United States Patent [19]

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Cooper

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[54] **SAFETY CLOSURE CAP WITH RETAINING FEET**

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[21] Appl. No.: **434,053**

[52] **U.S. Cl.** **220/300;** 220/301; 220/304

[51] **Int. Cl.²** **B65D 41/06**

[58] **Field of Search** ..... 220/40 R, 40 S, 203, 293, 220/300, 301, 302, 304; 215/222, 332

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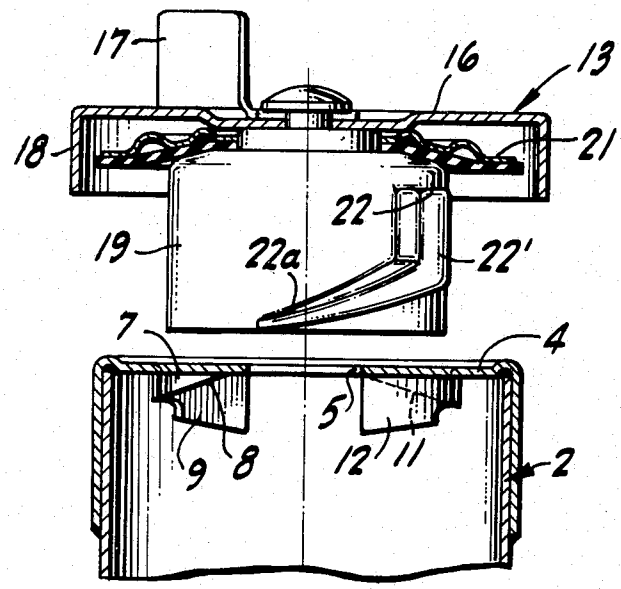
Primary Examiner—William I. Price
Assistant Examiner—Ro E. Hart
Attorney, Agent, or Firm—Stanley Bialos

[57] **ABSTRACT**

A safety closure cap for bayonet connection with a filler spout has blocking prongs extending downwardly from and rigid with latching lugs on the cap to insure proper seating of the cap on the rim of the spout when it is placed on the spout to latch it, in combination with circumferentially arranged retaining feet to prevent gas pressure built up in the tank from blowing the cap away from the spout as it is being unlatched.

