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SAFETY RADIATOR CAP

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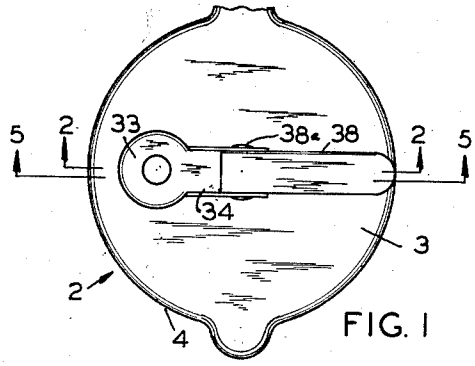

FIG. 1

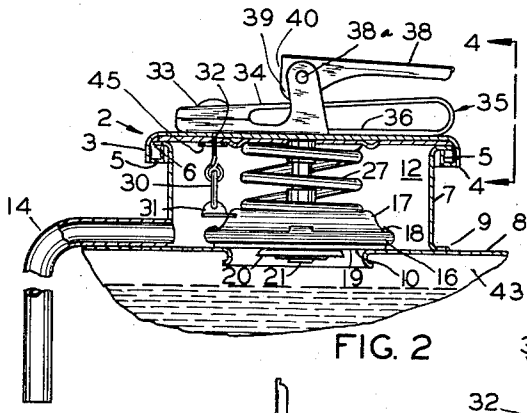

FIG. 2

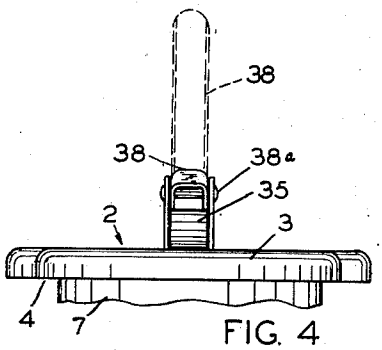

FIG. 4

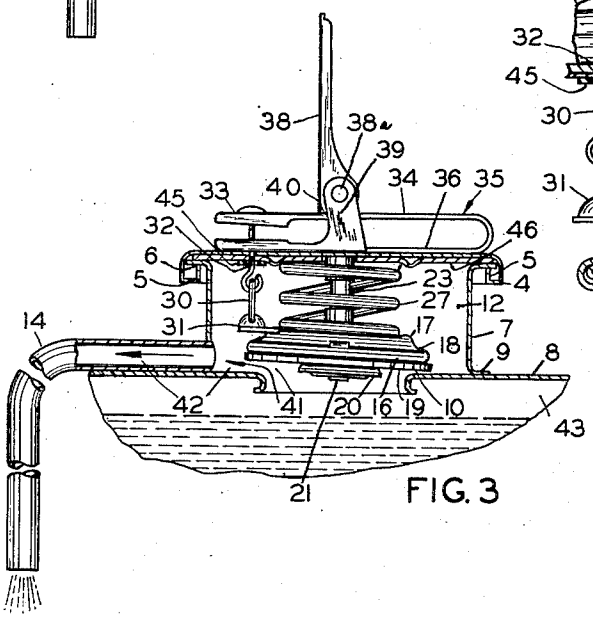

FIG. 3

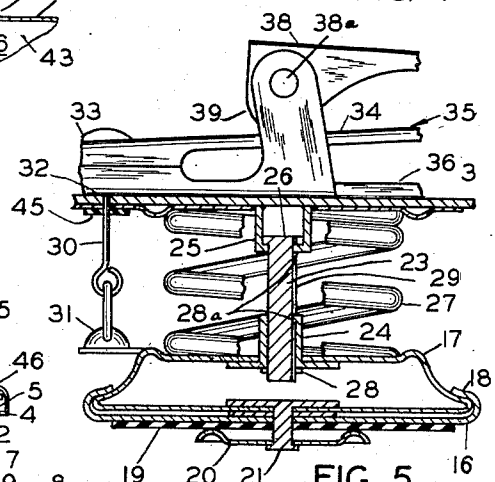

FIG. 5

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SAFETY RADIATOR CAP

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4 Claims. (Cl. 220—44)

This invention concerns a safety radiator cap for internal combustion engine radiators which operate at temperatures above the boiling point.

