Sept. 24, 1957 H. EICHENBAUM 2,807,386

CROWN CAP

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Fig. 1

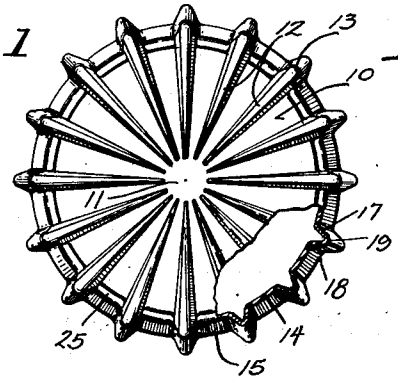


Fig. 3

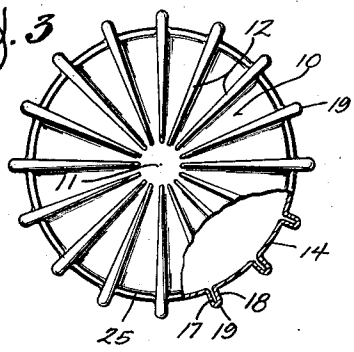


Fig. 2

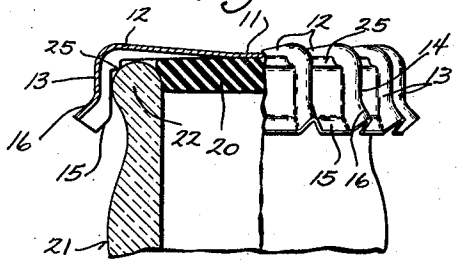


Fig. 4

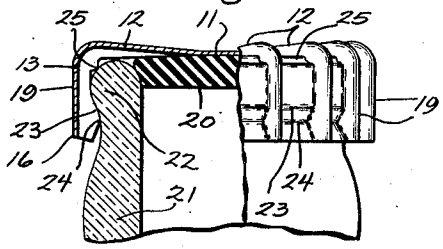


Fig. 5

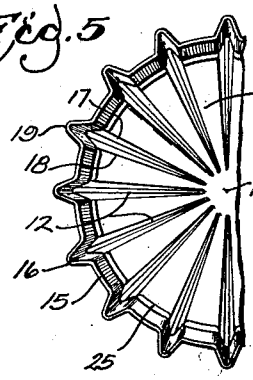
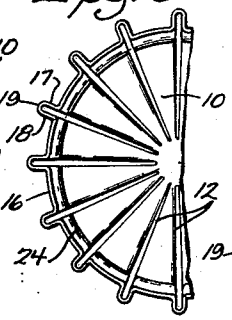


