CONTAINER AND CAP COMBINATION TO INDICATE TAMPERING

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ABSTRACT
A container and cap combination which indicates tampering if the cap is removed from the container, and then restored to its initial position on the container. The container has a tip which is adapted to be used to discharge its contents and which may be externally threaded. The tip connects with the shoulder on the forward end of the container and the shoulder connects with the side wall of the container, which, at least in the case of a collapsible tube, is initially open at the lower end but is subsequently filled with contents and closed. From the shoulder there extends a flange in the same direction as the tip and around the tip. The cap, which may be made of pliable plastic such as polyethylene, polypropylene or the like or of other materials such as metals, has an end wall adapted to close the opening of the tip, side walls connected to the end wall which may have internal threads to engage threads on the tip, and an outwardly extending flange which is smaller in diameter than and within the flange on the container, the flange on the container being inwardly flared over the outer edge of the flange on the cap. In removing the cap, the cap may outwardly deform the flange on the container and thus when the cap is restored indicate that the tube has been subjected to tampering. Instead, the cap may be so pliable that it will spring from under the flange on the container and be impossible to restore beneath the flange on the container, thus indicating that the container has been subject to tampering. In another variation the cap or the container flange may be frangible and may separate into two parts if an effort is made to remove the cap, thus indicating tampering. The flange on the container is preferably continuous, but it may consist of a plurality of lugs, projections, scallops or the like. While in smaller containers the flange on the container will preferably be of the same diameter as the side wall, in larger containers the flange on the container will preferably be of a smaller diameter than the side wall of the container. In the preferred embodiment the flange on the cap is provided with a sloping diagonal edge at its outer corner adjacent the shoulder of the container, to aid it in deforming any bent portion of the flange on the container outwardly in inserting the cap.
CONTAINER AND CAP COMBINATION TO INDICATE TAMPERING

The invention relates to a combination of a container and a cap. The container of the invention will preferably be a collapsible tube, although it may be a bottle, can or other container. When a collapsible tube is referred to in describing a specific embodiment, it will be understood that this description is exemplary.

The container has a tip provided with an opening which will eventually discharge the contents of the container when the container is filled, and this tip may be externally threaded. The tip connects with the shoulder on the forward end of the container which extends outwardly from the tip. The container has a side wall which extends from the shoulder in the direction opposite to the tip, and in the case of a collapsible tube this side wall will preferably be open at the bottom for insertion of the contents at the time of manufacture of the tube and cap. The container has a flange extending from the shoulder in the same direction as the tip and extending around the tip. On this tip is a cap having an end wall which is adapted to close the discharge opening in the tip and having side walls connected to the end wall. These side walls engage the tip either by a frictional engagement or by internal threads which engage external threads on the tip. At the end of the side wall of the cap nearest the shoulder the cap has an outward flange suitably inclined following the shoulder of the container, and permissibly having a sloping wall adjoining the corner nearest to the shoulder. The flange on the container is inwardly flared as by hot or cold forming, such as deforming, staking or otherwise over the outer edge of the flange on the cap.

In case the cap is removed after filling the container, this combination is adapted to indicate tampering by removal of the cap.

In one embodiment the cap material is relatively stiff, though it may be of a plastic, and even of a thermoplastic such as polyethylene, polyvinylchloride or the like, which as known in the art is so "dense" that in case of removal of the cap it distorts the flared portion of the flange on the container, and in case the cap is restored, the upstanding portion of the flange on the container indicates that the container has been tampered with.

In another embodiment the cap is of a pliable material, preferably a thermoplastic plastic such as polyethylene, polypropylene or polyvinylchloride of low density or stiffness, so that the flange on the cap bends or separates inwardly over the inwardly flared portion of the flange on the container, and in case of subsequent restoring of the cap to the container, the flange on the container is deformed and indicates that the tube has been tampered with.

In another embodiment, the cap has a flangible portion, suitably a flangible flange or a portion of the side wall adjoining the flange, so that the cap breaks apart and leaves a portion of the cap under the flared portion of the flange on the container in case of removal of the cap, thus indicating that the container has been tampered with.

In another embodiment of the invention the flange on the container is flangible and breaks apart when the cap is removed and the presence of this break indicates that tampering has occurred.

It will be evident that combinations of these designs are permitted, as for example where the cap partially distorts the flared portion of the flange on the container and partially springs from under the flared portion of the flange on the container on removal, and does not permit restoration of the exact appearance of the container and cap combination, thus indicating tampering.