11 Claims, 14 Drawing Figures



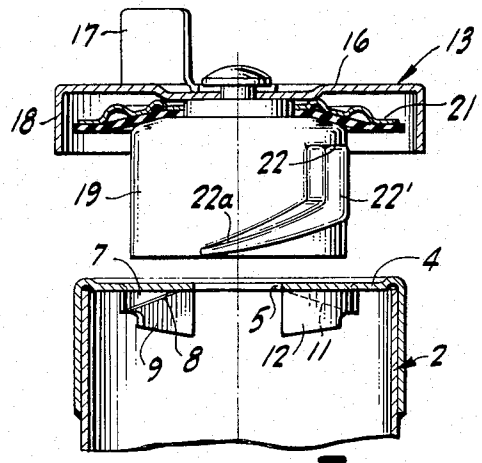


FIG. 3

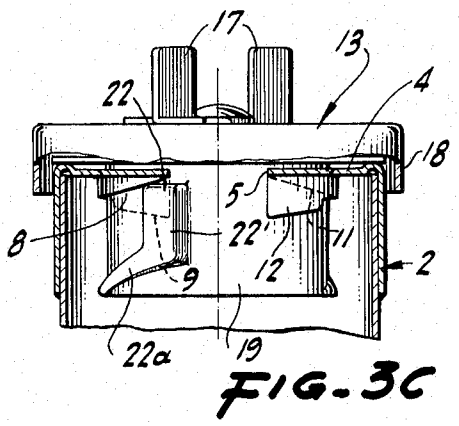


FIG. 3C

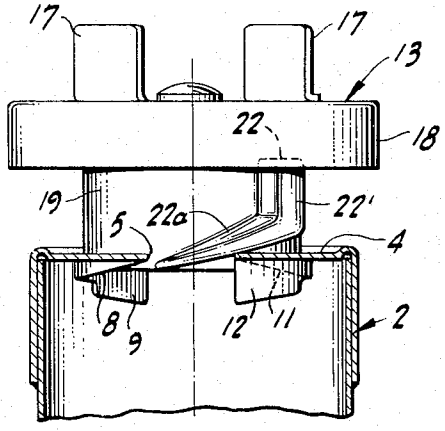


FIG. 3A

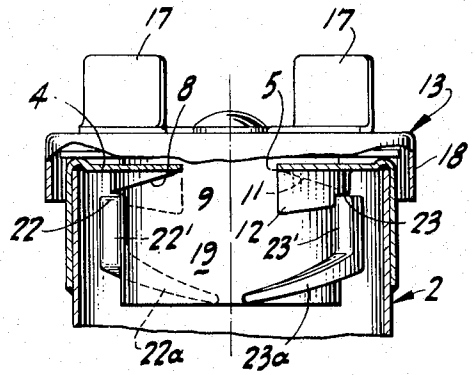


FIG. 3D

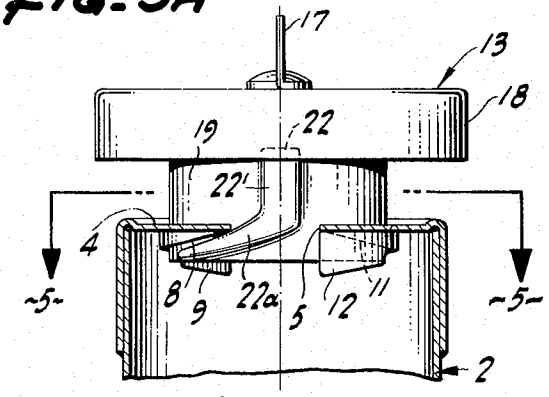


FIG. 3B

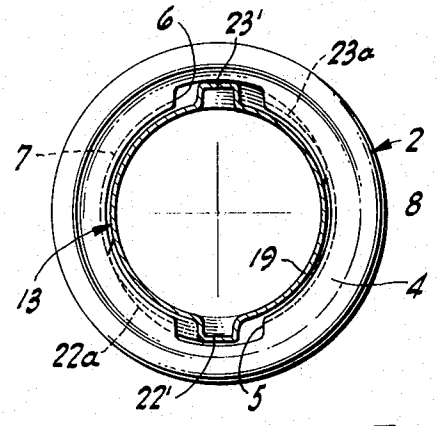
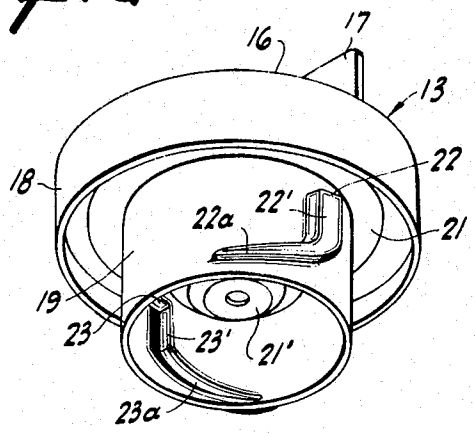


