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W. E. WOODS
SELF-SEALING CAP

2,550,132

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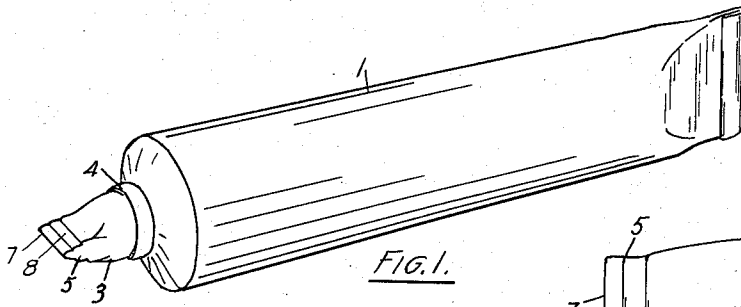


FIG. 1.

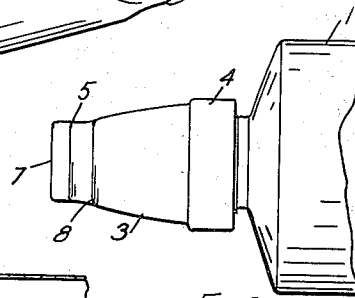


FIG. 2.

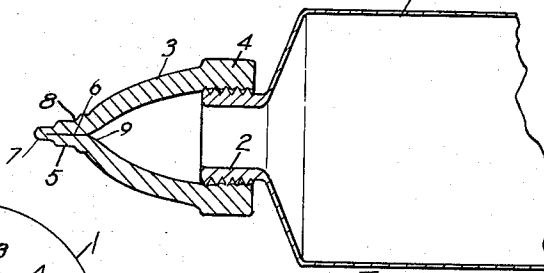


FIG. 3.

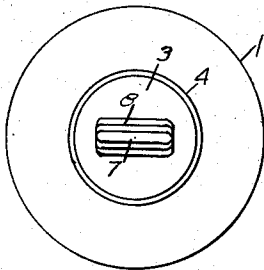


FIG. 4.

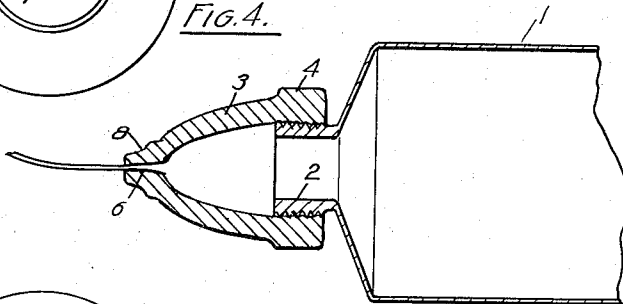


FIG. 5.

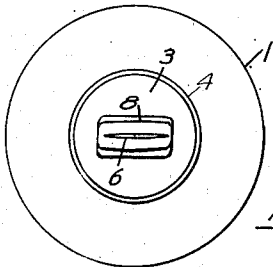


FIG. 6.

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UNITED STATES PATENT OFFICE

2,550,132

SELF-SEALING CAP

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1 Claim. (Cl. 222—490)

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For tubes containing tooth paste, shaving cream and the like there have been proposed self sealing caps made of rubber with a normally closed slit through which the material flows in ribbon form when the tube is squeezed. This invention is intended to improve caps of this type by making the caps of resilient flexible plastics which, compared to rubber, are not stretchable, and by proportioning the walls of the cap so the slit closes with a wiping action from the outlet toward the inside of the cap as the pressure on the tube is released. The slit may terminate short of the outer end of the cap so the cap is completely sealed until the outer end is cut off. This permits the use of the same cap for materials of different viscosity, the caps being cut so as to have a shorter slit for the more viscous materials. Further objects and advantages appear in the specification and claims.

In the drawing, Fig. 1 is a perspective view of a tube having a self sealing cap; Fig. 2 is a side view; Fig. 3 is a sectional view through the cap showing the cap in the sealed position; Fig. 4 is an end view; Fig. 5 is a sectional view through the cap showing the opening of the slit to release material from the tube; and Fig. 6 is an end view showing the opening of the slit.

