ABSTRACT: A medicine bottle closure that can be stuck through, with a flanged cap and with a sealing disc, which is made of at least two different materials and which is anchored on the front face of the bottle mouth, characterized in that a sealing disc 3 which seals the flat front face 5 of the bottle mouth 1a, which is made with a bevel-off 6 of its outer rim, consists of a layer, preferably of a Teflon disc 8 or of a similar foil, which covers the bottle opening and approximately half the bottleneck front-face 5 annular area delimited by its outer and inner diameters, and consists of an elastomeric gastight covering disc 7 which covers the bottle opening and the entire front face, upon the middle zone of which disc is applied the Teflon disc 8, and characterized in that this covering disc 7 carries at its outer rim, as an anchorage, a ridge 7b that fits the bevel 6 at the outer rim of the bottle mouth.
PIERCABLE CLOSURE FOR MEDICINE BOTTLES

This application is a continuation of Ser. No. 779,544, filed Nov. 27, 1968, now abandoned.

The invention concerns a closure, for medicine bottles, which can be stuck through, which has a flanged cap, and which has a sealing disc made of at least two different materials and lying anchoring on the front face of the bottle mouth; and the invention also concerns a process for the production of this sealing disc, consisting of at least two different materials, for a closure, for medicine bottles, which can be stuck through.

There is already known a closure, for medicine bottles, which can be stuck through and which has a sealing disc anchored relatively to the bottle mouth. In this case the anchoring is formed of an annular protruding bead of the bottle mouth which cooperates with a corresponding annular groove provided in the sealing disc.

This form of construction has a number of drawbacks. In the first place, providing the bottle mouth with such an annular bead is expensive and also requires not inconsiderable manufacturing tolerances, because glass bottles can not be produced with great accuracy. Moreover with this type of anchorage for the sealing disc on the bottle mouth it is not easily possible to house a second cosealing part of the sealing disc. In the case of medicine bottles it is however often desired that the sealing disc shall have a number of materials, of which the material of the side turned toward the inside of the bottle should in particular be chemically inert, while the outer part of the sealing disc should eliminate certain disadvantages of the first-named part and/or should be less expensive material, for forming the cheaper part of the sealing disc. In addition, in the case of closures, for medicine bottles, that can be stuck through, a radially acting anchoring of the sealing disc is also needed, because the flanged cap often does not hold the sealing disc sufficiently immovable in the said direction. For certain medicaments there has proved to be particularly suitable for the inner part of the sealing disc, which is turned toward the medicament, a synthetic substance having the trademark "Teflon," which is chemically inert with respect to many substances and is obtainable commercially.

On the other hand, however, perfect sealing between a Teflon disc and the front face of a bottle mouth is practically impossible, because relatively hard synthetic substances such as Teflon are unable to adapt themselves properly to unevennesses of the front face of glass bottles, so that the content of the bottle creeps between the Teflon disc and the front face of the bottle and emerges out of the bottle, and/or unsterile air can get from the outside into the inside.

In accordance with an already known process for producing a sealing disc made of two different materials, as a closure that can be stuck through for medicine bottles, and in particular a process for the application of a Teflon disc on a rubber sheet, it is known how to stick these to one another, and to use thereby for this sticking together an adhesive such as is ordinarily used for sticking rubber to metals.

Such a process has the drawback that the adhesive, under the relatively high temperature of the following vulcanization operation, readily becomes reconstituted or hardened, through which it is no longer possible to use a bottle closure consisting of such sealing discs to meet the purpose of the invention, as a closure, for medicine bottles, that can be stuck through to remove the content of the bottle by means of a cannula, because for the removal of the medicament the rubber disc together with the Teflon disc has to be stuck through and during this sticking through, from the zone between the Teflon disc and the rubber disc residues or portions of the adhesive used to stick the discs together may get into the interior of the cannula, through which unforeseeable injury may be done to patients.

The fundamental problem of the invention is to create for medicine bottles a closure that can be stuck through, consisting of a sealing disc that has a material that is chemically inert with respect to many substances, and that is on occasion hard, and consisting in particular of an inner part made of Teflon, whereby there is obtained above all a reliable sealing and also sufficient anchorage of the sealing disc, and furthermore the cost of making such a medicine bottle and its closure comes out as cheap as possible, and the problem includes creating a process for the production of a sealing disc consisting of at least two different materials, in which process, preferably, a Teflon disc, is vulcanized on a rubber disc without it being necessary to use an adhesive as a bonding means.

