July 17, 1962 D. A. LUDWIG ETAL 3,044,665

FREE BODY DISPENSER

Filed Dec. 26, 1957 4 Sheets-Sheet 1

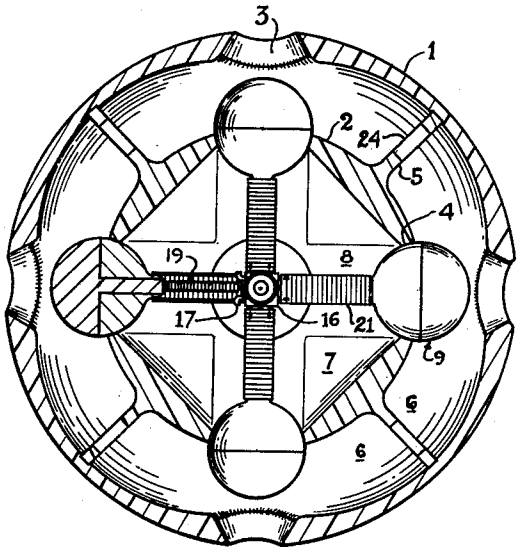


FIG. 2

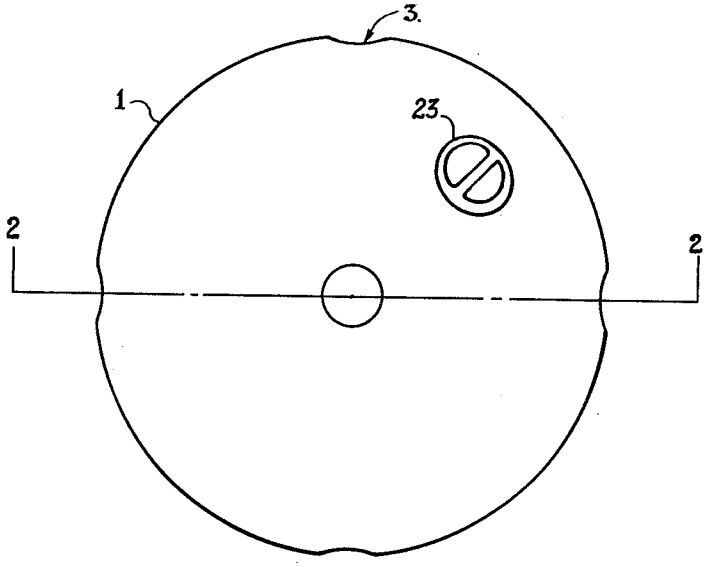


FIG. 1

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FREE BODY DISPENSER

Filed Dec. 26, 1957 4 Sheets-Sheet 2

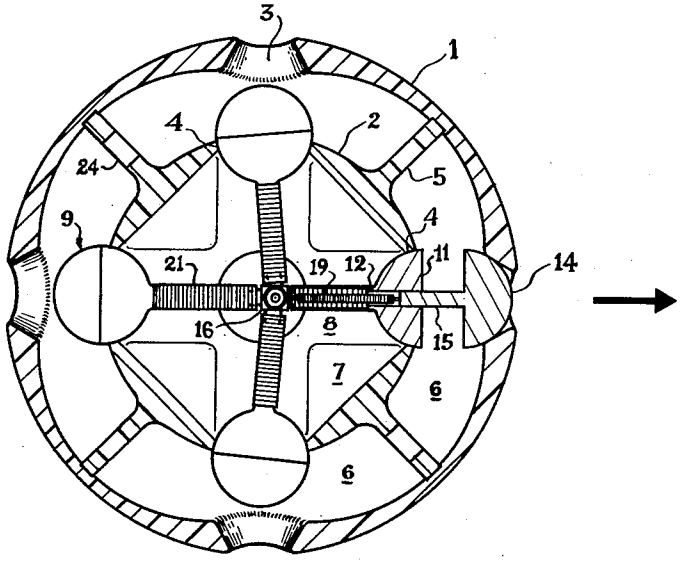


FIG. 3

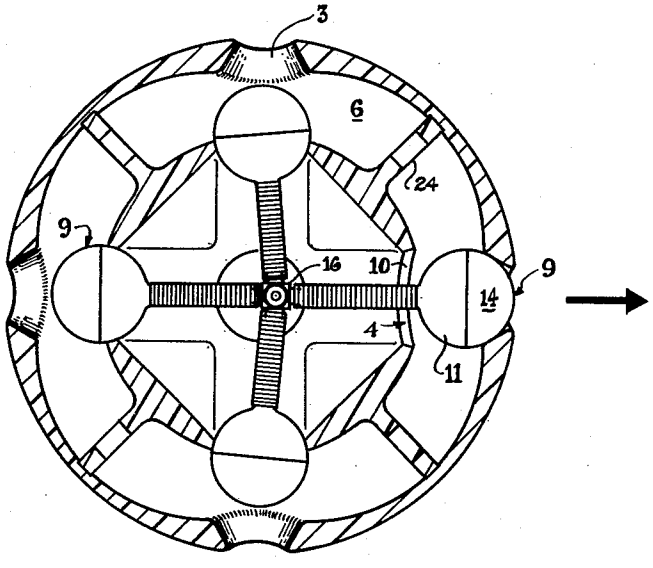


FIG. 4