FIG. 5

FIG-1



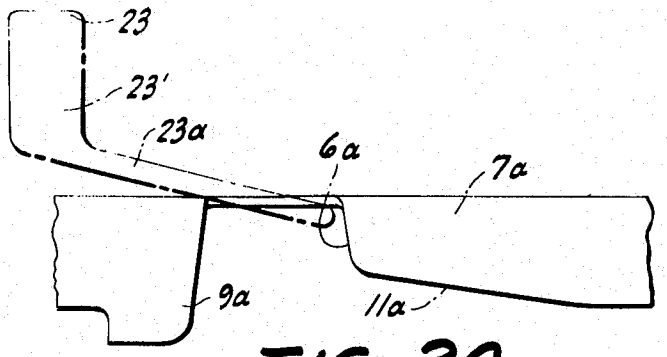


FIG-2A

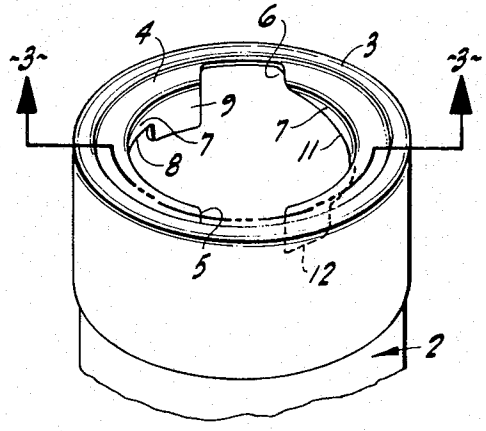


FIG-2

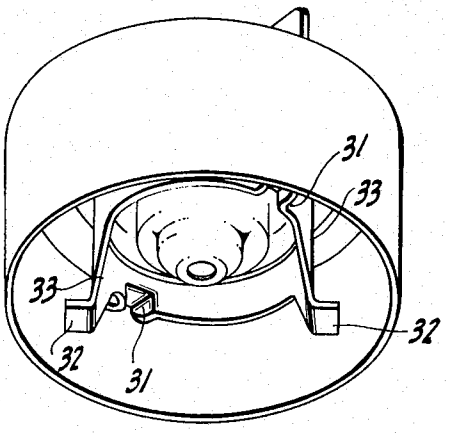


FIG-8

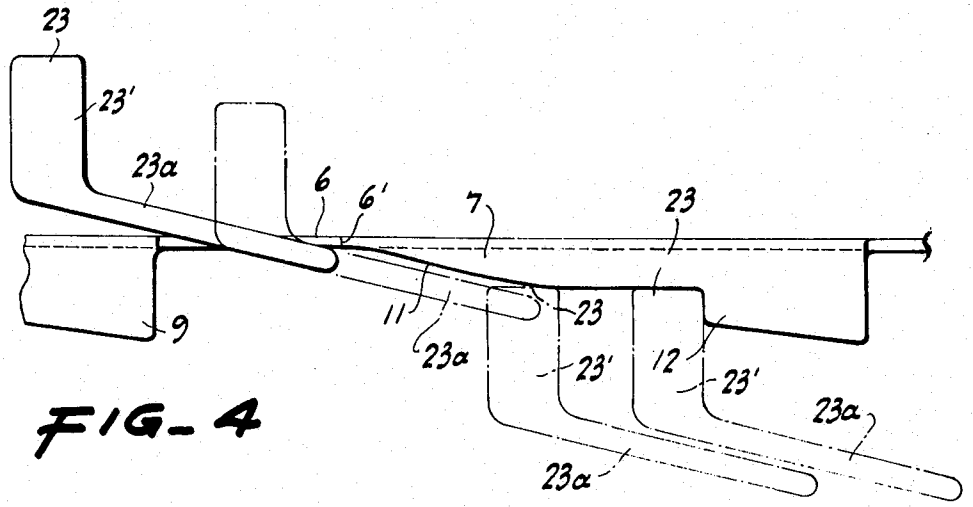


FIG-4

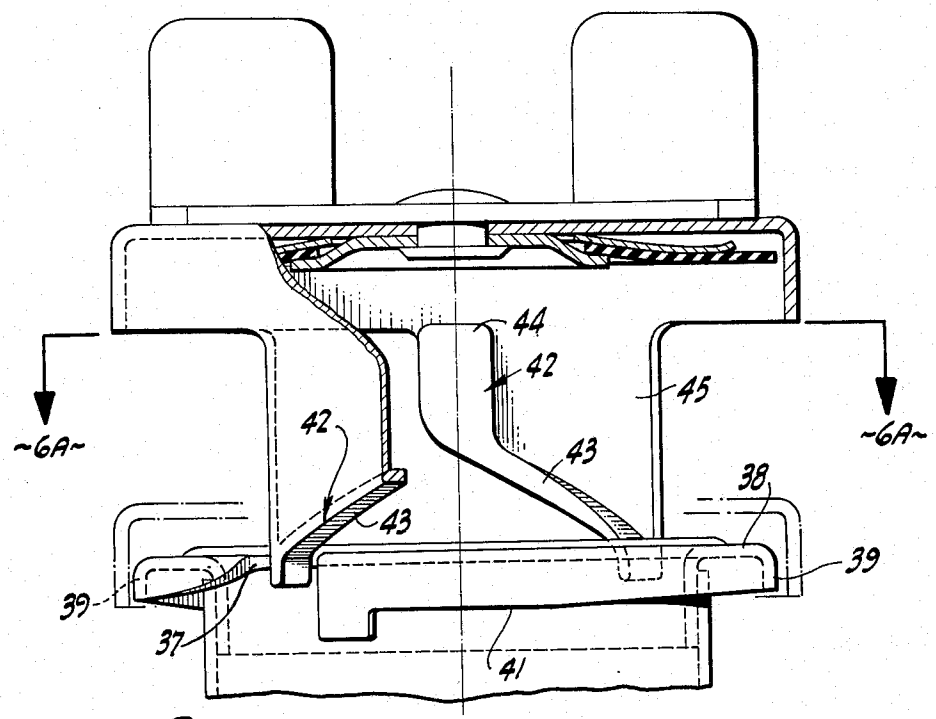


FIG-6

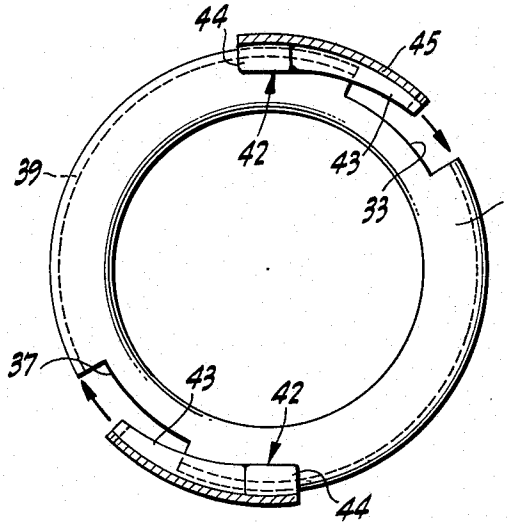


FIG-6A

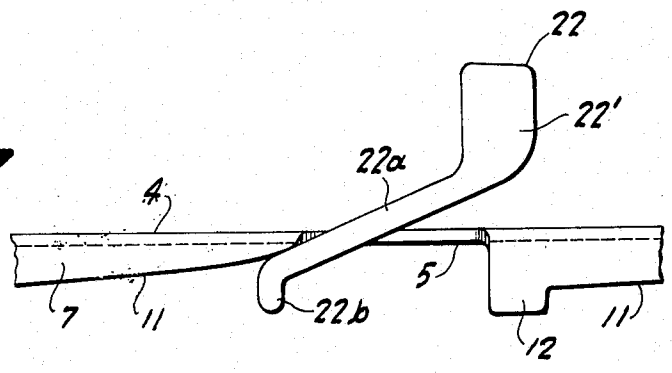


FIG-7

SAFETY CLOSURE CAP WITH RETAINING FEET

BACKGROUND OF THE INVENTION

A common type of closure cap for a filler spout on automobile gasoline tanks is adapted for bayonet connection with such spout. The spout comprises a top provided with a rim having diametrically opposite female notches therein through which latching lugs on the cap are insertable to provide a bayonet type connection upon turning of the cap in one direction over the top. Opposite cam surfaces are provided over which the latching lugs can ride. Each of these surfaces extends from and slopes downwardly from adjacent the end of a notch and terminates adjacent a downwardly extending stop. A spring pressed sealing disc structure is secured to the underside of the cap top to seal against the spout rim upon twisting or turning of the cap in said one direction, provided the latching lugs are inserted properly through the notches.

As is disclosed in applicant's U.S. Pat. No. **3,784,047,** dated Jan. **8, 1974,** for SAFETY CLOSURE CAP, gasoline station attendants are sometimes careless in applying the closure cap to the spout after a tank has been serviced with gasoline because sometimes only one latching lug is inserted into a female bayonet notch with the other latching lug merely resting on top of the spout. Latching is thus effected by only one lug and the cap becomes seated with a tilt so that gasoline can escape from the spout, especially when the vehicle is accelerated. This problem is overcome, as is disclosed and claimed in the aforementioned patent, by the provision of means in the form of blocking prongs which extend downwardly from the latching lugs to insure that the cap becomes properly seated on the top of the spout before it can be turned to latch the same.

