Feb. 17, 1953 L. A. MAYO 2,628,996

EXTENSIBLE FOLDED TERMINAL FOR ELECTRICAL COILS

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FIG. 1.

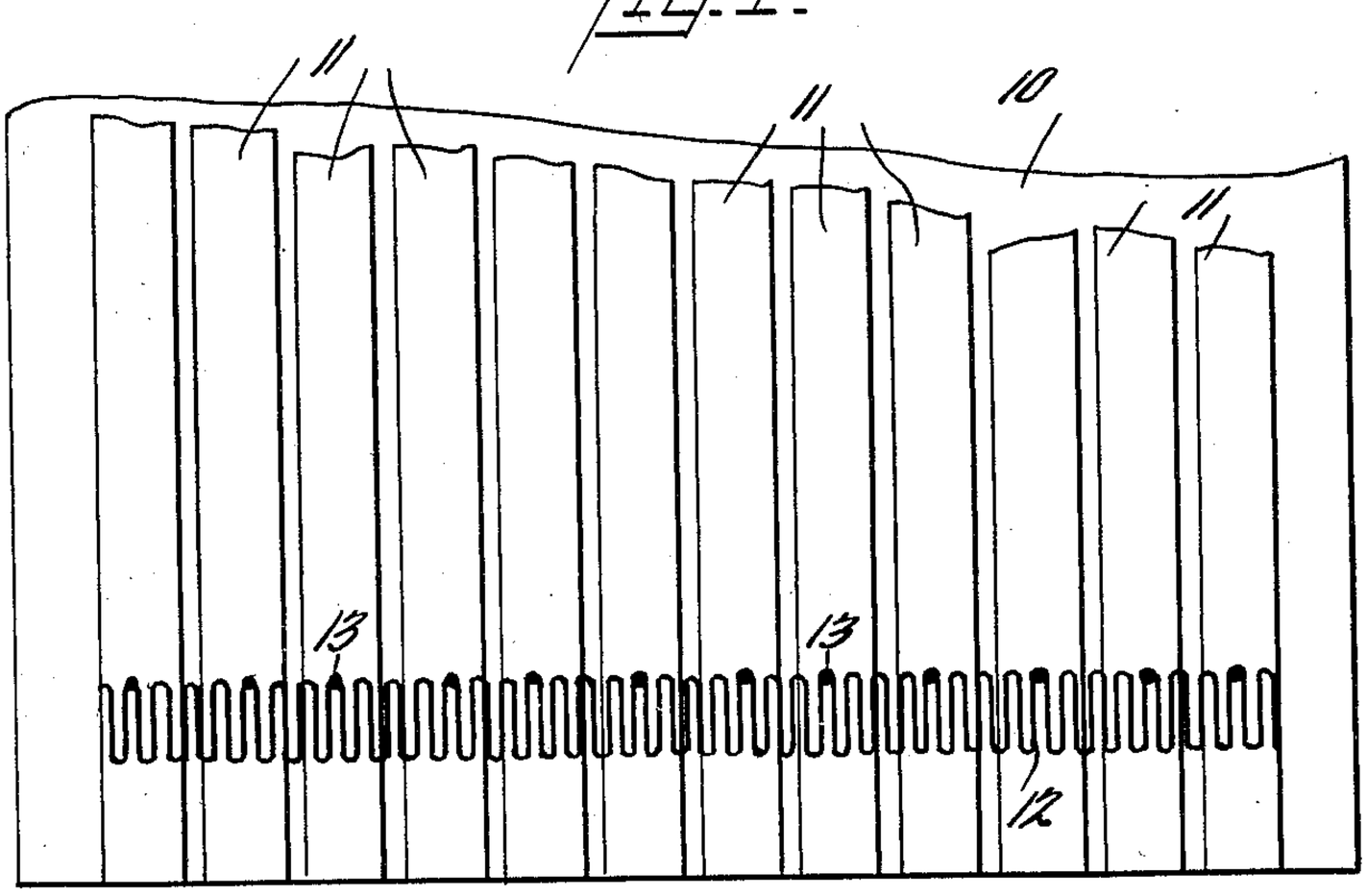


FIG. 2.

