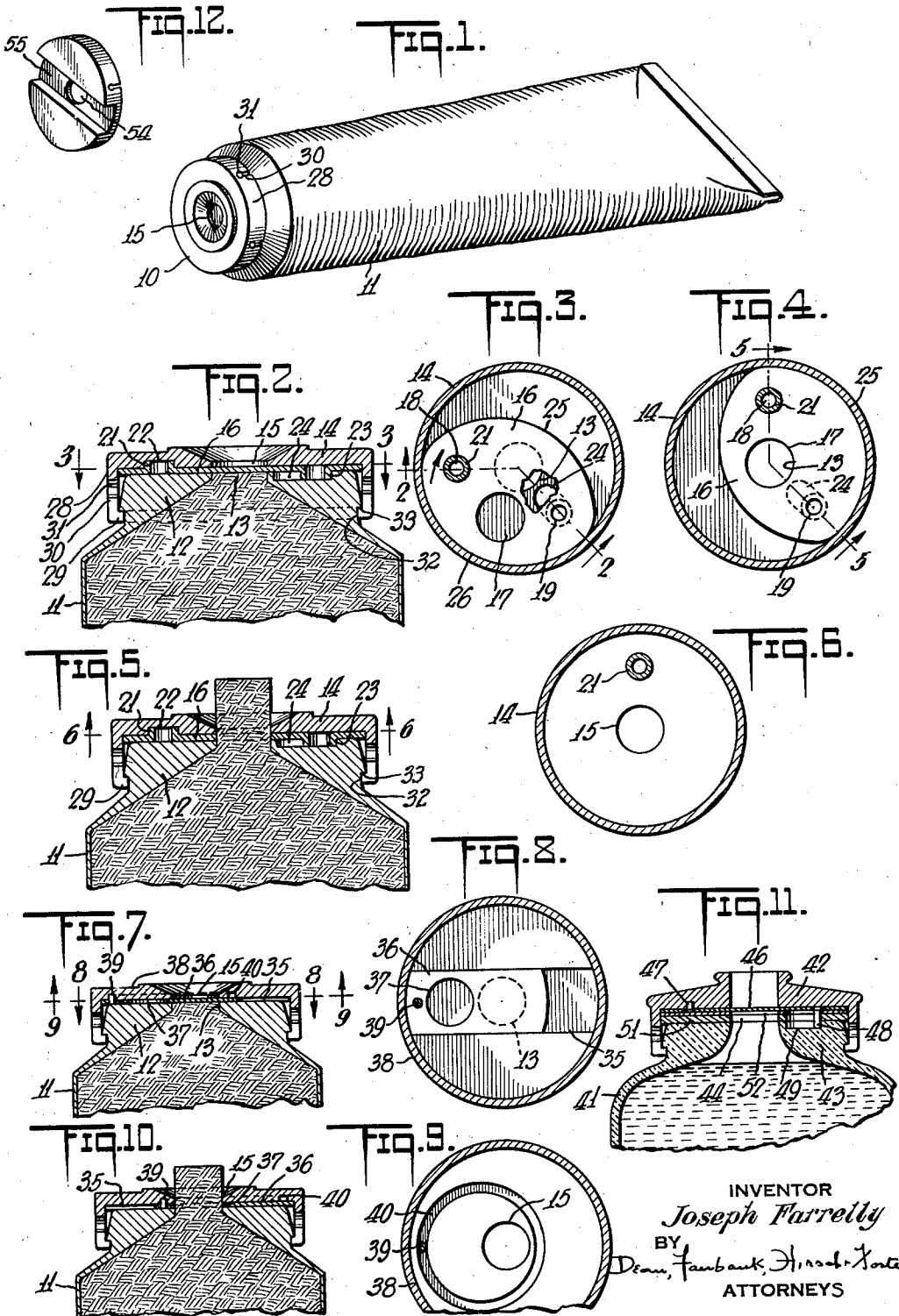


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CLOSURE DEVICE

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CLOSURE DEVICE

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The present invention relates to closure devices for containers, and more particularly to a valve type of closure device, which is adapted to be permanently or continuously attached to the top of a container, and which is opened or closed through the rotation of a cap forming part of said device.

One object of the present invention is to provide a new and improved closure device of the type described, which may be manufactured at a very small cost, and which may be easily and effectively attached to the mouth of a container.

Another object is to provide a new and improved air-tight closure device of the type referred to, for use on liquid containers and the like.

Still another object is to provide a new and improved closure device of the type referred to, in which the wear on the relatively movable parts thereof is reduced to a minimum.

A further object is to provide a closure member of the type described, which is so constructed as to minimize the possibility of jamming the relatively movable parts thereof into inoperative positions.

The present invention is applied to that type of closure device, in which the rotation of a cap provided with a central opening, causes a valve plate having a valve opening, to oscillate and to bring the valve opening into and out of registry with the central opening of said cap.

