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[33] **Japan**
[31] **43/72940**

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55.3, 40 (S)

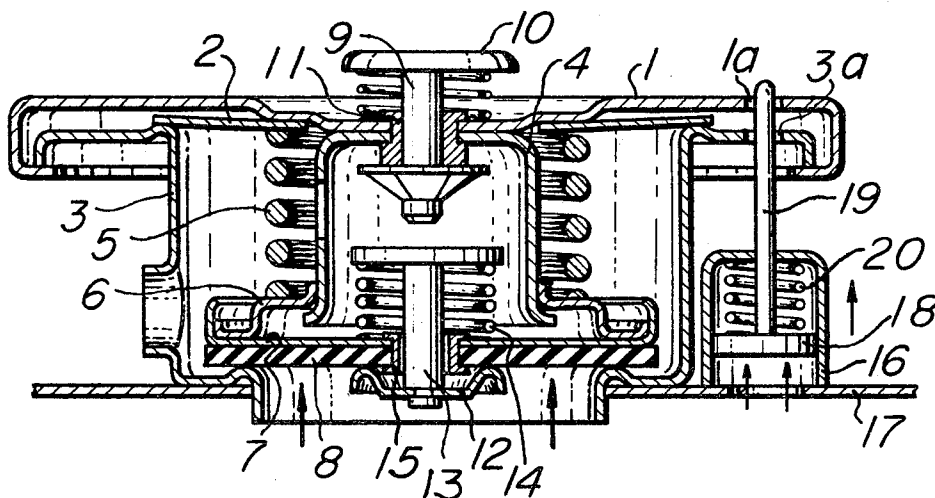
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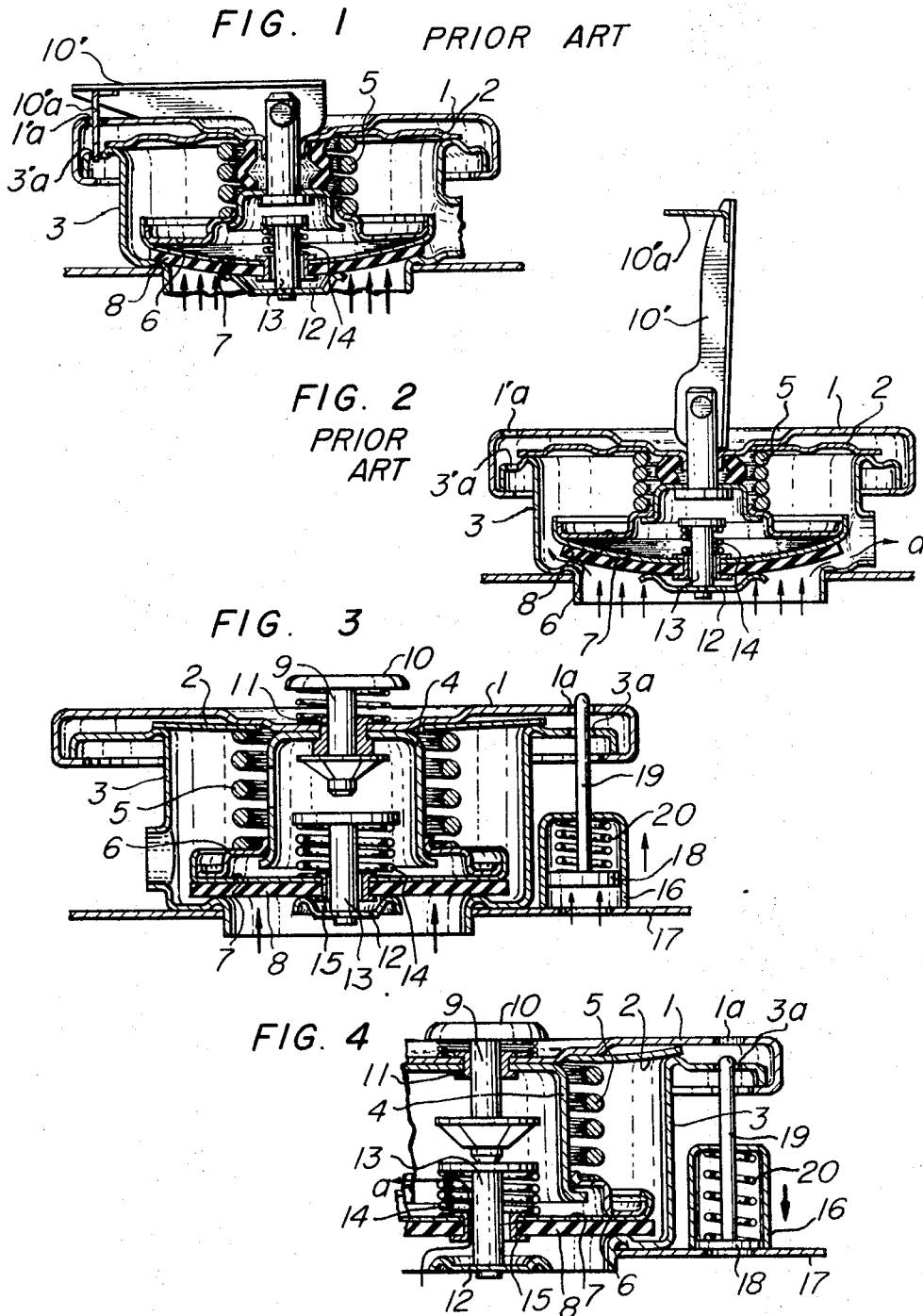
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[54] **PRESSURE CAP UNIT WITH PRESSURE
RELEASING MEANS FOR RADIATORS OF
INTERNAL COMBUSTION ENGINES**
2 Claims, 8 Drawing Figs.