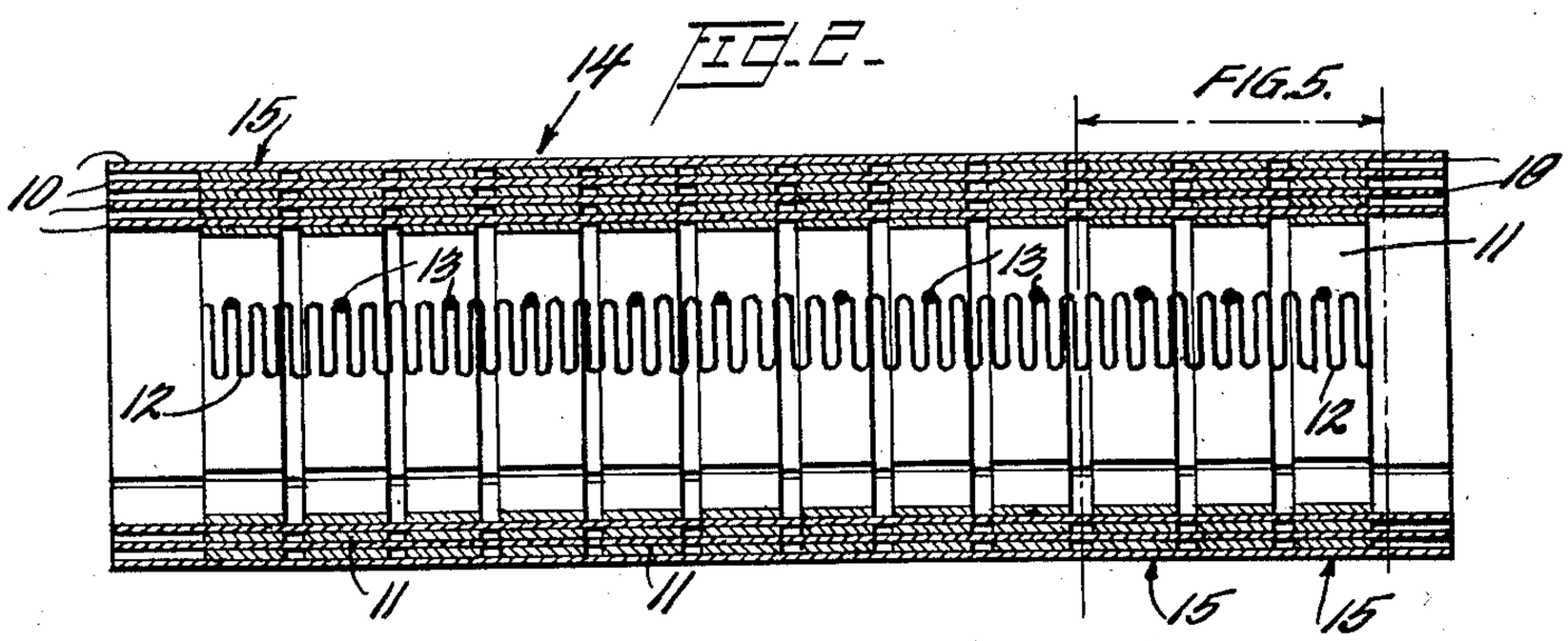


FIG. 5.

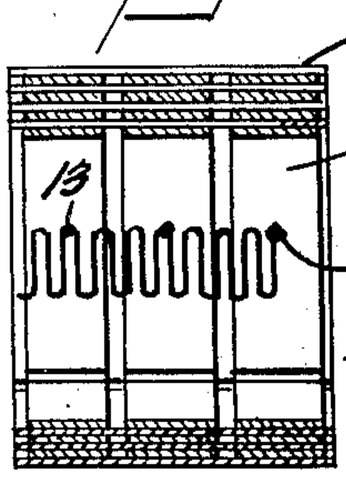


FIG. 3.