In prior closure cap constructions, vapor from the gasoline in the tank was allowed to vent into the atmosphere. However, with the recent advent of modern emission control system requirements, the tank on new model automobiles is maintained at a positive pressure to drive the vapor to the carburetor, to be consumed by the engine. This is undesirable because the cap must be unlatched with pressure applied to it; and if the cap does not have a safety feature to retain it during the unlatching, it could sometimes become propelled dangerously by sudden relief of the gas pressure, and cause injury to a person unlatching the same. This is overcome in the construction of caps for late model automobile gasoline tanks by the provision of diametrically opposite retaining lugs offset from and positioned a substantial distance below the latching lugs to engage the bottom of cam surfaces on the spout, to prevent the gas presure from blowing the cap away from the spout as it is being unlatched.

With such construction, it is necessary in latching the cap to place it evenly over the top of the spout by inserting the retaining lugs through the spout notches, turn it partially in the direction to latch the same to allow the offset latching lugs to enter the spout notches whereupon it drops downwardly, and then continue the turning until the cap becomes fully latched. Frequently with such construction, the attendant filling the tank believes the cap is fully latched after it moves downwardly before it is rotated to the fully latched position. This results in possible leakage of gasoline from the tank upon acceleration of the automobile.

Conversely when a properly latched cap is unlatched, it requires three motions to unlatch the same, namely, first partial rotation from the position at which the respective latching lugs engage one edge of the aforementioned spout stops to a position adjacent the spout notches, next lifting the cap upwardly until the latching lugs are removed through the spout notches, and finally turning the cap to the position whereat the offset retaining lugs can be removed through the notches.

It is also possible for an attendant to accidentally latch the aforementioned late model cap with only one latching lug inserted through a spout notch so that the cap is not evenly seated on the rim for latching but is tilted. This allows fuel to escape under acceleration of the automobile. Moreover, late model constructions have narrow spout entry notches through which the retaining lugs must be inserted, which renders them difficult to locate; and a relatively deep latching cam surface (extending a substantial distance below the rim of the spout) is provided, which makes for a relatively expensive construction.

