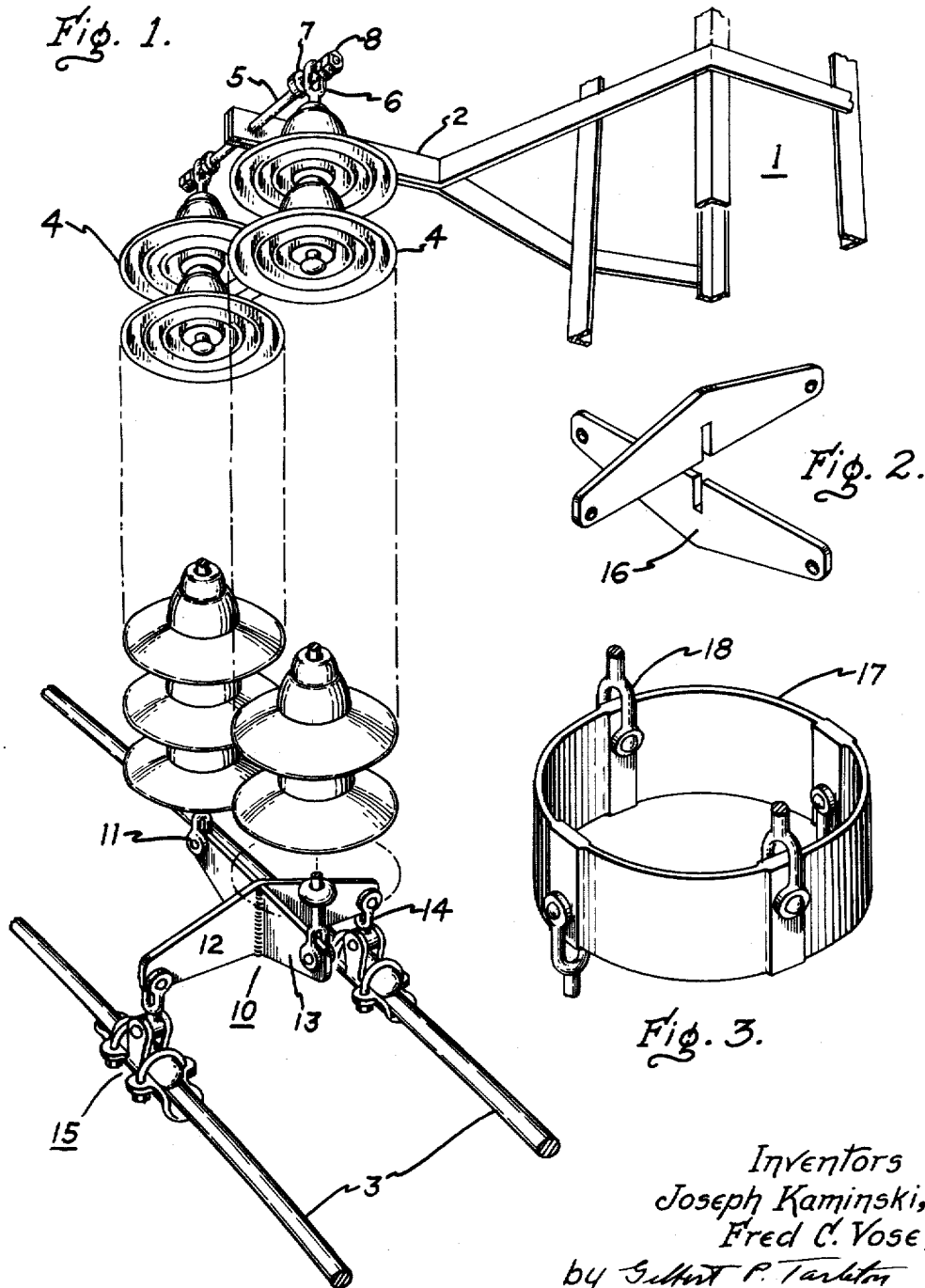


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SUPPORT OF TRANSMISSION LINES HAVING
MULTIPLE CONDUCTORS PER PHASE
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SUPPORT OF TRANSMISSION LINES HAVING MULTIPLE CONDUCTORS PER PHASE

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This invention relates to a mode of supporting transmission lines which have multiple conductors per phase.

In installing transmission lines having multiple conductors for each phase of electrical energy there are many characteristics which are desirable. One desirable characteristic is that the suspended length from the tower crossarm to the conductors be as short as possible for a given insulator string length. A short length is desirable since it permits a maximum angle of swing for the lines toward the tower. Another desirable characteristic is that the insulator strings be attached to the crossarms in such a manner as to make the crossarms as short as possible in order to keep tower costs to a minimum. Still other desirable characteristics are to connect the insulator strings to the crossarms, and the multiple conductors of each phase to the insulator strings, so that the multiple conductors can swing freely with respect to each other as well as through the angle of swing in such a manner so as not to impose unequal loads on the insulator strings or twisting stresses on the multiple conductors.

It is an object of this invention to provide means for supporting the multiple conductors of each phase of a transmission system which provides the above-mentioned desirable characteristics.

In one form of the invention two insulator strings are used to support a pair of conductors of each phase of the electrical system. The insulator strings are positioned so that a plane passing through both of their axes extends generally parallel to the conductors as contrasted to transverse of the conductors. The upper ends of the insulator strings are disposed at generally the same vertical level as the crossarm and they are individually pivotally connected to the crossarm. The lower ends of the insulator strings are individually pivotally connected to a short combination yoke and spacer element which has the pair of conductors individually pivotally connected thereto in spaced relationship.

The features of the invention which we believe to be novel are set forth with particularity in the appended claims. Our invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a perspective view of one form of the invention; and

Fig. 2 is an exploded perspective view of another form of yoke and spacer element; and

Fig. 3 is a perspective view of still another form of yoke and spacer element.