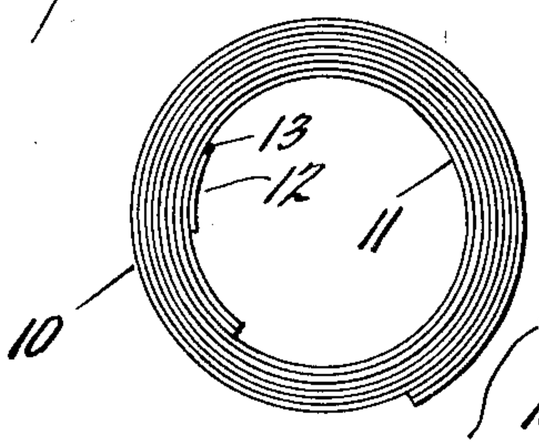
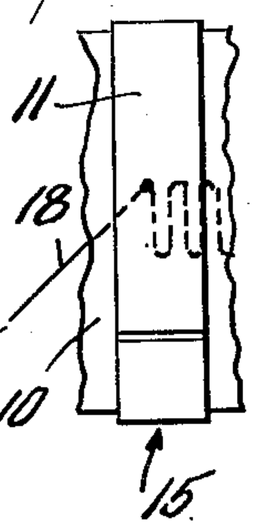


FIG. 4.



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EXTENSIBLE FOLDED TERMINAL FOR ELECTRICAL COILS

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2 Claims. (Cl. 174—35)

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This invention relates to electrical apparatus with extensible leads and to a method of providing such extensible terminal leads in electrical devices, and more particularly to zigzag folded leads for electrical coils and shielding devices.

In various electrical assemblies utilizing coils, it is often necessary to make internal lead connections to the coil in order to have the inner and outer surfaces of the coil free from obstructions. Previous attempts have been made to connect the terminal lead wire to the coil material before winding in order to avoid making connections to the finished coil but the entanglement of the externally extending terminal lead wire with the winding apparatus rendered this solution unsatisfactory.

Accordingly, an object of this invention is to provide electrical coils with internal zigzag folded terminal lead wires which may be easily pulled out to the desired length after the coils are wound.

Another object is to provide a method of winding simultaneously a plurality of electrical coils with internal extensible leads.

With these and other objects in view the invention comprises a continuous crimped or zigzag folded wire which is connected to each of a plurality of spaced conducting strips on a backing sheet which is wound in one operation into a single coil so that following the winding operation the single coil may be cut into desired lengths and the ends of the crimped wire may be pulled out from between the convolutions of the coil to provide terminal lead wires of desired length.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings wherein

Fig. 1 is a plan view of a backing sheet with spaced metal strips cemented thereto and carrying a continuous zigzag folded wire spot welded to the individual copper strips;

Fig. 2 is a longitudinal sectional view of a roll or coil made from the composite sheet strips and zigzag folded wire shown in Fig. 1;

Fig. 3 is an end view of the composite roll shown in Fig. 2;

Fig. 4 is a sectional view of one of the coil segments of the composite roll in which the terminal wire is shown attached to an inner convolution; and

Fig. 5 is a longitudinal sectional view of a three coil segment of the roll shown in Fig. 2 which is used to illustrate the manner in which

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the roll can be cut into sections of varying length and how the crimped wire is pulled out to form a terminal lead wire of a desired length.

Referring now to the drawings, Fig. 1 discloses a sheet 10 of a dielectric material such as paper upon which a plurality of metal foil strips 11 are secured by any suitable adhesive. The metal strips 11 are secured to the sheet 10 through the use of any adhesive coating such as pure latex which is applied to the surface of the sheet 10 in any desired manner. After the adhesive coating is applied to the sheet 10, the metal strips 11 are placed in spaced parallel relation to each other on the surface of the sheet 10 and the coating is allowed to dry so as to cause the strips 11 to adhere to the surface of the sheet 10. Although it is possible to use strips of any conducting material of suitable thickness this particular embodiment utilizes a tinned copper foil strip of approximately $\frac{1}{1000}$ of an inch in thickness.

