April 26, 1966 K. F. FERGUSON 3,248,076

RADIATOR MOUNTING SYSTEM

Filed Aug. 24, 1964

FIG. 1.

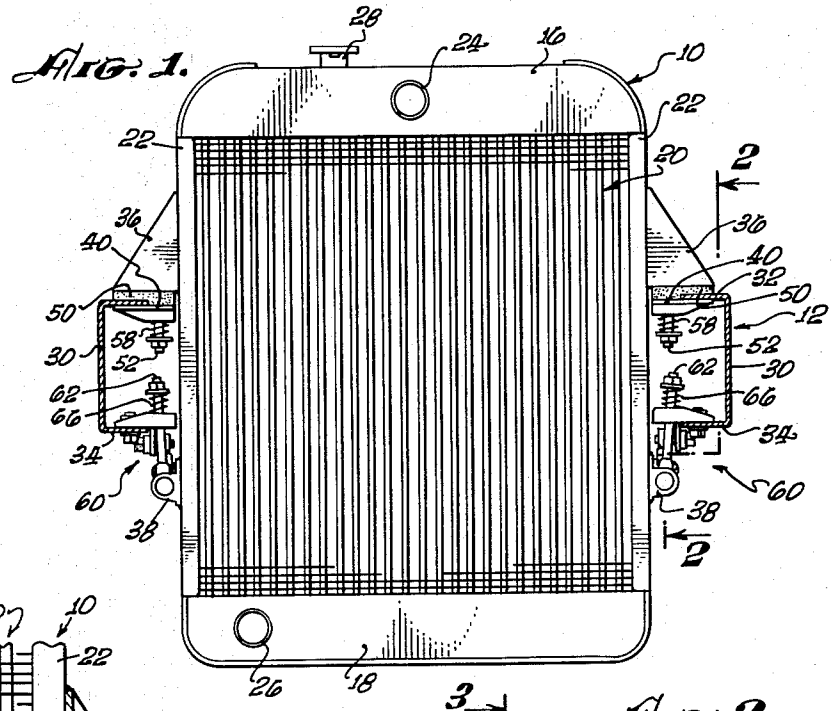


FIG. 3.

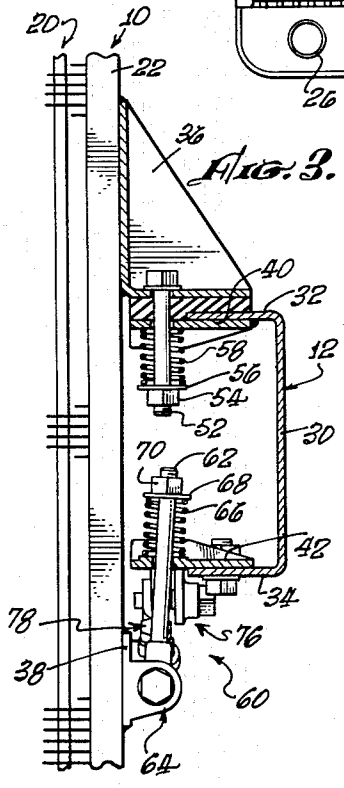
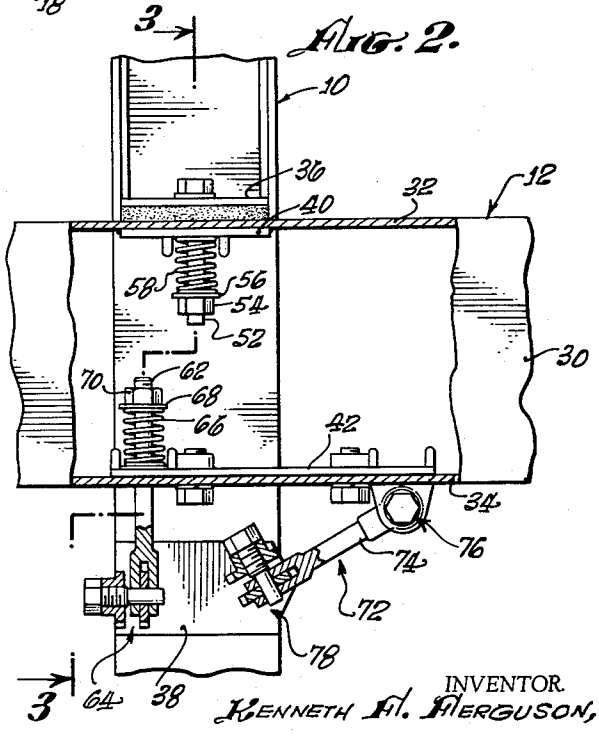