In many cases it is preferable to make the flange on the container non-continuous rather than continuous, in which case it will be a series of lugs, projections, scallops or the like, which are effectively a flange.

If the container is of small diameter, the flange on the container preferably has the same diameter as the side wall of the container, but in larger containers the flange on the container is preferably of smaller diameter.

In the drawings several embodiments are shown to indicate different applications of the principles of the invention, choosing the forms from the standpoints of simplicity of illustration, satisfactory operation and clear demonstration of the principles involved.

In all of FIGS. 1–14 and 17 the parts shown are symmetrical around the circumference and all cross sections on the axis are the same.

FIGS. 1–5 indicate a sequence of manufacture and use of the preferred embodiment of the invention.

FIG. 1 indicates a container, suitably a collapsible tube as extruded, the view showing the tube in fragmentary axial section.

FIG. 2 is a fragmentary axial section of the tube of FIG. 1 after producing the threads on the tip and trimming around the orifice.

FIG. 3 is a fragmentary axial section of the tube of FIG. 2 after capping.

FIG. 4 is a fragmentary axial section of the tube of FIG. 3 after the flange on the tube has been formed over the flange on the cap.

FIG. 5 is a fragmentary axial section of the tube and cap of FIG. 4 after removal and replacement of the cap.

FIGS. 6 and 7 indicate a variation in which the cap flange is sufficiently elastic to spring from under the flange on the container.

FIG. 6 is a fragmentary axial section corresponding to FIG. 4 of the container and cap as modified after forming of the flange on the container over the flange on the cap.

FIG. 7 is a fragmentary axial section of the tube and cap of FIG. 6 after removal and replacement of the cap, indicating tampering.

FIGS. 8–10 show a modification in which the cap has a flangible flange.

FIG. 8 is a fragmentary axial section corresponding to FIG. 3, showing the cap in place on the container before forming the flange on the container over the flange on the cap.

FIG. 9 is a fragmentary axial section of FIG. 8 after forming the flange on the container over the flange on the cap.

FIG. 10 is a fragmentary axial section of the cap partially removed and showing the breaking of the flange from the tip away from the rest of the cap to indicate tampering.

FIGS. 11–14 show a modification of the invention using a flangible flange on the container.

FIG. 11 is a fragmentary axial section corresponding to FIG. 2 showing the container tip ready for insertion of the cap, with a modified flange on the container.
FIG. 12 is a fragmentary axial section like FIG. 11 after a cap has been put on the tip of the container.

FIG. 13 is a fragmentary axial section like FIG. 12 after the flange on the container has been formed over the flange on the cap.

FIG. 14 shows partial removal of the cap in the container-cap combination of FIG. 13, showing breaking of the flange on the container to indicate tampering.

FIG. 15 is a fragmentary side elevation of a container fitted with a cap according to the invention in which the flange on the container consists of a plurality of symmetrical scallops.

FIG. 16 is a fragmentary side elevation of a container and cap according to the invention in which the flange on the container consists of a plurality of symmetrical lugs.

FIG. 17 is a fragmentary axial section corresponding to FIG. 4, showing a modified tip and cap construction according to the invention.

In modern packaging using collapsible tubes, bottles, cans and the like, great emphasis is placed on freedom from particles which may contaminate the content. While this development in part stems from packaging of ophthalmic preparations and other pharmaceutical preparations in which the presence of particles in the content is counterindicated, it is considered very important to avoid the possibility of any foreign matter in any preparation dispensed by means of a collapsible tube, bottle, can or the like.

The prior practice of closing the discharge opening in the tip by a membrane of metal when the container is initially sold, and of having the user break this metal membrane as by screwing down on the cap, is therefore now frowned upon since the metal membrane may itself contaminate the contents or separate into particles which will contaminate the contents.

Also, many containers, especially collapsible tubes, are coated with a protecting layer, and any opening of the tip which involves unprotected material of the container (such as aluminum alloy, tin alloy or lead alloy) is deemed unsatisfactory.

Accordingly, one of the purposes of the invention is to indicate that the container has been tampered with by removing its cap, even if none of the contents has been removed. This is particularly important to indicate loss of microbiological sterility or purity by exposure to organisms.

In the invention an effort is made to make as little change as possible in the practice of manufacturing and capping containers and distributing such capped containers to be filled with contents dispensed by the container.

The invention lends itself to extruding containers such as collapsible tubes with a very slight modification in their construction, producing caps which are slightly different from standard caps, and capping the containers either by hand or by machine in much the normal way, the only marked deviation from usual practice being the flaring of the flange of the cap by rolling, deforming, staking or otherwise.

