Feb. 3, 1959 A. M. BOOTHE 2,872,649

INTERMEDIATE FREQUENCY TRANSFORMER

Filed Oct. 25, 1955

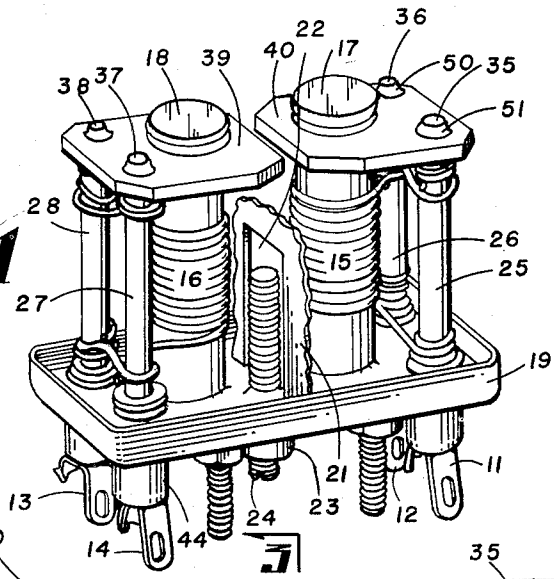


Fig 1

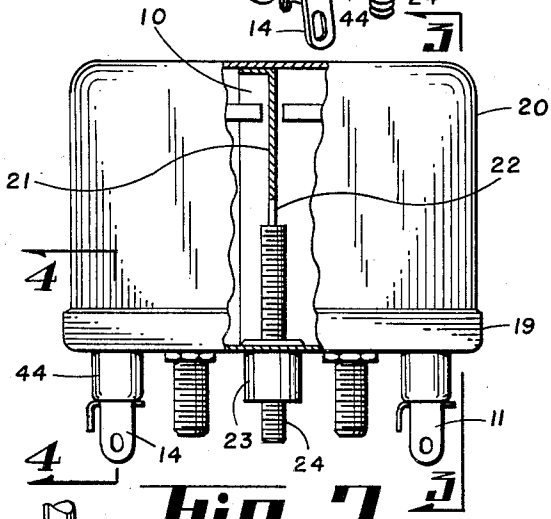


Fig 2

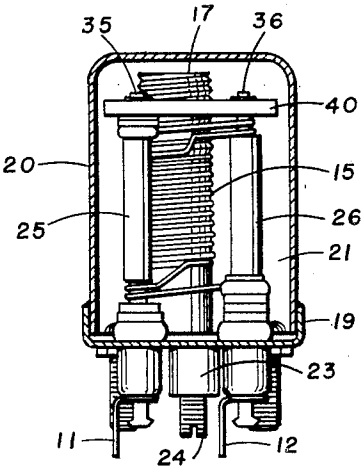


Fig 3

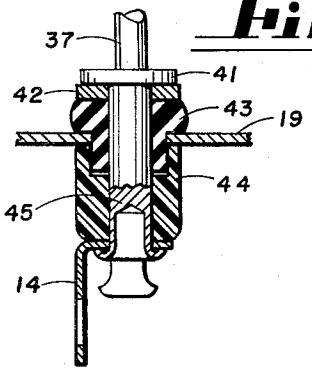


Fig 4

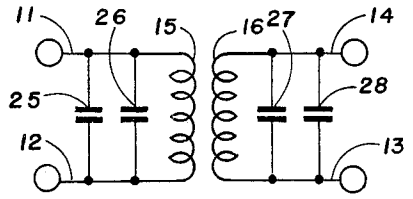


Fig 5

INVENTOR.
ALONZO M. BOOTHE.
BY Alden D. Bedfield.
Charles M. Hogan.
ATTORNEYS.

United States Patent Office 2,872,649 Patented Feb. 3, 1959

2,872,649

INTERMEDIATE FREQUENCY TRANSFORMER

Alonzo M. Boothe, Cincinnati, Ohio, assignor to Avco Manufacturing Corporation, Cincinnati, Ohio, a corporation of Delaware

Application October 25, 1955, Serial No. 542,747

1 Claim. (Cl. 333—77)

The present invention relates generally to intermediate frequency (I. F.) signal transformers and specifically provides a miniature I. F. transformer of particularly durable construction, stable gain, and uniform band width.

A specific object of the invention is to provide a compact I. F. transformer which is suitable for the following electrical requirements:

Q of each inductance: 125 at 18.9 megacycles per second,

Band width characteristics of a four-stage amplifier employing five of these transformer: 140 kilocycles (kc.) at the 6 db points and 440 kc. at the 60 db points.

A primary object of the invention is to achieve miniaturization in an I. F. transformer of the type which is particularly suitable for use in a glide slope receiver, without impairing the desired Q characteristic.

Another object of the invention is to provide, in an intermediate frequency transformer, effective means for adjusting the coupling without increasing the space requirements and after sealing of the assembly.

For a better understanding of the invention, together with other and further objects, advantages, and capabilities thereof, reference is made to the following description of the accompanying drawings.

In the drawings:

Fig. 1 is a perspective view showing my improved transformer structure with only a fragment of the partition portion of the shielding can in place;

Fig. 2 is a front elevational view partially broken into section, showing the assembly of base and can and the details of the arrangement for adjusting the coupling;

Fig. 3 is a side elevational view taken along the section line 3—3 of Fig. 2;

Fig. 4 is an elevational sectional view taken along the line 4—4 of Fig. 2, looking in the direction of the arrows and showing details of a representative terminal lug and associated structure; and

Fig. 5 is a circuit diagram of the entire transformer unit in accordance with the invention.