[52] U.S. Cl..... 220/40,
220/44
[51] Int. Cl..... B65d 41/06

ABSTRACT: A pressure cap unit with pressure releasing means for the radiators of internal combustion engines, which is so designed that it cannot be removed unless the internal pressure of the associated radiator has been completely released and which, therefore, can be handled with no danger of scald and is highly safe.





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FIG. 6

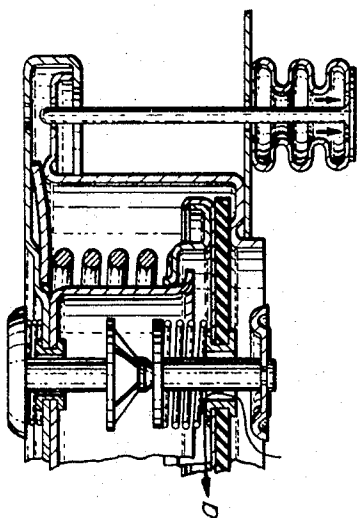


FIG. 8

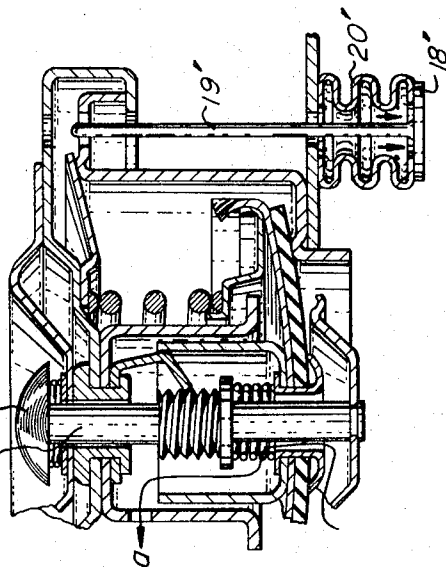


FIG. 5

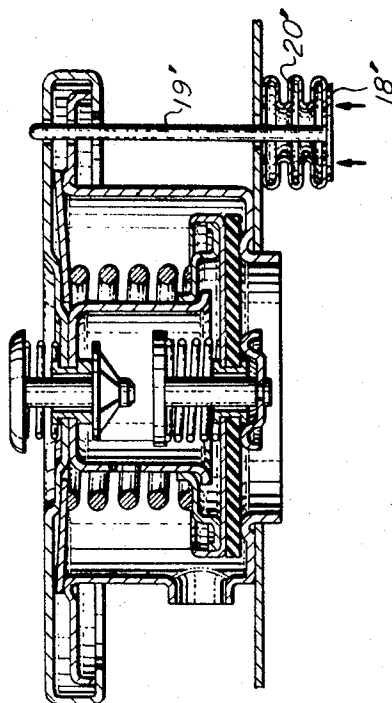
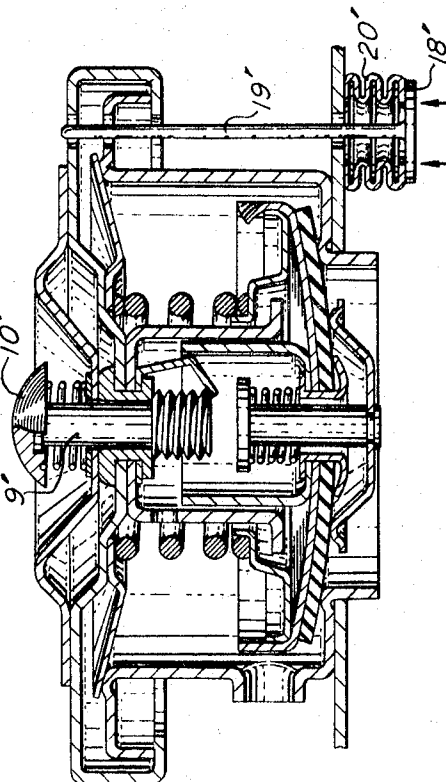


