W. E. VER PLANCK.

MEANS FOR SUPPORTING ENGINES IN SELF PROPELLED VEHICLES.

APPLICATION FILED APR. 23, 1912.

1,080,736.

Patented Dec. 9, 1913.

2 SHEETS—SHEET 1.

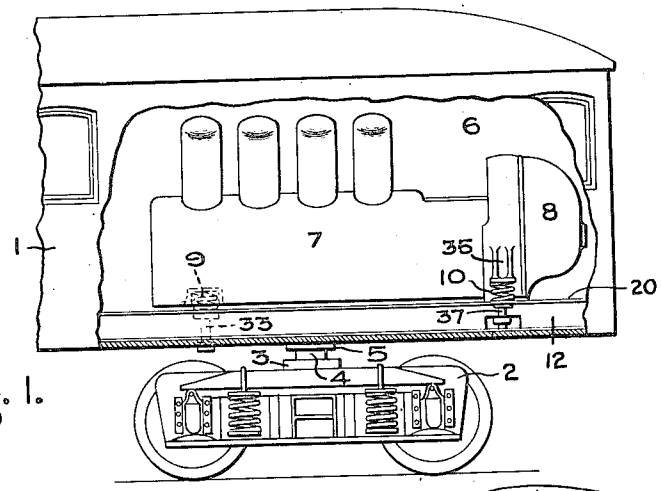


Fig. 1.

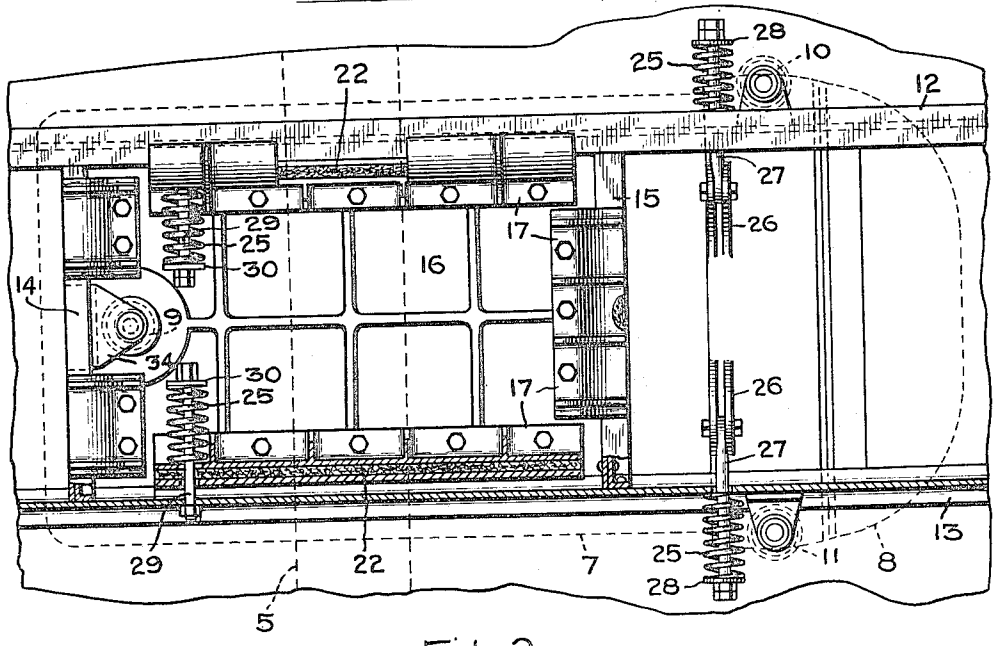


Fig. 2.

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Fig. 3.

