United States Patent [19]

Tusing

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[54] **RADIATOR CAP**

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[21] Appl. No.: **437,615**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 402,196, Oct. 1, 1973, abandoned.

[52] **U.S. Cl.** **220/203;** 220/209; 220/360; 220/361; 220/367; 220/373; 220/DIG. 27

[51] **Int. Cl.²** **B65D 51/16**

[58] **Field of Search** ..... 220/373, 203, 209, 303, 220/366, 367, 360, 361, DIG. 27

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[57] **ABSTRACT**

A radiator cap adapted to allow coolant to forcibly be added to the interior of the radiator while the cap remains attached thereto. The cap includes the usual cap body that grips the filler neck for removable attachment thereto and a pressure plate assembly including a gasket and having a spring for yieldably urging the gasket against a seat portion of the filler neck. The inventive cap also includes an outer tubular bypass communicating the interior of the radiator with the exterior thereof and a lower check valve selectively occluding the outer bypass. The lower check valve is automatically opened to admit air/fluid to pass into the radiator when the pressure therein drops below atmospheric pressure, i.e., the air/fluid passes through the outer bypass. The lower check valve may also be automatically opened by forcing fluid through the outer bypass thus allowing coolant to be admitted to the radiator without removing the cap therefrom.

An alternate embodiment additionally includes an upper check valve also selectively occluding the outer bypass. The upper end of the outer bypass is provided with a transverse aperture disposed above the upper check valve. The aperture is communicated with a recovery overflow tank and coolant is allowed to pass one way only through this aperture, i.e., from the tank into the radiator.