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FREE BODY DISPENSER

Filed Dec. 26, 1957 4 Sheets-Sheet 3

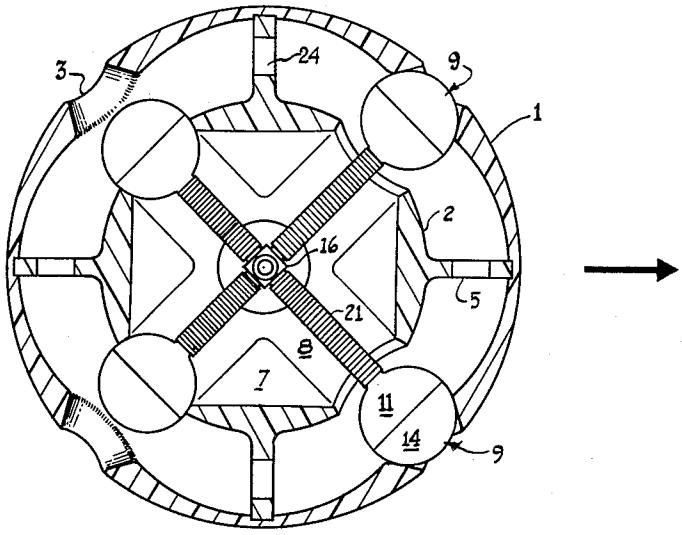


Fig. 5

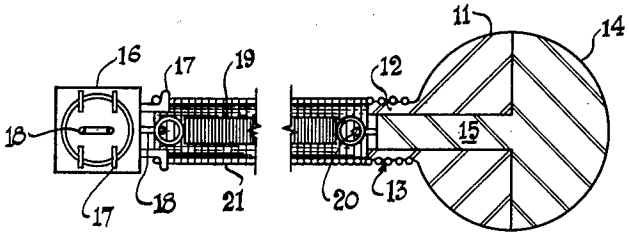


Fig. 8

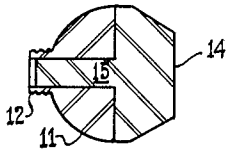


Fig. 9

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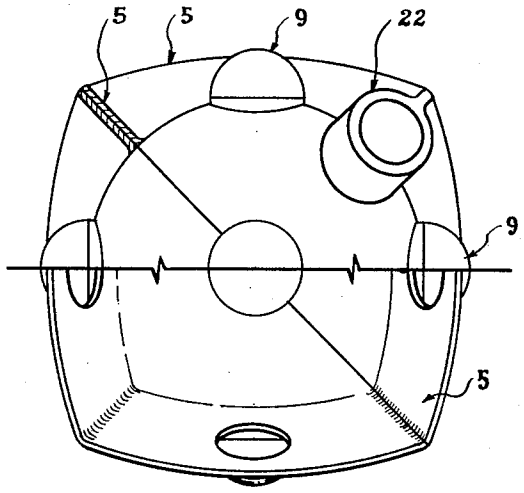


FIG. 6.

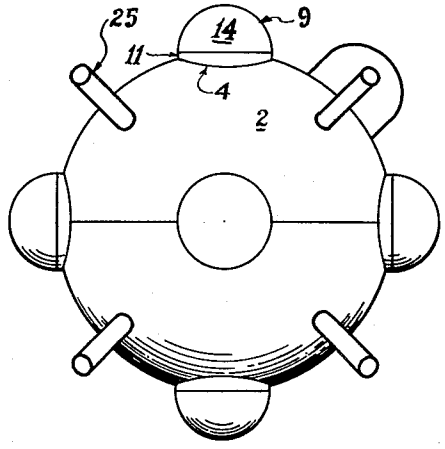


FIG. 7.

