Oct. 25, 1949. M. SILVER 2,485,666

TRANSFORMER

Filed April 6, 1946

Fig. 1.

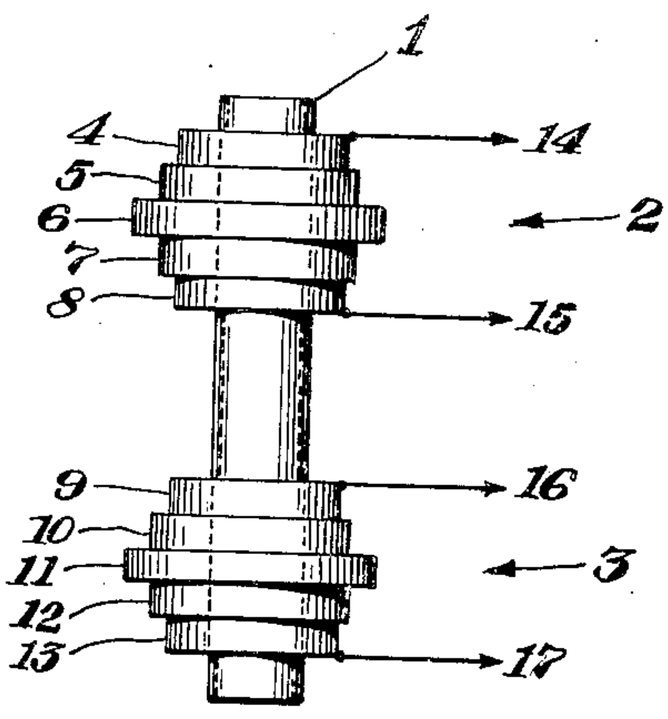
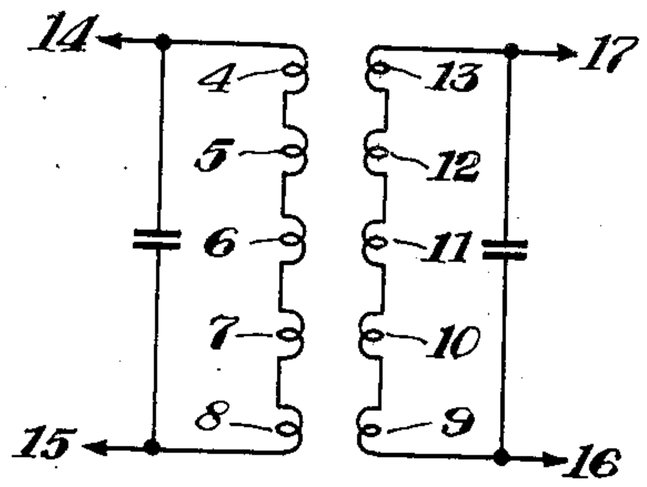


Fig. 2.



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2,485,666

TRANSFORMER

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2 Claims. (Cl. 175—359)

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This invention relates to transformers and more particularly to the arrangement of the transformer windings in order to achieve a given degree of coupling.

In certain applications of the electronics art, it is desirable, for example, in the case of low frequency-intermediate frequency systems that the intermediate frequency transformers used therein be characterized by a narrow band width. In the conventionally designed transformer a narrow band width may be achieved only by increasing the looseness of coupling of the primary and secondary coils. Ordinarily, this is possible only at the expense of the compactness of the mechanical design since rather wide spacing of the coils is required.

It is an object of the invention to provide an intermediate frequency transformer which is characterized by a comparatively low mutual inductance as between its primary and secondary coils.

It is also an object to provide a transformer which is characterized by compactness in spite of a loose coupling of the coils.

Still a further object is to provide a transformer of the type referred to which is compact and has a narrow band characteristic.

In accordance with the invention, I provide a transformer which comprises a tubular magnetizable member on which are mounted a series of pie windings constituting the primary and the secondary coils. The windings which are connected in series, are arranged in the form of two stacks, the diameters of the windings being small at the ends of the coil and increasing toward the centers thereof. The effective mutual inductance of the corresponding pie windings is thus made a function of their size and respective distances. In addition, increased shielding of the more remote coils with respect to one another is achieved by arranging the larger windings in the center of the two coils.

These and other features and objects will become more clearly apparent and the invention itself best understood from the following detailed description of an embodiment of this invention reference being had to the accompanying drawings, in which:

Fig. 1 is a diagrammatic representation of a transformer in accordance with the invention; and

Fig. 2 is a diagram in schematic form of the transformer windings of Fig. 1.

Referring to Fig. 1, the transformer is seen to comprise a tubular magnetizable member 1 on

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which are mounted in the form of stacks a primary coil 2 and a secondary coil 3. Each of the coils 2 and 3 are comprised of five windings 4, 5, 6, 7, 8 and 9, 10, 11, 12 and 13 respectively. As shown in Fig. 2 the respective windings are connected in series to form the primary and secondary coils 2 and 3 respectively, having respective terminals at 14, 15, 16 and 17. According to a preferred form, windings 4, 8, 9 and 13 may each comprise 75 turns; the windings 5, 7, 10 and 12, 100 turns; and the windings 6 and 11, 150 turns. The size of the coils as indicated in Fig. 1 has been made to correspond with the preferred number of turns for such windings.

It will be seen that the pies 8 and 9 of the smallest size are the closest to one another. The next adjacent set of pies 7 and 10 are slightly larger, that is, have a larger inductance, but are spaced a greater distance away and consequently will have a small effective mutual inductance. The largest windings 6 and 11 have a small mutual inductance because of their distance. The remaining windings 4, 5 and 12 and 13 are shielded from one another by means of the larger intervening windings 6 and 11, whereby their coupling is reduced. It is of course understood that there is also mutual inductance between the other windings such as between 8 and 10. However, this does not lessen or alter the effects just explained.

It is thus seen that the mutual coupling between the primary and secondary is looser in this arrangement than it would be if all the pies were uniform in size but reduced in diameter to give the same total inductance. This has been achieved in part by the factor of distance in size, as well as the partial shielding effect of the larger windings in respect to some of the smaller ones.

Although I have shown and described a specific form, it should be understood that the relative sizes and distances of the pies as well as their number may be varied to attain any desired degree of coupling and shielding.

While the above is a description of the principles of this invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of this invention.

I claim:

1. An intermediate frequency coupling transformer having a narrow band width, comprising a magnetizable portion, a primary and secondary coil on said portion, said coils each having a given equal number of windings forming two stacks of submultiple windings, the outer diameters of said

windings being of varying size, said windings having the largest outer diameter being disposed in the center of said stacks whereby a shielding effect is obtained as between the outermost windings, whereby a given looseness of coupling between said primary and secondary winding is obtained with a relatively small physical size of transformer.

2. An intermediate frequency coupling transformer comprising a magnetizable tubular member, a primary and secondary coil each comprising an equal number of stacked submultiple windings in series on said member, the corresponding windings of the primary and secondary coils being of substantially the same diameter and increasing in diameter from the ends of said coils towards the centers thereof, whereby a given looseness of coupling between said primary and secondary winding is obtained with a relatively small physical size of transformer.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,927,672	Wheeler	Sept. 19, 1933
2,180,413	Harvey	Nov. 21, 1939
2,351,604	Ferrill	June 20, 1944

FOREIGN PATENTS

Number	Country	Date
532,251	Germany	Aug. 13, 1931
687,804	France	May 5, 1930