6 Claims, 5 Drawing Figures

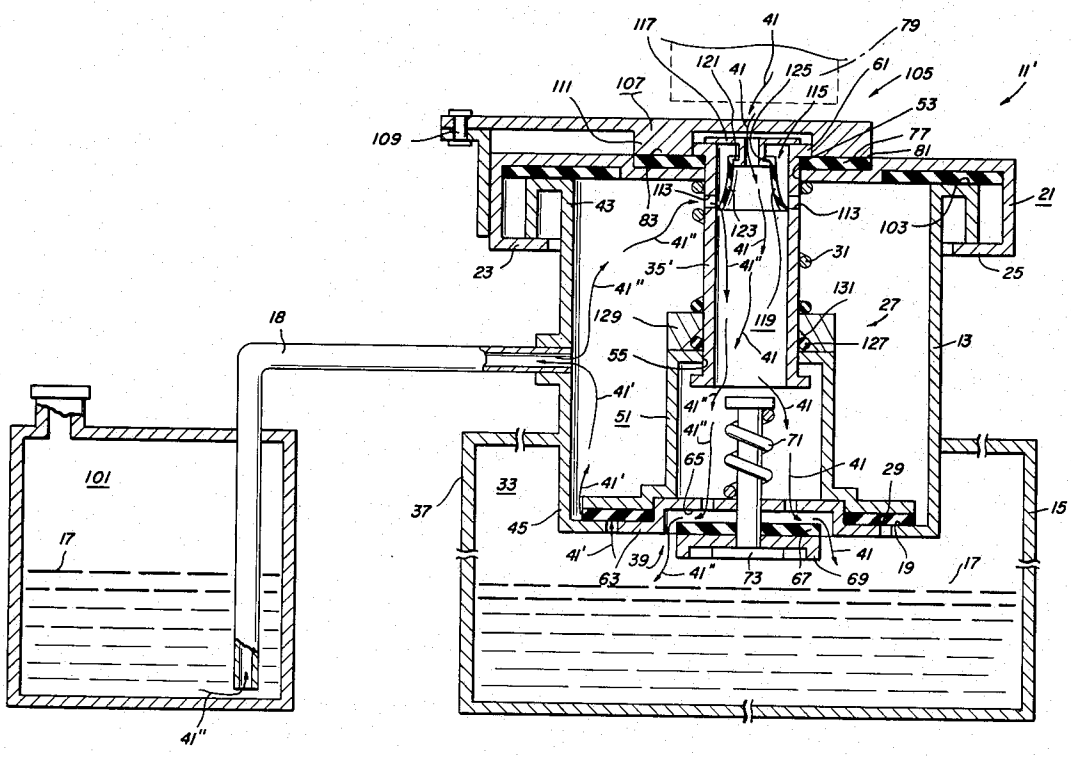


FIG. 1

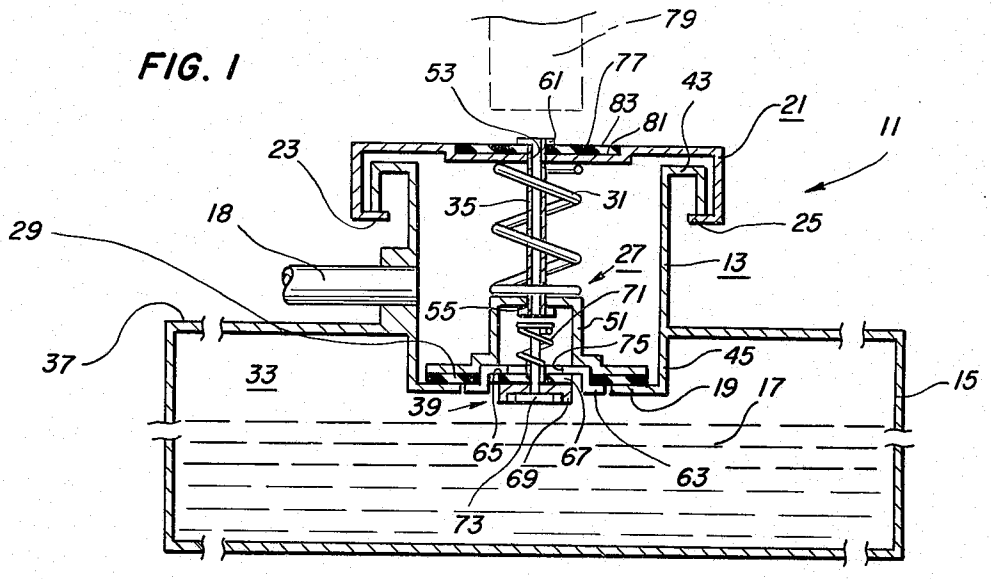


FIG. 2

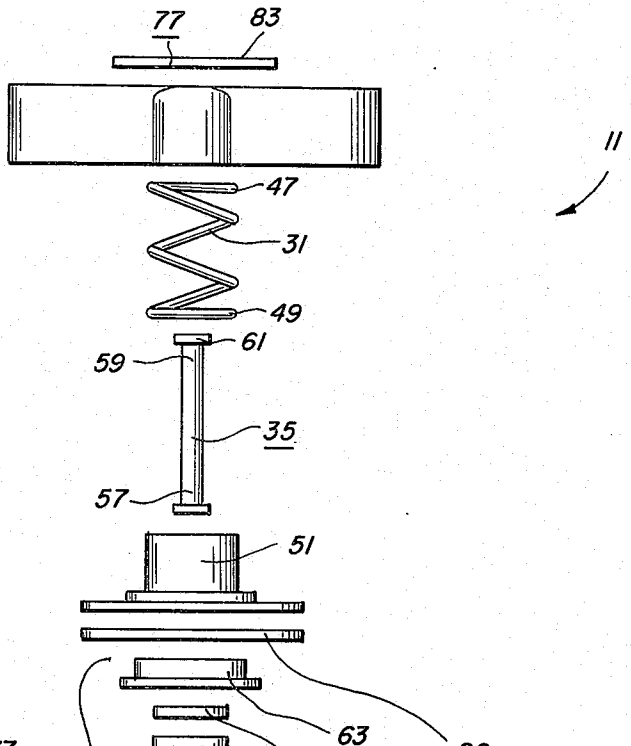
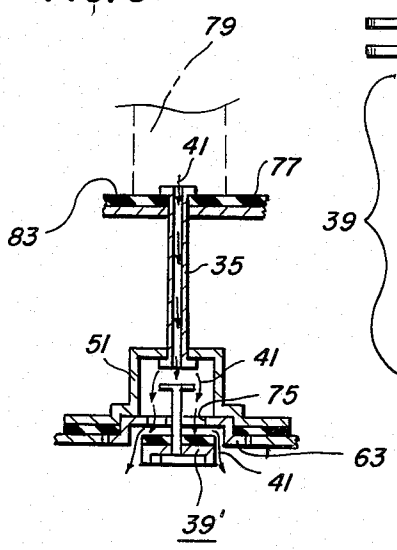


