Aug. 23, 1960 J. M. TAYLOR 2,950,338

PLASTIC INSULATED ELECTRICAL LINE AND MOUNTING THEREFOR

Filed Dec. 23, 1957 2 Sheets-Sheet 1

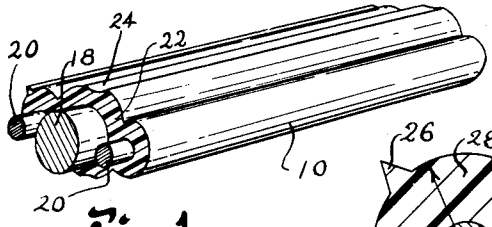


Fig. 1

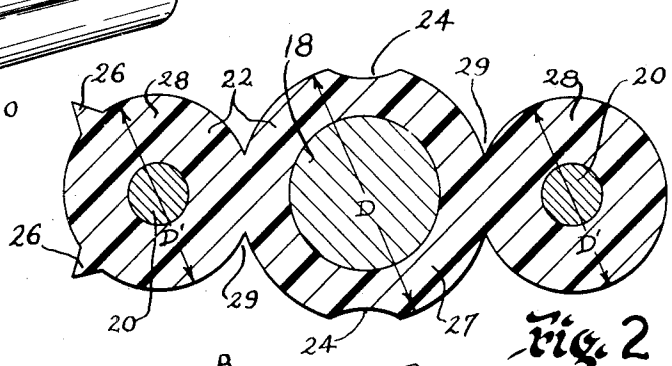


Fig. 2

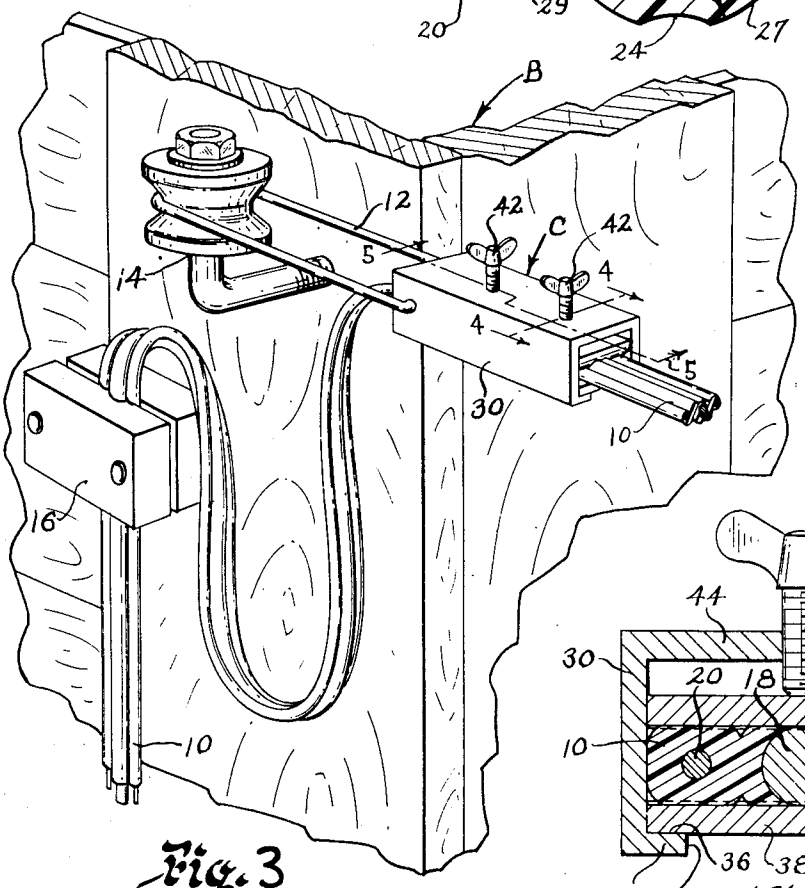


Fig. 3

Fig. 4

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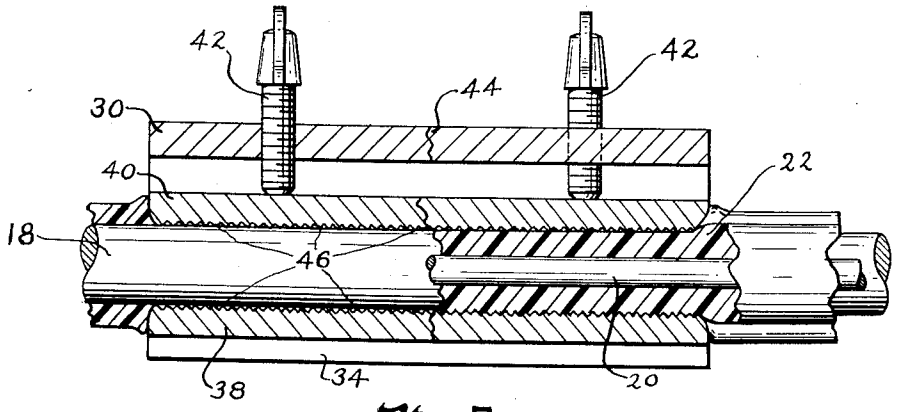