After the adhesive coating has dried with the strips 11 secured to the sheet 10, a zigzag folded wire 12 is laid transverse to the parallel metal strips 11 and spot welded or soldered to each of the strips 11 at points 13 as shown in Figs. 1 and 2. The wire 12 may be of any composition and gauge but it is preferred that the wire 12 be such that it can be pulled from its zigzag fold into a straight line. The wire 12, as shown in Fig. 1, is mounted near the lower edge of the sheet 10 so that the wire 12 is visible in Figs. 2 and 5 but it is to be understood that the wire 12 may be placed in any desired position relative to the metal strips and the length of the sheet 10. Fig. 4 shows an embodiment wherein the crimped wire 12 is in a removed position from the edge of the sheet 10 so that the wire 12 lies between two inner convolutions of the coil.

When the wire 12 has been secured to the individual strips 11, the entire sheet 10 with strips and wire is rolled along the longitudinal axis of the metal strips 11 so as to form a completed roll 14 (Figs. 2 and 3) in which each of the metal strips 11 form a coil 15 of a plurality of convolutions insulated each from the other by the dielectric sheet 10, but interconnected by the zigzag folded wire 12.

The completed roll 14 may be cut between any of the coils 15 so as to provide any desired number or lengths of coils 15 for use as an electromagnetic shield or for any similar device. Fig. 5 shows an electrical segment 16 cut as indicated from the roll 14 (Fig. 2) in which three coils 15 have been severed as a single interconnected unit from the roll 14. After remov-

ing the segment 16 from the roll 14, the severed ends 17 of the wire 12 may be grasped by a pair of pliers and pulled out to form terminal leads 18 (Fig. 5) which may then be connected to any desired external connecting means. Since the wire 12 is stored in a fold, it is possible to pull a long length of wire from the segment 16 for use as the terminal leads 18. This method of providing terminal lead wires 18 is accomplished quickly in an expeditious manner without any damage to the complete coil 16.

Fig. 4 shows a single coil segment 15 which has been cut from a completed roll 14 in which the wire 12 is extending between two inner convolutions of the coil 15 so as to provide the coil segment with both a smooth inner and outer surface. The terminal lead wire 18 is provided by reaching between the convolutions of the coil 15 with a pair of long nose pliers and pulling the severed ends 17 of the wire 12 free from the coil 15. The spot weld at the point 13 establishes electrical connection with the metal strip 11 and also prevents the wire 12 from being pulled completely free from the coil 15. Inasmuch as the wire 12 is accordion pleated, the terminal leads 18 are of sufficient length to permit easy connection with any desired apparatus.

It is also possible to utilize the sheet 10, the strips 11, and the wire 12 as an electromagnetic shield prior to the rolling operation. The sheet 10 may be cut into various desired sizes and shapes and used to line cabinets from which stray electromagnetic fields are to be removed. The severed end 17 of the crimped wire 12 is pulled out to provide a ground terminal lead through which any stray electromagnetic radiation collected by the strips 11 is conducted to ground.

It is to be understood that the above described arrangements are simply illustrative of the application of the principles of the invention and numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An article of manufacture comprising a

sheet rolled into a coil of several convolutions, said sheet including a layer of dielectric material upon which are secured in spaced relationship a plurality of parallel conducting strips, and a continuous folded excess length of wire electrically connected to each of the conducting strips and extending across the space therebetween and both ends of which are adapted to be pulled from between the convolutions of the coil to form a common lead to all of the conducting strips.

2. A method of making electrical coils which comprises applying a coating of adhesive material to a sheet of dielectric material, positioning a plurality of metal strips in spaced parallel relationship on the adhesive coating, drying the adhesive coating, soldering each of the metal strips to a continuous transversely extending folded wire, rolling the dielectric sheet into a roll so that the metal strips form a plurality of spaced conducting coils, severing the roll between any desired adjacent coils to form a roll segment having a desired number of spaced metal strips, and pulling a severed end of the wire from an end of the roll segment to produce a common lead to all of the metal strips therein.

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