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Kuecken

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[54] **MOBILE ANTENNA MOUNTING ASSEMBLY**

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[52] **U.S. Cl.** **343/715,** 343/880, 248/15, 248/43

[51] **Int. Cl.** **H01q 1/32**

[58] **Field of Search** 248/43, 44; 343/713, 343/715, 882, 900, 888, 880; 243/15, 20, 43

[56] **References Cited**

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[57] **ABSTRACT**

In this self-erecting antenna mounting assembly for mobile applications, the antenna mount/mount plate is attached to a base, which is fixed to or part of a vehicle, solely by a spring arrangement which provides that the antenna (typically a whip) may temporarily deflect aft beneath tree limbs, etc. without damage, while providing a far greater bias in the forward direction for preventing "whipping" from, for example, panic stops, and yet even greater bias for preventing movement to either side resulting from steep, fast turns or skids. The antenna mount is coupled to the base portion by way of three parallel springs arranged end-on threbetween at the apices of an isosceles triangle. The arrangement is such as to provide for a flexing of the two springs defining the base of the triangle and the stretching of the third, positioned forward of the other two, for an aft deflection, while a forward deflection would require the two springs to be stretched while the third is flexed, in giving rise to greater bias. The greatest bias is provided for sideways deflections, by maintaining a broad separation between the two similar acting springs defining the base of the triangle. Increasing the separation between the latter mentioned springs will further increase the spring bias against sideways deflection, while increasing the separation between the third spring and the base of the triangle as defined by the other two springs correspondingly increases the spring bias against forward deflection.