For solving this problem the invention proposes that, in the case of a medicine bottle closure that can be stuck through, this closure be made in such a way that a sealing disc which seals the front face of the bottle mouth, which is made with a bevel-off of its outer rim, shall consist of a layer, preferably a Teflon disc, that covers the bottle opening and approximately half the bottleneck front-face annular area delimited by its outer and inner diameters, and shall consist of an elastomeric gas-tight covering disc that covers the entire front face, upon the middle zone of which disc is applied the Teflon disc, and the invention proposes that this covering disc carry at its outer rim, as an anchorage, a ridge that fits the bevel at the outer rim of the bottle mouth.

Through this it is obtained that the bottle contents can be sealed, essentially by means of a chemically neutral material; namely a synthetic substance of the Teflon type, and this relatively expensive Teflon disc can be thin, and at the outer zone of the bottle front face there is a covering disc that is gastight and sufficiently elastic to complete the seal, and it can also, in association with the ridge at its outer rim and the flanged cap, form an anchorage.

A particularly favorable and reliable anchorage is obtained when the ridge of the covering disc is made substantially wedge-shaped is so dimensioned that it becomes clamped tightly after the flanging-in of the cap.

In an advantageous way the middle zone of the covering disc, which carries the Teflon disc or the like, can be surrounded by an annular groove. This is not only of advantage during the production in that it is possible to center the Teflon disc, which is to be bonded to the covering disc, properly in a specified position, but the Teflon disc, during its vulcanization on the covering disc, can contract slightly inward, through which a better hold in the radial direction is obtained.

The angle of bevel of the ridge of the covering disc can be flatter than the bevel on the bottle mouth, so that the apex of the ridge, in its unformed state, projects somewhat over the rest of the diameter of the covering disc.

The Teflon disc can be bent a little inwardly into the annular groove.

The problem of finding a process for the vulcanization of a Teflon disc on a rubber plate, without having to resort to the aid of an adhesive, was solved in that an elastic raw-rubber plate, consisting of a rubber mixture having in its freshly prepared state an adhesive effect, is covered with a disc of Teflon or the like kind of foil having a roughened surface, and while still in a fresh state it is pressed upon or applied upon this foil, and in that in a second operation the side of the raw-rubber plate to which the Teflon foil is applied is laid in a press upon an annular cutting tool having a diameter greater than the inner diameter of an annular groove of the covering disc in its finished state, and is pressed under relatively high pressure until the elastic raw-rubber plate is compressed to such an extent that the counterpressure becomes so great that the cutting tool cuts through the Teflon foil and the rubber plate under pressure, after which, after relief of the pressure, the reascending diameter-decreasing covering disc blank, with its applied disc of Teflon or the like projecting over the inner diameter of the subsequent groove, is in a third operation brought to the final peripheral form of the sealing disc and is subjected to a vulcanization operation, whereby the projecting edges of the applied Teflon disc become included in the inner zone delimited by an annular former part forming the groove of the sealing disc.

In the case of the rubber mixture, the expression "fresh state" existing after its production means that state in which...
this rubber mixture is as a rule still warm, and is in any event still unpowdered and for that reason displays a sticky effect. With certain materials the adhesive effect, among other things, can be retained for a short time in the cold state while the just produced rubber mixture is still unpowdered. In all cases the important thing is that the rubber mixture, when after its production it is still unpowdered, has its adhesive effect utilized.

The process of the invention affords the advantage that the application of a roughened covering disc or foil, preferably made of Teflon, enables this foil to stick tightly when it is applied directly after the production of the raw-rubber plate, made from a rubber mixture, while it is in a fresh state before being powdered, through which it is unnecessary to use a sticky medium as an adhesive, with all the aforesaid drawbacks. This application process is made possible in that the rubber mixture, made in the usual way in accordance with the specifications prescribed for covering discs for sealing the medicaments concerned, while it is still in a hot state and is unpowdered, has very great surface adhesiveness, which vanishes after the vulcanization operation, but persists however at that place covered by the application of the roughened Teflon disc, because the presence of atmospheric oxygen is necessary for eliminating the surface adhesiveness.

A further advantage of the process of the invention is that it becomes possible to project somewhat over the stamped-out round parts, so that these projecting edges can be bent over, for better anchorage in the rubber part, by the pressure from the press.