Fig. 5

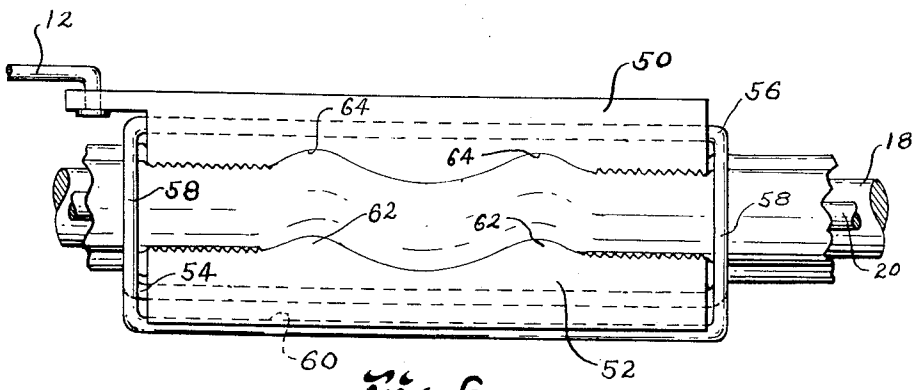


Fig. 6

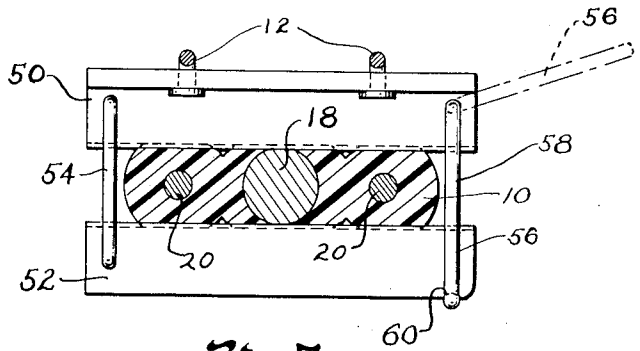


Fig. 7

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PLASTIC INSULATED ELECTRICAL LINE AND MOUNTING THEREFOR

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5 Claims. (Cl. 174—40)

This invention relates to electrical wire and mountings therefor and it relates more particularly to telephone drop-wire of special design and means for securing it to a stationary object.

Telephone drop-wire, which is the transmission line leading from the telephone pole to a building, must be strong enough to hold not only its own weight in relatively long spans, but also the additional loads caused by the wind and by ice and snow in northern climates. In addition drop-wire must of course be properly insulated and protected so that there is no interference or interruption in service. In order to give it sufficient strength, telephone drop-wire has usually consisted of copper covered steel conductors or copper alloy conductors, having adequate tensile strength to withstand severe weather conditions. The conductors are insulated with rubber and jacketed with cotton braids, bituminous compositions, waxes or neoprene. When a telephone is installed in a house, the drop-wire is fastened to the pole and to the building by means of clamps which are designed to frictionally engage the outer surface of the jacket, but not to break through it; for this would destroy both the insulating quality and the weather resistance of the cord. In conventional drop-wire, it is mandatory that the rubber insulation adhere well to the conductors so that the tension on the conductors can be transferred through the insulation and jacketing materials to the clamp which, as just mentioned, grips only the surface of the drop-wire jacket. If the adhesion between the conductors and the insulation is not firm and if the drop-wire is put under heavy tension, the insulation and jacket will tear and break, exposing the bare conductors.

For many years it has been considered desirable to use plastic insulation in place of the fabric and rubber coverings heretofore employed in drop-wire. However, mere substitution of a thermoplastic insulating material for the more costly type of insulation now used in drop-wire, has not been feasible due to the fact that the plastic insulation does not adhere to the conductors and, therefore, tears and breaks under the tension placed on it when compression clamps are used to fasten it to the pole or building. For this reason and because it has been necessary to employ compression clamps in order to support the weight of the span of wire, plastic insulation for drop-wire has been totally unsatisfactory. Moreover, since plastic materials suitable for wire insulation will flow under compression at normal temperatures, whereas rubber or neoprene does not, the compression clamps tend to break through the jacket of the plastic covered conductors, destroying the insulation. It has, therefore, been generally felt by those skilled in the art that it would be impractical to use plastic insulation in drop-wire.