SUMMARY AND OBJECTS OF THE INVENTION

Summarizing the invention hereof, it embodies the feature of blocking prongs extending downwardly from the respective latching lugs to insure proper seating of the cap on the spout at all times, as is disclosed and claimed in applicant's aforementioned patent. In combination with such prongs, a retaining foot extends from the lower end of each prong. The retaining feet are arcuate, and extend circumferentially in the same direction about the axis of the spout.

Because they extend from the ends of the blocking prongs, they are insertable with the associated prongs through the spout entry notches upon rotating the cap in one direction to latch the same. The arcuate or helical retaining feet form a screw threaded connection with the cam surfaces of the spout. As a result, latching can be effected substantially without interruption by turning or rotating the cap in one direction. It can be unlatched by turning the cap in an opposite direction, and removed by lifting the ends of the retaining feet through the spout notches. The retaining feet retain the cap loosely on the spout until the cap is manually removed. The construction permits relatively wide notches compared to the width of the latching lugs. This enables an initially loose fit of the cap on the spout, facilitating finding the ends of the retaining feet for entry into the notches. To facilitate such entry, the ends of the retaining feet may be provided with downwardly extending end projections insertable into the respective spout notches to locate the same when the cap is placed on the spout for latching it.

From the preceding it is seen that the invention has as its objects, among others, the provision of economical and simple means on a closure cap for an automobile tank filling spout or the like, to insure that the cap is properly seated on the spout before it is latched, in combination with such means of simple and economical means for retaining the cap on the spout while it is being unlatched while simultaneously allowing venting of gas pressure which may build up in the tank, thus preventing the gas pressure from blowing the cap away from the spout as it is being unlatched. Other objects will become apparent from the following more detailed description and accompanying drawings, in which:

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view looking at the underside of the closure cap of this invention;

FIG. 2 is an isometric view of the filling spout hereof illustrating its relationship to the cap of FIG. 1 before they are latched;

FIG. 2A is a developed elevational view illustrating a filling spout with a deep cam to compare it with a shallow cam shown in FIGS. 2 and 4; the blocking prong and retaining foot hereof being illustrated;

FIGS. 3 through 3-D are vertical sections taken along line 3—3 in FIG. 2 which includes an intermediate arcuate section, illustrating the relationship of the safety cap hereof to the filling spout in various positions during the latching operation; in these Figs.:

FIG. 3 illustrates the position wherein the retaining feet are ready for positioning in the spout notches;

FIG. 3A illustrates the position at which a retaining foot is just ready to enter a notch;

FIG. 3B is a position wherein the cap has been partially turned after entry into the notch;

FIG. 3C illustrates a position after the cap has been turned so that a latching lug now engages a cam surface on the spout;

FIG. 3D illustrates the fully latched position of the cap on the spout;

FIG. 4 is a schematic developed view illustrating various positions of a retaining foot, blocking prong and latching lug with reference to the latching cam surface and entry notch during the latching operation;

FIG. 5 is a horizontal section taken in a plane indicated by line 5—5 in FIG. 3B;

FIG. 6 is a vertical, sectional elevation of an embodiment of the invention wherein the closure gap is adapted for an external bayonet type connection, portions of the view being broken away to illustrate the construction more clearly;

FIG. 6A is a horizontal section taken in a plane indicated by line 6A—6A in FIG. 6, and showing the spout in elevation;

FIG. 7 is a schematic elevational view illustrating an embodiment wherein a downwardly extending end projection is provided at the end of each retaining foot insertable into a spout notch to facilitate location of the notches; and

FIG. 8 is an isometric view of the underside of a late model emission control gap, illustrating the retaining lug construction employed therein.

DETAILED DESCRIPTION

For purposes of reference in the preceding and following description, the positions of the parts are referred to considering the top of the spout and the cap as the uppermost part. It is to be understood, however, that the spout and the cap may be arranged, for example, horizontally, depending on the environment wherein the spout is employed. Although particularly adapted for the filler spout of an automobile tank, the invention hereof is applicable to any other filling spout for a tank wherein pressure can build up in the tank.

Referring to FIGS. 1, 2, 3 through 3D, 4 and 5, a more or less conventional filling spout 2 for an automobile gasoline tank of the shallow cam type, is illustrated in association with the closure cap construction hereof. These parts have a bayonet type connection.

Filling spout 2 has a top comprising rim 3, and horizontal flange 4 extending inwardly and substantially even with rim 3. Diametrically opposite entry notches 5 and 6 which provide for a bayonet connection, are formed in flange 4 which has a down turned flange 7 on each side of the spout extending between entry notches 5 and 6. The under edge of one of down turned flange 7 forms a cam surface 8 which extends from an edge of notch 5, slopes gradually downwardly and terminates adjacent a downwardly extending stop 9 at opposite notch 6. A like cam surface 11 and stop 12 are formed on opposite flange 7 with cam surface 11 diametrically opposite cam surface 8, and stop 12 diametrically opposite stop 9. The parts thus far described are conventionally made from stamped metal.

