July 3, 1928.

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L. H. CROOK

ANTIOSCILLATING AND STRESS REDUCING DEVICE FOR CABLES

Filed Oct. 18, 1926

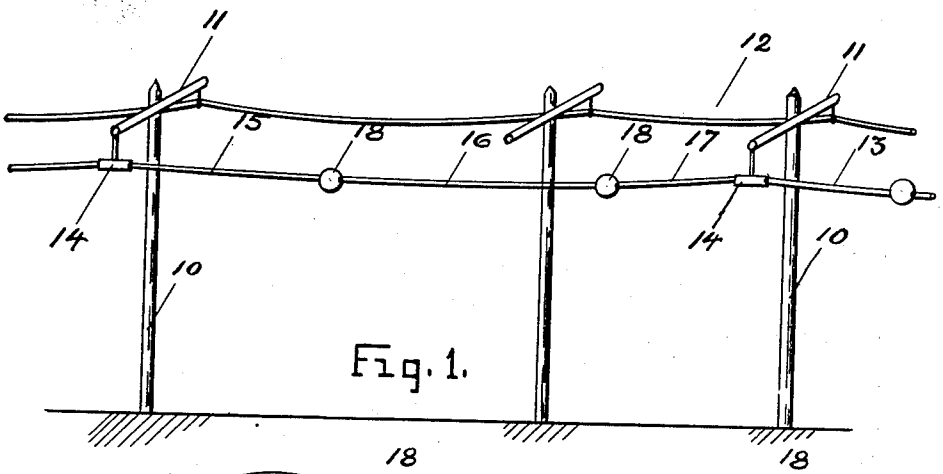


Fig. 1.

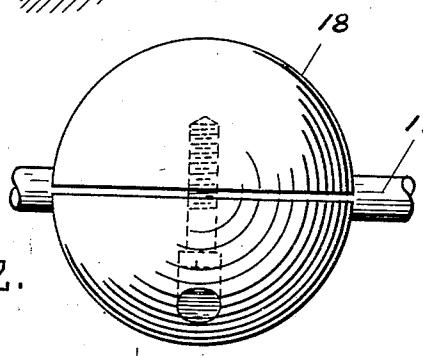


Fig. 2.

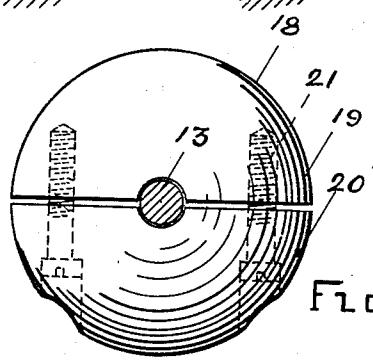


Fig. 3.

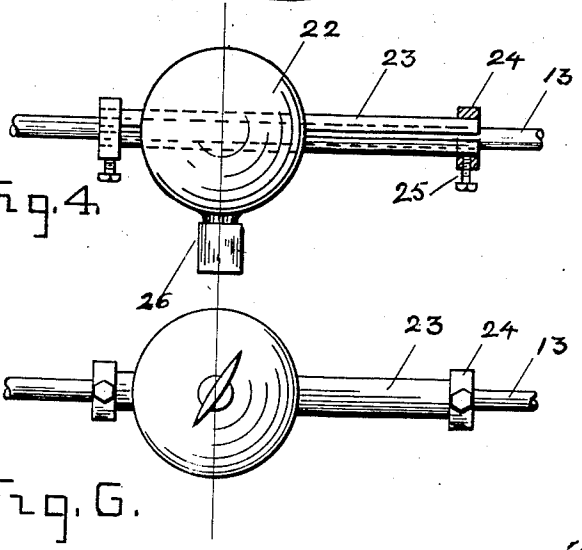


Fig. 4.

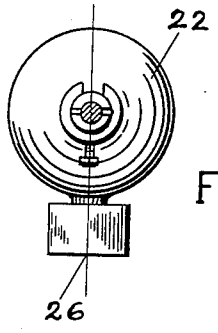


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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ANTIOSCILLATING AND STRESS-REDUCING DEVICE FOR CABLES.

Application filed October 18, 1926. Serial No. 142,302.

It is a well known fact that transmission lines for electric current, such as wires and cables used for telephone, telegraph and power transmission, often break near their supporting points which is a very serious disadvantage and very costly to the electric companies and particularly in the case of high tension lines using for instance aluminum wire one half inch thick. Many different devices have been attempted to overcome these breakages but, as far as is known, none has been found successful.

The cause of the cables breaking is the constant oscillation of the wires when acted upon by the wind. Thus the entire length of the span between two fixed points such as the insulators, will start a fundamental period swing, which is not obstructed by any other oscillating but rather augmented if the spans are of the same length.

The constantly repeated stresses caused by the various oscillations of a suspended wire emitting a fundamental tone with its overtones, will finally produce fatigue in a wire which sooner or later must cause its breakage.

If on the other hand the fundamental period swings of adjacent portions of the wire or cable are made incommensurate, they will interfere with or counteract each other so that the oscillations and consequent "swinging" of the wires must discontinue, and the stresses at the suspension points be eliminated.

The object of the present invention is now to create such incommensurable fundamental periods in adjacent portions or sections of the wire. If accordingly a span of wire of ten meters length, for instance, is subdivided into sections of two, three and five meters length by fixed nodes, it is evident that different periods of oscillations will occur in each section.

In the accompanying drawing a practical solution of the problem is illustrated, and

Fig. 1 is a perspective side elevation of an electrical, aerial line showing the application of the invention;

Fig. 2 is a side elevation of the device attached to a wire;

Fig. 3 an end view of Fig. 2;

Fig. 4 a side elevation of the device in slight modification to that shown in Fig. 2;

Fig. 5 an end view of Fig. 4, and

Fig. 6 a bottom plan view of Fig. 4.