8 Claims, 3 Drawing Figures

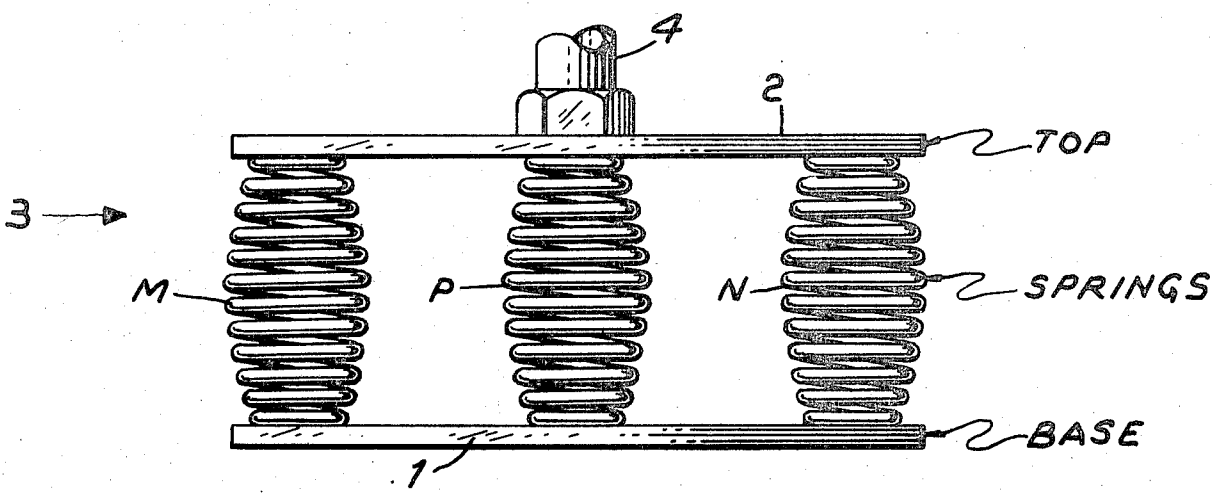


Fig. 1A

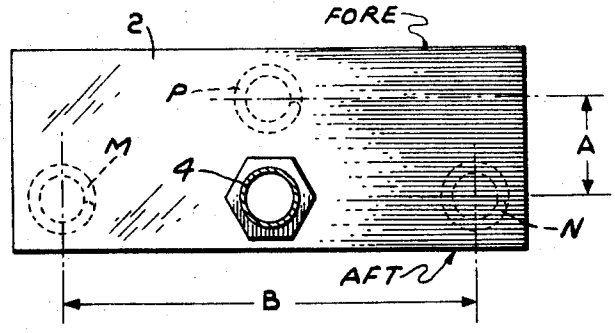


Fig. 1B

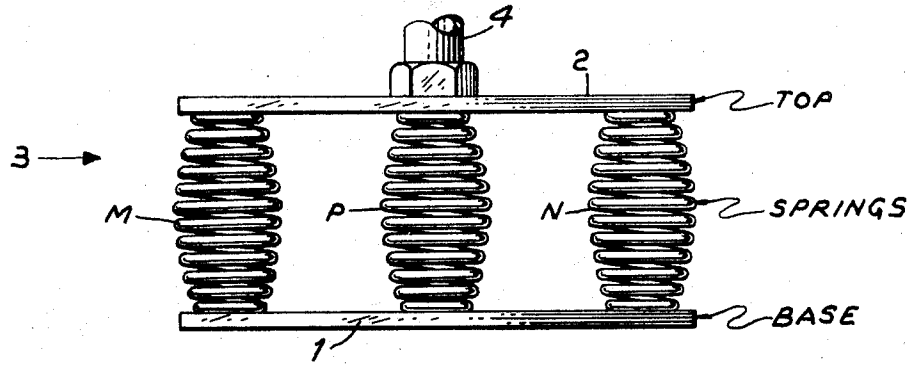
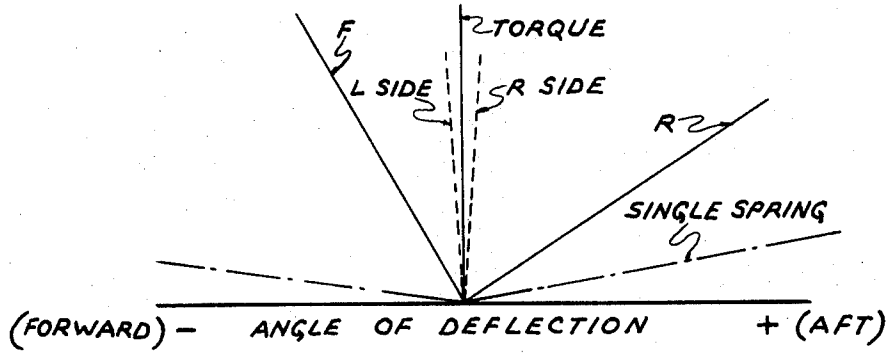


Fig. 2



MOBILE ANTENNA MOUNTING ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates to antenna mount assemblies, and more particularly to a self-erecting mobile antenna mounting assembly employing a special spring mount arrangement designed to severely dampen unwanted deflection of, for example, a rather lengthy and heavy whip antenna in the sideways and forward directions, while permitting the antenna to deflect backwards from tree limbs etc. and to return to the erect position even in the case of a fast moving vehicle.

In most mobile radio systems, especially when a tall antenna is employed, it is desirable to have the antena base attached to the vehicle in a springy manner so that the antenna can deflect beneath bridges, tree limbs, etc. without damage, and yet self-erect to the upright position for best transmitting and receiving capability. With slender antennas up to about ten feet in height a single spring is frequently employed for this purpose.

At heights in excess of 10 feet, such as 15' and 25' whips sometimes used on military vehicles, the single spring arrangements offer severe problems and whip breakage is quite common. Howeve, even when such a spring has a maximum diameter of say 2 inches and a wire diameter of say 0.250 inches, the performance is marginal on high-speed vehicles (as opposed to low-speed military trucks). Moreover, multi-spring arrangements have heretofore failed to differentiate effectively between fore and aft deflections and also to substantially eliminate sideways deflections in spring mountings.

In practice, the requirements for a good antenna base spring assembly should be very sensitive to direction. For example, the spring assembly should be only just stiff enough to prevent excessive backward "blow-down" from the slip stream of high speed driving, whereas it should be very stiff in the forward direction to prevent the antenna from whipping across the vehicle in the event of a "panic" stop. Sideways, the assembly should be stiffer yet to prevent whipping-out in the event of a skid or a fast turn.