The cap 13 hereof, which cooperates with the described spout, comprises a flat top 16 having diametrically opposite upright lugs 17 for grasping to turn the cap on the spout, and a downwardly extending cylindrical flange 18 which fits over the spout. A centering hub 19 is secured to the underside of cap top 16, and a conventional spring pressed sealing disc structure 21 is fixedly secured between the cap top and centering hub 19. Centering hub 19 encloses a conventional gas vapor emission control valve 21' which is preferably employed but it is not necessary for the latching features of this invention. The parts of the cap thus far described are conventional.

As in the aforementioned U.S. Pat. No. 3,784,047, centering hub 19 has fixedly secured thereto a pair of diametrically opposite outwardly extending latching lugs 22 and 23 which are provided by the top ends of downwardly extending blocking prongs 22' and 23', respectively, insertable through the notches. Although latching lugs 22 and 23 are integral with blocking prongs 22' and 23', respectively, they may be provided as separate elements in line with each other. Extending from the lower end of the respective blocking prongs 22' and 23' and integral therewith are arcuately shaped diametrically opposite downwardly inclined or helical retaining feet 22^a and 23^a, respectively.

These feet extend in the same circumferential direction about the axis of the cap, and are rigid with the centering hub 19 and the respective blocking prongs. Each forms a generally L-shaped structure with the associated blocking prongs and latching lugs; and because of their arcuate shape and downward inclination they provide a screw cooperable with the cam surfaces or edges 8 and 11.

The ends of retaining feet 22^a and 23^a are insertable through the respective notches 5 and 6. It will be noted from FIGS. 1, 2, and 3 through 3D that in latching the cap the ends of retaining feet 22^a and 23^a are inserted through the respective notches 5 and 6, and turned or rotated until the upper latching ends 22 and 23 of blocking prongs 22' and 23', respectively are fully inserted through the respective notches 5 and 6 such upper ends 22 and 23 forming the latching lugs as was previously noted. Upon continued turning of the cap, the latching lugs 22 and 23 ride over cam surfaces 8 and 11 whereupon the cap becomes fully latched when the latching lugs and associated blocking prongs engage against the respective stops 9 and 12; tight latching and sealing of the cap being maintained by the spring pressed sealing disc structure 21.

FIGS. 3 through 3D illustrate various positions as the cap is turned or rotated clockwise to latch the same; in

this connection the L-shaped structures are in the same relationship as in FIGS. 1 and 2. FIG. 4 schematically depicts development of the L-shaped structure 23, 23' and 23^a insertable through notch 6 in the spout from adjacent which the end of sloping cam surface 11 extends. The left-hand portion of FIG. 4 shows the position just after retaining foot 23^a has entered notch 6, while the phantom lines indicate further positions after the cap has been rotated clockwise.

It will be noted that cam surface 11 has a slight gradual slope from edge 6' of entry notch 6. This facilitates insertion of the retaining foot and rotation of the L-shaped structure. When the cap is turned, latching lug surface 23 rides against cam surface 11, being pressed against it by the spring pressed sealing disc structure 21 as it engages the rim of the spout. When latching lug 23 and associated blocking prong 23' engage against stop 12, the cap becomes tightly latched by the spring pressure exerted by spring pressed sealing structure 21. The opposite L-shaped structure 22, 22' and 22^a is simultaneously inserted through notch 5 (FIG. 1), and latches in the same manner.

As in the aforementioned application patent, blocking prongs 22' and 23' insure that the cap becomes evenly seated on the spout rim 3 before it can be rotated for latching the same, to thus prevent latching with only one lug. Unlatching is effected by rotating the cap in a counterclockwise direction until the ends of the retaining feet are removed through the respective entry notches 5 and 6.

During such unlatching, it will be noted that retaining feet 22^a and 23^a are underneath latching surfaces 8 and 11, respectively, as the cap is being unlatched; and during this period pressure built up in the tank is vented through entry notches 5 and 6, and between the flange 18 and the outside surface of spout 2. However, such pressure cannot blow the cap away from the spout because the retaining feet can engage such surfaces upon axial displacement of the cap under said pressure, to thus retain the cap on the spout until the gas has been completely vented whereupon the cap can be removed manually from the spout by turning it to move the lower ends of the retaining feet through the spout entry notches 5 and 6. Thus possible injury to the person unscrewing the cap is precluded.