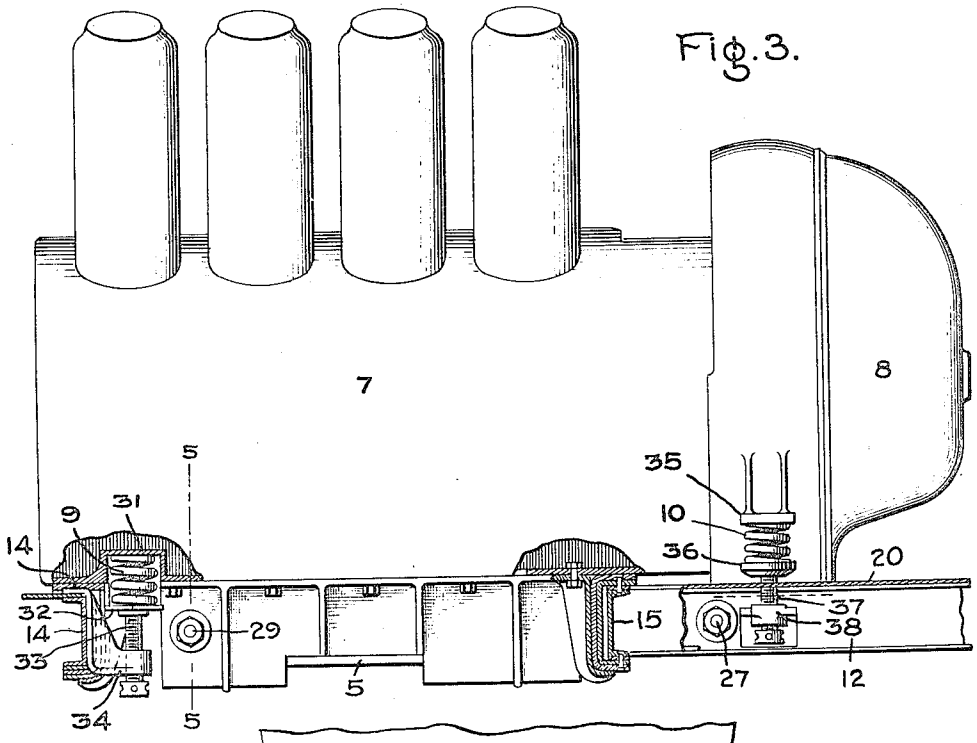


Fig. 4.

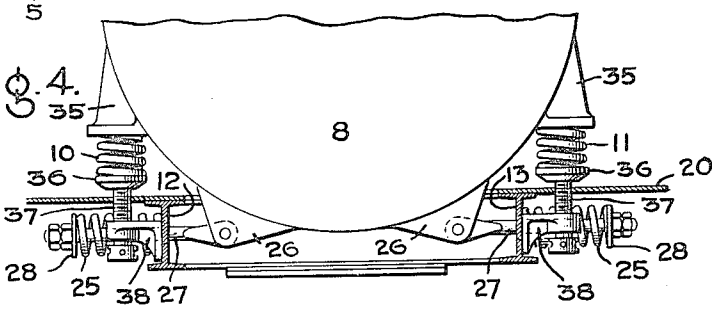
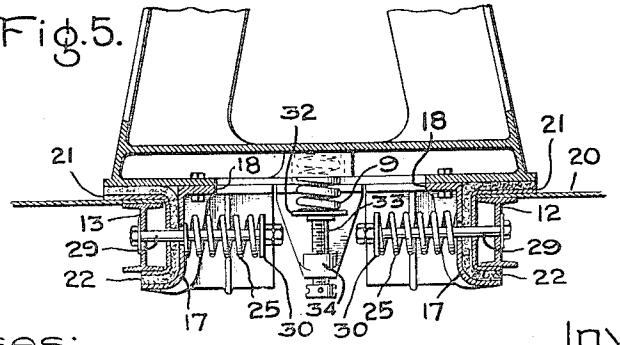


Fig. 5.



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UNITED STATES PATENT OFFICE.

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MEANS FOR SUPPORTING ENGINES IN SELF-PROPELLED VEHICLES.

1,080,736. Specification of Letters Patent. Patented Dec. 9, 1913.

Application filed April 23, 1912. Serial No. 692,747.

To all whom it may concern:

Be it known that I, WILLIAM E. VER PLANCK, a citizen of the United States, residing at Erie, county of Erie, State of Pennsylvania, have invented certain new and useful Improvements in Means for Supporting Engines in Self-Propelled Vehicles, of which the following is a specification.

The present invention relates to means for supporting engines, and more especially to supporting internal combustion engines on self-propelled vehicles, which are direct connected to and drive electric generators, the latter supplying current to electric motors mounted on the vehicle axles. In such constructions trouble has been experienced by reason of fact that the vibration of the engine, under certain conditions, is transmitted to the vehicle frame and body to the discomfort and annoyance of the occupants.