FIG. 7



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PRESSURE CAP UNIT WITH PRESSURE RELEASING MEANS FOR RADIATORS OF INTERNAL COMBUSTION ENGINES

The present invention relates to a pressure cap unit with pressure releasing means, which is adapted for radiators of the internal combustion engines, for example, of automotive vehicles.

Conventional pressure cap units of the type described above are so designed that once a pressure reducing lever has been raised up, the cap is removable even before the internal pressure of the associated radiator has been released completely, so that there is the danger of the operator getting scalded in the hand by the steam blowing off the radiator. Thus, the conventional cap units have the drawback that they are not entirely satisfactory from the safety standpoint.

It is, therefore, the object of the present invention to provide a highly safe pressure cap unit which obviates the foregoing drawback or the conventional ones and which is so designed that it cannot be removed before the internal pressure of the associated radiator has been completely released, whereby the danger of scald otherwise caused by a jet of steam of the like can be completely eliminated.

The present invention will now be described in detail with reference to an embodiment illustrated in the accompanying drawings, in which:

FIG. 1 is a vertical sectional view of a conventional pressure cap unit showing the positions of the component parts when the cap unit is in use;

FIG. 2 is a fragmentary vertical sectional view of the pressure cap unit of FIG. 1, showing the positions of the component parts when the internal pressure of the associated radiator is reduced;

FIG. 3 is a vertical sectional view of the pressure cap unit according to the present invention, showing the positions of the component parts when the cap unit is in use;

FIG. 4 is a fragmentary vertical sectional view of the pressure cap unit of FIG. 3, showing the positions of the component parts when the internal pressure of the associated radiator is reduced.

FIG. 5 is a vertical sectional view of a modification of the pressure cap unit shown in FIGS. 3 and 4, wherein members 18' and 20' are used instead of the pressure sensing members 16, 18 and 20 in FIGS. 3 and 4, and which is in a normal position;

FIG. 6 is a fragmentary vertical sectional view of the pressure cap unit of FIG. 5, showing the positions of the component parts after the pressure has been released sufficiently;

FIG. 7 is a vertical sectional view of a conventional pressure cap unit in a normal position, to which the pressure sensing members 18' and 20', shown in FIGS. 5 and 6, are applied; and

FIG. 8 is a fragmentary vertical sectional view of the pressure cap unit of FIG. 7, showing the positions of the component parts after the pressure has been released sufficiently. In the drawings, same numerals designate same or corresponding parts.

First of all, the conventional pressure cap unit will be described with reference to FIGS. 1 and 2. When the pressure cap is desired to be removed, a pressure reducing lever 10' is raised up at first to release the internal pressure of the associated radiator as indicated by the arrow *a* and also to disengage locking means 10'a of said pressure reducing lever 10' from slots 1'a and 3'a, and then the pressure cap is removed by revolving a handle 1. In this way, it is possible to eliminate the danger which would be induced when the pressure cap is removed directly without using any pressure replacing means. However, according to the construction described above, since the pressure cap is removable even before the internal pressure has been released completely, there still remains the danger of the operator getting scalded in his hand by the steam or the like emitting from the radiator and thus, the conventional pressure cap has the drawback that it is not entirely satisfactory from the standpoint of safety.