In the drawing reference numeral 10 represents the usual posts with cross bars 11 for supporting the transmission lines. One of the lines is shown as an ordinary wire 12, while the other is shown as a heavy cable 13 with my anti-oscillating device installed. The cable is suspended in the usual manner by insulators 14 from the cross bars 11 and each span, that is to say, the length of cable between two insulators 14, is divided into shorter portions or sections 15, 16 and 17, three being shown in the drawing, but any other number may be selected to suit circumstances and the length of the span. The lengths of the cable sections 15, 16, 17 are determined mathematically from the total length of the span and that of the adjacent spans in such a manner that their fundamental periods of oscillation will be incommensurable. In this manner the fundamental period of oscillation of one cable section will counteract or interfere with those of the sections in the same or the next span. Accordingly as soon as an oscillation is started in one section it will be stopped by another section.

In order to determine the nodes between the sections a mass 18 of any suitable material, such as metal, glass, wood, celluloid is attached to the cable at each node. The mass has been shown as a ball in the drawing, but it is evident that flat disks or any other body of different shape may be used.

In Figures 1, 2 and 3, the mass or ball is split in the middle so as to form two half spheres 19 and 20 in order to facilitate the assembling of the ball on the cable. Any suitable means may be employed for securely clamping the half spheres together on the cable, but clamping screws 21 have been indicated in Figures 2 and 3. The balls are secured in position after the suspension of the cable 13 at the predetermined nodes, so that the device may be applied with ease to already installed cables.

A modified form of the device is illustrated in Figures 4, 5 and 6. The ball 22 is in this case permitted a limited sliding movement on the cable. The ball may also here be made in halves as already described, or it may be provided with a straight hole for engaging around a short pipe 23 secured in place on the cable by clamping rings 24 with clamp screws 25. To facilitate assembling, the pipe 23 may be divided in halves

along its axis and held firmly on the cable 13 by clamping rings 24 at each end and secured by the clamping screws 25. The clamping rings then form abutments to limit the sliding of the ball on the pipe, which should be thin and of light material.

On the underside of the ball 22 is shown a vane 26 which may be placed at any desired angle on the ball. As best seen in Fig. 6, the vane is double cambered so that forces in different directions will be set up by the slightest change in the wind. These forces will cause the ball to slide back and forth on the pipe between the clamping rings. A similar vane may also be used in connection with the ball 18 in Figures 1, 2 and 3.

As before the position of the pipes 23 on the cable 13 is determined mathematically to obtain incommensurable harmonic distances between the nodes or lengths of the sections 15, 16 and 17 so that the same fundamental periods of oscillation cannot take place at the same time. If the fundamental tones differ, so do also the overtones in the subdivisions of the sections.

While in Figures 1, 2 and 3 only a rigid or fixed mass 18 is employed, in Figures 4, 5 and 6 both a rigid mass consisting of pipe 23 and clamping rings 24, and a sliding mass 22 are used.

It is evident that the insulators on the poles also form nodes so that the spacing of the poles may be taken into account for breaking up the oscillations if the pole distances are incommensurate.

It is to be understood that my invention as here described is not limited to the details of construction shown and described and that these may be varied widely without departing from the spirit of the invention as defined by the claims.

When in the claims the term "cable" is used, this is meant to cover any kind of wire or cable used for transmission lines.

I claim:

1. The combination with an aerial transmission line including a cable suspended to form a plurality of spans of an anti-oscillation device therefor; said device comprising a mass positioned on the cable to divide a span into sections of automatically variable lengths having incommensurable periods of oscillation.

2. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a mass positioned on the cable to divide a span into sections having incommensurable harmonic periods of oscillation and means permitting automatical variation of such position.

3. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a body positioned on the cable in order to divide a span into sections having incommensurable harmonic periods of oscillation said body adapted to have a limited axial movement on the cable.

4. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a body positioned on the cable to permit axial displacement thereon in order to divide a span into sections having incommensurable harmonic periods of oscillation, and a wind vane on said body.

5. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a body secured to the cable in order to divide a span into sections having incommensurable harmonic periods of oscillation, and a member mounted on said body and adapted to have a limited axial movement relatively to the cable.

6. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a body secured to the cable in order to divide a span into sections having incommensurable harmonic periods of oscillation, a member mounted on said body and adapted to have a limited axial movement relating to the cable, and a wind vane on said member.

7. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a plurality of balls adapted to be positioned in spaced relation on the cable so as to divide a span into sections having incommensurable periods of harmonic oscillation, said balls having axial movement on the cable and a wind vane on each of said balls.

8. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a plurality of tubular members adapted to be secured in spaced relation on the cable so as to divide a span into sections having incommensurable periods of harmonic oscillation and a ball mounted on each of said members adapted to have a limited axial movement relatively to the cable.

9. The combination with an aerial transmission line including a cable suspended to form a plurality of spans, of an anti-oscillation device therefor; said device comprising a plurality of tubular members adapted to be secured in spaced relation on the cable so as to divide a span into sections having incommensurable periods of harmonic oscilla-

tion and a ball mounted on each of said members adapted to have a limited axial movement relatively to the cable and a wind vane on each ball.

10. The combination with a transmission line including an electric cable, having a plurality of spans, of an anti-oscillating device therefor; said device comprising a series of tubular members adapted to be secured in spaced relation on the cable so as to divide a span into sections having incommensurable periods of oscillation, and a like series of bodies slidably mounted on the respective tubular members.

In testimony whereof I affix my signature.

LOUIS H. CROOK.