The principal object of the present invention is to render practical a plastic insulated drop-wire which is at least equally as serviceable as the present standard rubber insulated cord, not only from the standpoint of transmission but also from the standpoint of strength, weather resistance and long wear. Another object of the invention is to provide a drop-wire which is more economical to manufacture, yet is of a quality equal to or beter than that of drop-wire presently being used.

With these objects in view and some others which will be apparent to those skilled in the art, the present invention comprises providing a drop-wire having at least one wire conductor of a size in cross-section determined by the current carrying capacity required thereof and a support or strength member, as for example a steel wire, of substantially larger diameter than the conductor, both the conductor and support member being embedded in spaced parallel relation to each other in a thermoplastic insulation, such as polyethylene; together with a clamp which is adapted and arranged to bite through the insulation of the wire in a direction substantially perpendicular to the plane defined by the support member and conductor, whereby the jaws of said clamp are brought into direct frictional engagement with the support member but are prevented from coming into contact with the conductor by such engagement with the support member. The clamp, thus firmly gripping the drop-wire, is then fastened to the pole or building, as the case may be, so that the weight of the span of drop-wire is carried by the clamp which, being in rigid engagement with the support member in the wire, transmits all the tensile forces to that member instead of to the jacket or conductors of the drop-wire.

It will be apparent from the foregoing that, even though the problems involved in developing a commercially satisfactory plastic insulated drop-wire have been considered by those skilled in the art to be virtually insurmountable, the present invention effectively overcomes these problems in a unique manner and makes available the many advantages of plastic insulation for drop-wire.

One of the important advantages of plastic insulated drop-wire is its low cost as compared with that of the conventional drop-wire now being used. Savings in cost are effected in production, as well as in the cost of the materials used.

Another important advantage of plastic insulated drop-wire as compared with the conventional type is that it is possible to substitute the thermoplastic material alone for all the materials now used to insulate and protect the conductors in conventional drop-wire, the plastic insulation in the new wire being extruded directly onto the bare conductors and support member. This permits the overall size of the finished wire to be reduced considerably which, in and of itself, is highly desirable for several reasons. For example, such wire is much less conspicuous when installed between a telephone pole and house, a factor of importance in residential installations more particularly. The smaller size likewise decreases the weight per unit length of wire, so that a considerably greater strength to weight ratio can be attained. This is of course enhanced by the fact that the separate support or reinforcing member of the present drop-wire may be of smaller diameter, yet have greater tensile strength, than the weight carrying conductors commonly used heretofore. Furthermore, the reduced size of the wire decreases the load on it due to wind and the formation of ice.

An advantage of a drop-wire having a separate support member, as contemplated by the present invention, is that in installations where a ground is not readily available, as for example where plastic water pipe may be used in a building, the support member in the drop-wire may be used as the ground. In that event the support wire will be connected to a suitable ground at the telephone pole.

A particularly desirable feature of the present invention is that the line from the pole to the house is supported by direct engagement of the mounting clamps with the support member so that none of the tensile force due

to the weight of the wire is transmitted through the jacket or insulation of the wire. This is accomplished using convenient compression clamps so that installation is no more difficult than in existing installations.

A drop-wire and clamp arrangement embodying the invention in its most advantageous form is illustrated in the accompanying drawings, in which

Fig. 1 is a perspective view of a section of a novel plastic insulated drop-wire;

Fig. 2 is an enlarged cross-section of the wire shown in Fig. 1;

Fig. 3 is a perspective view showing the drop-wire and clamp therefor in a typical installation;

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 3, looking in the direction of the arrows;

Fig. 5 is a vertical view taken in longitudinal section on the line 5—5 of Fig. 3, looking in the direction of the arrows;

Fig. 6 is a side elevation of another type of clamp; and

Fig. 7 is an end view of the clamp shown in Fig. 6, looking from left to right, with the drop-wire shown in section.

Referring to the drawings, 10 designates the drop-wire which is stretched from a telephone pole to the building B to which it is fastened by means of a clamp C having a bail 12 looped over an insulated mounting post 14 on the building. Similar means are provided at the telephone pole for mounting the drop-wire at that end. The drop-wire 10 passes through clamp C and is led to the telephone box (not shown) through the usual insulators 16 that can be nailed or screwed to the side of the building at desired points.

