A METERING DEVICE FOR SYRUPS AND OTHER FLUIDS

The container (1) with dispensing nozzle (5) also comprises bellows (12); an external bellows control member (24), controlling the bellows to push the fluid out of the nozzle is regulated by means of a threaded device (1G, 20) which regulates the stroke in order to set the volume of fluid to be dispensed at each stroke.
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"A METERING DEVICE FOR SYRUPS AND OTHER FLUIDS"

DESCRIPTION

The invention relates to a metering device for liquids - such as syrups or other - which characteristically also forms the container of said liquid to be measured out.

The main object of the invention is to provide a practical, convenient way for metering out the required doses, which can easily be defined without complex operations and without the need for objects which do not belong to the packaging.

These and other objects and advantages will be described in the text that follows.

The metering device according to the invention substantially comprises: a container with dispensing nozzle piece; bellows defining at least part of the volume of the container; an external bellows control member to make the bellows collapse and push the fluid out of the nozzle; and means for regulating the stroke of said external bellows control member to predefine the volume of fluid to be dispensed at each stroke.

The bellows can be made of elastic shape memory material so that the bellows can re-expand and either ensure or facilitate the return stroke of said external control member.

The external control member stroke regulating device of the bellows can essentially comprise two reciprocally angularly adjustable components.

According to a possible embodiment, said device can comprise a threaded coupling between said two components to adjust the position of a pawl along the axis of the bellows and means for reading the reciprocal rotation between the two components of said threaded coupling. The bellows may even be helical in shape to form one of the threaded coupling components.

According to another possible embodiment, said external control member stroke regulating device of the bellows can comprise a first component, forming a plurality of grooves of different length, and a second component, which is slidingly mobile with respect to the first component,
provided with at least one ridge capable of sliding in either one or the other of said grooves, and which is angularly adjustable with respect to said first component to position said at least one ridge in correspondence with one of the grooves. These grooves are preferably longitudinal.

Advantageously, said two components of the regulating device can comprise cavities or grooves and pins to define a plurality of reciprocal angular positions corresponding to an equal number of doses.

The invention will now be better understood following the description and the accompanying drawing, which shows a practical non limitative example of the invention. In the drawings:

Figs. 1 and 2 show a first embodiment of a cap according to an external partial cross-sectional view in two positions;

Fig. 3 is a transversal cross-sectional view according to III-III of Fig. 1;

Figs. 4 and 5 show a second embodiment similarly as Fig. 1 and 2;

Figs. 6, 7 and 8 show a view and partial cross-sectional view according to VI-VI, a transversal cross-sectional view according to VII-VII in Fig. 5, and a partial cross-sectional view according to VIII-VIII in Fig. 7, of the external member only;

Figs. 9 and 10 show views and partial cross-sectional views of a different embodiment of Figs. from 1 to 3, in two positions;

Figs. 11 and 12 show an additional embodiment.

Figs. 1 to 3 show a solution in which reference numeral 1 indicates the container for the liquid to be dispensed by setting doses, which can be made of synthetic resin susceptible of being flexible and elastic and whose thickness is limited. Particularly, the container 1 includes: an exposed section 1A with a larger diameter; a threaded neck 1B, which is used to screw and unscrew a cap 3 on it; a terminal 1C - also threaded - used to engage a dispensing piece or nozzle or "pacifier" 5 made of elastic material with an outlet hole 5A. Said dispensing piece or nozzle 5 can present an internal helical ridge 5B, which applies a braking action on the fluid output to prevent involuntary release through the hole 5A. The cap 3 is provided with an internal appendix 3A susceptible of closing the outlet hole 5A when the cap 3 is in
closed position (Fig. 1); the cap 3 also presents a crown 3B which centers and closes the nozzle 5 and the cap 3.

The cap 3 may be equipped with a safety, or so-called “childproof” device, allowing the removal of the cap only following a combined unthreading and releasing action; this safety device can be implemented in any known way for this function. According to the example shown, at least one or preferably two opposite tabs 3C are arranged along the open terminal part of the cap; the tabs 3C can bend inwards when pressed radially to release the respective appendixes 3E of said tabs 3C from corresponding teeth 1D projecting from a step formed by the container 1 between the section 1A and the threaded neck 1B. Thanks to this arrangement, the cap 3 can be turned and released from the neck 1B of the container 1 only by pressing the tabs 3C.