My invention has for its object to overcome the objection above referred to. Briefly stated this is accomplished by supporting the engine and generator on springs carried by the vehicle frame, the latter and the body being mounted on trucks in any usual or suitable way. By experiment I determine the speed at which the engine vibration is at a maximum. Having ascertained this I so design the engine supporting springs that they will have a very much lower period of vibration, and preferably one that is not an exact multiple of that of the engine. In other words the period of vibration of the engine and that of the springs are dis-similar. This feature of my invention is based on the fact that a given spring loaded with a certain mass has only one period of vibration; *i. e.* when impulses of a particular period are applied to it, it will vibrate and will not vibrate when impulses of any other period are applied to it. It will therefore be seen that with supporting springs of low period of vibration and an engine of relatively high period of vibration, said latter vibrations will be absorbed by the springs and hence not transmitted to the vehicle frame or support. In the motor car arrangement herein illustrated the frequency of the vibratory force is double the revolutions per minute of the crank shaft, and as the engine usually runs at speeds from 300 to 600 R. P. M. the vibratory force will have a frequency from 600 to 1200 vibrations per minute. The natural period of the springs supporting the engine must either be very much greater or very much less than the above figures. Making it very much greater would mean an extremely stiff spring which would be impracticable as even the car structure itself would not be stiff enough to raise the natural period sufficiently high. I therefore go to the other extreme and use very soft springs which give a natural period to the mass of the engine of 50 to 75 vibrations per minute. Thus when the engine is acted upon by a force vibrating 600 to 1200 times per minute it refuses to move and therefore no vibrations are transmitted through the springs to the car structure. In addition to the springs for supporting the engine and generator thick pieces of dense felt are inserted between the engine frame and the sills of the vehicle frame, which act as cushions to prevent engine movements of any appreciable magnitude, due to irregularities in the road bed or other causes and also prevent the transmission of vibrations. In order to prevent this felt from transmitting vibrations from the engine to the vehicle frame it must not be compressed to a high degree. This compression will of course depend upon the kind of felt used, and on the area of the surface to be supported by it. My experience with felt of ordinary commercial manufacture is that a compression of about ten pounds per square inch is the maximum. In order that the engine may be properly alined and to distribute the weight uniformly on the felt, said engine and its generator are supported by three springs, two being located at one end and one at the other. The two springs may be located under the engine proper or under the generator as best suits the conditions. Each of these springs is made adjustable so that the engine and generator may be adjusted with great exactness. A three point support for the engine and generator possesses many advantages in the way of simplicity in alining and adjusting as will readily be appreciated. I may also use a greater number of springs if desired; in some cases four springs arranged in pairs will be found to be satisfactory. By using a pair of springs located at one end of the engine which are spaced some distance apart and in substantially the same transverse plane, I am able to reduce the tendency of

the engine to rock. Owing to the fact that the engine and generator are spring supported, it becomes necessary to provide anchors or stops which positively limit the fore and aft side-wise and lifting movements thereof. These anchors may be attached to the engine or to the frame of the vehicle, or partly to the engine and partly to the frame as desired. Between these anchors and the sills of the body are cushions to prevent the transmission of engine vibrations thereto. In addition to this, I find it advantageous to provide coiled compression springs to retard the lateral or side-wise movements of the engine and generator as the vehicle lurches due to unevenness of the road bed.

In the accompanying drawings, which illustrate one of the embodiments of my invention, Figure 1 is a view in side elevation of an engine and generator located within the cab of a self-propelled vehicle; Fig. 2, is an inverted plan view showing the engine in position on the vehicle frame; Fig. 3 is a view in side elevation of an engine and generator with certain of the parts broken away to show the means for supporting and anchoring the same in position; Fig. 4 is a detail view of the spring suspension on the generator end, and Fig. 5 is a detail sectional view taken on line 5—5 of Fig. 3.