FIG. 3



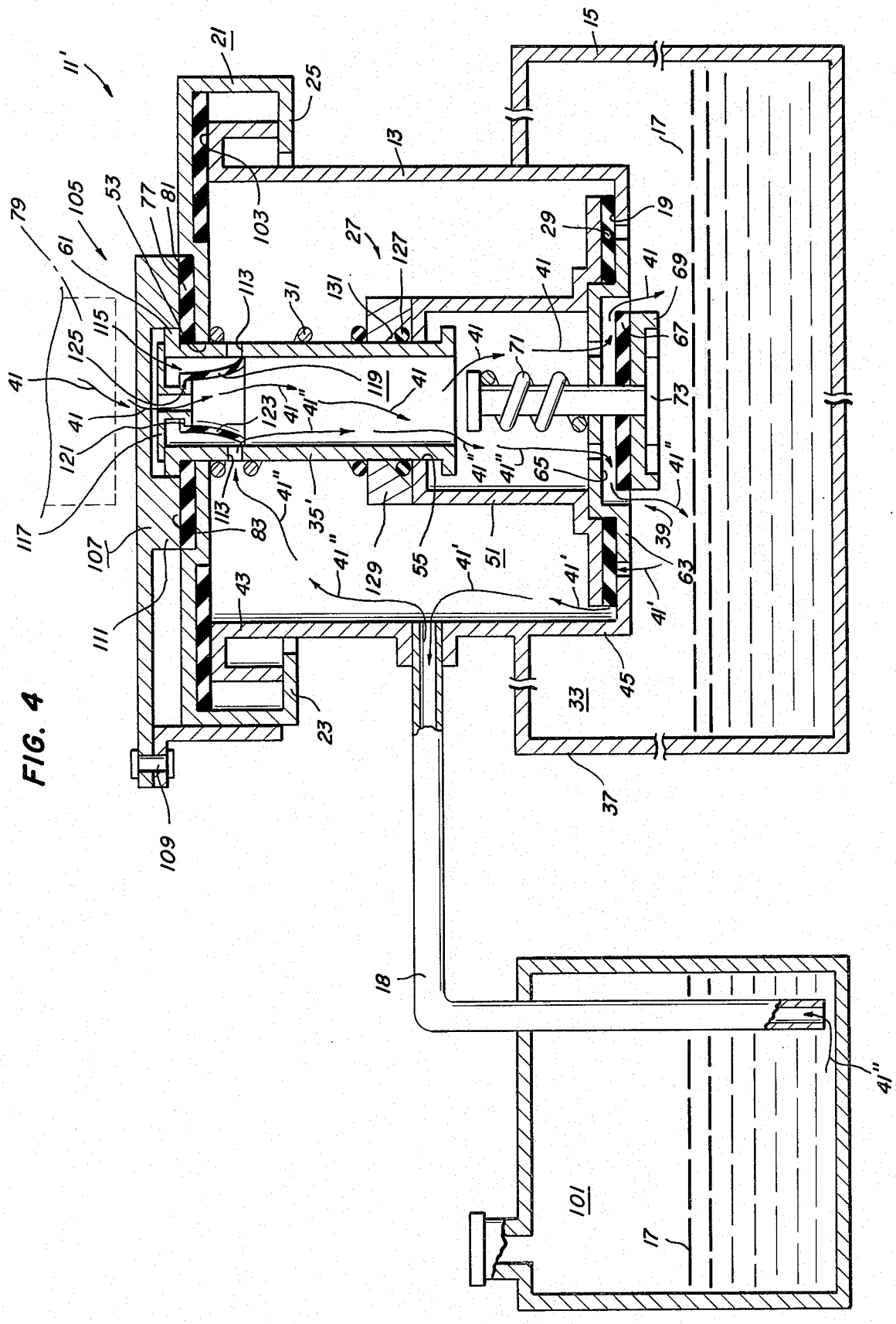
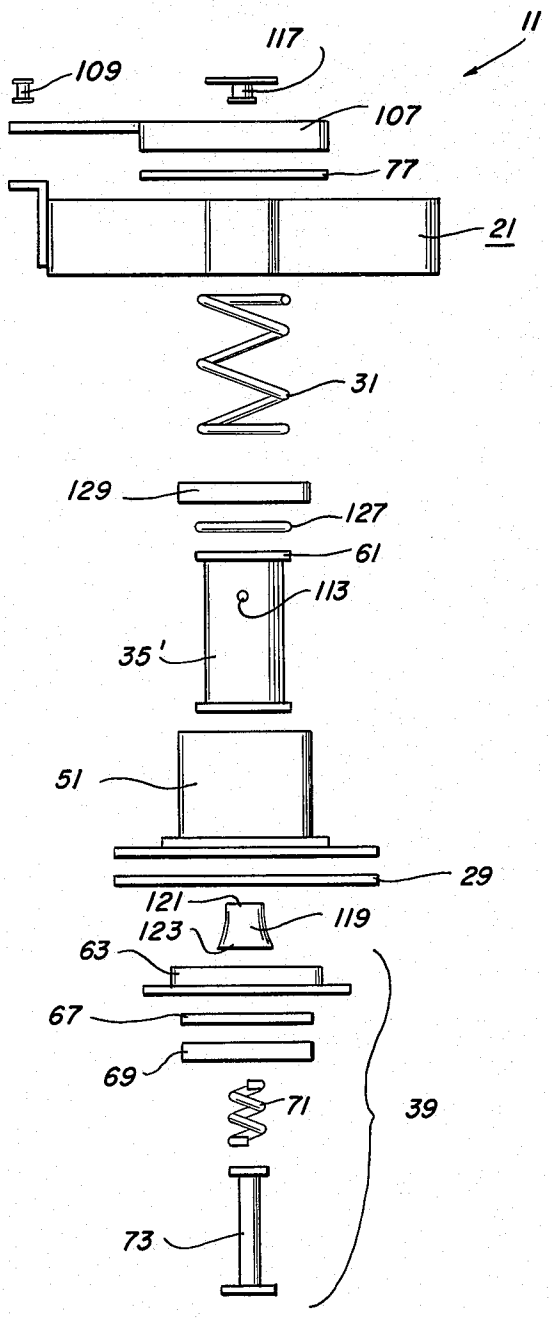