The cap 3 can additionally be equipped with a quality seal, which can traditionally consist of a terminal collar 3H of the cap 3, connected to said cap by means of thin links, capable of being easily sheared the first time that the cap 3 is opened and released from the threaded neck 1B; this system can form the quality seal. A contoured tooth 3K may be arranged on said collar 3H to shear said links by penetrating in a corresponding indent formed in the edge of the cap 3 to facilitate turning the collar 3H and shearing said links connecting the cap 3 to the collar 3H.

The cap 3, made in this or other ways, may also be used as a measuring cup, e.g., to form a mixture with the addition of a solvent to a freeze-dry product, a soluble powder, or other material originally contained in container 1, after the first cap opening operation, for forming a syrup or other liquid product on the spot, with the addition through the neck 1C of a certain amount of solvent to the product to be dissolved.

The container 1 presents a section 1E whose diameter is smaller than that of section 1A, where a projecting ring 9 is provided (also see Fig. 3) having cavities 9A, for the purposes set forth herein after. The container 1 continues with a section 1F, which in part presents a projecting threading 1G; the container 1 continues - over a step offset 1H - with a cylindrical section
1K, which is combined with bellows 12, which can either be part of section 1K of the container 1 or applied to and communicating with the container. The bellows 12 are capable of dilating elastically from a collapsed position shown in Fig. 1 to an elastically dilated position to ensure changes in volume which can be adjusted to form the required dose to be measured out. The bellows 12 must be designed to reach a spontaneous elastic dilatation also exceeding that illustrated in Fig. 2, which represents the change in volume forming the maximum dispensable unitary dose.

Reference numeral 16 indicates a sleeve which essentially covers the sections 1E and 1F and the ring 9, which sleeve 16 is essentially rigid to ensure the maintenance of the shape of sections 1E, 1F, 1K of the container 1, which can be made by blowing and which, therefore, can be relatively thin and flexible. The sleeve 16 forms an operating grip for the dispensing operations described later, despite sections 1E, 1F, 1K being relative flexible.

The sleeve 16 presents one or more internal ridges or an inner annular ridge 16R, which can exceed the ring 9 in assembly but which contrasts said ring 9 to prevent accidentally loosening of the sleeve 16.

The sleeve 16 presents one or more longitudinal projections 18 (also see Fig. 3) capable of co-operating with the cavities 9A of the ring 9 to allow a sequence of angular movements to preset positions of the sleeve 16 with respect to the ring 9 (and consequently to the container 1), in addition to permitting relative longitudinal movements. An internal threading 20 capable of coupling with threading 1G of the container 1 is also made inside the sleeve 16. The sleeve 16 also presents a step 16A and an extension 16B leading to a terminal internal annular stop 22. The extension 16B and the internal annular stop 22 partially surround the smaller diameter section 1K.

Reference numeral 24 indicates an external control member of the bellows 12 for performing the dispensing operation; the external control member 24 essentially consists of a cylindrical cup and is fitted on section 1K of the container 1 and on the bellows 12, being capable of sliding with respect to these parts and arranged between the section 1K and the extension 16B of the sleeve 16. This external control member 24 presents an external stop ring
24A capable of cooperating with the internal annular stop 22 which is on the end of the extension 16B of the sleeve 16.