Referring now particularly to Fig. 1, illustrated therein is a tower structure 1 having a crossarm 2. A pair of conductors 3 are supported from the left-hand end of the crossarm 2 by a pair of insulator strings 4 and hardware which will be described hereinafter.

The tower 1 is exemplary of conventional metallic tower structures which are used to support transmission lines. These towers support the lines of single or three

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phase electrical transmission systems. Two more pairs of conductors such as 3 would be supported from the arm 2 and would constitute the other two phases of a three phase system. Therefore, the pair of conductors 3 can be viewed as comprising one phase of a three phase transmission system.

The upper ends of the two strings 4 are pivotally connected to opposite ends of a strut 5 which is fixed at its central portion to the arm 2. The strings 4 are pivotally connected to the opposite ends of strut 5 by means such as eyebolts 6. A pair of stops 7 and nuts 8 or equivalent means retain the upper ends of the strings 4 in spaced relationship. Since the upper ends of strings 4 are at the same vertical level as the arm 2 the distance between the arm 2 and conductors 3 is kept to a minimum for a given insulator string length. A horizontal plane passing through the arm 2 would generally include the eyebolts 6.

The lower ends of the insulator strings 4 are individually pivotally connected to a short combination yoke and spacer element 10 by suitable means such as clevises 11. The element 10 may be generally cross shaped and constructed from a plate 12 which has a pair of arms 13 welded generally perpendicularly and centrally thereto. The opposite ends of the arms 13 space the lower ends of the insulator strings 4 and the opposite ends of the plate 12 space the conductors 3. A pair of clevises 14 are pivotally connected to a pair of conventional saddle-type clamps 15 for the conductors 3, and the conductors 3 are pivotally connected to the opposite ends of plate 12 by pivotally connecting the clevises 14 to the plate 12. Besides spacing the conductors 3 and strings 4 the element 10 also displaces the strings 4 about 90 degrees from the conductors 3. That is, if a plane were passed through the axes of the strings 4 the plane would be generally parallel to and midway between the conductors 3.

The Fig. 2 combination yoke and spacer element is very similar to element 10 except that it is fabricated from a pair of notched plates 16. The plates 16 are identical and are fitted into the notches of each other by reversal, and they can be permanently fastened together by means such as welding.

The Fig. 3 combination yoke and spacer is a short and generally cylindrical element 17 which has four clevises 18 pivotally connected thereto at intervals of about 90 degrees with alternate clevises being reversed.

If the strings 4 were not displaced about 90 degrees from the conductors 3 they would be generally aligned with the clamps 15. In such a position of the strings 4 the length of the crossarm 2 would have to be increased before the upper ends of the strings could be directly connected to the crossarm 2. Additionally, as the conductors 3 moved toward and away from the tower 1 the load on the strings 4 would not be distributed evenly and the conductors 3 would be twisted. These disadvantages might be overcome by using a yoke which was shaped generally similar to plate 12 between the upper ends of the strings 4 and the crossarm 2. However, such a yoke would increase the distance between the arm 2 and conductors 3 for a given insulator string length and would interfere with swinging of conductors 3. The last mentioned disadvantage could be overcome by giving the yoke the shape of a steep isosceles triangular plate. However, this would further increase the distance between the arm 2 and conductors 3. As the length from the arm 2 to conductors 3 is increased for a given insulator string length the permissible angle of swing for the conductors 3 toward the tower 1 is decreased.

While there have been shown and described particular embodiments of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and therefore, it is intended by the appended claims to cover all

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such changes and modifications as fall within the true spirit and scope of the invention.

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

1. In an electrical installation comprising a pair of spaced and generally parallel electrical conductors which are suspended from a pair of spaced and generally parallel electrical insulator strings, said strings being disposed in a plane which extends generally parallel to and midway of said conductors, means for connecting said conductors to said strings and retaining said strings and conductors in spaced relationship comprising a combination insulator string and conductor yoke and spacer member which is disposed between said strings and conductors and which is pivotally connected to each of said strings and conductors.

2. In a structure having a crossarm for supporting a pair of spaced electrical conductors which extend generally parallel to each other and generally perpendicular to said crossarm, a pair of spaced and generally parallel electrical insulator strings for suspending said conductors from said arm, said strings being disposed in a plane which extends generally parallel to and midway of said conductors, the upper ends of said strings being positioned at generally the same vertical level as said crossarm and being pivotally connected to said crossarm, and a combination insulator string and conductor yoke and spacer element which is pivotally connected to the lower ends of each of said strings and each of said conductors.

3. In a structure as in claim 2, wherein said combination yoke and spacer element comprises a generally cross shaped member whose alternate ends are pivotally con-

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nected to the lower ends of said strings and whose other ends are pivotally connected to said conductors.

4. In a structure as in claim 2, wherein said combination yoke and spacer element comprises a generally circular shaped member which is pivotally connected to the lower ends of said strings and said conductors at intervals of about 90 degrees about said member, alternate intervals being connected to the lower ends of said strings and the other intervals being connected to said conductors.

5. In a structure as in claim 2, wherein the upper ends of said strings are pivotally connected to the opposite ends of a strut which is fixed adjacent its central portion to said arm, and said combination yoke and spacer element comprises a generally cross shaped member, alternate ends of said member being pivotally connected to the lower ends of said strings and said conductors.

6. In a structure as in claim 2, wherein the upper end of said strings are pivotally connected to the opposite ends of a strut which is fixed adjacent its central portion to said arm, and said combination yoke and spacer element comprises a generally circular shaped member which is pivotally connected at alternate intervals of about 90 degrees along said member to the lower ends of said strings and said conductors.

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