Fig. 6



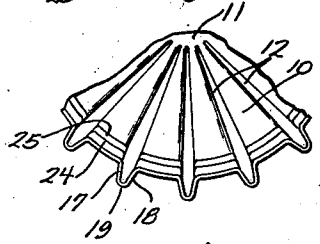


Fig. 7

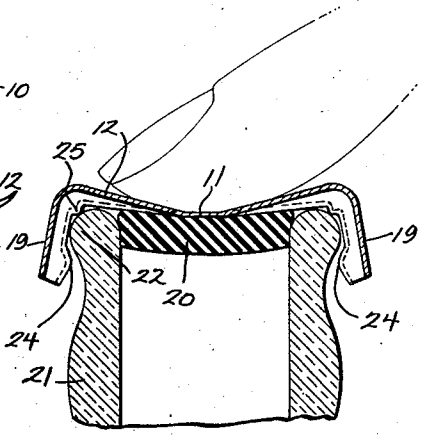


Fig. 8

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Fig. 9

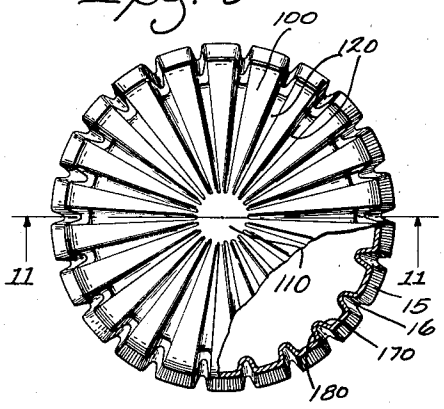


Fig. 10

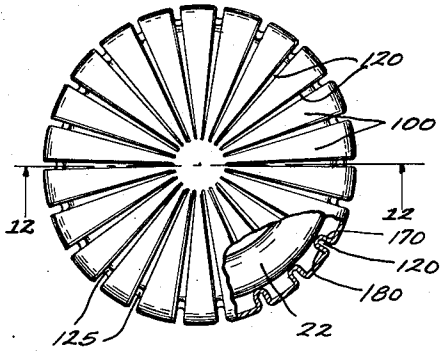


Fig. 11

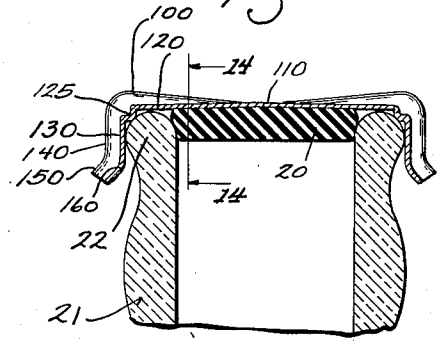


Fig. 12

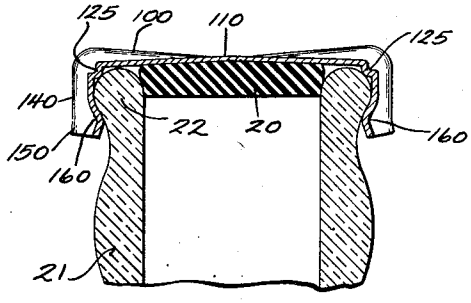
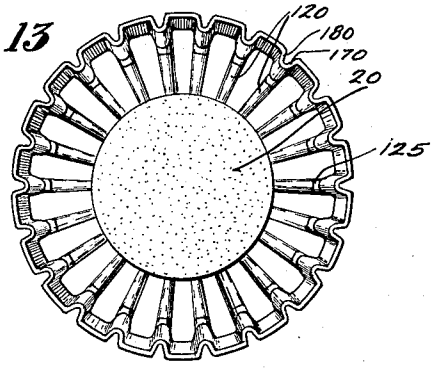


Fig. 13



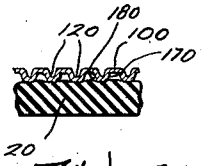


Fig. 14

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2,807,386

CROWN CAP

Helmut Eichenbaum, Wauwatosa, Wis.

Application February 12, 1954, Serial No. 409,810

21 Claims. (Cl. 215—39)

This invention relates to a crown cap releasable by light central pressure.

The crown cap herein disclosed is applicable in a conventional capping machine but requires no bottle cap remover, since the pressure of the operator's finger in the center of the cap is sufficient to release it from the mouth of a bottle with which it is engaged.

The cap features ribs which radiate outwardly from its center over its upper surface to its edge and are then continued downwardly upon its skirt. Each such rib operates as a bell crank lever for effecting the release from the bottle bead of the shoulder portions of the skirt formed by the cap.

Ribs are ordinarily used by way of reenforcement or stiffening. In the instant device, the ribs actually weaken the cap in a peripheral direction to enable its circumferential dimensions to be varied with relatively light pressures. Thus, some of the material of the cap is gathered into the ribs at the time the cap is applied to a bottle and the ribs expand circumferentially under the pressure of the operator's finger to release the cap from bottle engagement.

As the cap is sold, prior to its application to a bottle, the individual ribs have side wall portions which not only diverge slightly from each other radially outwardly from the center of the cap and downwardly over the skirt, but which also diverge from each other rather broadly from the apex of each rib toward the base thereof. In the course of the capping operation, the respective ribs are all collapsed to the point that their respective side walls are entirely or nearly parallel.

In the releasing operation, each rib still functions like a substantially rigid bell crank lever, but in order to disengage the shouldered web of the skirt from the bead, it is necessary to provide for a substantial enlargement of the diameter of the skirt and this is accomplished by the fact that each of the ribs spreads out as it pivots over the bead of the bottle, the separation of the sides of the several ribs providing the necessary rim or skirt expansion.

In other words, the rim or skirt, initially contracted in the application of the cap to the bottle, is expanded by a converse operation capable of being effected by the mere pressure of the operator's finger and this, despite the fact that the rim or skirt portion of the cap is not slit, but is metallicly continuous around the bottle mouth.

In one form of the invention as herein disclosed, the ribs are on the outside of the cap; in another embodiment the ribs are on the inside of the cap so that the cap presents externally a relatively smooth appearance, its generally flat surfaces being separated by narrow channels opening into the concealed ribs in the interior.