For reasons of efficiency well known to the trade, and those familiar with the art, water cooled internal combustion engines, such as, for example, those having air cooled radiators containing circulating water, have been operated at temperatures above the boiling point of water at sea level, and at the place of operation. Under these conditions steam pressure builds up within the radiator. Since radiators are commonly provided with filling spouts having closing caps which are removably attached to the top of the spout, these cooling systems operating above atmospheric pressure have now been provided with a cap having an upper portion which closes on the filling spout of the radiator and a lower portion including a disc shaped valve which is held closed on a seat at the bottom of the spout neck by a spring of predetermined strength. The cap portion above the spring is held in place on the radiator spout by partial threads, according to the usual practice, and an overflow drain pipe is commonly connected to the spout neck above the valve plug seat at its bottom. If the engine over heats and steam pressure in the radiator exceeds that for which the spring held valve plug is designed, the plug is raised from the seat and steam and water escape through the overflow pipe which is directed downward at one side of the radiator. However, when it is necessary to add water to the radiator, and the top part of the cap is loosened from the spout, the spring tension on the closing plug is released and steam and hot water escape from the radiator spout often scalding and burning the person who loosens the cap. Obviously the safe way to remove the radiator cap is to wait until the pressure in the radiator has dropped, but this takes considerable time and as a rule it is inconvenient to wait until pressure within the radiator drops below the boiling point.

In order to provide a radiator cap which will remove the hazard of opening the spout before the pressure has dropped to atmospheric pressure we have provided a structure whereby it is possible to lift the disc shaped closing plug within the spout and allow vapor pressure to escape into the overflow drain pipe without disturbing or loosening the upper part of the cap from its position on the upper portion of the radiator spout.

In view of the foregoing, one of the objects of our invention is to provide a radiator cap having a closing plug which is adapted to close on a seat in the neck of the radiator spout with a pre-determined resilient pressure, so that water in the radiator may be maintained at a temperature above the boiling point, with means for partially opening the closing plug to allow vapor pressure to escape from the radiator through the overflow drain pipe before the upper part of the cap is loosened or removed.

Another object is to provide a radiator cap of the type above described with means for lifting one edge of the disc shaped plug from its seat at the bottom of the radiator spout neck in order to allow vapor pressure to escape through the drain, which means can be operated without disturbing the closure of the upper part of the cap on the spout, and which can be easily and cheaply made and easily operated.

Other objects will appear hereinafter.

We attain the foregoing objects by means of the devices, parts and combinations of parts shown in the accompanying drawings in which—

Figure 1 is a plan view of a radiator cap incorporating my invention;

Figure 2 is a side elevation of the cap with the parts sectioned off substantially on line 2—2 of Figure 1 and with the cap shown in closed position;

Figure 3 is a view similar to that of Figure 2 but with the cap closing valve raised to allow the escape of steam while the outer hold down cap, which is screwed onto the neck of the shell of the radiator, is maintained in closed position;

Figure 4 is a side elevation of the cap as shown in Figure 2; and

Figure 5 is a sectional view of the radiator cap, taken substantially on line 5—5 of Figure 1, and drawn on an enlarged scale.

Similar numerals refer to similar parts in the several views.

The radiator closing cap 2 consists of an upper closing cap 3 which is provided with a rim 4 that includes lugs 5 which engage under the lip 6 of neck 7 which is attached to the radiator shell 8 by the flange 9.

Within the neck the shell 8 of the radiator is opened and provided with a rim to form a valve seat 10. The space 12 within the neck is open to the atmosphere when the cap is closed through the overflow drain pipe 14.

The valve seat is closed by a valve plate 16 which is made of metal and a gasket 19 held onto a pressure double faced pan 17 by metal clips 18 which are bent upward over the rim of the pan. Gasket 19 is made of fiber-like material and is held upward against the valve plate by a washer 20 and this, in turn, is held in place by a loose rivet 21 which extends through the valve plate 16 and the bottom of pressure pan 17.

