

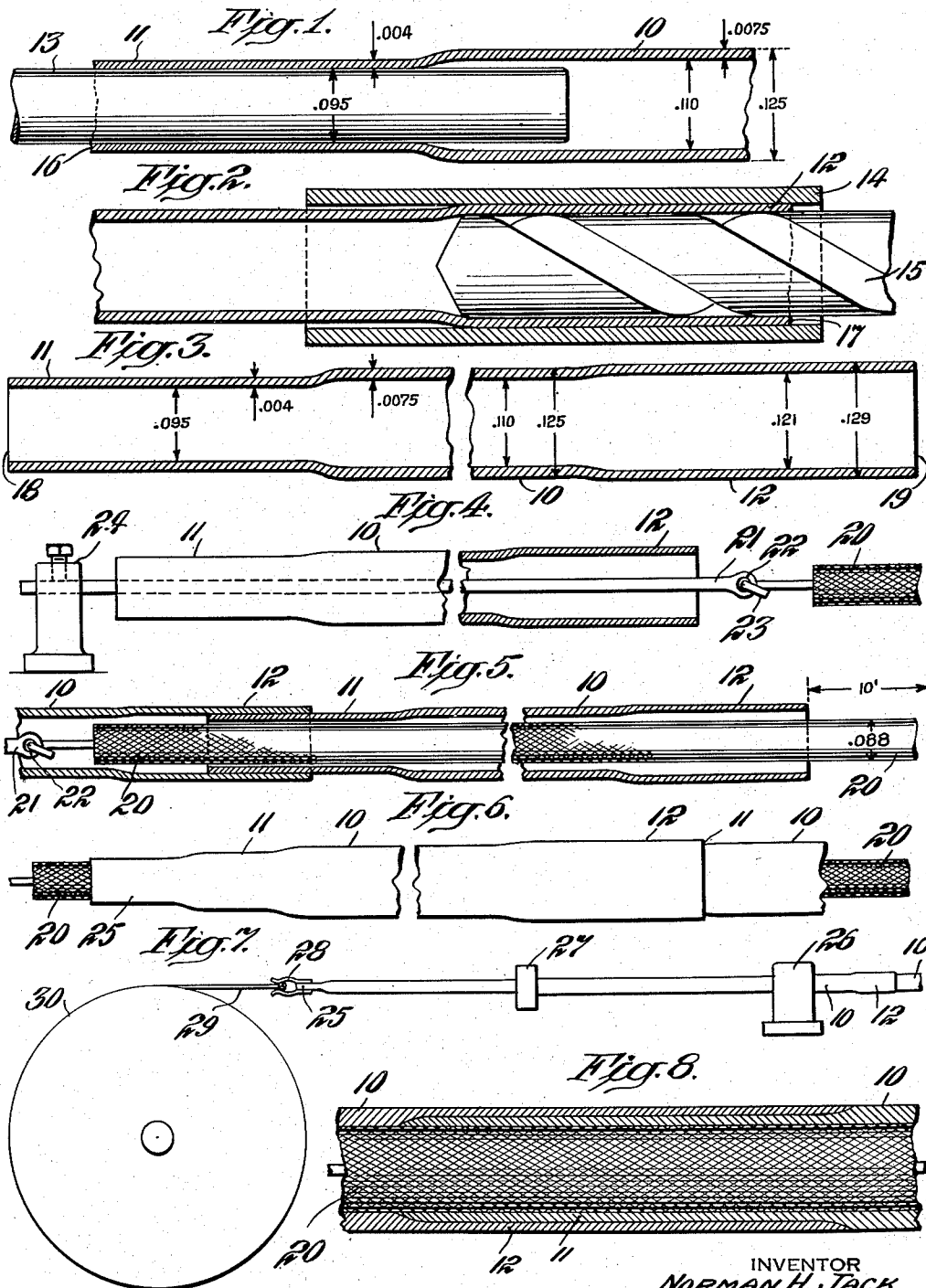
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N. H. JACK

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METHOD OF CONTINUOUSLY SHIELDING WIRE IN UNLIMITED LENGTHS

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INVENTOR
NORMAN H. JACK
BY *Philip S. [Signature]*
ATTORNEY

UNITED STATES PATENT OFFICE

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METHOD OF CONTINUOUSLY SHIELDING
WIRE IN UNLIMITED LENGTHS

Norman H. Jack, Philadelphia, Pa.

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5 Claims. (Cl. 29—155.42)

The invention here disclosed relates to the metal shielding of wire and the general objects of the invention are to accomplish the water-tight and air-tight metal shielding of wire in continuous, unlimited lengths, expeditiously and economically.

The Norman H. Jack Patent 2,066,201 of December 29, 1936, discloses a method of shielding by drawing a softened metal tube down onto an enclosed wire.

The present invention is directed particularly to a method of joining lengths of tubing together over the wire, to accomplish shielding in unlimited lengths, while maintaining substantially the same internal and external dimensions and without altering desired qualities as to ductility, mechanical strength and moisture-proof and air-tight conditions.

Other purposes of the invention and the novel features by which the objects of the invention are attained will appear or are hereinafter fully set forth.