Referring to the drawing, 1 indicates the conventional tube with an externally threaded outlet 2. In place of the conventional cap which must be removed and replaced with each use of material from the tube is a self sealing cap 3 having its lower end 4 pressed over and resiliently gripping the threads on the outlet 2. At the upper end of the cap is a flat nozzle 5 having a slit 6, the sides of which are normally closed by the inherent resilience of the cap and the outer end of which is closed by an integral section 7 of the cap. On the outer surface of the nozzle are ridges 8 which indicate lines along which the outer end of the cap may be cut off. Until the outer end of the tube is cut off, the contents of the tube are completely sealed. This is important in shipping and other handling of the tube before use of the contents is started. A plurality of ridges 8 are indicated. Severing the cap at the outermost ridge is desirable for less viscous materials. For more viscous materials a greater part of the end of the cap is cut off.

To secure progressive opening of the slit when the tube is squeezed, the walls of the slit decreases in rigidity from the inner end toward the outlet. In the construction shown, this is accomplished by stepping down the wall thickness so the walls of the slit are thinnest at the outer or discharge

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end, and also by the shape of the walls. The walls of the cap at the inner end of the slit 1, being of a more nearly circular shape at the inner end of the slit, offer a greater resistance to opening of the slit. At the inner end of the slit, the inside walls of the cap diverge, providing a wedge-shaped entrance 9. When the tube is squeezed, the fluid pressure acts on the diverging walls and exerts a greater spreading pressure, tending to open the slit. Since the materials customarily sold in tubes are viscous, the fluid pressure is greatest at the entrance to the slit and decreases as the material flows along the slit. The walls forming the sides of the slit are proportioned so that the opening of the slit is greatest at the inner end and progressively decreases toward the outer or discharge end, as clearly indicated in Fig. 5.

When the pressure on the tube is released, the inherent resilience of the cap causes contraction of the slit which progressively closes from the outer end toward the inner end with a wiping action keeping the surfaces of the slit clean. This makes possible a substantially clean closure of the outer end of the slit so that caking of the material in the slit is prevented.

The cap is made of a thermoplastic material, such as poly-ethylene, vinylplastic, or materials which belong to the class known as elastomers. These plastics are flexible and resilient but are not stretchable in the sense of rubber or are stretchable to a limited extent compared to rubber. These materials also are not attacked by oils, acids, or alkalis and are therefore substantially unaffected by the usual materials sold in tubes. Another advantage of these materials is that the surfaces are much smoother than those possible with rubber and less resistance is therefore offered to the flow of material through the slit and upon closing of the slit a thinner film will remain on the surfaces. This initial advantage over rubber caps increases with use since the rubber surface becomes progressively rougher due to the chemical attack of the rubber and due to the building up of dried films of materials on the surfaces.

The slit 6 may be cut after the cap is molded or it may be formed in the molding operation. Cutting produces a rougher surface but still a much smoother surface than can be produced with rubber. When the slit is cut, the closing pressure on the slit is greatest since no material is removed. It is also possible to form the slit in the molding operation by the use of a knife edge core thin enough so that the walls of the

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slit shrink into contact upon cooling of the cap. Molding the slit produces the smoothest wall surface but results in somewhat less closing pressure since some material is in effect removed to form the slit.

What I claim as new is:

A self sealing cap for collapsible tubes molded of resilient material having an elongated tip with a solid outer end and with a slit therein having sides normally closed into engagement with each other by the inherent resilience of the material and said slit extending from the inside of the cap toward and terminating short of the solid outer end of the tip whereby the cap is completely sealed until the outer end of the tip is cut off, the walls of the tip forming the sides of the slit decreasing in stiffness toward the outer end whereby the sides of the slit close progressively into engagement with each other

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from the outer end as pressure on the tube is released, and the tip being marked for cutting at a plurality of points inward from the outer end of the tip whereby the length of the slit remaining after cutting can be selected to correspond with the viscosity of the material in the tube.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,951,544	Burrell	Mar. 20, 1934
1,998,847	Schiefer	Apr. 23, 1935
2,176,513	Smith	Oct. 17, 1939
2,188,191	Roos	Jan. 23, 1940