RADIATOR MOUNTING SYSTEM

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The present invention relates in general to a radiator mounting system and, more particularly, to a mounting system for a radiator for dissipating heat from a liquid used to cool an internal combustion engine, especially the engine of an automotive vehicle, such as a truck.

The invention contemplates locating the radiator between and mounting it on the two main frame members of the vehicle, these frame members extending longitudinally of the vehicle and being horizontally spaced apart transversely of the vehicle. A general object of the invention is to mount the radiator directly on the two frame members in a manner which is an integral part of the frame members. Another object of the invention is to permit the radiator to be moved vertically in the event of road impact.

More particularly, an object of the invention is to so locate the radiator that its center of gravity is between the frame members and at substantially the same level as the horizontal centerlines of the frame members, whereby the radiator is substantially balanced with respect to external forces.

Another important object is to resiliently mount the radiator on the frame members for limited relative vertical movement of the radiator and the frame members, for limited relative twisting movement of the frame members and the radiator about a horizontal, fore-and-aft axis generally perpendicular to the front and rear surfaces of the radiator, and for limited racking movement of the frame members relative to the radiator.

Still another important object is to provide means for pivoting the radiator in the event of road impact.

Considering in more detail the resilient means for mounting the radiator for floating movement relative to the frame members in various directions, the frame members are provided thereon with vertically spaced upper and lower frame elements, which may be mounted on upper and lower curved channels, respectively.

In this environment, an important object of the invention is to provide resilient means for mounting the radiator on the upper and lower frame elements in a floating manner comprising: upper and lower mounting brackets on the radiator respectively located above and below the upper and lower frame elements on the frame members; elastomeric elements between and interconnecting the upper frame elements and the upper mounting brackets, respectively, and acting in compression to support the weight of the radiator; resilient means interconnecting the upper frame elements and the upper mounting brackets, respectively, and biasing the radiator downwardly relative to the frame members; and resilient means respectively connected to the lower frame elements, and respectively pivotally connected to the lower mounting brackets about pivot axes generally perpendicular to the planes of the radiator surfaces, for biasing the radiator upwardly relative to the frame members.

With this construction, the radiator is free to float relative to the frame members in various directions, despite racking or twisting of the frame, or other distortions thereof.

Another object of the invention in the foregoing environment is to pivotally connect the aforementioned braces, for restraining the radiator against pitching movement relative to the frame about a transverse horizontal axis, to the lower frame elements on the frame members and to the lower mounting brackets on the radiator. A related object is to locate these braces forwardly of the radiator and to so orient them that they extend downwardly and rearwardly from the lower frame elements to the lower mounting brackets.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the radiator mounting art in the light of this disclosure, may be achieved with the exemplary embodiment of the invention described in detail hereinafter and illustrated in the accompanying drawing, in which:

FIG. 1 is a rear elevational view of a radiator illustrating the manner in which it is mounted on the frame of an automotive vehicle, such as a truck, in accordance with the invention, the frame including two transversely spaced, longitudinal frame members which are shown in transverse section in FIG. 1;

FIG. 2 is an enlarged, fragmentary sectional view taken as indicated by the irregular arrowed line 2—2 of FIG. 1; and

FIG. 3 is a sectional view taken as indicated by the irregular arrowed line 3—3 of FIG. 2.

In the drawing, the numeral 10 designates a radiator which is mounted on the frame 12 of a truck, or other vehicle, in accordance with the invention.

The radiator 10 may be of any suitable construction and is shown as including the usual inlet and outlet headers 16 and 18 interconnected in fluid communication by the usual core 20, the two headers being structurally interconnected by frame members 22 at opposite sides of the radiator. The inlet and outlet headers 16 and 18 are respectively provided with inlet and outlet fittings 24 and 26, respectively, and their extensions through the core 20 being provided with internal communication.

The核心 of gravity of the radiator 10 is located between the two channels 30 with its center of gravity located at substantially the same level as the longitudinal centerlines of the channels, and with its center of gravity substantially midway between the longitudinal centerlines of the frame members.
the two channels. With this construction, the radiator 10 is substantially balanced with respect to external forces applied thereto, such as those resulting from starting of the vehicle, stopping of the vehicle, turning of the vehicle, and the like.