In the conditions shown in Fig.1 of the container 1 and the sleeve 16 - regardless of the application or removal of the cap 3 - the whole formed by container 1 and sleeve 16 is in a non-dispensing position which can be indicated by a "0" visible through a window 26 (see Fig. 2) in the sleeve 16. In this condition, the sleeve 16 is essentially entirely fastened with its own threading 20 on the threading 1G of the section 1F of the container 1, reason for which the step 16A of the sleeve 16 stops against the offset 1H, between the section 1F and the section 1K of the container 1. In this condition, the control member 24 is engaged between said stop 1H (included between sections 1F and 1K) and the internal annular stop 22, which withholds the stop ring 24A of said control member 24. In this condition, the control member 24 cannot move axially. By rotating the sleeve 16 with respect to the container 1 the sleeve is loosened and moves axially, so that the window 26 of the sleeve corresponds to one or the other of a plurality of markings formed and helically arranged on the external surface of the section 1E of the container 10 (see Fig. 1 and 2). The various markings correspond to respective doses which appear through window 26 - or through each of the two or more windows 26 - for reading the axial position reached by the sleeve 16 corresponding to the markings. By loosening the sleeve 16, the terminal internal annular stop 22 is distanced from the stop 1H between the sections 1F and 1K. In this way, the control member 24 can move axially - as N - as appears from the comparison of Fig. 1 and 2. Note that bellows 12 in home position - i.e. not compressed - are in extended position; the volume inside the bellows 12 is either equal to or even much higher than the maximum dose which is required for a unitary dispensed dose of the content of the container 1. The elastic dilatation stress applied by the bellows 12 makes the bellows 12 dilate according to the axial excursion which is offered by the control member 24 by the progressive loosening of the sleeve 16 on the threading 1G of the container 1. The sliding possibility (N) of the control member 24 is read according to the loosening imposed by the sleeve 16 with respect to the
container 1 and can be ascertained by reading the marking which appears in correspondence with the window 26. In this way, it is possible to read the dose which can be dispensed according to the allowed axial stroke of the control member 24, when this is pressed according to arrow f24 to partially compress the bellows 12 and distance the stop ring 24A from the annular stop 22 against the stop step 1H, between the sections 1F and 1K of the container 1 or until the bellows reach the stop.

To dispense the fluid, the cap 3 is removed, the whole is directed with the nozzle 5 down and, after having loosened the sleeve 16 until a unitary required dose is read, the control member is pressed in the direction of the arrow f24. This increases the internal pressure and causes the contents to flow through the nozzle 5 until the balance between internal and external pressure is re-established. The presence of the helical ridge makes the flow regular and prevents irregularities caused by sudden dynamic stress. The dose to be dispensed can be established as the unitary dose; multiple doses of the unitary dose are obtained by several strokes which are axially imposed in sequence by the control member 24.

The whole can be kept in the preset dose condition during the period of use of the contents, between one dispensing operation and the other of each of unitary doses which can be obtained by one or more strokes of the member, and each time the cap can be simply opened or closed. At the end of use, the sleeve 16 can be returned to the condition in which 16A is stopped against 1H - consequently to the original packing condition of the container - and the cap 3 can be applied onto the threading 1B of the container 1.

Essentially, the dose setting obtained by turning the sleeve 16 and consequently by its axial sliding due to the effect of the threading coupling, can be kept during the treatment by the user, because the position assumed by the sleeve 16 is held by the cavities 9A and by the ridges 1B.

The return of the bellows to the condition shown in Fig. 2 is obtained by elastic dilatation stress.

The possible reduction of the elastic return capacity to expanded configuration of the bellows 12 does not effect functionality, because the
original maximum dilatation of the bellows 12 is considerably higher than the
maximum unitary dose which can be obtained using the system herein
described.

Figs. from 4 to 7 illustrate a different solution of the dose metering
system, i.e. of the lower part, observing the drawing of the container, with
respect to that illustrated in Fig. 1 and 2; the upper parts are the same.

Reference numeral 101 indicates the container equivalent to that
indicated by reference numeral 1, whose arrangement is similar to 1, 3, 5
illustrated above. The container 101 presents a first section 101A, a threaded
neck 101B for the cap 3 and an annular cavity 101D for engaging a sleeve
116, that is equivalent to the one labeled 16 as concerns the possibility of
gripping the whole and the regulation method. The sleeve 116 surrounds a
section 101E which is equivalent to 1E. A subsequent section 101K, slightly
smaller in size, extends beyond the step 101G which divides the two sections
101E, 101K. Bellows 112 develop from section 101K. The sleeve 116 is
withdrawn by a step 116A, which rests on the step 101G, the latter being
additionally witheld by a small inner annual tooth 116B; the latter is engaged
in the annual groove 101D of the container 101. The sleeve 116 extends over
the step 116A with an external cylindrical wall 118, which is the continuation
of the sleeve 116, and with an internal cylindrical wall 120, which with the
external cylindrical wall defines a tubular seat 122, whose bottom is open as
shown in Fig 5 and 6; the tubular wall 124A of an external control member
124 (equivalent to that indicted by reference numeral 24 in the previous
example), capable of axial movements in the direction of the arrow f124 for
dispensing the set dose, penetrates in the tubular seat 122.