11'
21
25
13
15
17
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29
31
33
35'
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39
41
41'
41"
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127
129
131
18

FIG. 4

FIG. 5


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117
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107
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21
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129
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113
35'
51
29
121
123
119
63
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69
71
39
73

RADIATOR CAP

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of my copending application, Ser. No. 402,196 filed Oct. 1, 1973 entitled, "Radiator Cap" and now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of radiator caps and is particularly directed toward radiator caps adapted to allow coolant to be added to the radiator while the cap remains attached thereto.

2. Description of the Prior Art

Several attempts have been made during the past 50 years to perfect a radiator cap of the general type herein disclosed. This is evidenced by certain patents yet to be mentioned. However, for various reasons and in spite of these advancements the usual radiator caps, used for closing the filler necks of radiators containing coolant which is intended to cool liquid cooled internal combustion engines such as the engines used in present-day automobiles, do not allow coolant to be added to the interior of the radiator while the cap remains attached thereto. Yet almost everyone who has operated a vehicle for any length of time has experienced the age-old problem of engine overheating.

An overheated engine invariably forces a considerable amount of the coolant outwardly through the overflow line thus reducing the quantity of coolant which tends to compound the problem since the operating temperature of an internal combustion engine is normally inversely proportional to the amount of coolant forced therethrough, i.e., the coolant being at a lower temperature than is the engine.

Further, most vehicle operators are familiar with the hazards involved in attempting to remove the usual radiator cap to add coolant to the radiator of an overheated engine. Since the usual radiator is pressurized, removing the cap causes instant release of extremely hot coolant which is spewed outwardly from the radiator making it very difficult if not impossible to avoid being burned by the hot coolant. This further loss of coolant raises the operating temperature of the engine even higher, oftentimes permanently damaging the engine.

The prior art includes the following U.S. patents: the Mills U.S. Pat. No. 1,537,254; the Baskin et al, U.S. Pat. No. 1,548,244; the Ferrier U.S. Pat. No. 1,833,833; the Lisota U.S. Pat. No. 2,558,620; and the Boddie U.S. Pat. No. 3,380,619. None of the above references disclose or suggest applicant's device. However, it should be mentioned that the Baskin et al, U.S. Pat. No. 1,548,244 which was filed in 1921 appears to be first in recognizing the problem or at least certain aspects of the problem herein disclosed. The complexity of certain of the prior radiator caps and the expense involved in manufacturing them probably are contributing factors as to why the usual present-day radiator cap does not incorporate the advantage of permitting coolant to be added to the radiator without removing the cap.

It should also be mentioned that the usual present-day radiator cap incorporates structure to maintain a predetermined pressure on the coolant, i.e., it has been found that pressurization of cooling systems results in greater heat transfer efficiency. Accordingly, radiator caps of various pressures are available, e.g., normally ranging from 7 lbs. per square inch up to 15 lbs. per square inch. In other words, once the pressure reaches the set limit, air and/or coolant may be exited from the radiator to prevent overpressurizing the radiator. On the other hand, these radiator caps also incorporate vacuum relief valves for allowing air to be admitted to the radiator as the radiator cools down, i.e., thus preventing a vacuum pressure within the radiator.

Another radiator cap, used recently in conjunction with a vented recovery overflow tank, additionally includes means for sealing the top of the filler neck as well as the bottom thereof, i.e., the bottom seal is spring loaded to pop open when the selected pressure is reached. This radiator cap assures that the coolant escaping from the radiator is transferred to a vented recovery overflow tank where it is temporarily stored. The only passageway for fluid to be readmitted to the radiator as it cools off is through the overflow tube which is communicated with the overflow tank. Therefore, the negative pressure developed within the radiator as it cools down draws fluid from the overflow tank into the radiator.

SUMMARY OF THE INVENTION

The present invention is directed towards overcoming the disadvantages and problems relative to previous radiator caps. The present invention provides a radiator cap which incorporates the aforementioned advantages of the usual present-day radiator cap, i.e., the ability to pressurize the cooling system and provide vacuum relief. More specifically, the present invention is directed toward providing a radiator cap that is constructed along similar lines of the usual present-day radiator cap, thus minimizing the complexity and the cost thereof to enhance the probability of widespread use thereof. Additionally, the inventive radiator cap is adapted to allow coolant to be admitted to the radiator, even though it is overheated, without removing the cap therefrom.