As a feature of the present invention, the valve plate has a pair of oppositely disposed circular edges, conforming with the inner cylindrical surface of the cap. The valve plate is movable substantially diametrically of the cap, and in a direction substantially transversely of said edges to bring said edges respectively into engagement with diametrically opposite sides of said cylindrical surface in extreme positions of said valve plate. It is seen that in the operation of the closure device, there is little or no sliding movement between the edges of the valve plate and the inner cylindrical surface of the cap, so that there is no wear on the valve plate, which would affect its operation.

As another feature of the invention, the valve plate has a sliding guide connection with the mouth of the container, which is such as to prevent the jamming of the plate in an undesirable inoperative position. For this purpose, the plate is guided along a slot or recess in the mouth of the container, extending substantially radially with respect to the axis of the container.

As another feature, the closure device is constructed to effect a new and improved snap-fit connection with the mouth of the container.

Various other objects, features and advantages of the invention will be apparent from the following particular description and from an inspection of the accompanying drawing in which:—

Fig. 1 is a perspective view showing a container having one form of my improved closure device attached thereto,

Fig. 2 is a vertical section taken on the line 2-2 of Fig. 3, and showing the device of Fig. 1 in closed position,

Fig. 3 is a section taken on the line 3-3 of Fig. 2, and showing the closure device in closed position,

Fig. 4 is a section similar to Fig. 3, but showing the closure device in open position,

Fig. 5 is a vertical section taken on the line 5-5 of Fig. 4,

Fig. 6 is a section taken on the line 6-6 of Fig. 5,

Fig. 7 is a vertical section of another form of closure device, and showing said device in closed position,

Fig. 8 is a section taken on the line 8-8 of Fig. 7,

Fig. 9 is a section taken on the line 9-9 of Fig. 7,

Fig. 10 is a vertical section taken through the closure device similar to that shown in Fig. 7, but showing the closure device in open position,

Fig. 11 is a vertical section through another form of closure device having an air-tight connection with the mouth of a container, and

Fig. 12 is a perspective of another form of closure device.

In Figs. 1-6 is shown one form of my improved closure device 10 as applied to a collapsible tube or container 11, but it must be understood that the container may be of any suitable construction, for holding powders, creams, pastes, and liquids. This container 11 has an end wall 12, provided with a central opening 13. The closure device 10 comprises a rotary cap 14 having a central opening 15 in axial alignment with the opening 13 of the container. Interposed between the rotary cap 14 and the container wall 12 is a valve plate 16. This valve plate 16 has a valve opening 17, and is oscillated in response to the rotation of the rotary cap 14 to selectively bring said valve opening into or out of registry with the openings 13 and 15, so as to block or open the passage between said openings 13 and 15. In

order to effect this oscillatory movement of the valve plate 16, said plate has a pivotal connection 18 with the underside of the rotary cap 14, and has a slide connection 19 with the upper side of the end wall 12.

As a feature of the present invention, the pivotal and slide connections of the valve plate 14 are effected with the minimum of construction and complication. For the pivotal connection, the valve plate 16 is provided with an upstanding pivot pin 21, in the form of a cylindrical flange, spun or swaged from said plate. This pin 21 fits into a correspondingly shaped recess 22 in the underside of the rotary cap 14. The slide connection is effected in a similar way, by forming a downwardly extending guide pin 23 in the form of a flange, extending into an elongated groove 24 formed on the top side of the container 12 and extending substantially radially with respect to the axis of the container.

When it is desired to actuate the valve plate 16 into open position, the cap 14 is rotated in a clockwise direction from its position shown in Fig. 3. The cap 14, during this operation, carries the pivot pin 21 of the valve plate 16 along a circular path concentric with the axis of the cap, while the guide pin 23 slides in the groove 24. The resultant movement of the valve plate 16 causes its valve opening 17 to move into registry with the openings 13 and 15, into the position shown in Fig. 4.

In order to close the container, the rotary cap 14 is rotated in a counterclockwise direction from the position shown in Fig. 4 and into the position shown in Fig. 3.

The valve plate 16 is large enough to cover a substantial portion of the cross-sectional area of the rotary cap 14, so as to provide large sealing surfaces contacting between said cap and the end wall 12. Furthermore, the valve plate 16 has a pair of oppositely disposed circular edges 25 and 26 which are curved to conform with the inner cylindrical periphery of the rotary cap 14, so that in the two extreme open and closed positions of said valve plate, said edges will be respectively in engagement with substantially diametrically opposite sides of said cylindrical surface. In the movement of the valve plate into either of these extreme positions, there is little or no sliding of its edges against the inner cylindrical surface of the cap 14, and consequently no wearing of said edges.

As a feature of the present invention, the closure member 10 is so constructed as to permit its attachment to the neck of the container 11 in a facile and expeditious manner. For that purpose, the rotary cap 14 is made of spring material and has a downwardly extending annular flange 28 terminating at its lower end in an inwardly extending flange or lip 29. This flange 28 is divided into circumferential segments by a series of slots 30 which terminate at their upper ends in enlarged holes 31 in order to permit said segments to flex more readily about the horizontal plane of said holes.