As shown more particularly in Figs. 1 and 2, drop-wire 10 comprises a central support member 18, which may desirably be a 1/16" diameter galvanized steel wire having a tensile strength on the order of 135,000 lbs. per square inch, capable of meeting the minimum 400 pound tensile load requirements for standard telephone drop-wire. Two bare soft copper conductors 20 of No. 22 AWG wire are located parallel to and on opposite sides of the support member 18, with the axes of conductors 20 and support member 18 located in a common plane. A thermoplastic insulation 22, such as polyethylene, is extruded around the conductors and support member in a parallel wire plastic extrusion machine. As has already been mentioned hereinbefore, the plastic insulation functions both as an electrical insulator and as the protective covering for the conductors.

In the specific embodiment of the invention shown in the drawings, the diameter of the support member 18 is considerably more than twice the diameter of the conductors 20, so that when the jaws of the clamp C grip the wire with their gripping surfaces parallel to the plane of the support member and conductors, such jaws are forced through the plastic insulation into engagement with the support member 18, as best shown in Fig. 4, without engaging the conductors nor disturbing the insulation around them. In order to facilitate break through of the plastic covering adjacent the support member by the jaws of the clamp, the upper and lower surfaces of the plastic covering are grooved longitudinally of the wire at 24, 24, thereby weakening the covering 22 at these points. The usual pointed ribs 26, 26 may be provided in the covering next to one of the conductors in order to identify it with respect to the other.

With reference more particularly to Fig. 2, which shows, by way of example, one specific form of drop-wire especially useful in connection with the present invention, the dimension D of the cylindrical body 27 of the jacket around support member 18 may desirably be 0.102 inch, and the dimension D' of the cylindrical insulating bodies 28, 28 surrounding the conductors is 0.075 inch. If, as mentioned above, a 1/16" or No. 14 AWG support wire 18 is used, the diameter of which expressed

in decimals is about 0.064 inch, it will readily be seen that when the clamp is in full engagement with the support wire 18, as shown in Fig. 4, the plastic insulation surrounding the conductors 20 is under only very light pressure and, therefore, will not be damaged by the clamp. However, pressure of the clamp jaws on the plastic jacket above and below the support member causes the jaws to break through the jacket into firm contact with the member 18.

In order to provide a sufficient area of solid plastic material between the conductors 20 and the support member 18 so that the conductors will not accidentally separate, the conductors must be properly spaced from the member 18 to ensure sufficient overlap of the body portions 27 and 28 of the insulating material surrounding these members. To this end, the centers of the conductors 20, in the specific drop-wire shown, should be about 0.082 inch from the center of support member 18. This ensures that the conductors and support member will be securely bound together, yet provides V-shaped grooves 29 in the insulation between the conductors and support member at the intersections of the cylindrical body portions. The V-shaped grooves 29 serve two purposes. When it is desired to connect the ends of the conductors to their terminals, the V-shaped grooves facilitate severance of the conductors from the support member without uncovering the conductors. Secondly, the space provided by grooves 29 between the various cylindrical portions of the drop-wire allows the plastic material compressed by the clamp on the upper and lower sides of the support member 18 to flow laterally so that the clamp will bite into the support member without disturbing the insulation surrounding the conductors.

A desirable form of clamp which may be used in connnection with the invention is shown in Figs. 3, 4 and 5 and comprises a generally tubular metal body 30, which in this instance is rectangular in cross-section. One side of the body 30 is open at 32 throughout its length so that a mid-section of the drop-wire 10 can be fitted within it without necessity of feeding the wire through the clamp from one end. The inturned leg portions 34 adjacent opening 32 form ledges 36 which support a metal plate or lower jaw 38 against which the drop-wire is pressed when the clamp is tightened. An upper jaw 40, extending the length of body 30 and parallel to lower jaw 38, is movable vertically within the body. A pair of tightening screws 42 are threaded through the wall 44 of the clamp body 30 opposite the opening 32 therein, the ends of screws 42 engaging the upper side of jaw 40 for the purpose of forcing the latter down against the drop-wire 10, which is placed flat on the lower jaw 38. While two tightening screws are shown in the drawings, one is usually sufficient to crush the covering of drop-wire 10 adjacent support member 18, bringing the jaws 38 and 40 into metal-to-metal contact with the support member 18 and thereby providing the necessary grip on the line for mounting purposes.

In order to enhance the grip of the clamp on the support member of the wire, various friction increasing devices may be employed. Thus, as indicated in Fig. 5, the wire-engaging sides of the jaws 38 and 40 may be provided with lateral serrations 46 which bear on the steel support member 18. Or, if desired, the clamp may be provided with off-set, laterally extending ribs (not shown) on both the upper and lower jaws which bend the wire 10 as the jaws are tightened and bite into the member 18. The bail 12, which may be formed of wire, is secured in any suitable manner to the body 30 of the clamp, as shown by way of example, in Fig. 3 where the ends of bail 12 are fastened to opposite sides of the clamp body 30.