SUMMARY OF THE INVENTION

It is, therefore, the principal object of this invention to provide an antenna mounting assembly for mobile applications in which the above hazzards are avoided and the above-mentioned requirements of a good antenna mount assembly are achieved.

According to the broader aspects of the invention, there is provided in a mobile antenna mount assembly, a spring mounting arrangement providing predetermined unequal spring biasing against deflection of an antenna coupled to the mounting assembly in the forward, aft and side directions.

This arrangement comprises a triangular arrangement of springs for effecting biasing against deflection of an antenna mounted to the assembly in each of the fore, aft and side directions, with the triangular spring arrangement providing in each of the respective directions a predetermined different bias.

A feature of the invention is that it is capable of use in a wide range of antenna heights and vehicle speeds.

Another feature is the invention's capability for spring positional adjustment to meet the varying operating conditions and environment.

A further feature is that the top plate, to which the antenna is secured and which in turn is coupled to the base portion solely by the spring arrangement, may be made of a strong insulating material such as silicone-bonded fiberglass, thus providing a very low capacitance and low-loss insulator of great physical strength and very favorable electrical characteristics in an r.f. field.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other objects and features of this invention will become more apparent and the invention itself will be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which:

FIGS. 1A and 1B are top and side views respectively of a spring antenna mounting assembly according to the invention; and

FIG. 2 is a graphical representation of the deflection biasing capability of the arrangement according to FIGS. 1A and 1B.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The antenna mount assembly of FIGS. 1A and 1B illustrates the principle of this invention. A base 1, which is rigidly mounted (not shown) to a convenient portion of a vehicle, and which defines fore, aft and left and right side directions relative to the vehicle, supports the spring assembly 3 and a top portion 2, to which an antenna such as a whip 4 is mounted. As particularly shown in FIG. 2B the spring assembly 3 comprises three springs designated M, P and N, arranged end-on between the top portion 2 and the base 1 in a spaced relationship of predetermined dimensions. Top portion 2, preferably is composed of a suitable very strong insulative material, which would provide a very low capacitance and low-loss insulative properties with great physical strength and favorable electrical characteristics in an r.f. field, such as, for example, silicon-bonded fiberglass.

As may be particularly seen in FIG. 1A, the spring assembly comprising preferably closed-turn springs M, P and N, are in a triangular arrangement such that the base of the triangle is defined by springs M and N near the rearward edge of top portion 2 which corresponds to the aft portion of the vehicle. The spring P is mounted substantially centered between springs M and N to form an isosceles triangle, and is displaced from the base of the triangle a predetermined distance A. Springs M and N in turn are arranged to be spaced apart a predetermined distance B. Spring P in being mounted forward of the base line drawn between springs M and N is physically arranged proximate the fore edge of the top portion 2. Top portion 2, as is the case with base 1, provides top and bottom broad surfaces, wherein the surfaces of top portion 2 facilitate the mounting thereto repsectively of the whip antenna 4 and the three springs M, P and N, and likewise with base 1, the surfaces facilitate respectively a mounting of the springs M, P and N and of the base 1 to the vehicle itself.

The springs M, N and P may be mounted end-on in any suitable known manner to enable positional (lateral) adjustments. In the case of springs M and N, the mounting would permit side-to-side positional adjustment, while the mounting of spring P would permit fore

and aft positional adjustment. Antenna 4 is preferably mounted on the base line of the triangle form by springs M, N and P, midway between springs M and N and directly behind or aft of spring P.

Springs M and N are intended to have predetermined equal physical properties according to the weight and height of the antenna 4 mounted to top portion 2; spring P, too, is intended to have predetermined physical properties, also based on the physical characteristics of the antenna to be employed, with spring P preferably being the same as M and N. Such an arrangement has met with very successful operation in practice.