The top part of pressure pan 17 is held in position by a shaft 23 onto which it is attached by sleeve 24 attached to the upper side of the pan. Shaft 23 extends upward to and is held in upper sleeve 25, centrally attached and positioned on the under face of upper cap 3 by head 26. Shaft 23 telescopes in sleeve 25 and its lower end slides on sleeve 24 when spring 27 is compressed. Sleeve 24 is retained by pin 28 extending through shaft 23. Relative rotation of pan 17 and cap 3 is prevented by key lugs 28 engaging in keyway 29 in shaft 23.

Open spring 27 extends between the upper face of pressure pan 17 and the under face of the closing cap. This spring holds pressure pan 17 downward with a pre-determined pressure. This pressure is such that the valve plate and its gasket seals on seat 10 with a force sufficient to maintain pressure in the radiator above atmosphere, as desired.

Since this pressure will force the entire radiator cap to blow off the neck whenever the upper cap portion 3 is released and thus will allow steam and hot water to escape from the upper portion of the radiator in a manner likely to scald and burn a person removing the cap, we will provide a means for releasing the valve plate from its closed position on the seat 10 which can be operated from a position on top of the cap 3 and without releasing it from the neck 7.

This means consists of a link rod 30 which is connected by a tab 31 to one edge of the hold-down pan 17. The link extends up through a hole 32 in the top of cap 3, extends above the top and connects to the outer end 33 of the upper arm 34 of a U-shaped spring 35 which has its lower arm 36 attached to the upper face of cap 3.

As shown in Figure 2, the spring 35 is compressed by a lever 38 pivoted on shaft 38a, which has a cam 39

which engages against the upper arm 34 of spring 35 when in the lowered position shown. In this position the link 31 does not pull upward on the lug 31 and does not interfere with the closing action of the valve plate 16.

When lever 38 is moved upward, as shown in Figure 3, and end cam portion 40 of the lever which is a continuing part of cam 39, engages against the upper arm 34 of spring 35, the arm is raised. Cam portion 40 is arranged so that the tension of the upper arm of the spring 35 is released and the spring tends to open and thereby exerts a pull on link 30. The tension of spring 35 is great enough to overcome the tension of spring 27 on valve plate 16 thereby raising one edge of the valve plate as shown in Figure 3. This opens the upper part of the radiator 43 so that steam and hot water escape through the opening 41 and enter the interior area 12 within neck 7, as indicated by arrows 42. This steam, released by the tilting of valve plate 16, escapes through the overflow drain pipe 14, as also indicated by arrows 42.

When steam pressure in radiator 42 has reached atmospheric pressure the cap 3 may be removed without danger of scalding the user. When the cap is replaced, lever 38 is moved downward to the position shown in Figure 2, and cap 3 is replaced on neck 7.

It is to be noted that the raising of lever 38 raises valve plate 16 and keeps it open until it is again lowered. This effective way of releasing pressure in radiator 43 is simple, easy to operate, and the parts used are cheap and may easily be attached to caps now commonly used.

A sealing washer 45 surrounds hole 32 in cap 3 through which the upper part of link 30 extends and a fiber washer 46 maintains a tight closure between the top of neck 7 and the underface of cap 3. It is to be understood that the radiator, the spout including cap 3, by itself, the resiliently closing valve plate 16, and the valve seat 10 have been commonly used on automobile radiators and are not in themselves, a part of this invention. The invention, here concerned, resides in the means disclosed for opening the valve closing plate 16 and relieving the pressure in the radiator without removing or disturbing the cap 3 to avoid the danger of scalding the user when the cap is opened as has been done heretofore.

Therefore the following claims are made.