The internal surface of the external cylindrical wall 118 presents a
number of longitudinal grooves 126, with progressively different lengths along
the circumference. Preferably, two contiguous sets of said grooves 126 may
be provided, which are similar and opposite to one another. A tooth 128
formed on the edge of the tubular wall 124A of the external control member
124 can slide in either of these grooves 126 in either one or both sets: The
tooth 128 is elastic due to the presence of two slots 130 arranged by the side
of the tooth 128, to render it resilient. Both the grooves 126 and the one or two opposite teeth 128 are contoured so that the external control member 124 can turn to preset positions inside the tubular seat 122, thanks to the elasticity of said teeth 128, so that the tooth or the pair of teeth 128 can pass from one groove 126 to another, seeking the groove whose length corresponds to the stroke which can be imposed by the control member according to the arrow f124 to obtain partial collapse of the bellows 112 according to the required preset dose to be dispensed each time. The angular position sought for the control member 124 with respect to the whole 16, 18 is controlled by a graduated scale arranged circumferentially and a reference on the contiguous external surfaces of the wall 118 and the wall 124A. An internal pawl 118X stops the rotation and identifies the zero dosing position. An external annular ridge 120A of the internal cylindrical wall 120 can cooperate with retainer projections 124C which are suitably distributed and face inwards on the tubular wall 124A to provide sufficient hold to prevent the spontaneous release of the external control member 124.

With this arrangement, the stroke according to the arrow f124 required to collapse the bellows 112 to a variable degree is limited to the length of the longitudinal grooves 126 which are sought by the angular movement of the member 124 with respect to the sleeve 116; the selected groove 126 is that whose length corresponds to the thrust stroke according to f124 of the bellows 112 required to obtain the output of the required dose at each stroke imposed by the control member 124 and for the consequent collapse of the bellows 112. The search for the groove 126 of required length (and consequently the required dose) is obtained by a scale and reference which are visible on the external surfaces of the cylindrical wall 118 and tubular wall 124A. The dose setting can be kept for later operation thanks to the resistance offered by the elasticity of teeth 128, being sufficient to permit movement of the tooth or teeth 128 to contiguous positions to change the dose to the measured out.

Fig. 9 and 10 show a variant of the bellows control system. In this case, the container 301 directly forms a bellows 312 which has a helical, i.e. threaded, profile onto which an edge 324A of the external control member
324 can be fastened, the latter being fitted onto said helical profile bellows 312. According to this embodiment, in the configuration shown in Fig. 9, the control member 324 is fastened by contrast between two offsets 301K of the container 301 and 324K of the control member 324. The required distance N between the two offsets 301K and 324K can be obtained by gradually loosening the control member 324 between the grooves 312 and 324A, as shown in Fig. 10. In the conditions shown in Fig. 10 the external control member 324 can be pushed according to the arrow f324 by an amount N which corresponds to the dosing stroke i.e. to the partial collapse of the bellows 312. The turns of the bellows 312 which are engaged by the threading 324A of the control member 324 cannot collapse. The selected N stroke which corresponds to the required dose can by controlled by observing the relative angular position of the container 301 and the external control member 324 through a window 326 in the skirt of the control member 324, which window can slide along a graduated scale formed on the external surface of the container 301 according to a helical pattern corresponding to the pitch of the coupled threads 312 and 324A.

The position of the external control member 324 with respect to the container 301 can be ensured by a ring 309 provided with cavities (such as that indicated by reference numeral 9 in the first example) cooperating with the longitudinal grooves 318 (equivalent to 18) along the internal surface of the cylindrical wall of the control member 324, to create a limited resistance to spontaneous reciprocal movements of the container 301 with respect to the control member 324, and to identify the preset positions which correspond to the doses observed through window 326 and the helical graduated scale on the external surface of the container 301.

The threaded edge 324A can present a threading 324A on the outside. The internal visibility of the threading 324A can be avoided by making the external part of the edge 324A cylindrical.

