Sept. 18, 1951 C. E. RACZYNSKI 2,568,169

STAMPED HELICAL COIL

Filed May 11, 1949

Fig. 1

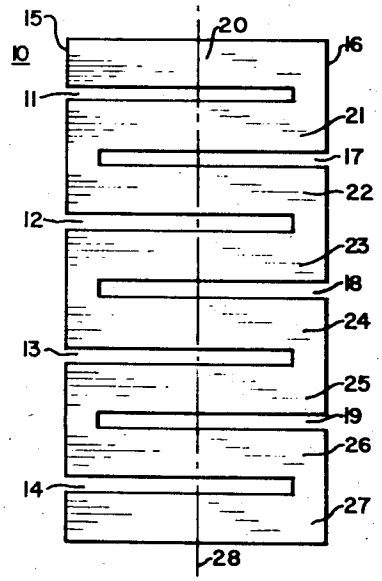


Fig. 2

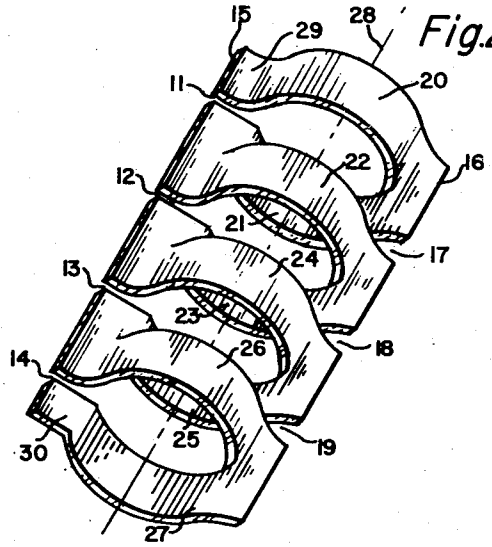


Fig. 3

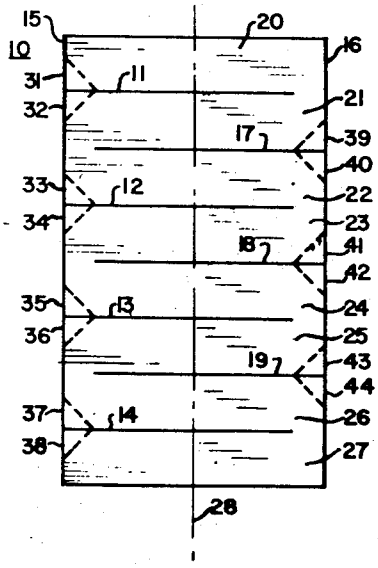
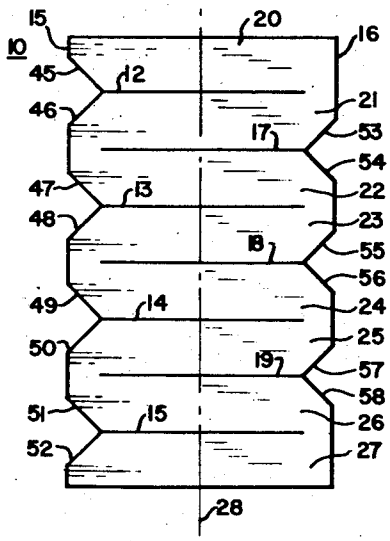


Fig. 4



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HIS AGENT

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STAMPED HELICAL COIL

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7 Claims. (Cl. 175—21)

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This invention relates to a novel inductor and more particularly to an inductor adapted to be constructed from a thin sheet of conductive material by speedy, mass-production methods.

A conventional type of inductor generally used for high-frequency operation utilizes a wire conductor, having a large cross-sectional diameter or strip of a conductive material, having a large cross-sectional area, wound into the form of a helix. The winding operation for such an inductor or coil entails the use of a winding machine having a rotatable member, such as a mandrel or a chuck, and a wire-feeding mechanism driven by a lead screw or the like. A driving mechanism or a motor simultaneously drives both the rotatable member and the mandrel or chuck. In winding a coil with such a winding machine, the wire or strip must be affixed to a form mounted for rotation by the rotatable member. The rotatable member then is rotated while at the same time the conductor is guided onto the form at the proper pitch by means of the wire feeding mechanism. After a selected number of turns has been completed, the machine is stopped, the conductor is cut and the coil is removed. It is apparent that the above-described operation is both slow and costly.

It is, therefore, an object of this invention to provide a novel inductor which can be produced with speed and economy.

