Feb. 21, 1967 AKIRA MATSUSHITA 3,305,727

PARAMETRON CIRCUIT UTILIZING THIN FILM ELEMENT

Filed May 27, 1964

FIG. 1

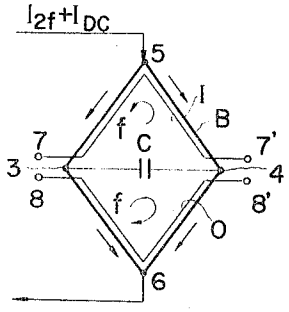
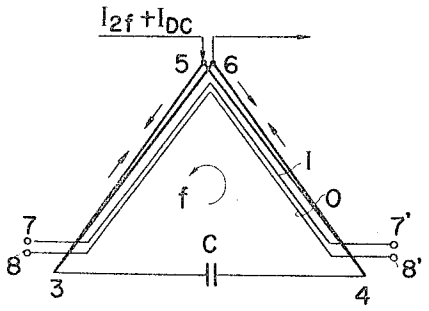


FIG. 2



FIG. 3



United States Patent Office 3,305,727 Patented Feb. 21, 1967

3,305,727

PARAMETRON CIRCUIT UTILIZING THIN FILM ELEMENT

Akira Matsushita, Kitatama-gun, Tokyo-to, Japan, assignor to Kabushiki Kaisha Toko Radio Coil Kenkyusho, Tokyo-to, Japan, a joint-stock company of Japan

Filed May 27, 1964, Ser. No. 370,594
Claims priority, application Japan, May 30, 1963, 38/28,074
3 Claims. (Cl. 307—88)

This invention relates to an improved parametron of a balanced bridge type.

In this type of parametrons, as the input and output coils are disposed close to the arms of the bridge, there is a tendency for the output signal to be affected by the excitation curent flowing through the arms of the bridge due to inductive coupling between these coils and bridge arms.

Accordingly, the principal object of this invention is to provide a novel bridge type parametron wherein such error due to inductive coupling is eliminated.

Further objects and advantages of the present invention will become apparent and this invention will be better understood from the following description, reference being made to the accompanying drawings in which like parts are designated by like reference characters, and in which:

FIG. 1 shows a diagram of a bridge type parametron element utilizing wires having coatings of magnetic material;

FIG. 2 shows a perspective view of a wire having a coating of a magnetic material; and

FIG. 3 is a diagram illustrating the parametron according to this invention.

Referring now to the accompanying drawing, FIG. 1 shows a balanced bridge B comprising four arms each consisting of a core **1** of a diamagnetic or non-magnetic material such as copper, molybdenum, Invar alloy, and the like and a magnetic film **2** such as permalloy, nickel alloy, and the like deposited on the core by electrolytic plating, vapor deposition, and the like process, as shown in FIG. 2. A tuning capacitor C is connected across balanced terminals **3** and **4** of the bridge while an excitation current I_{2f} having a frequency $2f$ and a direct current I_{DC} are applied across input terminals **5** and **6** to produce an oscillating voltage having a frequency f across the capacitor C. As shown in FIG. 1, an input coupling coil I having input terminals **7** and **7'** is disposed adjacent to the upper two arms, and an output coupling coil O having output terminals **8** and **8'** is similarly disposed adjacent to the lower two arms of the bridge. While the input and output coupling coils are each shown as comprising a single conductor, they may each comprise a plurality of parallel conductors.

While the input and output coupling coils are disposed closely adjacent to the bridge arms to inductively couple the coils with the arms, the coils are also coupled with the excitation current I_{2f}, so that there is difficulty in deriving an accurate output.

This invention contemplates the elimination of said difficulty, and it is a unique feature of this invention that the bridge B shown in FIG. 1 is folded along a line passing through the balanced terminals **3** and **4** to superpose the arms of the bridge as well as the input and output coils I and O respectively, as shown in FIG. 3.

While in FIG. 3, for the sake of clear illustration, the overlapped bridge arms and input and output coupling coils are shown slightly displaced from each other, it will be understood that they may be precisely overlapped, or, in actual construction, one of them can be

wired on one surface of a base plate made of insulating material, while the other is wired on the opposite surface thereof.

With the construction wherein the bridge arms and coils are folded along a line passing through the balanced terminals **3** and **4**, the excitation current flows through the superposed bridge arms in opposite directions to cancel each other, so that, as a result, said current does not appear in the output. Thus, only an output signal of the frequency f will be derived at the output.

For brevity, while in FIG. 1 the balanced bridge B is shown in the shape of a diamond, if the terminals **5** and **6** are made as printed wires, the bridge arms on the opposite sides of a line passing through the terminals **5** and **6** can be made as straight lines (thus the bridge including printed wires can be made as a rectangle). As a result, the arrangement shown in FIG. 3 and including lead wires of the capacitor C can be made up in a triangular form.

Alternatively, the superposed two bridge arms as well as input and output coils may be wired as straight lines. In other words, these bridge arms may be formed by disposing two straight wires having magnetic coatings with their intermediate points utilized as excitation terminals and their ends interconnected together and connected with the tuning capacitor.

Further, it is to be understood, of course, that all of the bridge arms can be made from a single wire having a magnetic coating.

While the invention has been explained by describing particular embodiments thereof, it will be apparent that improvements and modifications may be made therein without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. A parametron comprising a balanced bridge including arms composed of a wire having a coating of a magnetic material, a tuning capacitor connected across balanced points of said bridge, said bridge being folded along a line passing through said balanced terminals to superpose the arms of said bridge so that excitation current flows therethrough in opposite directions, and input and output coupling coils disposed adjacent and close to said superposed bridge arms.

2. A parametron of generally a triangular form comprising two input terminals at an apex of said triangle, two pairs of bridge arms each extending from one of said input terminals to the other apices of said triangles, each of said arms consisting of a diamagnetic core and a coating of magnetic material, a tuning capacitor connected betwen said other apices and input and output coupling coils disposed close to said bridge arms comprising two sides of said triangle.

3. A parametron of generally a triangular form comprising two input terminals at an apex of said triangle, two pairs of bridge arms each extending from one of said input terminals to the other apices of said triangle, each of said arms consisting of a non-magnetic core and a coating of magnetic material, and a tuning capacitor connected between said other apices and input and output coupling coils disposed close to said bridge arms comprising two sides of said triangle.

References Cited by the Examiner

FOREIGN PATENTS

1,363,569 5/1964 France.

BERNARD KONICK, *Primary Examiner.*
J. MOFFITT, *Assistant Examiner.*