The drawing accompanying and forming part of the following specification illustrates various steps in the method and discloses structural features of the invention. Features of the invention however may be modified and changed, all within the true intent and broad scope of the invention as hereinafter defined and claimed.

Figs. 1 to 7 are broken sectional and partly diagrammatic views illustrating successive steps or stages in the manufacture of the continuously shielded wire.

Fig. 8 is a broken sectional detail of the completed product.

The shielding medium consists in the illustration of thin walled tubing 10, of slightly larger internal diameter than the wire to be covered.

This shielding tubing is usually made up in copper or aluminum and in pieces about 30 feet long.

The present invention enables these pieces of tubing of limited length to be applied to and to provide a smooth, substantially uniform, water-tight, continuous metallic shield for wire in any unlimited length.

Figs. 1 and 2 illustrate steps in the preparation of the lengths of tubing, Fig. 1 showing how the tubing, such as annealed copper tubing, is contracted and thinned at one end at 11, and Fig. 2 showing how the opposite end is correspondingly expanded and thinned at 12.

In practice, the reduction of the one end is usually effected by swaging the end portion of the tube down over an inserted rod or mandrel 13,

of slightly less diameter than the size of the wire to be covered, substantially as indicated in Fig. 1.

The expansion and thinning of the opposite end may be effected as indicated in Fig. 2 by surrounding that end with a supporting sleeve 14, slightly larger than the outside diameter to which this end is to be expanded and then drilling into the so supported end with a drill 15, slightly larger than the wire diameter and of slightly less diameter than the desired inside diameter of the expanded portion.

When the reduction of the one end is effected by swaging, the so-called "tight" swaging method is employed, so as to actually reduce the wall thickness as well as bringing this portion down to smaller diameter.

By confining and supporting the end which is to be expanded, the drill is made to cut and stretch the metal thus to thin down the wall as well as to expand it to greater diameter.

The contracting and expanding operations will ordinarily leave the opposite ends of the tubing with rough edges, such as indicated at 16, and 17, in Figs. 1 and 2. These ends may be cut off square and clean as indicated at 18, 19, Fig. 3, and if found necessary or desirable, be reamed or otherwise treated to fully smooth them and remove any burrs. The squaring operation may be effected with a circular saw and this may be followed by a grinding operation across the cut ends of the tubing.

Both end portions may then be annealed back beyond the contraction and the expansion and after quenching, the tubing may be blown out, as with hot air, to remove moisture and any fine cuttings or foreign matter. These annealing operations are important for copper tubing, but may not be found necessary for tubing of aluminum.

The wire to be shielded, such as the insulated wire represented at 20, may be cut to the length which is to be covered and, if the space is available, preferably is laid out straight, to facilitate engagement of the tubing thereover.

For a length of 100 feet, three 30 foot lengths of the prepared tubing may be enough, the longitudinal flow of the metal in the drawing down of the tubing usually being sufficient to cover the additional ten feet in such an example.

The engagement over the insulated wire is conveniently effected by first slipping a length of the tubing over a fishwire 21, Fig. 4, the reduced end first and far enough to uncover the eye 22, on the end of the fishwire, so that the insulated wire may then be hooked thereto as

indicated at 23. This arrangement locates the enlarged or belled end 12, of the tubing, opposite the end of the insulated wire and adapted to act as a funnel to facilitate movement of the tubing back off the fishwire 21, and on over the insulated wire 20. These operations are aided also by having the far end of the fishwire secured in an anchorage block at 24. In particular, this will enable the fishwire to serve as a guide and support for the length of tubing, while it is being slid over the temporarily attached end of the insulated wire.

In the example under consideration, the first 30 foot length of tubing is pulled on over the insulated wire to within about 10 feet of the end of that wire, substantially as indicated at the right in Fig. 5.

With the first section of tubing in place, as many other sections as are necessary, are added in similar fashion, that is, after unhooking the insulated wire at 23, from the eye of the fishwire, by slipping other sections, one at a time, over the fishwire, hooking on the insulated wire and then backing such tubing section off onto the insulated wire, as at the left in Fig. 5.

As each section is added, the enlarged end of the last section is telescoped over the reduced end of the preceding section.

After all tubing sections are applied, the reduced end of the final length of tubing is secured down over the end portion of the insulated wire by a tagging or "pointing" operation, substantially as indicated at 25, Fig. 6. The firm telescopic engagement of the adjoining ends one over the other may be effected after thus securing what now has become the "leading" end of the tubing down on the wire being covered.

Fig. 7 illustrates the operation of "sinking" the telescoped tubing down onto the wire. The pointed end of the covered wire after being fed through a lubricating block 26, and passed through a sinking die 27, is caught in the grip of a clamp 28, on the end of the draw cable 29, on the sinking roll or reel 30.

The die 27, is of the proper size to sink the tubing down into the desired firm engagement on the insulation of the wire and to smooth and flow the thinned walls of the telescoped joints, substantially to the same uniform extent down onto the enclosed structure, substantially as represented in Fig. 8. In this drawing operation, the joints are made of substantially the same uniform continuity as the single thickness portions of the tubing and so integrated as to become substantially equal in tensile strength. The pliability at these unified joints also is substantially the same as other portions of the shielded wire. The elongated and thinned out overlapping layers at the joints permit substantially uniform bending and on relatively sharp curves, without mechanical injury or loss of water-tight and gas-tight qualities. If desired, the joints may be spotted or ringed with solder, dipped, tinned, lacquered or otherwise treated.