Each of the latching lugs and associated blocking prongs and retaining feet are of a width substantially less than the width of each of spout notches 5 or 6 as can be seen best from FIG. 5. Thus an initial loose fit is provided which facilitates locating the notches and entrance of the ends of the retaining feet into the notches.

An important feature to facilitate latching and unlatching of the cap is the shallow latching cam employed herein. Referring to FIG. 4, it will be noted that latching surface 11 leads directly from the edge 6' of notch 6, and the latching surface slopes gradually from such edge, being located a relatively short distance from the top of the spout. FIG. 2A illustrates a deep cam construction wherein latching surface 11^a extends from an edge 6^a of flange 7^a a substantial distance. Consequently, it blocks smooth entrance of retaining foot 23^a underneath cam surface 11^a The shallow cam not only has the advantage described but it is also easier to manufacture, and consequently reduces cost compared to a deep cam.

The precise depth of the cam surface below the rim of the spout is not particularly critical, nor is the degree of slope of the cam surface critical. All that is desirable is for the slope to be gradual, and for the end of the cam surface to lead gradually from the entry notch as shown in FIG. 4 to allow retaining foot 23^a to slide into position easily. A suitable cam slope is between about 4° to 6°.

FIG. 8 depicts a present popular type of late model closure cap for a deep cam on the spout. Diametrically opposite latching lugs 31 are offset or staggered relative to opposite retaining lugs 32 which are provided on downwardly extending brackets 33 also located diametrically opposite each other. In this construction, two distinct turning operations are required to latch the cap, after retaining lugs 32 have been inserted through the spout notches, namely, an initial turning until latching lugs 31 are opposite the notches in the spout whereupon the cap drops down vertically, and a final turning to latch the same by the latching lugs riding over the cams.

An inexperienced attendant, after inserting the retaining lugs through the notches and making the first turning of the cap, might not realize that the second turning operation is still required, and, therefore not perform the final turning to latch and seal the cap. Consequently, under acceleration of the vehicle gasoline can escape from the spout which is not uncommon. This is precluded by the present construction because latching is accomplished essentially by one continuous sweep or turning of the cap to the fully latched and sealed position. Latching can be effected with a rotation of the cap of about 150° compared to about 250° with late model caps.

Referring particularly to FIG. 7, each end of a retaining foot, for example retaining foot 22^a with reference to FIG. 1, may be provided with a downwardly extending end projection 22^b insertable into a notch 5 to facilitate location of the respective notches when the cap is placed on the spout for latching it. This feature is not necessary but may be employed if so desired.

In the embodiment of the invention illustrated, which is for a conventional gasoline tank filler spout for an automobile, the spout is about 2¼ inches outside diameter with horizontal flange about ¼ of an inch wide, the depth of cam flanges 7 at the highest point being about 3/16 of an inch, notches 5 and 6 about ⅝ of an inch wide, blocking prongs 22' and 23' each about 3/16 of an inch wide, and about ⅝ inch long, and stops 9 and 12 each of about ⅝ of an inch wide and ⅜ of an inch long. For the described size, the arcuate length of each retaining foot is about ⅞ of an inch and its angle of inclination about 5°. The above dimensions are not particularly critical but are merely given by way of example, as it is to be understood that the length of the blocking prongs and retaining feet, and the angle of the retaining feet may vary depending upon the size of the spout and the particular dimensions of the cap. As previously indicated, each of the L-shaped structures is a rigid continuous structure rigid with centering hub 19. It may be formed as a stamping integral with the hub or as a separate rigid structure welded to the metal hub.

The previously described embodiment of the invention is an internal bayonet connection which is common for closure caps on automobile gasoline tanks; and the latching and L-shaped structure is on the exterior face of centering hub 19 for entry through internal bay-

onet notches in the spout. However, as disclosed in the aforementioned patent, the principle of the invention is also applicable to an external bayonet connection, which is illustrated in FIGS. 6 and 6A wherein, for example, a radiator filling spout **36** is shown.

Opposite exterior entry notches **37** are provided in horizontal exterior flange **38** of the spout from which extends a downwardly extending flange **39.** The under surface **41** of flange **39** provides the camming surfaces. L-shaped structures **42** having the described retaining feet **43** with locater extensions **44** at their ends, are rigid with the interior face of centering hub **45.** They are insertable through notches **37** and the upper ends **44** serve as latching lugs to engage against cam surfaces **41** when the cap is fully positioned on the spout and rotated in a clockwise direction.