Figs 11 and 12 show an embodiment in which the container 401 is mostly covered by a rigid sleeve 416 which forms the operating grip and is withheld in position by one or more internal ridges 416A which contrast a ring
409 with cavities (similar to ring 9) formed by the container 401. The container 401 forms the helical shaped bellows 412 (as the one shown at 312). The sleeve 416 forms an annular step 416B and continuous with a cylindrical edge 416C forming the internal threading fastened on the turns of the helical bellows 412. Said bellows 412 project from the cylindrical edge 416C and engage an annular ridge 430A of an operating cap 430 by means of its own annual groove 412E. The cap 430 covers the bellows 412 and reaches step 416B, in the configuration shown in Fig. 11.

In the conditions shown in Fig. 11, the bellows cannot be axially collapsed by applying an axial thrust. Therefore, no unitary dispensing is possible. A relative rotation between the elements 416 and 430, which is programmable and controllable via a graded scale on the surface of the container 401 and a window in the sleeve 416 is required to dispense the contents. By causing a relative rotation between the sleeve 416, 416C and the whole 401, 430, axial movement of the sleeve 416 is obtained by the helical movement of the threading 416C with respect to the bellows 412 (see Fig. 12). This releases the turns and the factions of turns of the bellows 412; consequently, the bellows can be collapsed by axial thrust in the section N3 causing the output of the unitary dose corresponding to the indication which appears through the window in the sleeve, the whole being turned with the nozzle pointing downwards. Elastic re-expansion of the bellows returns the whole of the position shown in Fig. 12.

It is noted that the drawing is provided by the way of an example only and that numerous changes can be implemented to the construction and embodiments of the invention herein envisaged without departing from the scope of the present invention. The presence of reference numerals in the annexed claims has the purpose of facilitating comprehension of the claims with reference to the description and does not limit the scope of protection represented by the claims.
1. A metering device per syrup and other fluids, characterized in that it comprises: container (1, 101, 301) with dispensing nozzle (5-5A); bellows (12, 112, 312) defining at least one part of the volume of the container; an external bellows control member (24, 124, 324) to make the bellows collapse and push the fluid out of the nozzle; and means for regulating the stroke of said external bellows control member (24, 124, 324) to predefine the volume of fluid to be dispensed at each stroke.

2. Metering device according to claim 1, characterized in that the bellows are made of elastic shape memory material to ensure or facilitate the re-expansion of the bellows and thus the return stroke of said external control member (24, 124, 324).

3. Metering device according at least to claim 1, characterized in that said regulating device (24, 124, 324), for regulating the stroke of the external bellows control member, comprises two components (1, 16; 116, 124; 301-312, 324; 416, 401-412) which are reciprocally angularly adjustable.

4. Metering device according at least to claim 3, characterized in that said regulating device comprises a threaded coupling (1G, 20; 312, 324A; 416, 412) between said two components (1, 16; 312, 324; 416, 401) to adjust the position of a pawl (1H; 301K) along the axis of the bellows and means for reading the reciprocal rotation between the two components of said threaded coupling.

5. Metering device according to claim 4, characterized in that the bellows (312, 412) are helical in shape and form one of the threaded coupling components.

6. Metering device according at least to claim 1 or 3, characterized in that said regulating device for regulating the stroke of the external bellows (112) control member (124) comprises a first component (116, 118) forming a plurality of grooves (126) of different length, and a second component (124) which is slidingly mobile with respect to the first component (116, 118), provided with at least one projecting tooth (128) capable of sliding in said grooves (126) and which is angularly adjustable with respect to said first
component to position at least one projecting tooth (128) in correspondence with one of the grooves (126).

7. Metering device according to claim 6, characterized in that said grooves (126) are longitudinal.

8. Metering device according at least to one of the preceding claims, characterized in that said two components (1, 16; 302-312, 324) of the regulating device comprise cavities and projections (9, 18; 309, 318) capable of defining a plurality of reciprocal angular positions corresponding to an equal number of doses.

9. Metering device according at least to claim 1, characterized in that said nozzle (5, 5A) presents and internal helical projection (5B) capable of conditioning the flow of the dosed liquid to be dispensed.

10. Metering device according to claim 1 or 5, characterized in that said nozzle (5, 5A) is made of elastically flexible material.

11. A metering device per syrup and other fluids; essentially as described and illustrated for the specified purposes.
A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01F11/08 B05C17/005

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01F B05C

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 practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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** Further documents are listed in the continuation of box C. **

** Patent family members are listed in annex. **

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