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United States Patent Office 3,044,665 Patented July 17, 1962

3,044,665
FREE BODY DISPENSER

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Filed Dec. 26, 1957, Ser. No. 705,271
13 Claims. (Cl. 222—129)

This invention relates to dispensers and more particularly to a free body type dispenser of an improved nature. Embodiment of the subject invention provides a capsule dispenser which automatically functions under the influence of centrifugal force effects and constitutes an improvement of our dispenser disclosed in United States Application for Letters Patent Serial Number 669,675, filed July 2, 1957, entitled "Dispenser Capsule."

The invention will be particularly described with reference to its use in dispensing a fabric softener in an automatic washer. However, this dispenser can be equally employed in a multitude of other applications such as in introducing dyes or chemicals in material or food processing. Accordingly, those versed in the art will recognize the complete versatility of the subject invention.

The use of free body dispensers has been limited to date. The reason has been the difficulty in fabricating dispensers which would precisely and automatically function when required.

The present invention provides a capsule in the form of a sphere including an inner capsule which accommodates a charge of softener to be dispensed. The space between the capsules is compartmented and control means of an improved nature are provided which are condition responsive to centrifugal force effects to selectively or jointly seal aligned apertures in the capsules. This insures that the dispensing operation is controlled as to its operating cycle and positive in function.

A primary object of the invention is to provide improvements in capsule type dispensers whereby they may be economically manufactured, more efficient and satisfactory in use, adaptable to a wider variety of applications and be unlikely to get out of repair.

A further object of the invention is to provide an improved dispenser of the type which is condition responsive to centrifugal force effects.

Another object of the invention is to provide a novel free body dispenser in the form of a sphere which is condition responsive to centrifugal force effects to dispense a charge fully and automatically in a fluid body.

An additional object of the invention is to provide a capsule type dispenser including concentrically spaced spheres having radially aligned apertures employing connected split spherical closure elements automatically responsive to centrifugal force conditions to selectively or jointly operate to move a charge of softener or the like from the inner sphere and to the outer sphere and from the capsule as required.

A further object of the invention is to provide improvements in centrifugal force operated valve elements.

Another object of the invention is to provide a dispenser possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein described.

With these primary and other objects in view which will become more apparent from the following specification and claims, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof and their means and mode and operation as herein described or illustrated in the accompanying drawings or their equivalents.

Referring to the accompanying drawings, wherein illustrative but not necessarily the only forms of embodiment of the invention are shown,

FIG. 1 is a plan view of a capsule dispenser in accordance with the invention;

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1; showing the valve elements therein in their normal position;

FIG. 3 is a view similar to FIG. 2, but showing a first stage operation of the valving system employed in the dispenser;

FIG. 4 is a view similar to FIG. 2, but showing a second stage operation of the valve system of the dispenser;

FIG. 5 is a view similar to FIG.4, but showing the operation of the valve system in a different manner due to modified operating conditions;

FIG. 6 is a view of the capsule of FIGS. 1–5 with the outer sphere removed and a section of the spacers broken away for clarity of disclosure;

FIG. 7 shows a modified form of inner sphere for the capsule dispenser;

FIG. 8 is a fragmentary detail view illustrating valve assembly structure in accordance with the invention, and

FIG. 9 is a detail view of an alternate form of valves which may be employed in the practice of the invention.

As illustrated in the drawings, the improved capsule includes an outer sphere **1** and an inner sphere **2** positioned concentrically within the outer sphere. The outer sphere is provided with six equidistantly spaced apertures **3** which are circular in transverse cross-section and expand conically inwardly of the sphere. These spheres are preferably formed of plastic.

The inner sphere **2** has six apertures **4** adapted to axially align with the apertures in the outer sphere. Externally the sphere **2** has radial plate-like projections **5** in connected relation defining a sphere by their arcuate extremities of a dimension slightly greater than the internal dimension of outer sphere **1**. This enables a fixed positioning of the inner sphere relative the outer sphere with the projections **5** seating in grooves in the inner surface of outer sphere **1** and serving as spacers to maintain their concentricity.