FIG. 2.



INVENTOR.
KENNETH F. FERGUSON,

By His Attorneys
HARRIS, KIECH, RUSSELL & KERN.

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RADIATOR MOUNTING SYSTEM

Kenneth F. Ferguson, Placentia, Calif., assignor to Hunt Foods and Industries, Inc., Fullerton, Calif., a corporation of Delaware

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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 mentioned without the use of any cross member between the two frame members, and without the use of radius rods extending from the radiator to other parts of the vehicle structure.

The primary object of the invention is to so locate the radiator relative to the two frame members that the radiator is substantially balanced with regard to external forces, and to so mount the radiator on the two frame members that it is free to float relative to the frame members in various directions, whereby the radiator is not affected by racking or twisting of the frame, or the like.

More particularly, an important object 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 bracing means connected to the radiator and the frame members for bracing the radiator against relative pitching movement of the radiator and the frame members about a transverse horizontal axis generally parallel to the radiator surfaces. A related object is to provide a bracing means comprising braces pivotally connected to the respective frame members and pivotally connected to the radiator at points spaced vertically from, preferably spaced vertically below, the two frame members. Since the radiator is substantially balanced against external forces, these braces can be quite short to provide a compact bracing means, which is an important feature.

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 flanges of channel-shaped frame members. 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 also 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** connectible to the internal combustion engine to be cooled, not shown, by means of conventional hoses, not shown. The inlet header **16** is provided with the usual filler neck **28** through which water, or other liquid coolant, may be introduced into the radiator **10**.

The vehicle frame **12** is conventional construction and is shown as including two main frame members in the form of channels **30** which extend longitudinally of the frame and which are horizontally spaced apart transversely of the frame. The two channels **30**, which are suitably interconnected and cross braced in a conventional manner, not shown, face inwardly toward each other and include vertically spaced upper and lower flanges **32** and **34**.

An important feature of the invention is that 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 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 same 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 channels **30** for bracing 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 substanitally 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. Since 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.

I claim:

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) resilient means mounting said radiator on 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 parallel to said radiator surfaces and extending between said frame members.

2. 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 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, respectively, 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 combinatoin of:

(a) two horizontally spaced frame members each having 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 above said upper frame elements;

(d) elastomeric elements between and interconnecting said upper frame elements and said mounting brackets, respectievly, 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 biasing said radiator downwardly relative to said frame members; and

(f) resilient stabilizing means interconnecting said lower frame elements and said radiator and permitting limited relative movement thereof in different directions and biasing said radiator upwardly relative to said frame members.

4. In a radiator mounting system, the combination of:

(a) two horizontally spaced frame members each having 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 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 biasing said radiator downwardly relative to said frame members;

(f) resilient means respectively connected to said lower frame elements, and respectively pivotally connected to said radiator about pivot axes generally perpendicular to the planes of said radiator surfaces, for biasing 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 approximately 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 movement of said radiator and said frame members in different directions, for supporting the weight of said radiator;

(d) bracing means connected exclusively to said frame members 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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CLAUDE A. LE ROY, *Primary Examiner.*

J. F. FOSS, *Assistant Examiner.*