The radiator cap of the present invention includes the usual cap body that grips the filler neck for removable attachment thereto and a pressure plate assembly including a gasket and having a spring for yieldably urging the gasket against a seat portion of the filler neck. The instant cap also includes an outer tubular bypass which communicates the interior of the radiator with the exterior thereof and a lower check valve which selectively occludes the outer bypass. The lower check valve is automatically operable to an open position to admit air/fluid to pass into the radiator when the pressure therein drops below atmospheric pressure, i.e., the air/fluid passes through the outer bypass. The lower check valve may also be automatically operable to the open position by forcing fluid through the outer bypass thus allowing for coolant to be admitted to the radiator without removing the cap therefrom.

An alternate embodiment is also disclosed which is intended for use with the above described recovery overflow tank. The alternate embodiment additionally includes an upper check valve also selectively occluding the outer bypass. The upper end of the outer bypass is provided with a transverse hole disposed above the upper check valve and which opens into the filler neck. This transverse hole is communicated with the recovery overflow tank and coolant is allowed to pass one way only through this aperture, i.e., from the tank into

the radiator. Also included is an eyelet rivet which functions as an inner tubular bypass to permit the transverse hole to be bypassed when adding coolant to the radiator without removing the cap therefrom. Additionally, a manually operable stopper is included which normally plugs the outermost end of the outer and inner tubular bypasses to enable the filler neck to hold a slight vacuum for pulling fluid from the overflow tank. When it is desired to add fluid to the radiator while the cap remains attached thereto, the stopper is manipulated so as to unplug these inner and outer tubular bypasses, thus enabling fluid to be added in like manner as the principal embodiment. Unplugging these bypasses does not vent the radiator, therefore, hot coolant will not spew out of the radiator by manipulating the stopper.

DESCRIPTION OF THE DRAWING

FIG. **1** is a sectional view of the radiator cap of the present invention shown suitably attached to the filler neck of a radiator with the view being taken as on a vertical plane through the center line and showing coolant supply structure in phantom which may be used to add coolant to the radiator without removing the cap therefrom.

FIG. **2** is an exploded elevational view of the radiator cap of the present invention.

FIG. **3** shows the coolant supply structure in phantom suitably engaging the device; also the path the replenishment coolant travels in bypassing the cap is shown.

FIG. **4** is a view similar to FIG. **1** depicting an alternate embodiment of the inventive radiator cap, shown in combination with a recovery overflow tank.

FIG. **5** is an exploded elevational view of the alternate embodiment of the radiator cap of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The radiator closing device or radiator cap **11** is intended for closing the filler neck **13** of a radiator **15**, which contains coolant **17** used to cool a liquid cooled engine (not shown). The filler neck **13** includes the usual overflow tube **18** and seat means **19** for sealable engagement with the radiator cap **11** in the usual manner which enables the coolant **17** to be pressurized.

The device **11** generally comprises a cap body **21** including means, such as the inwardly directed flanges **23, 25,** for gripping the filler neck **13** thus removably attaching the device **11** to the radiator **15.** Pressure plate means **27** are included having gasket means **29** and spring means **31** which yieldably urges the gasket means **29** against the seat means **19** thus sealing the interior **33** of the radiator **15** from without. Outer tubular bypass means **35** is included for communicating the interior **33** of the radiator with the exterior **37** thereof. Lower check valve means **39** is provided for selectively occluding the bypass means **35.** The lower check valve means **39** is automatically operable to an open position as depicted in FIG. **3** of the drawing and characterized therein by the numeral **39'** to admit air/fluid, indicated by the arrows **41,** into the interior **33** of the radiator **15** when the pressure therein drops below atmospheric pressure. The air/fluid, shown by the arrows **41,** passes through the outer bypass means **35.** The lower check valve means **39** may also be automatically operated to the open position **39'** by forcing fluid under pressure, e.g. water, through the outer bypass means **35** thus allowing the coolant **17** or water to forcibly be admitted to the interior **33** of the radiator **15** while the closing device **11** remains attached to the radiator **15.** Therefore, the arrows **41** in FIG. **3** synonymously illustrate air, coolant, or simply water.

More specifically, the filler neck **13** has a proximal end **43** and a distal end **45** with the seat means **19** being adjacent the distal end **45** and the flanges **23, 25** gripping the proximal end **43** in a well-known manner. Further, the spring means **31** preferably is a compression spring which is disposed subjacent the cap body **21** with the upper end, as at **47** thereof, restingly engaging the cap body **21** and the lower end, as at **49,** of the spring means **31** restingly engaging the pressure plate member **51** of the pressure plate means **27.** Accordingly, the pressure plate member **51** coacts with the spring means **31** for yieldably urging the gasket means **29** tightly against the seat means **19** thus sealing the interior **33** of the radiator from without. It should be understood that the tension of the spring means **31** is predetermined so that when the pressure within the radiator builds up to a specified pressure the pressure plate member **51** pops up or moves toward the cap body **21** thus compressing the spring means **31** to allow an intermittent escapement of air and/or coolant from the radiator **15.** In other words, the tension on the spring means **31** determines the maximum pressure permitted to build up within the radiator **15.**