Further details of the invention are explained in more detail by the aid of the drawings, where, in different scales:

FIG. 1 shows a vertical lengthwise section through the upper part of a medicine bottle having a closure that can be stuck through;

FIG. 2 shows to an enlarged scale a partial section through the sealing;

FIG. 3 shows a cross section through the cutting tool in which is situated the Teflon foil and the preshaped hardened raw-rubber plate, with the Teflon disc applied to it, and this namely directly prior to the cutting operation;

FIG. 4 shows the cutout disc blank, provided with the Teflon foil, while it is being brought into the vulcanization mold, shown in section; and

FIG. 5 shows in section the finished sealing disc, in the closed vulcanization mold shown in section.

A medicine bottle 1 has a closure designated as a whole by 2. The closure has a two-part sealing disc 3, which is fastened by means of a flanged cap 4 to the bottle mouth designated as a whole by 1a. The flanged cap 4 hereby is in known wise set in the middle zone of a so-called tear-off tab 4a, and through tearing upward this tab the middle region of the sealing disc 3 is exposed, so that it is possible to stick through 4, for example a hollow needle, a cannula or the like, and then to draw off part or all of the bottle's contents.

Medicine bottles 1 having such closures 2 are often used as infusion flasks, whereby a hollow needle of fairly large diameter is frequently stuck through the sealing disc 3.

The front face 5 of the bottle mount 1a is in known wise made flat, and it is part of the invention that it has at its outer rim an annular bevel 6. The sealing disc 3 consists of two parts: namely a covering disc 7 and a thin Teflon disc 8. The covering disc 7 is made of an elastomeric gastight material, of butyl rubber for example. The middle zone of the covering disc, surrounded by an annular groove 9, is covered by a Teflon disc 8, which is fastened by the process of the invention. Here the diameter of the Teflon disc 8 and the inner diameter of the annular groove 9 are respectively so that about half the bottleneck front-face annular area 5 delimited by its outer and inner diameters is covered by the Teflon disc 8.

As a material for the elastomeric gastight covering disc 7 butyl rubber can be of good use. The Teflon disc 8 is near the annular groove 9 in the covering disc 7 bent upward at its rim, as can be clearly seen from FIG. 2. Through this the Teflon disc 8 has a better hold in the radial direction also.

The aforesaid annular groove 9, whose shape is advantageous for centering the raw-rubber plate 7a in the vulcanizing mold (FIGS. 4 and 5), has advantages even after the bottle is closed: it then acts so to say as a labyrinth. If a perfect seal is practically never obtained between the Teflon disc 8 and the front face 5 of the bottle mouth, because Teflon or a similarly hard material is unable to adapt itself sufficiently to unevenesses of the glass, there still remains a labyrinthlike annular space between the Teflon disc and the zone the covering disc 7 bears against. This groove exerts a barrier effect particularly when there prevails in it a pressure greater than prevails in the interior of the bottle, for example in the case of evacuated bottles. With medicine bottles 1 that have to be sterilized again after being filled, an above-normal pressure may be produced in the annular groove 9 and be maintained there, for a certain time at least. This pressure difference then prevents any slowly emerging contents of the bottle from creeping between the bottle front face 5 and the Teflon disc 8, so as to then react chemically with the covering disc 7 and exert a marked reaction on the contents of the bottle. Slight quantities of the contents of the bottle that go to react outside the Teflon disc 8 to enter into reaction with the covering disc 7 would for the greater part remain in the annular groove 9.

By means of the invention there is obtained a medicine bottle having a closure 2 with which chemically neutral and on occasion very hard synthetic substances, such as Teflon, which have unfavorable characteristics as respects sealing in association with glass, but which on the other hand have very desirable characteristics, can be used for the sealing disc 3. Both the manufacture of the medicine bottle 1 and also the manufacture of the sealing disc and the flanging over hereby remain very simple.