Turning now to a consideration of the manner in which the radiator 10 is mounted on the channels 30 for floating movement relative thereto in various directions, the side frame members 22 of the radiator are provided thereon with upper and lower mounting brackets 36 and 38 respectively located above and below upper and lower frame elements 40 and 42 welded to, or otherwise secured to, and extending inwardly from, the respective upper and lower flanges 32 and 34. The upper and lower mounting brackets 36 and 38 on the radiator 10 are respectively connected to the upper and lower frame elements 40 and 42 on the channels 30 in accordance with the invention, as will now be described.

Elastomeric elements 50, having the form of blocks or pads of a suitable elastomeric material, are seated on the upper frame elements 40 and upper flanges 32 and have the upper mounting brackets 36 seated thereon. Thus, the elastomeric elements 50 act in compression to support the weight of the radiator 10 and to transmit the loads to the frame 12.

Extending downwardly through openings in the upper mounting brackets 36 and the upper frame elements 40 are bolts 52 the heads of which are seated on the upper mounting brackets 36. The bolts 52 are provided at their lower ends with nuts 54 on which are seated washers 56 serving as seats for the lower ends of compression coil springs 58 encircling the bolts. The upper ends of the springs 58 are seated against the upper frame elements 40, whereby these springs serve to bias the radiator 10 downwardly relative to the frame 12 to tend to increase the compression in the elastomeric elements 50. It will be noted that the holes in the upper mounting brackets 36 and the upper frame elements 40 through which the bolts 52 extend are enlarged relative to the bolts. With this construction, the radiator 10 may move relative to the channels 30 in all directions to permit the radiator to float relative to the frame 12. For example, the radiator 10 can move upwardly or downwardly relative to the frame 12, can move horizontally relative to the frame 12 in the transverse direction, can move horizontally relative to the frame 12 in the longitudinal direction, and the like.

The radiator 10 is stabilized relative to the frame 12 by stabilizing means designated generally by the numerals 60. These stabilizing means include generally upright bolts 62 connected at their lower ends to the lower mounting brackets 38 by pivot assemblies 64 providing pivot axes extending longitudinally of the frame 12 and perpendicular to the front and rear surfaces of the radiator 10. The bolts 62 extend upwardly through enlarged holes through the lower frame elements 42. Encircling the bolts 62 above the lower frame elements 42 are compression coil springs 66 the lower ends of which are seated against the lower frame elements 42 and the upper ends of which are seated against washers 68 retained by nuts 70 threaded on the upper ends of the bolts 62. As will be apparent, the springs 66 bias the radiator 10 upwardly relative to the frame 12, thus opposing the biasing action of the springs 58. Because of the pivotal connections of the bolts 62 to the lower mounting brackets 38, and because of the enlarged holes for the bolts through the lower frame elements 42, the radiator 10 is free to float relative to the channels 30 in all directions.

The stabilizing means 60 for the radiator 10 also includes bracing means 72 pivotally connected to the radiator and the frame 12 and connecting the radiator against relative pitching movement of the radiator and the frame 12 about a horizontal axis generally parallel to the front and rear radiator surfaces and extending transversely of the frame. More particularly, the bracing means 72 includes two braces 74 pivotally connected to the lower frame elements 42 forwardly of the radiator 10 by pivot assemblies 76 providing aligned horizontal pivot axes extending transversely of the frame 12. The braces 74 extend downwardly and rearwardly from the pivot assemblies 76 and are connected at their other ends to the lower mounting brackets 38 by pivot assemblies 78 providing parallel pivot axes which are inclined upwardly and rearwardly relative to the frame 12.

It will be noted that the braces 74 are relatively short, being pivotally connected to the lower frame elements 42 a short distance ahead of the radiator 10, and being connected to the lower mounting brackets 38 a short distance below channels 30. This construction provides adequate bracing against pitching of the radiator 10 relative to the frame 12 about a transverse horizontal axis, because of the fact that the radiator 10 is substantially balanced relative to the frame 12 because of the center-of-gravity location hereinbefore discussed. Thus, the invention achieves a very compact bracing means 72, which is an important feature. Further, the pivotal connections of the braces 74 to the lower mounting brackets 38 and the lower frame elements 42 permit achieving the desired bracing action against pitching motion without interfering with the floating action provided by the hereinbefore-described connections between the upper mounting brackets 36 and frame elements 40 and the lower mounting brackets 38 and frame elements 42.