In order to facilitate the slipping of the cap 14 over the end wall 12 of the container, the periphery of said end wall at the upper portion thereof is tapered upwardly and has a reduced neck 32 forming an axially and downwardly facing shoulder 33. In attaching the closure device to the container, the valve plate 16 is seated on the upper side of the end wall 12 with the guide pin 23 extending into the groove 24. The cap 14 is then slipped over the valve plate 16 to bring

its pivot pin 21 into the recess 22 of said cap. As the rotary cap 14 is pressed downwardly over the end wall 12, the flange or lip 29 riding over the inclined periphery of the end wall 12, spreads out the flange segments until it reaches the neck 32. In this latter position, the flange segments will snap inwardly into locked engagement with the neck 32. The engagement of the lip 29 with the shoulder 33 prevents the withdrawal of the rotary cap 14.

If the container 11 is to be used for creams or pastes, which are applied by a finger or hand, it is advantageous that the outlet side of the cap opening 15 be chamfered or countersunk to facilitate the scooping of the extruded cream with the fingers.

In Figs. 7-10 is shown another form of closure member in which the rotary cap may be rotated continuously in either direction, the rotation of this cap causing the oscillation of the valve plate into and out of open position. In this construction, the end wall 12 of the container is provided with a diametrically extending guide groove or trackway 35 in which is reciprocally mounted the valve plate 36 having a valve opening 37. In order to reciprocate the plate 36 in response to the movement of the rotary cap 38, said valve plate has a cam follower in the form of a pin 39, extending into a circular cam groove 40 formed on the underside of the cap 38. This cam groove 40 is eccentric with the axis of the cap 38, so that the rotation of said cap 38 in either direction from the position shown in Fig. 8, causes the movement of the valve plate 36 to the right in the trackway 35, until the valve opening 37 is in registry with the openings of the container and the cap. In this extreme open position, the right-hand end of the valve plate 36 will abut the inner periphery of the rotary cap 38, and the cam follower 39 will extend in the portion of the cam groove 40 closest to the axis of the cap. The continued rotation of the cap 38 causes the valve plate 36 to return into closed position. In other words, the movement of the cap 38 through half a revolution in either direction, causes the reversal of the valve plate 36 into either open or closed position.

In Fig. 11 is shown a construction for providing an air-tight connection between the closure device and the mouth of the container. In this construction, the container 41 is shown of rigid construction for the purpose of holding a liquid, in which case the closure device will necessarily have to be air-tight to prevent the liquid from leaking out from the sides of the closure device when the container is tilted in pouring position. In this construction there is shown a rotary cap 42 of the same general shape as that previously shown and described, except that the head end of the cap may be of a particular design more suitable for use on liquid containers.

The container 41 has an end wall 43 provided with a central opening 44. A valve plate 46 similar in shape to the valve plate 16 and similarly provided with a valve opening shown in Figs. 1-6, has a pivot pin 47 extending upwardly into a correspondingly shaped recess in the cap 42, and a pin 48 extending downwardly into a radial groove 49 in the end wall 43. Seated on the end wall 43 is a disk 51 of resilient material such as a cork or rubber, and interposed between said disk 51 and the valve plate 46 is a thin metal disk or metal foil plate 52.

The operation of the closure device is similar to that shown and described in Figs. 1-6, the

rotation of the cap 42 causing the movement of the plate 46 into and out of opened position. The thin metal disk 52 is interposed between the valve plate 46 and the resilient disk 51 in order to prevent the sliding of said valve plate directly over said disk.

The snap connection between the closure device and the container is such as to hold the parts of said closure device in snug, firm, airtight relationship, while permitting the necessary relative movements for proper operation.

In Fig. 12 is shown a form of closure device particularly adapted for use with dental cream containers. In this construction, the rotary cap is provided with a central opening 54 of the general type and for the purpose already described with regard to the other forms, and has a diametrically extending groove 55 adapted to guide the bristles of a toothbrush therealong. In the operation of this construction, after a certain amount of dental cream has been extruded from the container, a toothbrush is passed across the groove 55 with the bristles thereof extending into said groove, to cut off a length of the extruded cream and at the same time wipe off the cream from around the opening 54.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In combination with a container having an end wall provided with an outlet opening, a closure device for said opening including a rotary

cap having a central opening in axial alignment with said outlet opening, a valve plate between said cap and said wall member and having a valve opening, and means responsive to the continuous rotation of said rotary cap in one direction for oscillating said valve plate to bring said valve opening into and out of registry with said two first mentioned openings.

2. In combination with a container having an end wall provided with an outlet opening, a closure device for said opening including a rotary cap having a central opening in axial alignment with said outlet opening, a valve plate between said cap and said wall member and having a valve opening, and means responsive to the continuous rotation of said rotary cap in either direction for oscillating said valve plate into and out of open position.

3. In combination with a container, a closure device therefor including a rotary cap mounted over the mouth of said container and having a central discharge opening, said rotary cap being free to rotate but held against withdrawal from said container, and having a diametrically extending groove on the top portion thereof adapted to guide a toothbrush therealong, a valve plate between the mouth of said container and said rotary cap, and means responsive to the rotation of said cap for operating said valve plate into open or closed position.

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