. ☐ Claims Nos.:
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:

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:

see additional sheet

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 an 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.:

1-12

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12

   A metering closure for a dispenser to dispense a unique powder dose.

   ---

2. claims: 13-18, 23, 24

   An apparatus and a method to prepare a nutritional powder shake in a shaker.

   ---

3. claims: 19-22

   Dispenser with a metering closure dispensing two different doses.

   ---

4. claims: 25-30

   A metering closure for a dispenser with a sensor and a transmitter to sense the movement of meter disk and transmit to a remote device.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2018/062434

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3249266 A	03-05-1966	NONE	
KR 20130004796 A	14-01-2013	NONE	
US 4560092 A	24-12-1985	NONE	
US 4832235 A	23-05-1989	NONE	
US 2016159636 A1	09-06-2016	NONE	
EP 1772710 A1	11-04-2007	NONE	