FIG. 3 is a graphical representation of the behavior of the spring assembly in terms of torque and angle of deflection for the respective aft, forward and sideways deflections. With the three closed-turn springs M, N and P mounted at the apices of the triangle, the torque in an aft deflection would effect a flexing of springs M and N, while the spring P is stretched. In a forward deflection, spring P if flexed and springs M and N are stretched. It may be seen that in the former or aft deflection case, the spring arrangement provides for a particular angle of deflection for a corresponding torque, as represented by the line R in the graph according to FIG. 3. On the other hand, the line F is a representation of a forward deflection wherein a greater torque is required to provide even smaller angles of deflection, the illustrated result, therefore, being that the spring arrangement, with M and N being arranged to form the base of a triangle which is parallel to the aft edge of top portion 2 and spring P being arranged toward the fore edge of top portion 2, enables a greater bias against deflection in the fore direction. The desirable disparity between fore and aft deflection may be easily attained and controlled through the choice of dimension A (FIG. 1A), larger spans yielding greater stiffness.

By the illustrated arrangement of springs M, N and P, there is provided extremely stiff biasing against sideways deflection either to the left or right, as is indicated in FIG. 3 according to the lines designated L side and R side. In similar manner to the above, an increase in the stiffness of sideways deflection may be obtained by increasing the dimension B (FIG. 1A). Thus, full control of base spring parameters in the desirable directional sensitive manner may be obtained through the use of conventional springs. It is to be noted in FIG. 3 that a dashed-line graphical representation is included for a single spring type mounting assembly commonly found in the art, wherein the same large antenna (15' or greater) is employed. In cases where a whip of 15 or more feet long is used, FIG. 3 indicates that the angle of deflection is great for even a small amount of torque, thus showing decidely the shortcomings of single spring arrangements for larger antenna applications. It is to be noted further that the forward and rearward deflection in single spring applications is substantially the same, in contrast to the demonstrated directional sensitivity of the instant case.

It is to be understood that the foregoing description of specific apparatus is made by way of example only and is not to be considered as limiting on the scope of this invention.

I claim:

1. In a whip antenna mount assembly, a triangular arrangement of spring means for effecting a biasing against deflection of an antenna mounted to the assembly in each of fore, aft and side directions, said triangular arrangement of spring means being adapted to provide in each of the respective named directions a predetermined different bias.

2. An antenna mounting assembly comprising a base defining fore, aft and left and right side directions; an antenna mount; and a spring mounting arrangement coupled between said base and said mount for providing predetermined separate and distinct spring biasing against deflection of an antenna secured to said mount in fore, aft and side directions.

3. The assembly according to claim 2 wherein said spring mounting arrangement includes a plurality of springs each arranged end-on between said base and said mount and defining a triangle, the base of said triangle being in turn defined by first and second springs to be of predetermined dimension and perpendicular to the fore and aft directions, with a third spring of said triangular plurality being positioned from said triangle base a predetermined separation in the fore direction.

4. The assembly according to claim 3 wherein each of said first, second and third springs are mounted to be position-adjustable, said third spring being such as to enable a variation of said predetermined separation thereof from the base of the triangle, and said first and second springs being such as to enable an adjustment of the dimension of the base of the triangle.

5. The assembly according to claim 4 wherein the antenna is secured to said mount by way of an end portion of the former which is positioned mid-way between said first and second springs at the base of the triangle.

6. The assembly according to claim 5 wherein said antenna mount is composed of a low-loss insulating material providing a very small capacitance, said mount also having great physical strength and favorable electrical characteristics in an r.f. field.

7. In an antenna mount assembly having a broad base portion and a broad top portion to which is coupled an antenna, a spring mount arrangement providing the sole coupling of the base portion to the top portion, said spring mount arrangement comprising a plurality of springs each arranged end-on between the top and base portions and positioned to be separated a predetermined amount to form a triangular arrangement, said triangular spring arrangement providing predetermined separate and distinct biasing against deflection of the antenna in fore, aft and side directions.

8. The assembly according to claim 7 wherein said springs have substantially the same physical spring properties.

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