In fastening the clamp C to the drop-wire 10, the wire is fitted through the opening 32 in the bottom of the body 30 with the lower jaw 38 removed, the upper

jaw **40** being in position against the ends of tightening screws **42**, which are retracted so that the clamp may receive the wire. The lower jaw **38** is then slid endwise into place in the clamp under drop-wire **10** and over the inturned legs **34** of the clamp body **30**. The tightening screws **42** are then turned down snugly to ensure engagement of the jaws with the support wire **18**.

Figs. 6 and 7 illustrate use of another form of clamp having upper and lower jaws **50** and **52**, respectively. Jaws **50**, **52** are joined at their ends by means of links **54** and **56**, which may be formed of relatively rigid wire. Link **54** is permanently fastened to both the upper and lower jaws, as for example by passing it lengthwise through passages in the jaws and welding or soldering the ends of the link. This permanently connects jaws **50** and **52** along the back side of the clamp but permits the jaws to swing open and closed with respect to each other. Link **56** passes through a passage in upper jaw **50** adjacent the front side of the clamp and is provided with longer end-reaches **58** which permit the link to pass under the lower jaw **52** into a groove **60** that holds it in place. Link **56** can therefore be pivoted on the upper jaw **50** from the unlocked position shown in broken lines in Fig. 7 to the locking position shown in full lines. Links **54** and **56** are arranged so that in their locked position the distance between the jaws at the point where they engage the support member **18** of the drop-wire is equal to, or slightly less than the diameter of this member. Consequently, when the jaws are clamped down on the wire **10** by means of a pair of pliers or the like, and the locking link **56** is slipped into position in the groove **60** under the lower jaw, the support member **18** of the drop-wire **10** will be rigidly gripped by the jaws **50**, **52** in a manner similar to that of the clamp shown in Figs. 3 to 5. Thus, the clamp jaws bear on the support member **18** in order to hold it firmly, but do not in any way disturb the conductors **20**.

Auxiliary friction means, such as sharp lateral serrations on the faces of the jaws, may also be provided in the clamp shown in Figs. 6 and 7. In addition the face of the jaws may be provided with laterally extending humps **62** and depressions **64**, the humps on each jaw being positioned so as to fit into the depressions in the other. Such an arrangement causes the wire to be bent between the jaws when the clamp is applied.

Although reference is made throughout the foregoing disclosure to telephone drop-wire more particularly, it will of course be understood that the invention is applicable to other communication lines as well, or to power lines involving similar problems. It is also apparent that various drop-wire designs, other than the one specifically illustrated herein, could be used, so long as the support member is of larger diameter than the conductors and the conductors are positioned within the body of plastic insulation such that the jaws of the mounting clamp may be forced through the insulation into direct contact with the support member without engaging the conductors.

What is claimed is:

1. An electrical line and mounting therefor, comprising, in combination, a support member extending the full length of said line and at least one electrical conductor extending in spaced, parallel relation thereto, said support member and conductor being integrally embedded in a thermoplastic insulating material with their central axes defining a reference plane, said support member being substantially larger in diameter than said conductor, a clamp in engagement with said line for securing same to a stationary object, said clamp having opposed jaws exerting a gripping force on said line in a direction substantially normal to said reference plane, and means compressing said jaws to penetrate through said insulating material adjacent said support member and to be in direct frictional contact with said support member on opposite sides thereof, said jaws being free from contact with said conductor by engagement with said support member.

2. The combination defined in claim 1, wherein two conductors are provided in said line, each being located substantially in said reference plane and on opposite sides of said support member.

3. The combination defined in claim 1, wherein said support member is at least twice as large in diameter as said conductor.

4. The combination defined in claim 2 wherein the means compressing said jaws is screw means.

5. A drop-wire and mounting therefor comprising, in combination, a support member consisting of a steel wire extending through the full length of said drop-wire, a pair of electrical conductors extending in spaced, parallel relation thereto, said support member and conductors being integrally embedded in a thermoplastic insulating material with their central axes lying substantially in the same reference plane, said support member being at least twice as large in diameter as each of said conductors, a clamp in engagement with said drop wire for securing same to a stationary object, said clamp having opposed jaws exerting a gripping force on said drop wire in a direction substantially normal to said reference plane, and means compressing said jaws to penetrate through said insulating material adjacent said support member and to be in direct frictional contact with said support member on opposite sides thereof, said jaws being free from contact with said pair of electrical conductors by engagement with said support member.

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