A substantial part of the invention is represented by the bevel 6 of the bottle mouth in cooperation with the ridge 7b at the outer rim of the covering disc 7. The dimensions of the ridge are adapted to the bevel 6 at the outer rim of the bottle mouth, and it is made somewhat wedge-shaped with its apex turned downward, and it is preferably dimensioned so that during the flanging-in of the flanged cap 4 it becomes cramped tightly on the bottle mouth. Through this there is obtained both a good supplementary sealing with the covering disc 7, and also an anchoring of this covering disc on the entire sealing disc 3. The aforesaid clamping attachment of the sealing disc 7 is needed in particular for processing the medicine bottles in completely automatic flanging machines, because these flanging machines—on account of the tolerances of the glass medicine bottle 1—do not always operate with the same flanging pressure, so that the flanged cap 4 does not always receive the same flanging pressure, and thus the pressure on the glass rim, over which the flanging takes place, is not always uniform. It is true that the flanging pressure can be adjusted so that a sufficient sealing of liquids is obtained; however a sufficient sealing against gases can not be obtained. In accordance with a further development of the invention, where the bevel angle α (FIG. 2) of the ridge 7b is slightly or is much flatter than the angle of the bevel 6 at the bottle mouth, the result is that there is also good sealing between the outer rim 6 of the bottle and the ridge 7b even when the covering disc 7 is no longer clamped very tightly against the front face 5 of the bottle mouth 1a by the flanged cap 4. This reliable sealing in the region of the ridge 7b is to a great extent independent of the production tolerances. A good carryover 7c of the ridge 7b in the open flanged cap 4 while it is being put on is obtained when the apex 7c of the ridge 7b, in its undeformed state, projects somewhat beyond the remaining diameter of the covering disc.

The sealing disc consisting of a Teflon foil fastened on a rubber disc can be produced, without using any adhesive for sticking them together, as follows:

A covering disc 7 is made from a specially composed rubber mixture, which meets most of the requirements relatively to the
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contents to be sealed in the bottle, and which has raw-rubber surface adhesiveness, which vanishes after vulcanization at the places exposed to the air and generally powdered, and which has the property of adhering to a roughened Teflon foil. For this purpose there is applied on such a raw-rubber plate 7a while it is still hot, directly after it has been produced, a Teflon foil 8, with its roughened surface pressed against the plate 7a.

In order to ensure that the Teflon disc is somewhat greater than the inner diameter of the annular groove 9, disposed in the covering disc when it is in its finished state, and in order later on to be able to bend these projecting edges of the Teflon disc 8 in the direction of the annular groove 9, to make it possible to obtain a better holding of the Teflon disc 8, the side of the raw-rubber plate 7a upon which the Teflon foil 8a is applied is laid on a not too sharp cutting tool (FIG. 3), upon which tool the round shape is stamped out under high pressure. The Teflon foil 8a in the instant first takes the pressure without the cutting tool cutting into it. By means of the pressure on the raw-rubber plate the rubber plate becomes compressed until the pressure has become so great that the not too sharp circular knife 20 cuts into the Teflon foil 8a (FIG. 3). The circular knife 20 has at this same instant the counteraction of a pressed flat and somewhat radially expanded raw-rubber plate, which after the pressure is relieved, ascends again and becomes smaller in diameter, while the stamped-out Teflon disc 8 projects somewhat over the inner diameter of the annular groove 9. After this, the covering disc 7, provided with the Teflon disc 8, is put into a mold 21, 22, whereby the projecting edges of the Teflon disc 8 become bent up by the forming part / that makes the annular groove FIGS. 4 and 5). After oxygen has reached the sides of the disc 7 not covered by the Teflon disc 8, the great surface adhesiveness of the former vanishes at the places coming into contact with air, and they may if desired be powdered in knowiswase.

The anchorage of the covering disc and on occasion an improvement of its sealing action, is obtained by the ridge 7b of the invention, which during the flanging-in becomes clamped laterally against the bottle mouth. This squeezing-in of the pointed runout of the ridge 7b is promoted in that the diameter of the medicine bottle, like all glass objects, has relatively large manufacturing tolerances, so that the flanged cap 4 leaves a certain clearance between it and the outer contour of the bottle mouth 1a, into which clearances parts of the ridge 7b become drawn during the flanging operation, and at the end of the flanging operation they are clamped there with a sealing effect. The clamping attachment is important particularly when a hollow needle is stuck with great force through the sealing disc 3, or when such an operation is done repeatedly by a cannula. It is advantageous in the latter case that the covering disc 7 consists of an elastomeric material that closes up again after the cannula is removed from the stuck through hole.

In a way that is of itself known the covering disc 3 can have a thinning 12 of its wall, to facilitate the sticking-in.