In accordance with the invention the container as extruded has a tip provided with a discharge opening through which the contents of the container will be dispensed. The discharge opening may be wholly open or later to be opened, although as discussed above it is not preferred to have the discharge opening closed by a membrane when the container is sold. The tip may or may not have external threads which will cooperate with internal threads on the cap. The container extends outwardly from the base of the tip in a shoulder, usually diagonal or inclined to the axis of the container, and the shoulder joins to a side wall which extends to the bottom of the container. The container as extruded and sold normally has a round open bottom which will subsequently be used to insert the contents and then closed as in normal practice.

Unlike most containers, however, the container of the invention has a flange which extends upwardly or in the direction around the tip from the shoulder. This flange may be of the same outside diameter as the side wall or of a smaller diameter than the side wall, as preferred in larger containers. This flange on the container is to cooperate with the cap in indicating that there has been tampering if the cap is removed before the container reaches the ultimate user. The removal of the cap during the process of shipment or sale may not be for the purpose of pilfering (theft) but may be the result of curiosity or mischief. Nevertheless, it may do great harm as removal of the cap violates microbiological sterility and may cause infectious organisms to come into a supposedly sterile pharmaceutical preparation or the like.

The cap of the invention surrounds the tip and has an end wall which is adapted to close the discharge opening on the container. The cap also has side walls connected to the end wall which extend around the tip and may or may not have internal threads cooperating with external threads if present on the tip. The distinctive feature of the invention is the presence of a flange at the end of the cap adjoining the shoulder, preferably sloping into conformity with the shoulder, and fitting inside a flange on the container.

Once the cap is seated on the tip, the flange on the container is inwardly flared over the flange on the cap as by deforming, staking or the like.

There are several ways as previously set forth above in which after removal of the cap the fact of tampering may be indicated. In one embodiment which applies to a cap of stiff material such as metal, thermosetting plastic or stiff thermoplastic plastic, the removal of the cap may distort the flange on the container outwardly around the cap, so that in restoring the cap to its initial position it will be difficult or impossible for a person who has tampered with the container to restore the flange on the cap to its initial inwardly flared shape and the presence of an upstanding flange will indicate that the container has been tampered with.

In another embodiment of the invention, using a pliable cap, preferably of pliable thermoplastic such as polyethylene, polypropylene or polyvinylchloride, the flange on the cap may spring inwardly over the inwardly flared flange on the container, and thus escape from the flange on the container without initially changing the position of the flange on the container. In case the tamperer desired to restore the cap, however, he cannot get it down again under the flange on the container and he may in trying to do so additionally distort the flange on the container, thus disclosing that the tube has been tampered with. As thermoplastic such as polyethylene, polypropylene and polyvinylchloride are commonly prepared in various densities.
and stiffnesses, it will be evident that the pliability of the flange on the cap can be assured by a combination of thinness and density of the plastic.

In some embodiments the cap is made frangible, so that the flange on the cap or the lower part of the side wall of the cap will be broken in removal of the cap, indicating tampering.

In another embodiment of the invention the flange on the container is made frangible so that it is broken off in removal of the cap, thus indicating tampering.

It is evident that the correct functioning of the flange on the cap and the flange on the container can be worked out by achieving the stiffness or pliability of the material of the cap, the thickness of the flange on the cap, the stiffness of the material on the container and the thickness of the flange on the container. The invention can be applied to containers made of metal, such as aluminum alloy, lead alloy, tin alloy, steel or the like and also made of plastics such as polyethylene, polypropylene, polyvinylchloride and the like. The cap on the container can also be made of metal, such as aluminum alloy, lead alloy or tin alloy or the like or of plastic such as phenol formaldehyde, urea formaldehyde, polyethylene, polypropylene, polyvinylchloride or the like.

In FIG. 1 a container, suitably a collapsible tube, has a tip 30 with a discharge opening 31, a closed end 32, a downwardly diagonally sloping shoulder 33 and a side wall 34. Additionally, this tube has an upwardly extending flange 35 in prolongation of the side wall. The container of FIG. 1 is preferably produced by impact extrusion. In FIG. 2 the end of the tip has been trimmed to produce an open end 36 and external threads 37 have been formed on the outside of the tip near the shoulder.