In the drawings:

Fig. 1 is a view on an enlarged scale of a bottle cap shown in plan and partially broken away to a horizontal section.

Fig. 2 shows the cap loosely applied to a bottle preliminary to the capping operation by which it is connected to the bottle, the cap being shown in side elevation and partially broken away to a vertical axial section.

Fig. 3 is a plan view of the cap as it appears following the capping operation.

Fig. 4 is a view similar to Fig. 2 showing the cap partially in side elevation and partially in section as it appears following the capping operation.

Fig. 5 is a fragmentary inverted plan view of the cap shown in Fig. 1.

Fig. 6 is a fragmentary inverted plan view of the cap shown in Fig. 3.

Fig. 7 is a fragmentary inverted plan view of the cap after its release from the bottle.

Fig. 8 is a view in vertical axial section through the cap atop the bottle to show the cap in process of being released.

Fig. 9 is a view in plan of a modified embodiment of my invention as it appears prior to being clamped to the mouth of the bottle, portions of the top wall being broken away.

Fig. 10 is a view of the device of Fig. 9 as it appears in plan after application to a bottle, portions being broken away.

Fig. 11 is a view taken in transverse section on the line 11—11 of Fig. 9 prior to the clamping operation.

Fig. 12 is a view taken in section on line 12—12 of Fig. 10 showing the cap as it appears when clamped to the bottle bead.

Fig. 13 is a view of the device in Fig. 9 in inverted plan.

Fig. 14 is a fragmentary detail view taken in section on the line 14—14 of Fig. 11.

My improved cap comprises a top wall portion **10**. From its center **11**, which need have no ribs whatever, radiate the ribs **12** which progressively increase in depth and width and are extended at **13** downwardly over the skirt or rim portion **14** of the cap. The lower margin of the skirt or rim flares outwardly at **15**, as best shown both in Figs. 1 and 2, and the ribs turn outwardly at **16** over the flaring edge **15**.

Each rib comprises side walls **17**, **18** integrally joined at an apex **19** from which the side walls are mutually divergent, as clearly shown in Figs. 1, 2 and 5.

Within each cap there is desirably a compressible gasket **20** which may be cemented or mechanically secured therein and is usually made of cork composition but may be made of natural or synthetic rubber or other suitable material. Instead of having this gasket seated on top of the bottle bead, I prefer that the gasket be of somewhat smaller diameter to be received, under some radial pressure, into the mouth of the bottle as clearly shown in Figs. 2 and 4.

When the cap is applied to the mouth of the bottle **21**, the gasket does not fully enter the mouth of the bottle within the bottle bead **22**. When the capping operation is commenced, the gasket **20** is pushed into the mouth of the bottle as shown in Fig. 2. As the capping operation continues, the rim or skirt is folded at **23** beneath the bead **22**, as shown in Fig. 4, to form at **24** a shoulder engaged beneath the bead. This straightens out the initial flaring portion **16** of each rib so that the rib apex at **19** extends substantially rectilinearly in a vertical direction, as shown in Fig. 4.

At the same time, this forming operation contracts the entire rim. The contraction is accommodated by contracting each individual rib so that the side wall portions **17** and **18** which were initially divergent, as shown in Figs. 1, 2 and 5 in the original condition of the cap, approach parallelism as shown in Figs. 3 and 6.

The change in form of the rib makes it much more rigid for functioning as a bell crank lever upon a fulcrum provided by the bottle bead **22**. Due to the annular

internal rib at **25**, which contacts the bottle bead **22** outside of its highest point, the length of the lever arm engaged by the operator's finger is somewhat increased. When the operator's finger exerts pressure on the central area **11** of the cap in the manner shown in Fig. 8, each rib acts individually as a bell crank lever to pivot over the bead **22** in a manner to force the shoulder **24** radially outwardly free of the bottle. The connection between the various bell crank levers, comprising the respective ribs, and the central portion of the cap is obviously entirely flexible. Only the symmetrical form, and the fact that the operator's finger pressure is transmitted alike to all ribs, assures their substantially uniform action as shown.

While the ribs all operate as rigid levers, it will be apparent that the expansion of the rim or skirt portion of the cap can be accommodated only at the expense of the widening of the respective ribs as they oscillate about their fulcrums. The result of this action is shown in Fig. 7. The respective side walls **17**, **18** of the ribs do not diverge as widely as they did in Fig. 5, prior to the capping operation, but they have spread very materially from their substantially parallel position shown in Fig. 6. Thus, inasmuch as the levers themselves furnish the surplus material required for the expansion which results from their oscillatory movement, the cap can be expanded without having any slits in its skirt portion, and the operator is able to free the cap from the bottle without requiring the use of tools and in a manner wholly unknown heretofore.