The dimensions given on the drawing are for purposes of illustration and by way of disclosing as fully as possible a typical set of practical operating conditions. Also, proportions may not be exact, the parts being greatly enlarged and in some instances, somewhat exaggerated.

What is claimed is:

1. The method of continuously shielding wire in unlimited lengths, comprising providing a plurality of lengths of shielding tubing, slightly larger in internal diameter than the external

diameter of the wire to be shielded and sufficient in end-to-end relation to cover the required length of wire when drawn down onto that length of wire, contracting one end and expanding the opposite end of each of said lengths of tubing, engaging said lengths of tubing over the length of wire to be shielded with the contracted end of one length of tubing opposed to the expanded end of the adjoining length of tubing and relatively shifting adjoining lengths of tubing to effect telescopic engagement of the adjoining contracted and expanded ends of the lengths of tubing and then drawing said lengths of tubing and telescopically engaged joints down onto the enclosed wire, the drawing being accomplished by passing the wire covered with the lengths of tubing through a sinking die and in the direction in which the contracted ends of the tubing are faced, to thereby effect the closing of the expanded ends down over said contracted ends of the tubing.

2. The method of continuously shielding wire in unlimited lengths, comprising providing a plurality of lengths of shielding tubing, slightly larger in internal diameter than the external diameter of the wire to be shielded and sufficient in end-to-end relation to cover the required length of wire when drawn down onto that length of wire, contracting one end and expanding the opposite end of each of said lengths of tubing, engaging said lengths of tubing over the length of wire to be shielded with the contracted end of one length of tubing opposed to the expanded end of the adjoining length of tubing and relatively shifting adjoining lengths of tubing to effect telescopic engagement of the adjoining contracted and expanded ends of the lengths of tubing and then drawing said lengths of tubing and telescopically engaged joints down onto the enclosed wire, tagging the contracted end of the length of tubing exposed at one end of the wire down onto the wire and then by engagement with that end, pulling the wire and the tubing through a sinking die to effect the drawing first referred to.

3. The method of continuously shielding wire in unlimited lengths, comprising providing a plurality of lengths of shielding tubing, slightly larger in internal diameter than the external diameter of the wire to be shielded and sufficient in end-to-end relation to cover the required length of wire when drawn down onto that length of wire, contracting one end and expanding the opposite end of each of said lengths of tubing, engaging said lengths of tubing over the length of wire to be shielded with the contracted end of one length of tubing opposed to the expanded end of the adjoining length of tubing and relatively shifting adjoining lengths of tubing to effect telescopic engagement of the adjoining contracted and expanded ends of the lengths of tubing and then drawing said lengths of tubing and telescopically engaged joints down onto the enclosed wire, the engagement of the lengths of tubing over the wire being effected by first sliding a length of tubing over a fishwire and then after attaching the end of the wire to be shielded to the end of the fishwire, sliding such length of tubing from the fishwire onto the wire to be shielded.

4. The method of continuously shielding wire in unlimited lengths, comprising providing a plurality of lengths of shielding tubing, slightly larger in internal diameter than the external diameter of the wire to be shielded and sufficient in end-to-end relation to cover the required

length of wire when drawn down onto that length of wire, contracting one end and expanding the opposite end of each of said lengths of tubing, engaging said lengths of tubing over the length of wire to be shielded with the contracted end of one length of tubing opposed to the expanded end of the adjoining length of tubing and relatively shifting adjoining lengths of tubing to effect telescopic engagement of the adjoining contracted and expanded ends of the lengths of tubing and then drawing said lengths of tubing and telescopically engaged joints down onto the enclosed wire, the engagement of the lengths of tubing over the wire being effected by first sliding a length of tubing over a fishwire and then after attaching the end of the wire to be shielded to the end of the fishwire, sliding such length of tubing from the fishwire onto the wire to be shielded and in so doing, sliding the lengths of tubing onto the fishwire with the contracted ends first and onto the wire to be shielded with the expanded ends first.

5. The method of continuously shielding wire

in unlimited lengths, comprising providing a plurality of lengths of shielding tubing, slightly larger in internal diameter than the external diameter of the wire to be shielded and sufficient in end-to-end relation to cover the required length of wire when drawn down onto that length of wire, contracting one end and expanding the opposite end of each of said lengths of tubing, engaging said lengths of tubing over the length of wire to be shielded with the contracted end of one length of tubing opposed to the expanded end of the adjoining length of tubing and relatively shifting adjoining lengths of tubing to effect telescopic engagement of the adjoining contracted and expanded ends of the lengths of tubing and then drawing said lengths of tubing and telescopically engaged joints down onto the enclosed wire, the expanding being effected by surrounding the end of the tubing which is to be expanded by an external support and then drilling into the end of the tubing so surrounded.

NORMAN H. JACK.