I claim:

1. A safety closure cap for connection with a filler spout of an automobile tank or the like comprising a top, said spout having an open filling end surrounded by a rim, a spring pressed sealing disc structure secured to the underside of the top to seal against said rim, the spout having adjacent said rim opposite cam surfaces which are separated by opposite entry notches, opposite latching lugs on the cap secured to a downwardly extending cylindrical centering hub secured to the underside of the cap top and being insertable through the notches, turning of the cap in one direction latching the cap against said rim of the spout by the lugs riding over the cam surfaces, blocking prongs secured to said centering hub and extending downwardly from and in alinement with the respective latching lugs to insure proper seating of the cap on the spout, and an arcuately shaped slightly downwardly inclined retaining foot extending circumferentially about the axis of said hub from the lower end of each prong and having its lower end spaced from the prong and forming a generally L-shaped rigid structure with said blocking prong, such feet extending in the same circumferential direction about said hub to form a screw and being insertable with the associated prongs through the entry notches upon turning of the cap in said one direction to latch the same; and upon turning of the cap in an opposite direction to unlatch the same, said feet being engageable with said cam surfaces upon axial displacement of the cap to retain the cap loosely on the spout until said lower ends of the feet are removed manually through the entry notches to thus allow venting of gas pressure which may have built up in the tank and thus prevent the gas pressure from blowing the cap away from the spout as it is being unlatched.

2. A safety closure cap for connection with a filler spout of an automobile tank or the like wherein said spout has an open filling end surrounded by a rim, and opposite cam surfaces adjacent said rim separated by opposite entry notches, each cam surface having a slight gradual downward slope from an edge of the associated entry notch, said cap comprising a circular top, a downwardly extending centering hub fixedly secured to the underside of said top and insertable into the open end of said spout, a spring pressed sealing disc structure about said centering hub secured to the underside of said cap top for sealing against said spout rim; and rigid generally L-shaped structures secured to said hub at opposite sides thereof, each structure comprising an upright blocking prong insertable through an entrance notch to insure proper seating of the cap on the spout, each prong terminating adjacent the spout top in a latching lug engageable with a cam surface, and an arcuately shaped slightly downwardly inclined retaining foot extending circumferentially about the axis of said hub from the lower end of each prong and having its lower end spaced from the prong, said feet extending in the same circumferential direction about said hub to form a screw and being insertable with the associated prongs through the entry notches upon turning of the cap in one direction to effect latching of said latching lugs against said cam surfaces; the retaining feet upon turning the cap in an opposite direction to unlatch the same being engageable with said cam surfaces upon axial displacement of the cap to retain the cap loosely on the spout until said blocking prongs and ends of the retaining feet are removed manually through such said entry notches.

3. A safety closure cap for connection with a filler spout of an automobile tank or the like comprising a top, said spout having an open filling end surrounded by a rim, a spring pressed sealing disc structure secured to the underside of the top to seal against said rim, the spout having adjacent said rim opposite cam surfaces which are separated by opposite entry notches, opposite latching lugs on the cap insertable through the notches which upon turning the cap in one direction latch the cap against said rim of the spout by the lugs riding over the cam surfaces, prongs extending downwardly from the respective latching lugs to insure proper seating of the cap on said rim of the spout, and an arcuate downwardly inclined retaining foot extending circumferentially about the axis of the cap from the lower end of each prong and having its lower end spaced from the prong, said retaining feet extending in the same circumferential direction to form a screw and being insertable with the associated prongs through the entry notches upon turning of the cap in said one direction to latch the same; and upon turning of the cap in an opposite direction to unlatch the same, said feet being engageable with said cam surfaces upon axial displacement of the cap to retain the cap loosely on the spout until said lower ends of the feet are removed manually through the entry notches to thus allow venting of gas pressure which may have built up in the tank and thus prevent such gas pressure from blowing the cap away from the spout as it is being unlatched.

4. The safety closure cap of claim 3 wherein said end of each retaining foot has a downwardly extending end projection insertable into the respective notches to locate the same when the cap is placed on the spout for latching it.

5. The safety closure cap of claim 3 wherein each prong is rigid and in alinement with the associated latching lug and is substantially perpendicular to the top of the cap.

6. The safety closure cap of claim 4 wherein each locating projection is rigid with the associated retaining foot and is integral therewith.

7. The safety closure cap of claim 3 wherein the width of each latching lug is substantially less than the width of each of said spout notches to form initially a loose fit of the cap on the spout.

8. The safety closure of claim 3 wherein said cap has a downwardly extending cylindrical flange for surrounding the spout.

9. The safety closure of claim 3 wherein each prong and its associated retaining foot is a continuous rigid structure.

10. The safety closure of claim 9 wherein the end of each cam surface of the spout adjacent an edge of an associated entry notch has a gradual slope from said edge to facilitate guiding of a cap retaining foot onto the cam surface.

11. The safety closure cap of claim 3 wherein the prongs and retaining feet on the cap are arranged to cooperate with external notches on the spout.

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