The very construction which makes the ribs function as rigid bell crank levers in the manner above described assures that the cap will grip the bottle bead against displacement by any normal pressure which can be developed within the bottle. It will be apparent from a study of Figs. 4 and 8 that any pressure developed by the contents of the bottle will, instead of releasing the cap, cause it to engage the bottle even more securely. An upward pressure at the center of the cap does not tend to expand the rim or widen the ribs, which therefore have their rigidity unimpaired. The action is such that a relatively lightweight metal can be used in the manufacture of the cap, thus facilitating its finger-operated release, and yet resisting the ordinary pressures developed by carbonated beverages and the like. Actual experimentation has shown that a cap which can be opened by finger pressure is capable of resisting many times as much bottle pressure as is developed in practice.

It is desirable, moreover, that the finger pressure which releases the cap is exerted in a direction in opposition to the bottle pressure, since this tends to prevent or control the tendency of the contained beverage to squirt when the cap is disengaged from the bottle bead.

In the construction shown in Figs. 9 to 14, the principal difference from the embodiment already described lies in the interior location of the ribs.

Fig. 9 shows the cap prior to its application to a bottle. The generally smooth surface areas **100** which comprise the top wall of the cap are slightly concave toward the center **110**. In the original form of the device, the ribs **120** which radiate from the center **110** appear as outwardly opening and relatively broad channels as shown in Fig. 9. The rib portions **130** extend downwardly over the bead **22** of bottle **21**. Between them, the skirt or rim portion **140** is also substantially vertical until it reaches the flaring lower margin **150** in which the channels or beads also turn outwardly at **160**.

It will be observed that the bottoms of the internal ribs **120** need not necessarily rest flat on the top of the bottle bead **22**. To increase the lever arm and to reduce the amount of finger pressure required, I prefer to locate the fulcrums outwardly as far as possible. To this end, and solely for this reason, I may form in each rib a slight downward indentation at **125** which constitutes a fulcrum shoulder resting on the bottle bead slightly outside of its highest point, as clearly shown in Fig. 11.

When the capping operation is performed, the entire external periphery of the cap is contracted. The slightly dished but otherwise flat top wall areas **100** of the cap are brought closer together as shown in Fig. 10. The upwardly opening channels which constitute the inner bead **120** are narrowed as clearly appears in that view. The side wall portions **170** and **180** of these respective channels **120** are brought into substantial parallelism as shown in the broken away portion of Fig. 10. The external and substantially cylindrical portions **140** of the skirt, between the channels, remain approximately vertical, but the initially flaring portions **150** thereof are now brought into substantially the same cylindrical surface as shown in Fig. 12, portions **160** of the ribs being folded beneath the bottle bead **22**. The result is the same, in effect, as that described in connection with the embodiment first disclosed. The bell crank levers formed by the individual ribs are de-formed at their ends into engagement with the bottle bead to rigidly connect the cap to the bottle. Yet, upon the application of finger pressure in the central zone **110**, these levers are caused to pivot upon the fulcrum shoulders **125** to spring outwardly the portion **160** thereof engaged beneath the bead. Such outward movement is, and can be, accommodated solely by the spreading of the sides of the individual ribs. The deeper the ribs, the more flexible will be a given weight of metal in accommodating this peripheral expansion from the contracted form of Fig. 10 toward the expanded form of the cap shown in Fig. 9. Thus the ribs which constitute the levers furnish from their own substance the surplus material required for the expansion which results from the pivotal movement of the several lever-like ribs.

I claim:

1. A crown cap comprising a top wall and skirt, the skirt being metallicly continuous about the top wall and said cap having a multiplicity of generally radial ribs with their inner ends in close proximity, said ribs extending outwardly from the center of the top wall and downwardly across the skirt, the said ribs becoming progressively deeper and wider in an outward direction and having apices from which their sides are oppositely divergent, the ribs being sufficient in number and depth and radial extent to accommodate the ready yielding of the skirt to release the cap under manual pressure.

2. The device of claim 1 in which the ribs are disposed within the said top wall.

3. The device of claim 1 in which the ribs are external to the said top wall.

4. The crown cap defined in claim 1 in which said skirt has a flaring marginal portion across which said ribs extend, the said flaring marginal portions being contracted into engagement with the bead of a bottle mouth by the lateral approach to each other of the sides of respective ribs.