The plate-like projections **5** are generally rectangularly positioned with respect to each aperture **4** and equidistantly thereabout so that in the assembled relation of the spheres, six chambers **6** are provided therebetween, the radial axis of each chamber being defined by aligned apertures **3** and **4**.

The inner surface of the inner sphere **2** is contoured with diamond shaped convexities **7** uniformly intermediate adjacent apertures **4** to define channels **8** to the apertures.

It is noted that the inner and outer spheres will each be preferably formed of identical half sections suitably welded together on assembly.

Generally spherical valve units **9** are provided to normally seal apertures **4** in the inner sphere. The valve units **9** include separable hemispherical elements **14** and **11**. Each aperture **4** is defined by a bowl-like surface **10** expanding outward to seat a hemispherical element **11**. The element **11** is centrally and axially apertured and the aperture to its inner extremity is defined by a tubular projection **12** which projects inwardly of sphere **2**, directed to its center. The external surface of tubular projection **12** is circumferentially grooved at **13** in thread-like fashion. Mating to the diametral outer surface of the element **11** is a second hemispherical element **14** generally forming a sphere therewith and provided with an axial projection **15** bearing in section **11** within the central aperture therein.

The elements **11** and **14** may be fabricated of bronze or material of similar properties.

Disposed in the geometric center of sphere **2** is a plastic block **16** having six rectangularly arranged hooks **17** anchored therein and projecting from each face at right

angles thereto. At the center of each face of the block a loop 18 is anchored.

The six valve units 9 are commonly connected to block 16 to be biased to normally seat over and seal the apertures in the inner sphere 2.

A coil tension spring 19 radially connects from each loop 18 on block 16 to a loop 20 on the inner end of a projection 15 of a hemispherical element 14 to apply a predetermined bias of the connected element 14 to the geometric center of the inner sphere, seating the inner element 11 which it abuts. Apertures 4 are normally sealed thereby.

Concentrically with each spring 19 is a larger coil spring 21 connected to hooks 17 about the loop 18 at its inner end and wrapped in the grooves 13 in the radially aligned tubular projection 12 of the element 11 at its outer end. Springs 21 apply a greater tension on the inner valve hemispheres 11 than springs 19 provide on the outer valve hemispheres 14 for purposes to become obvious.

This connection of the valve units 9 commonly to the block 16 through the medium of springs 19 and 21 provides a normal disposition of block 16 centrally of the inner sphere 2 with the springs radially thereof.

The inner sphere 2 and the outer sphere 1 have additional aligned apertures defined by a tubular element 22 therebetween integral with sphere 2. This tube 22 provides the passage for introduction of a charge of fabric softener or the like into the inner sphere 2. A flush cap 23 seals the aperture in the outer sphere and the passage 22.

The following description of the use of the subject invention in application to the dispensing of fabric softener in an automatic washer should clearly indicate its advantages, potential and versatility.

The cap 23 is removed to introduce the required charge of fabric softener through the passage 22 into the inner sphere 2. Since the valve units 9 at this point are in their normal sealing relation to the apertures 4, the charge is sealed in the inner sphere 2 by replacing cap 23. The capsule, thus sealed, is introduced into the basket of the automatic washer and the dirty clothes may be introduced therewith. As the automatic washing cycle is initiated, the wash water is introduced and enters the capsule through the apertures 3 in the outer sphere. The water thus introduced in compartments 6 causes the capsule to tend to stay to the bottom of the washer basket. The springs 19 and 21 controlling the valve units 9 are so designed that the valve units will continuously seal the apertures 4 in the inner sphere during agitation of the dirty clothes in the wash portion of the automatic cycle.