It should also be mentioned that the sealing disc blank 7, 8 put into the open mold 21, 22 is dimensioned as respects its part 7, which is for example made of butyl rubber, in such a way that this material, when the mold parts 21, 22 are closed, fills the remaining hollow space, as is shown by a comparison of FIGS. 4 and 5.

I claim:

1. A medicine bottle closure that can be stuck through, with a flanged cap and with a sealing disc which is made of at least two different materials and which is anchored on the front face of the bottle mouth, characterized in that a sealing disc 3 which seals the flat front face 5 of the bottle mouth 1a, which is made with a bevel-off 6 of its outer rim, consists of a layer, preferably of a Teflon disc 8 or of a similar foil, which covers the bottle opening and approximately half the bottleneck front-face 5 annular area delimited by its outer and inner diameters, and consists of an elastomeric gaslight covering disc 7 which covers the bottle opening and the entire front face, upon the middle zone of which disc is applied the Teflon disc 8, and characterized in that this covering disc 7 carries at its outer rim, as an anchorage, a ridge 7b that fits the bevel 6 at the outer rim of the bottle mouth.

2. A closure, which can be stuck through, for medicine bottles, in accordance with claim 1, characterized in that the ridge 7b of the covering disc 7 is dimensioned, and preferably made somewhat wedge-shaped, so that after the flanging-in operation it is clamped tightly in position.

3. A closure, which can be stuck through, for medicine bottles, in accordance with claim 1, characterized in that the bevel angle of the ridge 7b is flatter than the bevel 6 at the bottle mouth 1a, and preferably the apex 7c of the ridge 7b in its undistorted state projects somewhat over the remaining diameter of the covering disc 7.

4. A closure, which can be stuck through, for medicine bottles, in accordance with claim 1, characterized in that the middle zone of the covering disc 7, which carries the Teflon disc 8 or the like, is surrounded by an annular groove 9.

5. A closure, which can be stuck through, for medicine bottles, in accordance with claim 1, characterized in that the Teflon disc 8 is drawn somewhat into the interior of the annular groove 9.

6. A process for the production of a sealing disc which consists of at least two different materials and in accordance with one of the foregoing claims, and which forms a sealing disc which can be stuck through, for the closure of medicine bottles, characterized in that an elastic raw-rubber plate 7a, consisting of a rubber mixture having in its freshly prepared state an adhesive effect, is covered with a disc 8 of Teflon or similar foil having a roughened surface, and while still in its fresh state is pressed upon or applied upon it the said foil, and characterized in that in a second operation the side of the raw-rubber plate to which the Teflon foil is applied is laid in a press upon a circular cutting tool 20 having a greater diameter than the inner diameter of an annular groove 9 in the covering disc in its finished state, and is pressed under relatively high pressure until the elastic raw-rubber plate 7a is compressed to such an extent that the counterpressure becomes so great that the cutting tool cuts through the Teflon foil and the raw-rubber plate, after which, after release of the pressure, the reascending diameter-decreasing covering disc blank 7a, with an applied disc 8 of Teflon or the like, now projecting over the inner diameter of the subsequent groove 9, is in a third operation brought to the final peripheral form (a1, 22 22) of the sealing disc 3 and is subjected to a vulcanization operation, whereby the projecting edges of the applied Teflon disc become bent into the inner zone 5 delimited by an annular mold part / which forms the groove 9 in the sealing disc 3.

7. A closure, which can be stuck through, for medicine bottles, in accordance with claim 1, characterized in that the middle zone of the covering disc 7, which carries the Teflon disc 8 or the like, is surrounded by an annular groove 9.

8. A closure, which can be stuck through, for medicine bottles, in accordance with claim 3, characterized in that the middle zone of the covering disc 7, which carries the Teflon disc 8 or the like, is surrounded by an annular groove 9.

9. A closure adapted to be held in place over the opening in a container by a flanged cap comprising an elastomeric gaslight covering disc 7, a layer 8 of Teflon secured to the inner face of said covering disc 7 confronting the container opening, said layer 8 being of a smaller diameter than the inner face of said covering disc 7 so that it completely covers the opening in the container and a portion of the container adjacent the opening therein and means defining an annular groove in the inner face of said elastomeric disc 7 adjacent the inner peripheral edge of said Teflon layer 8, with said layer 8 defined by an annular edge lying the portion of the container adjacent the opening therein.