From FIG. **1** of the drawing it may be seen that the outer tubular bypass means **35** is disposed within the filler neck **13** and extends from the pressure plate member **51** to the cap body **21.** Accordingly, the cap body **21** and the pressure plate member **51** are provided with respective apertures **53, 55** for receiving the outer bypass means **35.** More specifically, the lower end, as at **57,** of the outer bypass means **35** extends through the aperture **55** and the upper end, as at **59,** of the outer bypass means **35** extends through the aperture **53** with the spring means **31** being circumferentially disposed about the outer bypass means **35.**

The device **11** also includes captive means **61** for attaching the cap body **21,** the pressure plate means **27,** and the spring means **31** one to the other in such a manner that the pressure plate means or member **51** is movable yieldably towards the cap body **21** against the resistance of the spring means **31.** It should be understood that the captive means **61** is intended to include the latest developments in the state of the art for attaching the pressure plate member **51** to the cap body **21** in the above-described manner. In view of the above, I prefer to simply show the captive means **61** as an enlarged portion of the upper end **59** of the outer bypass means **35** with the upper end **59** being free to slide to and fro within the aperture **53,** i.e., as a result of pressure buildup in the interior **33** as above described.

On the other hand, the upper end **59** of the outer bypass means **35** may optionally be fixedly attached to the cap body **21** in any well-known manner as by brazing or the like. In this event, the pressure plate member **51** would be slidably received about the lower end **57** of the outer bypass means **35,** i.e., thus enabling the pressure plate member **51** to slide along the lower end **57** as a result of the pressure buildup as above described. In other words, the outer bypass means **35** and the pressure plate member **51** may be integrally formed or fixed

one to the other in which case the upper end **59** is free to slide in the aperture **53** or if desirable, the pressure plate member **51** may be free to slide about the outer bypass means **35** as above described.

The lower check valve means **39** may be of any well-known construction for selectively occluding the bypass means **35.** Accordingly, sufficient disclosure should be evident by simply stating that the lower check valve means **39** preferably includes a main body member **63** which is conveniently attached to the pressure plate member **51** and includes a valve seat **65.** Additionally, the lower check valve **39** includes a seal member **67,** a seal actuating member **69,** a compression spring **71,** and a rivet **73.** The rivet **73** captures the seal actuating member **69,** the seal member **67,** and the compression spring **71** to the main body member **63** in such a manner that the seal actuating member **69** is movable yieldably away from the main body member **63.** It should also be mentioned that the main body member **63** is provided with a plurality of apertures as at **75** which are selectively closed and opened by the seal member **67,** i.e., the lower check valve means **39** being moved to the open position shown by the numeral **39'** (FIG. **3**) when the pressure in the interior **33** of the radiator **15** drops below atmospheric pressure as previously described. Accordingly, the air/fluid, shown by the arrows **41** (FIG. **3**), as well as the fluid under pressure or replenishment coolant **17** passes through the apertures **75** when admitted to the interior **33.**

The device **11** preferably includes means, such as annular seal means **77,** suitably disposed adjacent the exterior of the cap body **21** and conveniently attached thereto for sealably receiving certain replenishment coolant supply structure, for example, the end of a garden hose **79** or the like, which delivers the pressurized replenishment coolant **17** to the outer bypass means **35.**

More specifically, the cap body **21** preferably is recessed as at **81** with the seal means **77** being fixedly attached to the exterior of the cap body **21** with the outer surface of the seal means preferably being flush with the exposed exterior surface of the cap body **21.** The outer surface, as at **83,** of the seal means **77** preferably is resilient (e.g., made out of rubber, plastic or the like) for sealable engagement with the coolant supply structure or garden hose and the like as the coolant supply structure **79** is manually urged thereagainst.

Accordingly, it will be appreciated that the coolant supply structure **79** need not be specially constructed or adapted with fittings or the like to force coolant **17** into the radiator **15.** Therefore, the seal means **77** not only sealably engages the flat end of a garden hose but sealably engages limitless other typical nozzles and the like to facilitate the desired feature of instantly adapting the device **11** to an extremely wide variety of coolant supply structures **79.** The ultimate objective of instantly adapting a wide variety of coolant supply structures **79** to the radiator cap **11** has the obvious advantage of minimizing the delay in replenishing the coolant **17** in an overheated radiator **15** without exposing anyone to the hazard of being scalded by the extremely hot coolant, i.e., as experienced when removing the usual well-known prior devices.

ALTERNATE EMBODIMENT

Particular attention is now directed toward FIGS. **4** and **5** of the drawings wherein it may be seen that an alternate embodiment of the radiator cap is disclosed and is character referenced therein by the numeral **11'.** The radiator cap **11'** is similar in some respects to the radiator cap **11,** accordingly, the similar structure will be identified by identical numerals while structure peculiar to the radiator cap **11'** will be fully disclosed and identified by numerals peculiar thereto.