Next, the dirty water is extracted by spinning the washer bakset. As the water is automatically extracted, the decrease in the weight of water in the basket is accompanied by a gradual increase in the rate of spin. The tension of the coil springs 19 in the illustrated embodiment is so designed that when a valve in the capsule is subjected to the centrifugal force effects resulting from a spinning of the basket at a rate of 200 revolutions per minute, the outer hemisphere 14 will fly out, overcoming the tension of the connected spring 19 to position itself in sealing relation to the axially aligned aperture 3 in the outer sphere. The tension of the springs 21 are of a degree that the mating hemispherical element 11 will continue to seal the aperture 4 in the inner sphere. During the spinning of the basket, as the dirty water is extracted, the clothes, of course, will hug the side of the basket due to centrifugal force effects, the capsule being similarly affected. The particular valve unit or units 9 affected by the centrifugal force resulting from this spinning of the basket at 200 revolutions per minute will depend on the position of the capsule relative the side of the basket which it hugs. Due to the configuration of the capsule, it will tend to hug the basket side at the position of an aperture 3, such as indicated by the arrow in FIGURE 3 of the drawings. In this instance the hemispherical element 14 aligned with such aperture will be the one which is caused to fly out under the influence of centrifugal force and seat itself in sealing relation to the aperture 3. The mating hemispherical element 11 will continue to maintain the seal of the aligned aperture 4. It is to be noted that as the element 14 flies out it applies a bias to the central block 16 through the medium of its connected spring 19 which causes additional tension on the other valve units and insures that the apertures 4 to which they seat remained sealed. The fact that the stem 15 of the displaced element 14 is guided axially of the mating element 11 insures a positive self positioning of the elements 11 and 14 to seal the respective apertures 4 and 3.

During the increasing rate of spin of the washer basket in the extraction of the dirty wash water the water between the spheres 1 and 2 is automatically ejected so that the chambers intermediate the spheres are rendered substantially free of water at this time. To the end of the extraction cycle as the wash basket is emptied, it will tend to approach maximum speed. The springs 21 are designed so that immediately preceding maximum speed the inner hemispherical element 11 of the relatively separated valve unit 9 will overcome the tension of its spring 21 and fly out to abut the outer element 14. This establishes the complete valve unit 9 in sealing relation to the aperture 3 in an improved self sealing manner. The aperture 4 uncovered thereby provides the outlet for the charge of softener in the inner sphere. The centrifugal force effects of the high rate of basket spin at this time causes the required charge to automatically fly out into the compartment 6 adjacent the open aperture 4 which is defined by the rectangularly positioned partitions 5.

The partitions 5 are provided with apertures 24 in the event the prescribed charge of softener ejected from the inner sphere through aperture 4 requires a larger intermediate chamber than defined by the partitions about the open aperture. In such event the softener will flow through the apertures 24 into adjacent chambers.

As the wash water is completely extracted at this time, the basket slows down and the displaced elements 11 and 14 reverse their operation. The spring 21 pulls element 11 in to seal open aperture 4 as centrifugal force effects diminish and a short period later the element 14 is pulled inward by spring 19 to abut the element 11 and further bias it to seal aperture 4 as the speed of the basket drops below 200 revolutions per minute.

Thus, the sphere 2 is sealed once more with the charge of softener between sphere 2 and sphere 1. Apertures 3 are now open. The rinse water is introduced in the washer basket at this time, initiating the flushing of the charge out of the capsule through apertures 3. The subsequent agitation of the clothes in the rinse water insures that the softener will be completely moved from between the spheres into the rinse water.

The operation of the capsule is complete, positive, and automatic. By use of proper springs 19 and 21 to afford the necessary tension, the portions of the valve units can be caused to operate at any desired condition of spin. Staged operation of the valve units prevents dilution or loss of the softener and its most efficient application.

In the event the dispenser capsule should assume an intermediate position against the side of the washer basket as the dirty wash water is extracted, then a plurality of valve units may respond to centrifugal force effects rather than the single one as described and illustrated in FIGS. 2–4 of the drawings. FIG. 5 illustrates the displacement of two valve units 9 in the manner of the one described when the abutting surface of the capsule is at the location of a partition 5. There is no change in the operating cycle of the valve unit caused thereby. No matter what the position of the sphere 1 as it is caused to cling to the side of the washer basket, as it spins, at least one pair of aligned apertures 3 and 4 will be caused to provide a staged passage for dispensing a charge from the capsule.

The use of spherical valve units 9 as prescribed herein

is preferred since the mating elements 11 and 14 reciprocally control each other in a manner to cause their respective seating in optimum sealing relation to apertures 3 and 4.

An alternate form of element 14 is illustrated in FIG. 9 as having a conical exterior surface 14' for mating in the apertures 3 in the outer sphere 11. This is not the preferred configuration of element 14 however.

FIG. 7 illustrates a modification of partitions 5. Here it would be provided that the spacers be provided by cylindrical radial projections 25 from sphere 2, the projections being integral therewith and of identical length. Sunitable recesses for the outer ends of projections 25 would be provided in the inner surface of sphere 1 in a manner believed obvious.