1. A radiator cap for closing the filling spout of a radiator of a water cooled internal combustion engine, having a neck connected to the radiator top which has an opening with valve seat rim, an overflow pipe in the lower part of said neck, an upper closing cap removably attached to the top of the spout neck, and a closing valve plate attached to the lower face of the upper closing cap, resiliently closing on said valve seat, means for unseating said valve plate without disturbing said upper closing cap consisting of a link connected to said valve plate and extending upward through said closing cap, a valve opening spring on top of said cap attached to said link and adapted to normally hold said valve plug in unseated open position, and a lever on top of said closing cap operating a cam adapted to compress said valve opening spring so that said valve plate will remain closed, and adapted to release said valve opening spring to unseat said valve plate, when desired.

2. In a radiator for water cooled internal combustion engines, having a shell, a spout including a neck attached to the top of said shell and covering an opening in the top of said shell, a top closing cap removably attached by lugs to the top of said neck, an overflow pipe connected to the lower part of said neck, a valve seat formed around said opening in said shell, and a valve plate attached to the lower face of said closing cap by resilient means and normally resiliently closing on said valve seat when said closing cap is attached to the top of the spout neck, means for unseating said valve plate to open the radiator into said spout neck, so that vapor pressure will be discharged through said overflow pipe, consisting of a U-shaped spring having an upper arm and a lower arm mounted on the top of said closing cap, a link operatively extending through said cap attached at its lower end to a side portion of said closing plate and at its upper end to the upper arm of said U-shaped spring, and a lever attached to the top of said cap having a cam with two faces at its attached end, said cam faces and said link being arranged so that when said lever is horizontal the upper arm of said U-shaped spring is lowered so that the tension of said U-shaped spring is not applied through said link to said valve seat closing plate, and when said lever is raised said cam will release the upper arm of said U-shaped spring and it will raise said closing plate from its seat so that vapor pressure from said radiator will be released into said neck and will escape through said overflow pipe.

3. In a radiator for water cooled internal combustion engines, having a shell, a spout including a neck attached to the top of said shell and covering an opening in the top of said shell, a top closing cap removably attached by lugs to the top of said neck, an overflow pipe connected to the lower part of said neck, a valve seat formed around said opening in said shell, and a valve plate attached to the lower face of said closing cap by a valve closing spring normally resiliently closing on said valve seat when said closing cap is attached to the top of the spout neck, means for unseating said valve plate to open the radiator into said spout neck, so that vapor pressure will be discharged through said overflow pipe without loosening the cap on the spout neck, consisting of a valve opening spring attached to the top of said cap, a link attached at its lower end to an edge portion of said valve plate and extending upward through said cap in slidable and vapor tight relation therewith and attached at its upper end to said valve opening spring, lever means on top of said cap for compressing said valve opening spring, when desired, so that said valve closing spring will maintain said valve plate on said valve seat, said lever means being manually operatable so that compression of said valve opening spring may be released, when desired, thereby tilting said valve plate and raising it from said seat.

4. In a radiator for water cooled internal combustion engines, having a shell, a spout including a neck attached to the top of said shell and covering an opening in the top of said shell, a top closing cap removably attached by lugs to the top of said neck; said cap having a hole for the admission of a link; an overflow pipe connected to the lower part of said neck, a valve seat formed around said opening in said shell, and a valve plate attached to the lower face of said closing cap by a valve closing spring normally resiliently closing on said valve seat when said closing cap is attached to the top of the spout neck, means for unseating said valve plate to open the radiator into said spout neck, so that vapor pressure will be discharged through said overflow pipe without loosening the cap on the spout neck, consisting of a link attached at its lower end to a side portion of said valve closing plate extending upward through the hole in said cap, in slidable relation therewith, a gasket washer on the lower face of said cap surrounding said link and maintaining it in vapor tight relation with the top of said cap, a valve opening spring on the top of said cap operatively connected with the top end of said link and normally lifting one edge of said valve plate, and a manually operatable lever on top of said cap adapted to compress said valve opening spring so that said valve closing spring will force said valve plate on said valve seat.

References Cited in the file of this patent

UNITED STATES PATENTS

2,591,562	Levell	Apr. 1, 1952
2,634,748	Morrison	Apr. 14, 1953
2,641,437	Jay et al.	June 9, 1953