In accordance with the invention the inductor comprises a thin, substantially rectangular sheet of conductive material having one series of transverse slots extending more than half the width of the sheet from one edge of the sheet toward the opposite edge. The sheet also has a second series of similar transverse slots alternating with those of the first series, but extending from the opposite edge toward the one edge. The slots conjointly divide the sheet into a sequence of series-connected, transverse strips and successive ones of the strips project in alternate senses from the longitudinal axis of the sheet whereby successive pairs of strips form successive turns of the inductor.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention itself, both as to its organization and manner 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 represents a preformed conductive sheet

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used in fabricating an inductor in accordance with the present invention;

Fig. 2 is an isometric view of an inductor formed from the sheet shown in Fig. 1;

Fig. 3 shows a modified form of the sheet shown in Fig. 1; and

Fig. 4 represents another modification of the sheet shown in Fig. 1.

Referring to Fig. 1, there is represented a thin sheet of conductive material 10 having a first series of transverse slots 11 through 14 extending more than half the width of the sheet from an edge 15 toward an opposite edge 16. The sheet 10 also has a second series of transverse slots 17 through 19 similar to the first series 11 through 14, but extending from edge 16 toward edge 15. The slots 11 through 14 may be equally spaced as shown and each of slots 17 through 19 then is spaced equaly between successive pairs of slots 11 through 14. Also, the slots 11 through 14 may be unequally spaced, at increasing distances for example, in which case each of slots 17 through 19 is spaced between successive pairs of slots 11 through 14 at corresponding increasing distances. All of the slots 11 through 14 and 17 through 19 are preferably of equal length.

The slots conjointly divide sheet 10 into a sequence of series-connected, transverse strips 20 through 27. A broken line 28 represents a longitudinal axis of sheet 10 and the strips 20 through 27 have a width in a direction along the axis 28 substantially greater than the width of the slots in this same direction.

As shown in Fig. 2, successive ones of the strips 20 through 27 are deformed into substantially semi-circular arcs extending in alternate senses from the longitudinal axis 28 of sheet 10. Thus, a conductive turn of the inductor is effectively defined by each successive pair of strips. The plurality of conductive turns so formed are spaced at constant pitch and define an inductor in the nature of a helix which is terminated at end portions 29 and 30. If, for example, the inductor is formed from a sheet having slots 11 through 19 spaced at increasing distances, an inductor of varying pitch is effected.

To produce a coil such as the one illustrated in Fig. 2, it is apparent that only punching and/or stamping operations or the like are necessary. The details of such operations are well known to the art of metal working. A die or set of dies may be manufactured which in connection with a punch press enables the production of a sheet having the configuration shown in Fig. 1. In subsequent stamping operations, the transverse strips

20 through 27 may be deformed through the use of dies in accordance with stamping practices well understood in the art. It is entirely feasible to construct a set of dies by the use of which the entire deforming opertion can be accomplished with a single blow. It is also within the contemplation of this invention to produce a coil as illustrated in Fig. 2 by a set of dies in which both the cutting or punching, as well as the deforming or stamping operations, are completed with a single blow.

Thus, it may be seen that the device shown in Figs. 1 and 2 is an inductor or a coil adapted to be constructed from a thin sheet of conductive material by speedy, mass-production, punching and/or stamping methods. Further, inasmuch as these methods are applicable, the inductor or coil can be produced with economy as well as speed, compared with the slow and costly operations inherent in producing inductors by a winding machine.

The modified form of conductive sheet shown in Fig. 3 may readily be employed to form a coil such as shown in Fig. 2, by any of the methods described in connection therewith. The modified form of the sheet 10 is similar to that of Fig. 1 and corresponding portions thereof are indicated by the same reference numerals. In Fig. 3 the slots 11 through 14 and 17 through 19 are much narrower than those shown in Fig. 1. These slots are in the nature of slits, and are formed by a method similar to a single, shearing operation rather than a material-removing operation. It is recognized that in a slit formed by a shearing operation, some small degree of material, however minute, is removed. Also, where a shearing operation causes stretching or distortion of the sheet to seemingly close the gap formed by shearing, there will generally be an incomplete closure. This is true since the sides of such a gap usually are not perfectly straight.

It is apparent that in forming the sheet of Fig. 3 into the coil of Fig. 2, since very little material is removed between adjacent transverse strips, there may be a tendency for adjacent turns to be short-circuited. In order to preclude such a possibility, corner portions such as 31 through 44 of transverse strips 20 through 27 are deformed from the plane of the sheet either in the same direction or in alternate directions.