Now, the pressure cap unit according to this invention will be described with reference to FIGS. 3 and 4. According to the invention, as shown in FIGS. 3 and 4, a leaf spring 2 is provided on the underside of the handle 1. The leaf spring 2 bears against the top edge of a pressure cap mounting port 3 when the pressure cap is mounted on said mounting port. A pressing spring 5 is provided around a cylindrical member 4, fitted to the handle 1, with one end bearing against the handle 1 and the other end against a spring seat member 6. The spring seat member 6 is formed integrally with a packing mounting member 7 to which a rubber packing 8 is fitted. A valve pushing rod 9 is formed integrally with a pressure reducing button 10. The handle 1 and the cylindrical member 4 are caulked together by means of a rivet 11. A negative pressure releasing valve 12 is provided on an operating member 13 and normally held in pressure contact with the rubber packing 8 under the biasing force of the spring 14 acting on said operating member 13, thereby sealing the interior of the radiator from the outside. The valve operating member 13 is projecting upwardly in opposed relation to the valve pushing rod 9. The packing mounting member 7 and the rubber packing 8 are secured to each other by means of a rivet 15. A cylinder 16 is mounted on or at the top wall 17 of the radiator in communication with the interior of the radiator and a piston 18 is slidably mounted in said cylinder in sealing contact with the inner wall the latter. Namely, the piston 18 has, for example, an O-ring fitted around the periphery thereof for preventing leakage of steam or water through the space between the piston and the cylinder and for sliding movement therethrough. The piston 18 is operated by an operating rod 19 directly connected thereto and urged downwardly under the biasing force of a spring 20 which is disposed between said piston and the top wall of said cylinder 16. The top end of the operating rod 19 is extending upwardly through holes 1a and 3a formed in the handle 1 and the flange of the pressure cap mounting port 3 respectively.

The pressure cap of the present invention constructed as described above operates in the following manner: Namely, when the pressure cap is in use, the piston 18 is moved upwardly under the internal pressure of the radiator, while compressing the spring 20, and accordingly the operating rod 19, integral with said piston, is held in engagement with the holes 1a, 3a in the handle 1 and the pressure cap mounting port 3, whereby the handle 1 is prevented from revolving and the pressure cap cannot be removed from the radiator. When the pressure cap is desired to be removed, the pressure reducing button 10 is depressed, whereupon the internal pressure of the radiator is released to the outside as indicated by the arrow *a* and when the internal pressure has been reduced completely, the pressure having been acting on the piston 18 is eliminated, so that the piston 18 is moved downwardly under the biasing force of the spring 20. As a result, the holes 1a in the handle 1 is released from engagement with the operating rod 19 and the handle 1 becomes rotatable, providing for removal of the pressure cap from the radiator. Namely, if attempt is made to remove the pressure cap immediately after the pressure reducing button 10 is depressed, the pressure cap cannot be removed while the internal pressure of the radiator is still being released. The pressure cap is removable only after the internal pressure of the radiator has been released completely or nearly completely and safety of the operator has been ensured. Therefore, with the present pressure cap unit, the operator is completely freed from the danger of getting scalded by the steam emitting from the radiator during removal of the pressure cap, no matter how he handles the pressure cap, and safety of the operator can be assured completely.

Although in the embodiment described and illustrated herein, use is made of the piston 18, slidably fitted in the cylinder 16, as a pressure responding mechanism which operates upon sensing the internal pressure of the radiator, it will be obvious that such present responding mechanism is not necessarily limited to the piston 18 but various other means

may be employed for the same purpose, including, for example, a bellows as shown in FIGS. 5 and 6.

It is also to be noted that the pressure sensing members 18' and 20' shown in FIGS. 5 and 6, may be applied to the conventional pressure cap unit in the manner shown in FIGS. 7 and 8. In this case, it is not necessary to keep the pressure reducing button 10' depressed throughout the period of releasing the pressure but, once the pressure reducing button 10' has been depressed, the cap is held in a pressure releasing position successively thereafter.

The present invention brings about a remarkable advantage that the danger of scald by a jet of steam during removal of the pressure cap can be avoided completely because, since the pressure responding mechanism adapted to operate upon sensing the internal pressure of the radiator is provided adjacent the pressure cap mounting port so as to restrain the locking between the pressure cap and the pressure cap mounting member from being released, the pressure cap is rotatable only under a safe condition after the internal pressure has been completely released.

We claim:

1. A pressure cap unit with pressure releasing means adapted for use with the radiators of internal combustion engines, which comprises a pressure cap, a pressure cap mount-

ing port member, means for locking said pressure cap relative to said pressure cap mounting port member and a pressure responding mechanism provided adjacent the pressure cap mounting port member and adapted to operate upon sensing the internal pressure of the associated radiator, said pressure responding mechanism including an operating rod which is held in engagement with said locking means when the pressure in said radiator has reached a predetermined value and out of engagement with said locking means when the pressure in said radiator has dropped below said predetermined value.

2. A pressure cap unit with pressure releasing means adapted for use with the radiators of internal combustion engines, which comprises a pressure cap, a pressure cap mounting port member, means for locking said pressure cap relative to said pressure cap mounting port member and a pressure responding mechanism provided adjacent the pressure cap mounting port member and adapted to operate upon sensing the internal pressure of the associated radiator, said pressure responding mechanism including an operating rod and a bellows, said operating rod being held in engagement with said locking means but released upon operation of said bellows of said pressure responding mechanism.

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