1 indicates a car body of any suitable construction, mounted on a truck 2. The truck is provided with a bolster 3 and a center plate 4 which carries the body bolster 5. Located within the cab 6 at the fore end of the car is a multi-cylinder internal combustion engine 7 that is direct connected to an electric generator 8 of any suitable construction for supplying current to electric motors mounted on the axles of the truck 2. The frame of the generator is bolted to the base of the engine and from one point of view may be considered as a part of the engine frame. It is advantageous to separate the forward and rear springs as far as possible, measured longitudinally of the engine, to prevent pitching.

The engine is mounted on coiled compression springs of which three are shown, a rear spring 9 and front springs 10 and 11. These springs have a lower period of vibration than the engine, so as to prevent engine vibration from being transmitted to the car body.

12 and 13 indicate longitudinal sills of the car body. These are connected by transverse sills 14 and 15 thus forming a rectangular opening above which the engine is supported.

In Fig. 2, 16 indicates the underside of the base of the engine, said engine being indicated in dotted lines 7. To the engine base are bolted end and side rails 17 which form anchoring means to hold the engine against fore and aft, side-wise and lifting movements. These rails are shown in section in Fig. 5. They are substantially in the form of Z bars in cross-section. The upper flange 18 of each bar is bolted to the engine base and the lower flange 19 extends under the lower surface of one of the sills. A portion of each side rail is cut away to receive the body bolster 5, shown in dotted lines in Fig. 2.

Referring to Fig. 5, 20 indicates the floor of the cab, which rests on one of the side sills, the latter being of I beam construction. 21 indicates a plate that rests on the floor 20 for portion of its length and is bent down and around the underside of the I beam or sill 12 to form a back or support for the body of felt 22, said felt acting as a cushion to prevent engine vibrations from being transmitted to the body frame. The felt directly under the engine assists in supporting the weight thereof, the remainder being supported by the springs 9—10 and 11. Care should be exercised to see that the felt is not subjected to high compression because if it is vibrations will be transmitted from the engine to the body. With commercial felts now available to me, the compression should not exceed ten pounds per square inch. With different materials, different compression pressures may be used as can readily be determined by experiment. The arrangement of the various anchors is the same and hence further description is unnecessary.

The cushion under the engine frame can be made in one or more pieces as desired, so also may the cushions between the anchors 17 and the plates 21. The engine and anchor cushions may be made of a single piece or of two pieces as desired. As a general thing it will be found to be more convenient and satisfactory to make them of one piece. This latter arrangement has the advantage of holding the felt where it belongs without special retaining devices.

In order to retard the side-wise movements of the engine and also to center the same between the side sills 12 and 13 coiled compression springs 25 are provided and arranged in sets, one set being located at the forward end and the other set at the rear end of the engine. The rear set of springs is located between the sills 12 and 13, but owing to the fact that the lower part of the generator 8 projects below the level of the floor the forward set of springs is located outside of said sills. The arrangement of the forward springs is best shown in Figs. 2 and 4, and the arrangement of the rear springs in Figs. 2 and 5. Referring to the forward springs ears or projections 26 are formed on the underside of the generator to receive an eye bolt 27. The end of each bolt is provided with a collar 28 which is held in place by a nut, and between the col-

lar and the vertical web of the sill is a coiled compression spring 25. The rear springs are mounted on bolts 29 and are located between collar 30 and the vertical web of the anchoring rails 17, suitable clearance being provided around the bolt to prevent the transmission of vibrations, and also to permit the parts to move slightly.

Referring to the engine supporting spring 9, Fig. 3, the upper end of the spring is seated in a socket 31 which is formed in the engine base. The lower end of the spring rests on a spring cap 32 which is supported by an adjusting screw 33 by means of which the lifting effect of the spring can be adjusted so as to regulate the compression on the felt or cushion above referred to. The adjusting screw is mounted in a bracket 34 and the latter is attached to the transverse sill or brace 14 extending between the side sills. Referring to the forward springs 10 and 11, they are of similar construction and supported in the same manner. The engine or generator frame is provided with feet 35, each of which rests on a spring. The spring is supported by a cap 36 carried by an adjusting screw 37, the latter being mounted on a bracket 38 which is secured to a side sill. It will thus be seen that the engine is supported by a three-point support, and that by adjusting the screws, the weight of the engine on the felt can be uniformly distributed.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In combination, a car body, a truck therefor, an engine mounted on the body, coiled compression springs seated at different points on the body and sustaining a portion of the weight of the engine, which have lower periods of vibration than the engine, means for anchoring the engine on the support, and cushions interposed between the anchoring means and the engine which are under relatively low compression.