The modified conductive sheet of Fig. 4 is similar to that of Fig. 3 and corresponding portions thereof are indicated by the same reference numerals. As in the sheet of Fig. 3, since the slots comprise very thin slits, adjacent turns of the coil may be subject to short-circuiting. To preclude this possibility, each of the slits 12 through 15 and 17 through 19 is flared outwardly toward edges 15 and 16, respectively. The flaring is accomplished by means of diagonal corners such as 45 through 58 on the transverse strips 20 through 27 along edges 15 and 16 of sheet 10.

The process of forming a coil from the sheets shown in Figs. 3 and 4 will be readily understood from the afore-described operations performed on the sheet of Fig. 1. The same low cost and speedy methods are clearly applicable to these alternative configurations.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. An inductor comprising: a thin, substantially rectangular sheet of conductive material having a first series of transverse slots extending more than half the width of the sheet from one edge of the sheet toward the opposite edge and having a second series of similar transverse slots alternating with those of said first series, but extending from said opposite edge toward said one edge; and said slots conjointly dividing said sheet into a sequence of series-connected transverse strips, successive ones of said strips projecting in alternate senses from the longitudinal axis of said sheet whereby successive pairs of said strips form successive turns of the inductor.

2. An inductor comprising: a thin, substantially rectangular sheet of conductive material having a first series of equally spaced transverse slots extending more than half the width of the sheet from one edge of the sheet toward the opposite edge and having a second series of similar transverse slots alternating with those of said first series, and equally spaced between successive slots of said first series, but extending from said opposite edge toward said one edge; and said slots conjointly dividing said sheet into a sequence of series-connected transverse strips and successive one of said strips projecting in alternate senses from the longitudinal axis of said sheet whereby successive pairs of said strips form successive turns of the inductor.

3. An inductor comprising: a thin, substantially rectangular sheet of conductive material having a first series of transverse slots of equal length extending more than half the width of the sheet from one edge of the sheet toward the opposite edge and having a second series of similar transverse slots alternating with those of said first series, but extending from said opposite edge toward said one edge; and said slots conjointly dividing said sheet into a sequence of series-connected transverse strips and successive ones of said strips projecting in alternate senses from the longitudinal axis of said sheet whereby successive pairs of said strips form successive turns of the inductor.

4. An inductor comprising: a thin, substantially rectangular sheet of conductive material having a first series of transverse slots extending more than half the width of the sheet from one edge of the sheet toward the opposite edge and having a second series of similar transverse slots alternating with those of said first series, but extending from said opposite edge toward said one edge: and said slots conjointly dividing said sheet into a sequence of series-connected transverse strips individually having a dimension along the longitudinal axis of said sheet substantially greater than the dimension of said slots in the same direction, and successive ones of said strips projecting in alternate senses from said longitudinal axis whereby successive pairs of said strips form successive turns of the inductor.

5. An inductor comprising: a thin, substantially rectangular sheet of conductive material having a first series of transverse slots extending more than half the width of the sheet from one edge of the sheet toward the opposite edge and having a second series of similar transverse slots alternating with those of said first series, but extending from said opposite edge toward said one edge; and said slots conjointly dividing said sheet into

a sequence of series-connected transverse strips, successive ones of said strips constituting substantially semi-circular arcs extending in alternate senses from the longitudinal axis of said sheet whereby successive pairs of said strips form successive turns of the inductor.

6. An inductor comprising: a thin, substantially rectangular sheet of conductive material having a first series of transverse slots extending more than half the width of the sheet from one edge of the sheet toward the opposite edge and having a second series of similar transverse slots alternating with those of said first series, but extending from said opposite edge toward said one edge; said edges and said slots conjointly defining a plurality of corners and immediately adjacent ones of said corners being deformed from the longitudinal axis of said sheet; and said slots conjointly dividing said sheet into a sequence of series-connected transverse strips, successive ones of said strips projecting in alternate senses from the longitudinal axis of said sheet whereby successive pairs of said strips form successive turns of the inductor.

7. An inductor comprising: a thin, substantially rectangular sheet of conductive material having a first series of transverse slots extending more

than half the width of the sheet from one edge of the sheet toward the opposite edge and flared outwardly toward said one edge, and having a second series of similar transverse slots alternating with those of said first series, but extending from said opposite edge toward said one edge and flared outwardly toward said opposite edge; and said slots conjointly dividing said sheet into a sequence of series-connected transverse strips and successive ones of said strips projecting in alternate senses from the longitudinal axis of said sheet whereby successive pairs of said strips form successive turns of the inductor.

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