5. The device of claim 4 in which the contracted skirt engaged with a bottle mouth bead may be expanded to release said bead by pressure at the center of said top wall, thereby oscillating each respective rib as a substantially rigid bell crank to effect expansion of said skirt accommodated by the spreading of the sides of the respective ribs.

6. The cap of claim 5 in which the crown cap is provided with an internal gasket engageable with a bottle mouth bead and sufficiently flexible to yield in the flexing of said top wall for disengaging the crown cap skirt from such bead.

7. The device of claim 5 in which the ribs are at the outside of the top wall to project upwardly therefrom.

8. The device of claim 5 in which the ribs are on the under side of the top wall to project downwardly therefrom.

9. The device of claim 8 in which the respective ribs have their apices provided with inwardly directed fulcrum

shoulders near the outer perimeter of the top wall and therebeneath.

10. A crown cap as applied to a bottle mouth bead, said crown cap comprising a top wall and a skirt, said cap having a multiplicity of generally radial ribs with their inner ends in close proximity, said ribs extending outwardly from its center and downwardly over its skirt, the several ribs being adapted to function as bell cranks for cap release, the skirt being substantially continuous circumferentially of the bead and comprising web portions intervening between said ribs, each of the said ribs having an apex and sides joined at said apex and nearly parallel to each other, the said sides having a height progressively increasing outwardly from said center and downwardly over said skirt, the ribs being sufficient in number and depth and radial extent to accommodate the ready yielding of the skirt to release the cap under manual pressure.

11. The device of claim 10 in which the ribs are exposed and project upwardly above the top wall and outwardly of said skirt.

12. The device of claim 10 in which the ribs are disposed interiorly of the top wall and the skirt, the bottle bead being engaged by the apices of said ribs.

13. The device of claim 12 in which each such rib has at its apex a fulcrum shoulder extending inwardly to engagement with the bead, the several shoulders being in annular series and contacting the bottle bead slightly outside of the topmost surface thereof.

14. The cap of claim 10 in which said cap is provided with gasket means encircled by its skirt.

15. The device of claim 10 in which said cap is provided with gasket means encircled by its skirt and interposed between its top wall portion and the bottle mouth bead and yieldable when the top wall of the crown cap is subjected to central pressure, each of said ribs oscillating over said bead as a bell crank lever in response to such pressure to effect an increase in the radius of the skirt accommodated by an increase in the divergence of the sides of the respective ribs as they oscillate, such increase in skirt radius disengaging the shouldered skirt web from beneath the bead for the release of the crown cap from the bottle.

16. The device of claim 15 in which the respective ribs are disposed at the outside of the top wall of the cap, the bottle bead being engaged by such top wall intermediate the ribs.

17. The device of claim 15 in which the respective ribs are disposed inside of the top wall of the cap and the bottle bead is engaged by the apices of respective ribs.

18. The device of claim 17 in which the apex of each rib is provided with a bead-engaging inwardly projecting shoulder disposed in the angle between a generally horizontal portion of the bead apex beneath the top wall and a generally vertical portion of the bead apex outside the bottle bead.

19. A crown cap comprising a top wall and a skirt, the skirt being metallically continuous about the top wall and the cap having generally radial ribs extending outwardly from the center of the top wall and downwardly across the skirt, the ribs becoming progressively deeper and wider in an outward direction and having side portions converging to the apices of said ribs, the said cap having fulcrum means in annular series in a position to engage the bead of a bottle to which the crown cap is applied, whereby to facilitate the pivoting of the respective ribs upon the bead, each rib acting as a substantially rigid bell crank to effect and to respond to vertical movement of the central portion of the top wall as the cap is applied to and released from the bead of a bottle, contraction and expansion of the skirt portion of the cap being accommodated by relative approach and recession of side wall portions of the respective ribs.

20. The crown cap of claim 19 in which said fulcrum means comprises a discontinuous annular rib interrupted by the respective radial ribs, the radial ribs projecting outwardly of the top wall of the crown cap and the skirt thereof and the said discontinuous annular rib being internal and formed in said top wall at substantially the radius of the bead of a bottle to which the crown cap is applicable.

21. The crown cap of claim 19 in which said fulcrum means is provided by portions of the said radial ribs, the ribs projecting inwardly from the crown cap top wall in which they are formed.

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