The radiator cap **11'** is intended to be used in conjunction with the previously described radiator **15.** However, in this embodiment the overflow tube **18** thereof is communicated with a vented recovery overflow tank **101.** The radiator cap **11'** assures that the coolant **17** escaping from the radiator **15** is transferred to the vented recovery overflow tank **101** where it is temporarily stored. The negative pressure developed within the radiator **15** by the normal cooling down process draws the coolant **17** from the overflow tank **101** back into the radiator **15** in a manner about to be described.

The usual filler neck **13** includes a previously described valve seat **65** which will hereinafter be referred to as primary seat means also character referenced by the numeral **65.** Additionally, the filler neck **13** includes secondary seat means, as at **103.** The primary and secondary seat means **65, 103** coact with the device **11'** for sealing the respective lower and upper ends of the filler neck **13.** The cap body **21** is provided with the aperture **53** and disposed about the aperture **53** is the previously described annular seal means **77.** The radiator cap **11'** is characterized by stopper means, as at **105** for selectively closing and opening the aperture **53.** The stopper means **105** may simply include a lid member **107** which is pivotally attached to the cap body **21** by a vertical pivot pin **109.** The lid member **107** preferably includes an annular shoulder, as at **111,** which contiguously engages the annular seal means **77.** Thus, the negative pressure developed in the interior **33** of the radiator **15** is readily captured in the filler neck **13** from whence it is communicated through the overflow tube **18** to the recovery tank **101.**

The radiator cap **11'** includes outer tubular bypassing means **35'** which is very similar to the outer tubular bypass means **35** previously described. The bypass means **35'** preferably is larger in diameter than is the bypass means **35.** Further, the bypass means **35'** is provided with at least one but preferably a plurality of transverse holes, as at **113,** which are disposed adjacent the cap body **21** as clearly shown in FIGS. **4** and **5** of the drawings. The outer tubular bypass means **35'** is disposed in the filler neck **13** and extends from the pressure plate means **27** to the cap body **21** for communicating the interior **33** of the radiator **15** with the exterior **37** thereof, in the same manner as previously described for the principal embodiment.

The radiator cap **11'** includes upper check valve means, as at **115,** selectively occluding the outer tubular bypass means **35'.** The upper check valve means **115** is disposed subjacent the transverse holes **113** and functions automatically for allowing one-way flow of coolant **17** through the transverse hole **113.**

The radiator cap **11'** also includes means, e.g., inner tubular bypass means **117,** disposed within the outer tubular bypass means **35'** and coacting with the upper check valve means **115** for isolating the upper interior of the outer tubular bypass means **35'** from the lower interior thereof.

The radiator cap **11'** includes the previously described check valve means **39** which hereinafter will be referred to as lower check valve means and is character referenced in FIGS. **4** and **5** of the drawings by the numeral **39.** The lower check valve means **39** normally allows a positive pressure to build up within the interior **33** of the radiator **15.** Additionally, the lower check valve means **39** is automatically operable to allow coolant **17** to pass from the recovery overflow tank **101** into the interior **33** of the radiator **15** as the pressure therein drops below atmospheric pressure. In this regard, the coolant **17** passes through the overflow tube **18** into the filler neck **13,** thence entering the outer tubular bypass means **35'** (through the transverse hole **113** therein), thence through or about the respective upper and lower check valve means **115, 39.**

The lower check valve means **39** is also automatically operable to allow coolant **17** to be added to the radiator **15** through the aperture **53** provided in the cap body **21.** This may be accomplished by: First, opening the stopper means **105** while the device **11'** remains attached to the radiator **15;** second, by forcing fluid, such as water under pressure, through the outer bypass meand **35'** in the same manner as fully described above for the principal embodiment.

The upper check valve means **115** includes a flexible umbrella-like member **119** having an upper circular portion, as at **121,** and a lower flared skirt-like portion, as at **123.** The flared skirt-like portion **123** normally sealably engages the interior wall of the outer tubular bypass means **35'** as clearly shown in FIG. **4** of the drawings. The circular portion **121** is provided with an aperture **125** for receiving the lower end of the inner tubular bypass means **117.** The upper end of the inner tubular bypass means **117** extends upwardly through the aperture **53** provided in the cap body **21** and sealably engages the cap body **21.** A positive pressure beneath the skirt-like portion **123** caused by forcing water or the like through the inner and outer tubular bypass means **117, 35'** tends to expand the skirt-like portion. Thus, the water is precluded from exiting outwardly through the transverse hole **113** provided in the outer tubular bypass means **35'.** On the other hand, the skirt-like portion **123** is automatically collapsible inwardly to allow free passage thereabout of the coolant **17** which enters the outer tubular bypass means **35',** through the transverse holes **113** provided therein, i.e., the coolant **17** ultimately passes into the interior **33** of the radiator **15.**

The means coacting with the upper check valve means **115** for isolating the upper interior of the outer tubular bypass means **35'** from the lower interior thereof preferably includes the inner tubular bypass means **117.** However, if desirable, the bypass means **117** may constitute a typical eyelet rivet which extends through the respective apertures **125, 53** provided in the circular portion **121** and the cap body **21.** In this regard, the eyelet rivet conveniently fixedly attaches the upper check valve means **115** to the cap body **21** in a manner well known to those skilled in the art.