The novelty and versatility of the free body dispenser of the invention is believed clearly evident from the above described application. Its modification to suit the application will be clear therefrom.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprises an illustrative form of several modes of putting the invention into effect and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described our invention, we claim:

1. A dispenser comprising a first housing, a second housing connected within said first housing to define a hollow chamber therebetween, said first housing having apertures therein, said second housing having apertures therein respectively aligned with apertures in said first housing, said housings having means connected for introducing a charge of dispensable material to said second housing, valve units normally sealing the apertures in said second housing, said valve units including at least two relatively separable portions which are generally coaxially related, means connected to said valve units operative to maintain their portions normally together and in sealing relation to the apertures in said second housing and adapted to provide for a generally axial displacement of one portion of a valve unit relative to another to effect a simultaneous seal of aligned apertures in said first and second housings and a sequential displacement of the respective portions of the valve unit to jointly seal the outermost of aligned apertures.

2. A dispenser including, a pair of spheres, means connecting said spheres establishing them in generally concentric relation to provide at least one chamber therebetween, said spheres forming a buoyant free body and having generally aligned apertures therein open to said chamber, valve means consisting of relatively separable portions normally sealing the inner sphere, means contained within said free body connected for separately controlling the relatively separable portions of said valve means and adapted to provide for a relative separation of said separable portions to effect a simultaneous seal of aligned apertures in said shells or a displacement of all the portions to jointly seal the outer of aligned apertures.

3. A dispenser for introduction in a chamber or receptacle for relative free movement in fluid matter which may be introduced therein, including means defining an outer shell, an inner shell within said outer shell, means connecting said shells in spaced relation to define at least one chamber therebetween, at least one aperture in each shell opening into said chamber, means connected in said shells to provide for introducing a charge of dispensable material to the inner shell, valve means in said chamber between said shells including relatively separable portions, means housed in the inner shell connected to the relatively separable portions of said valve means and operative to normally maintain them together and in sealing relation to the inner of said spaced shells, said means connected to the separable portions of said valve means being adapted to provide for relative separation of said separable portions to effect a simultaneous seal of apertures in both shells and a coming together of said separable portions to seal the outer of said simultaneously sealed apertures.

4. A dispenser for introduction in a chamber or receptacle for relative free movement in fluid matter which may be introduced therein, comprising means defining an outer shell and an inner shell, means connecting said shells in spaced relation to define at least one chamber therebetween, at least one aperture in each shell opening into said chamber, the apertures in said shells being generally in axial alignment, means connected to said shells to provide for introducing a charge of dispensable material to the inner shell, valve means in said chamber between said shells including relatively separable portions, means housed in the inner shell connected to the relatively separable portions of said valve means and operative to normally maintain them together and in sealing relation to the inner of said aligned apertures, said means connected to the separable portions of said valve means being adapted to provide for relative separation of said separable portions to effect a simultaneous seal of both of aligned apertures and a coming together of said separable portions to the outer of said aligned apertures.

5. A dispenser for introduction in a chamber or receptacle for relative free movement in fluid matter which may be introduced therein, comprising a first capsule type shell, a second capsule type shell within said first shell, means connecting said shells in spaced relation to define at least one chamber therebetween, said shells being formed to provide a buoyant free body, each shell having at least one aperture opening into said chamber, means connecting said shells to provide for introduction of a charge of dispensable material to the inner shell, valve means in the chamber between said shells, said valve means consisting of separable portions, control means within said inner shell including spring means separately connecting to the respective separable portions of said valve means operative to normally effect a joint positioning of said separable valve portions to seal the inner of said shells, said spring means being arranged to provide sequentially a relative separation of the separable portions of said valve means to simultaneously seal apertures in both shells and then a coming together thereof to jointly seal the outer of the simultaneously sealed apertures in response to application of centrifugal force of increasing degree being applied to said free body by spinning thereof about an external axis.

6. A dispenser, including an outer shell, an inner shell, means mounting said inner shell within and in spaced relation to said outer shell to define at least one chamber therebetween, means defining apertures in said outer shell expanding inwardly thereof, means defining apertures in said inner shell aligned with the apertures in the outer shell and expanding outwardly, the inner shell having an inner surface formed to provide convexities defining channels leading to each aperture therein, diametrically split valve elements in the chamber between said shells, spring elements separately connected to the respective diametrically split portions of said valve elements, means anchoring said spring elements within said inner shell, said spring elements conditioning said respective portions of a valve element so that the outermost of said portions is responsive to application of centrifugal force to said

shells of a particular degree to move outwardly from the inner of said portions whereby to provide for simultaneous seal of aligned apertures in said shells and, on particular increase in the centrifugal force applied to said shells, the inner of said portions will move out to join the outer portion in sealing relation to the outer of said aligned apertures leaving the inner of said aligned apertures open for movement of material from the inner shell to the chamber between said shells.