As indicated above, this transformer is of particular utility in a glide slope receiver.

The coupling desired in the intermediate frequency transformer in accordance with the invention is primarily magnetic, not tight, and is of a single peak critical character. In accordance with this invention this objective is accomplished within rigid space limitations by constructing the transformer in the form of two closely spaced solenoid windings with a brass shield between them to restrict the coupling, as will be described below.

The transformer circuit connections are brought out to terminal lugs **11**, **12**, **13**, and **14**, the first two of which constitute the primary terminals and the remaining two the secondary terminals of the double-tuned intermediate frequency circuit electrically illustrated in Fig. 5. The primary and secondary windings **15** and **16** are simple closely spaced solenoids, each securely wound on a hollow externally threaded ceramic form **17** or **18**. The

forms are hollow in construction, closed at their upper ends and open at their lower ends (secured to base **19**), to permit tuning by means fo powdered iron cores slidably mounted within the coils. Such tuning adjustments by powdered iron cores are per se well known, so that the cores are not herein shown. The coil forms are rigidly secured to a copper base member **19** and project upwardly therefrom.

Shielding is provided by a copper can **20** which is secured to the base as shown in Figs. 2 and 3. In accordance with the invention, there is provided in the can **20** a transverse conductive partition **21**, made of copper or the like. The partition may be integral with the base or can or secured to the can by a flange as indicated at **10**. The partition restricts the coupling between the primary and the secondary circuits. Provision is made for adjusting the coupling in this manner: Partition **21** is slotted as shown at **22**; secured to a suitable internally threaded fitting **23** in the base **19** is an adjusting screw of brass or other suitable conductive non-magnetic material. Element **24** projects between the primary and secondary coils **15** and **16** to vary the coupling by adjustably closing, to a greater or lesser degree, the slot or opening **22** in the partition **21**. Only a fragmentary portion of partition **21** is shown in Fig. 1, and the entire partition is shown in section in Fig. 2.

The capacitance parameter in the primary circuit is supplied by fixed capacitors **25** and **26**. Similarly, fixed capacitors **27** and **28** are provided in the secondary circuit.

The mechanical structural arrangement of these capacitors is unique and complementary to the coil arrangement in that the capacitors are slidably mounted on terminal posts **35**, **36**, **37**, and **38**, each rigidly secured in place near its respective corner of the base **19** by a structure such as that detailed in Fig. 4.

During assembly and after the capacitors are slipped into place on the terminal posts, a rigid assembly of capacitors and coil forms is completed in such a way that the capacitors are prevented from coming into contact with the shielding can **20**. This is effected by phenolic boards **39** and **40**, each apertured to receive a coil form and having eyelets such as **50** and **51** soldered to the ends of a pair of terminal posts, as shown in Fig. 1.

Coming now to the details by which the terminal posts are secured to the base and electrically brought out to their respective lugs, post **37** in Fig. 4 is representative. An enlarged metallic portion thereof, designated **41**, abuts against a washer **42** which in turn is located adjacent a grommet **43**. Grommet **43** is formed with an annular extended portion which projects through base **19** into a countersunk portion of a plastic insulator **44**. The members **42**, **43**, and **44** are apertured to receive a projecting integral extension **45** of post **37**, and terminal lug **14** is electrically secured to such extension.

In a practical transformer suitable for use with an operating frequency of 18.9 megacycles, the primary capacitors **25** and **26** have an aggregate value of 100 micromicrofarads and the aggregate value of capacitors **27** and **28** is the same.

While there has been shown and described what is at present considered to be the preferred embodiment of the invention, I desire in the appended claim to secure a fair and reasonable range of equivalents.

I claim:

A double-tuned intermediate frequency transformer comprising, in combination: a rectangular copper base member; an open-mouthed copper shielding can including a transverse central copper partition having a slot formed therein, said slot opening into the mouth of the can, said can being removable from, but normally secured to, said base member with its mouth adjacent the

base member; first, second, third and fourth upwardly projecting terminal posts mounted adjacent the corners of said base member; first and second solenoid coils fixedly mounted on said base member, the central axis of each of said coils being disposed perpendicularly to said base member, said first solenoid coil being mounted adjacent said first and second posts, said second solenoid being mounted adjacent said third and fourth posts, said partition being located between said solenoids when the can is placed on said base member; first, second, third and fourth tubular capacitors concentrically mounted on said posts; means for interconnecting the first and second capacitors and the first solenoid in a primary tuned circuit; means for interconnecting the third and fourth capacitors and the second solenoid in a secondary tuned circuit, said tuned circuits being on opposite sides of said partition when the can is located on said base member; first and second insulating boards disposed with a gap therebetween, said first insulating board being disposed parallel to said base member and being apertured to receive and position in rigid assembly said first and second terminal posts, said first and second capacitors and said first solenoid coil; said second insulating board

being disposed parallel to said base member and being apertured to receive and position in rigid assembly said third and fourth terminal posts, said third and fourth capacitors and said second solenoid coil; said transverse partition extending through said gap, and an adjusting screw projecting through said base member into said slot for adjusting the coupling between said primary tuned circuit and said secondary tuned circuit, the central axis of said screw being directed lengthwise of said slot; said tubular capacitors extending from said base to said insulating boards.

References Cited in the file of this patent

UNITED STATES PATENTS

2,082,590	Neighbors et al.	June 1, 1937
2,388,049	Goode	Oct. 30, 1945
2,594,037	Landon et al.	Apr. 22, 1952
2,648,825	Eberhardt	Aug. 11, 1953

FOREIGN PATENTS

506,885	Belgium	May 5, 1952
691,333	Great Britain	May 13, 1953