The radiator cap **11'** preferably includes O-ring means, as at **127,** circumferentially engaging the outer tubular bypass means **35'** for sealing the pressure plate means **27** to the outer tubular bypass means **35'.** In this regard, a washer **129** is included which is chamfered, as at **131,** to direct and urge the O-ring **127** inwardly against the outer tubular bypass means **35',** i.e., the spring **31** restingly engages the washer **129.** Thus, the pressure plate means **27** is free to slide up and down as the pressure in the radiator varies.

The arrows **41** depicted in FIG. **4** of the drawings clearly show the path in which fluid travels through the outer tubular bypass means **35'** and the lower check valve means **29** when water under pressure is added to the radiator while the device **11'** remains attached thereto. Additionally, arrows character referenced by the numeral **41'** clearly depict the path the coolant **17** travels when a positive pressure develops in the interior **33** of the radiator **15.** Thus, this causes the coolant to pass outwardly through the overflow tube **18** and be temporarily stored within the overflow tank **101.** Further, arrows character referenced by the numeral **41''** clearly depict the path the coolant travels when being returned from the overflow tank **101** to the interior **33** of the radiator **15,** i.e., as the radiator **15** cools down.

Although the invention has been described and illustrated with respect to preferred embodiments thereof, it is not to be so limited since changes and modifications may be made therein which are within the full intended scope of the invention.

I claim:

1. In combination with a vented recovery overflow tank and a radiator communicated one with the other through the filler neck of the radiator, of a closure device for closing the filler neck of the radiator and allowing coolant to be admitted to the interior of the radiator while said closure device remains attached to the radiator, said device comprising a cap body provided with an aperture disposed concentrically thereof, said filler neck including primary and secondary seat means coacting with said device for sealing the respective lower and upper ends of said filler neck, pressure plate means disposed adjacent said primary seal means and including spring means for yieldably allowing pressurized coolant to pass from said radiator into said filler neck thence into said recovery overflow tank, outer tubular bypass means disposed within said filler neck and extending from said pressure plate means to said cap body for communicating the interior of said radiator with the exterior thereof, stopper means for selectively closing and opening said outer tubular bypass means, said pressure plate means being provided with an aperture for receiving the lower end of said outer bypass means with the upper end of said outer bypass means extending through said aperture in said cap body, said outer tubular bypass means being provided with at least one transverse hole opening into said filler neck, upper check valve means selectively occluding said outer tubular bypass means and being disposed therein subjacent said transverse hole for allowing one-way flow of coolant through said transverse hole, and lower check valve means for normally allowing a positive pressure within the interior of the radiator, said lower check valve means being operable selectively to allow coolant to pass from said recovery overflow tank into the interior of the radiator as the pressure therein drops below atmospheric pressure and by forcing fluid through said outer bypass means.

2. The combination of claim **1** in which is included means coacting with said upper check valve means for isolating the upper interior of said outer tubular bypass means from the lower interior thereof.

3. The combination of claim 2 in which said means coacting with said upper check valve means includes inner tubular bypass means.

4. The combination of claim 2 in which said upper check valve means includes a flexible unbrellalike member having an upper circular portion and a lower flared skirtlike portion, said flared skirtlike portion normally sealably engaging the interior wall of said outer tubular bypass means, said circular portion being provided with an aperture for receiving the lower end of said inner tubular bypass means, the upper end of said inner tubular bypass means extending through said aperture provided in said cap body and sealably engaging said cap body, said upper check valve means precluding fluid which passes through said inner and outer tubular bypass means from exiting outwardly through said transverse hole provided in said outer tubular bypass means, and said skirtlike portion thereof being automatically collapsible to allow free passage thereabout of coolant entering said outer tubular bypass means through said transverse hole provided therein to ultimately pass into the interior of the radiator.

5. The combination of claim 4 in which said inner tubular bypass means includes an eyelet rivet extending through the apertures provided in the circular portion of the upper check valve means and the cap body, said eyelet rivet fixedly attaching said upper check valve means to said cap body.

6. The combination of claim 1 in which is included O-ring means circumferentially engaging said outer tubular bypass means for sealing said pressure plate means to said outer tubular bypass means, said pressure plate means being free to slide up and down as the pressure in the radiator varies between predetermined limits.

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