7. A dispenser capsule including a pair of capsule-type shells, means connecting one shell within the other forming a chamber therebetween, said shells having aligned apertures, a generally hemispherical valve element seating to close each aperture in the inner shell having an aperture therethrough and its diametral surface outermost, anchor means within said inner shell, springs connected at one end to said anchor means and respectively connected at their other end to one of said valve elements to normally bias it inwardly with respect to said inner shell, a second generally hemispherical valve element mating with each of the first mentioned valve elements outwardly thereof, said second valve elements having springs connected and extending through the apertures in said first valve elements to connect to said anchor means in said inner shell, said first and second valve elements being conditioned thereby for relative displacement to effect a simultaneous seal of aligned apertures in both shells and sequential displacement to the outer of aligned apertures.

8. A free body dispenser including a charge receptacle, a capsule-type housing about and spaced from said receptacle, means connecting said housing and receptacle to maintain their relative spaced relation, said receptacle and housing having aligned apertures, extensible valve means within said housing and between aligned apertures, said valve means being normally biased to seal the receptacle, means positioned internally of said housing, operable on said valve means to provide, on said dispenser being subjected to predetermined centrifugal force effects, that said valve means simultaneously seals aligned apertures and, on increase of centrifugal force to predetermined extent, that said valve means open at least the receptacle aperture while maintaining a seal of the aligned housing aperture for automatic transmission of a charge from said receptacle to the chamber between said receptacle and said housing, said valve means being further responsive to a predetermined decrease in centrifugal force effects to retract and open the sealed housing aperture thereby and reseal the receptacle aperture aligned therewith.

9. In a pair of shell-like enclosures having means connecting them in substantially concentric spaced relation and having apertures placed in alignment thereby, valve means in the space between said enclosures, in alignment with said aligned apertures therein, including separable portions, means connected to the respective separable portions of said valve means normally biasing them to jointly seal the inner enclosure and rendering one of said portions operable in response to application of a predetermined physical stress to said enclosures to separate from said other portion which maintains a seal of the inner of aligned apertures to simultaneously seal the outer of the aligned apertures.

10. A dispenser including a pair of shells having means connecting them one within the other in generally concentric spaced relation and forming a unitary free body in the nature of a capsule thereby, the inner of said shells defining a chamber for a charge of material to be dispensed, generally axially aligned apertures in said shells and valving means normally sealing the inner of aligned apertures provided in the inner shell and so formed and controlled to respond to the spinning of the free body about an external axis to automatically, dependent on the point of application and degree of the centrifugal forces which result from the spinning of the body about an external axis, seal either of aligned apertures in said shells individually or simultaneously seal both of aligned apertures in said shells whereby to provide for staged passage of a charge therethrough.

11. Valving apparatus including a pair of spaced walls having aligned apertures, valve means intermediate said walls having separable portions, means connected to normally maintain said separable valve portions together in sealing relation to one of said aligned apertures and separately conditioning the respective portions to individually respond to application of predetermined stress on said valve means to provide for displacement of predetermined portions of said valve means in sequence related to the degree of applied stress to provide for seal of either or both of aligned apertures at any one instant, depending on the degree of the applied stress.

12. The structure as set forth in claim 7 wherein said springs connected to each pair of mating valve elements are concentric coil springs having varying degrees of applied tension.

13. A free body dispenser including, an inner sphere, an outer sphere, means connecting said spheres in concentrically spaced relation, a plurality of pairs of aligned apertures in said spheres expanding toward each other, inner and outer nesting valve elements between said spheres mutually spring biased to close the apertures in said inner sphere, a block within the inner sphere having a loop centrally of each side and projecting hooks thereabout for alignment with aligned apertures, the outer of said nesting valve elements having a guide projecting through and bearing in the inner of said valve elements, concentric springs between said block and each pair of nesting valve elements respectively connecting to said hooks and inner valve element and said loop and outer valve elements and having different tensions applied to said nesting valve elements therethrough.

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