Thus, the present invention provides a radiator mounting system which permits the radiator 10 to float freely relative to the frame 12 in all directions, and which permits the use of simple and compact mounting and stabilizing means because of the fact that the radiator is substantially balanced relative to the frame 12. Thus, the present invention provides for floating movement of the radiator 10 relative to the frame 12, there is no tendency to damage the radiator as the result of racking, twisting, or other distortion, of the frame, which is an important feature. This result is achieved with very simple and compact mounting, stabilizing and bracing means requiring no cross member between the channels 30 and requiring no elongated radius rods extending from the radiator to other parts of the vehicle structure.

Although an exemplary embodiment of the invention has been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiment without departing from the spirit of the invention as defined by the claims which follow.

1. In a radiator mounting system, the combination of:
(a) two horizontally spaced frame members;
(b) a radiator located between said frame members in an upright position, with its center of gravity at approximately the same level as said frame members, and having front and rear radiator surfaces extending across the space between said frame members;
(c) stabilizing means around the radiator for said frame members for limited relative vertical movement of said radiator and said frame members, and for limited relative twisting movement of said frame members and said radiator about a horizontal axis generally perpendicular to said radiator surfaces; and
(d) bracing means pivotally connected to said radiator, and pivotally connected to said frame members adjacent said radiator, for bracing said radiator against relative pitching movement of said radiator and said frame members about a horizontal axis generally extending between said frame members.

2. In a radiator mounting system, the combination of:
(a) two horizontally spaced frame members each hav-
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ing vertically spaced upper and lower frame elements;  
(b) a radiator located between said frame members  
in an upright position, with its center of gravity at  
approximately the same level as said frame members,  
and having front and rear radiator surfaces extending  
across the space between said frame members;  
(c) said radiator having mounting brackets respectively  
located adjacent said upper frame elements;  
(d) elastomeric elements interconnecting said upper  
frame elements and said mounting brackets, respectivley,  
and acting to support the weight of said radiator; and  
(e) resilient stabilizing means interconnecting said  
lower frame elements and said radiator and permitting  
limited relative movement thereof in different  
directions.

3. In a radiator mounting system, the combination of:  
(a) two horizontally spaced frame members each hav- 
ing vertically spaced upper and lower frame elements;  
(b) a radiator located between said frame members in  
an upright position, with its center of gravity at approx- 
imately the same level as said frame members, and having  
front and rear radiator surfaces extending across the  
space between said frame members;  
(c) said radiator having mounting brackets respectively  
located above said upper frame elements;  
(d) elastomeric elements between and interconnecting  
said upper frame elements and said mounting brackets,  
respectively, and acting in compression to support the  
weight of said radiator;  
(e) resilient means interconnecting said upper frame  
elements and said mounting brackets, respectively, and  
acting in compression to support the weight of said radiator;  
(f) resilient means respectively connected to said lower  
frame elements, and respectively pivotally connected  
to said radiator about pivot axes generally perpen- 
dicular to the planes of said radiator surfaces, for  
biassing said radiator upwardly relative to said frame  
members; and  
(g) bracing means pivotally connected to said radiator  
and said frame members for bracing said radiator against  
relative pitching movement of said radiator and said  
frame members about a horizontal axis generally parallel  
to said radiator surfaces and extending between said  
frame members.

5. In a radiator mounting system, the combination of:  
(a) two horizontally spaced frame members;  
(b) a radiator located between said frame members in  
an upright position, with its center of gravity at approx- 
imately the same level as said frame members, and having  
front and rear radiator surfaces extending across the  
space between said frame members;  
(c) means interconnecting said frame members and said  
radiator, and providing for limited relative move- 
ment of said radiator and said frame members in di- 
ferent directions, for supporting the weight of said  
radiator;  
(d) bracing means connected exclusively to said frame  
elements and said radiator for bracing said radiator against  
relative pitching movement of said radiator and said  
frame members about a horizontal axis generally parallel  
to said radiator surfaces and extending between said  
frame members; and  
(e) said bracing means being connected to said frame  
members adjacent said radiator and being connected  
to said radiator adjacent said frame members.

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