2. In combination, a support, an engine, coiled compression springs seated at different points on the support and sustaining the weight of the engine which have lower periods of vibration than the engine, and cushioning means interposed between the engine and the support to prevent engine movements of any appreciable magnitude with respect to the support.

3. In combination, a support, an engine, coiled compression springs seated on the support and sustaining the weight of the engine which have lower periods of vibration than the engine, and means for restricting fore and aft and side-wise movements of the engine with respect to the support.

4. In combination, a support, an engine, springs seated on the support and partially sustaining the weight of the engine, said springs having different periods of vibration than the engine, cushioning means interposed between the engine and the support which assist in supporting the engine and are under low compression, and anchoring means which engage said cushioning means and limit the movements of the engine with respect to the support.

5. In the combination, a support, an engine, coiled compression springs seated on the support and partially sustaining the weight of the engine, said springs being distributed at different points under the engine and having lower periods of vibration than said engine, cushioning means interposed between the engine and the support which assist in supporting the engine and are under low compression, and anchoring means which are separated from the support by said cushioning means and serve to limit the fore and aft, side-wise and upward movements of the engine with respect to the frame.

6. In combination, an engine, coiled compression springs seated on a support and forming a three-point support for the engine, said springs having lower periods of vibration than the engine, and means for limiting the longitudinal and transverse movements of the engine with respect to the support.

7. In combination, an engine, springs seated on a support and forming a support for the engine, means for individually adjusting the stress of the springs for the purpose of alining the engine, and cushioning means interposed between the support and the engine, which sustain a fractional part of the weight of the engine and are compressed to a low degree.

8. In combination, a support, an engine, springs seated on the support and sustaining the weight of the engine, said springs having different periods of vibration than the engine, means for limiting the longitudinal and transverse movements of the engine with respect to the frame, and springs which act to hold the engine in a central position and retard the horizontal movements of the engine with respect to the support.

9. In combination, a support, an engine, springs seated on the support which sustain the weight of the engine, each having a different period of vibration than the engine, anchoring means to limit the longitudinal and transverse movements of the engine with respect to the frame, and springs ar-

ranged in sets at opposite ends of the engine to hold the engine in a central position and retard the horizontal movements of the engine with respect to the support.

10. In combination, a support, an engine, springs seated on the support which sustain the weight of the engine, each having a different period of vibration than the engine, anchoring means to limit the longitudinal and side-wise movements of the engine with respect to the support, and cushioning means that are under low compression and are situated between the support and said anchoring means.

11. In combination, a support comprising longitudinal and transverse beams, an engine, springs for supporting the engine which have periods of vibration different from that of the engine and are supported by the beams at different points, means for transmitting thrusts of the engine to said beams, and yielding material interposed between the beams and said means to prevent the transmission of vibrations.

12. In combination, a support comprising longitudinal and transverse beams, an engine, springs located at different points for supporting the engine that are carried by the beams, anchoring means that are attached to the engine and extend between and under the beams, and cushions that are located between the side and bottom faces of the beams and said anchoring means.

13. In combination, a support comprising longitudinal and transverse beams, an engine, springs for supporting the engine that are carried by the beams, anchoring means that are situated between the beams and limit the longitudinal, side-wise and upward movements of the engine with respect to the support, and springs that are supported by the beams and occupy horizontal positions and serve to center the engine.

14. In the combination, a support comprising longitudinal and transverse sills, an engine, springs carried by the support and located at different points under the engine for supporting it, said springs having different periods of vibration than the engine, Z shaped bars that are attached to the engine frame and extend between and also under the sills, means for attaching the bars to the engine, cushioning material located between the bars and the sills, and fore and aft springs that serve to center the engine.

In witness whereof, I have hereunto set my hand this 17th day of April, 1912.

WILLIAM EVERETT VER PLANCK.

Witnesses:
HELEN ORFORD,
BENJAMIN B. HULL.