FIG. 3 shows a cap 38 applied to the tip having an end wall 40 which closes the open end 36, side walls 41 which surround the tip 30 and internal threads 42 which engage the threads 37. At its lower end the cap has an external flange 43 which preferably conforms with the slope of the shoulder and terminates at its corner near the shoulder in a sloping diagonal corner 44 which is adapted to prevent the flange 35, if damaged during manufacture, from being caught under the flange on the cap. In FIG. 4 the flange 35 on the container has been flared in over the flange 43 engaging it. This shows the completed package. FIG. 5 shows the container of FIG. 4 after removal and reininsertion of the cap. It will be seen that the flange 43 on the cap is so strong and stiff that the flange 35 on the container has been outwardly distorted in removing the cap, and though it is possible to restore the cap as shown, the flange 35 clearly indicates by its form that the tampering has occurred.

FIG. 6 shows a cap which has a flange 43' which by reason of thinness and pliability of the cap material, suitably a low density thermoplastic, springs from under the flange 35 of the container and in case of restoring the cap as shown in FIG. 7 the flange 43' cannot go under the flange 35 but is distorted upwardly and at the same time distorts the flange 35 downwardly, clearly indicating that tampering has taken place. It will be evident that in this form the flange 35 of the container has been thickened to make it more substantial.

FIG. 8 shows a cap which is slightly modified to provide a frangible portion 45 at the base of the side wall 41 and where the cap flange 43 begins.

While the cap of FIG. 8 is preferably of low density thermoplastic in order that it may break easily, it may also be made of metal or thermosetting plastic. In FIG. 9 the flange 35 on the container has been flared over the flange 43 on the cap. In case of removal of the cap as shown in FIG. 10, the flange 43 on the cap breaks off the side wall 41 of the cap, disclosing the presence of tampering.

In FIG. 11 a container is shown having a tip and a flange 35 which is relatively weaker than the flanges on the containers previously discussed.

In FIG. 12 when a cap of relatively stiff and strong material is applied and the flange 35' on the container is flared over the flange 43 on the cap as in FIG. 13, a structure is produced in which in case of removal of the cap as in FIG. 14, the deliberately weakened flange 35' breaks off the container as shown, thus indicating that tampering has taken place.

FIG. 15 shows a cap having a flange 43 and the container is varied so that the flange on the container consists of a series of scallops 35' which are symmetrically placed around the container as in the previous figures, but which are separately flared inwardly over the flange 43 of the cap.

In FIG. 16 the flange on the container consists of a symmetrical series of lugs 35' which are inwardly flared over the flange on the cap.

In the other figures an elongated container tip has been shown such as will be used on an ophthalmic tube and the flange on the container has been of the same diameter as the side wall of the container. This will not necessarily be the case and in FIG. 17 a container has been shown having a short tip or standard tip and having a flange on the container of a smaller diameter than the side wall on the container.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

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

1. A container and cap combination which indicates tampering after the cap has once been removed from the container, comprising a container having a threaded tip adapted to discharge the contents, a shoulder extending outwardly from the tip, a side wall extending from the shoulder in a direction opposite to the tip and a continuous container flange integral with and extending from the shoulder in the same direction as the tip and around the tip, and a cap having an end wall adapted to close the tip, threaded side walls connected to the end wall cooperating with the threads on the tip and having engagement with the tip and an outward cap continuous flange extending within the flange on the container and in contact with it, the flange on the container being inwardly flared over the outer edge of the flange on the cap, the flange on the cap projecting into the area between the inwardly flared edge of the flange on the container and the shoulder of the container so that the top of the cap extends out of the area which is free of the inwardly flared edge of the flange on the container, the container flange or the cap flange being of a material which must be distorted to remove.
the cap, the cap and container combination in case the cap is once removed indicating tampering.

2. The invention of claim 1, in which on removal of the cap the flange on the cap is adapted to force the flange on the container into a different shape.

3. The invention of claim 1, in which the flange on the cap is pliable, and on removal of the cap the flange on the cap springs from under the inwardly flared portion of the flange on the container and on restoring the cap the flange on the cap remains above the flange on the container.

4. The invention of claim 1, in which the cap has a frangible portion and on removal of the cap the flange on the cap breaks off at the frangible portion.

5. The invention of claim 1, in which the flange on the container is frangible and on removal of the cap the flange on the container breaks.

6. The invention of claim 1, in which the flange on the cap has an outward corner adjoining the shoulder which is relieved and adapted to force any inwardly bent portions of the flange on the container outwardly when the flange of the cap is first applied to the container before the flange on the container has been inwardly flared.

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