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In communications engineering devices it is known to arrange coils, which are (cross) coupled magnetically, adjacent or above one another on a coil former. A magnetisable iron core penetrates into the coil former, the coupling factor of the coils with respect to each other and the size of the inductances being affected by the said iron core. This iron core is implemented as a peg core for simple coil arrangements. The peg core is provided with a thread for a desired change in the parameters and is adjustable in its position with respect to the coils. In this type of construction, the frequency of the current is common to the individual coil parts.

From the document GB-A-2079065 is known a coil arrangement for a linear differential transmitter, in which a movable peg core penetrates into two adjacent windings which have approximately the same number of turns. The windings are connected in series so that their magnetic fields in the peg core act in opposite senses to each other. When an a.c. voltage from a third winding is coupled in, a voltage may be taken at the series circuit, from which a conclusion may be drawn about the position or the path covered by the peg core during its axial movement.

If the individual windings of a coil are to be used at different frequencies or the same frequency but for separate electrical applications, it is important that the inter-coupling of the coils should be minimised. The coupling has to be so small that there is no magnetic effect on one another. In order to reach such a solution, it is known to use a magnetic iron core in double E shape. The two E-shaped parts are joined together so that a rectangle is produced with two window openings. The windings are arranged on the two outer limbs. The magnetic separation is achieved by the fact that an air gap is cut into the outer limbs of the E-shaped iron core, while the iron parts rest directly on one another in the central crosspiece. The magnetic flow within the individual windings is therefore determined by the air gap inside the winding, while in the central crosspiece which is common to both coils the air gap is kept as small as possible, so that the magnetic (cross) coupling between the two coils reaches a minimal order of magnitude, which makes it possible to use the two coils separately e.g. at different frequencies. In order to have, as far as possible, no air gap in the central crosspiece, when joining the iron parts together, this surface is made flat optimally by special processing.

Since this type of arrangement with two E-shaped iron parts is very expensive, the objective underlying the invention is to state a coil arrangement having several windings for different applications with only one iron core.

This objective is achieved by the invention described in Claim 1. Advantageous refinements of the invention are described in the dependent claims.

In principle, magnetic fields of different size are produced by two coils arranged adjacent each other on a former, connected in series and having equally large inductances according to the

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polarity of the coils with respect to each other, when an a.c. voltage is applied in the common coil axis. When the polarity of the coils is in the same sense, this magnetic field reaches a specific value, whereas when there is polarity in opposite senses the resultant magnetic field cannot be or can scarcely be detected. This knowledge is exploited when solving the problem in a coil arrangement with a peg core, in order to implement coils for different objectives and at different frequencies. If in fact a third winding is arranged between the adjacent, series connected, magnetically oppositely polarised windings, then the said third winding is approximately free of outer winding field lines and may be used as a special coil. When there are different inductances, it is useful to arrange the coil with the larger inductance in the centre, since the core penetrates fully into this coil when using a peg core and there are no inductance losses as in the outer coils due to the oppositely polarised windings. Manufacturing tolerances may be compensated for during manufacture by shifting the peg core so that the outer windings have inductances of precisely the same size and when an a.c. voltage is applied have oppositely directed magnetic fields of the same size. The oppositely polarised connection of the outer windings necessitates inductance losses. Despite these inductance losses sufficient inductance is achieved for the outer windings, created by stray fields.

For better understanding of the invention examples of embodiment are described in greater detail below by way of drawings. In which:

Fig. 1 shows a schematic drawing of the coil arrangement,

Fig. 2 shows a part of a horizontal deflection circuit in a television appliance with correction of the east/west cushion distortion, in which the invention may advantageously find application

Fig. 3 shows an example of embodiment for a coil arrangement according to Fig. 1

Fig. 4 shows a part of a vertical deflection circuit in a television appliance with a vertical integration coil and the control part for a horizontal deflection circuit with a line driver transformer,

Fig. 5 shows the arrangement of the windings for the line driver transformer and for the vertical integration coil according to Fig. 4.

Fig. 1 shows a coil arrangement with three windings 2, 3 and 4 having winding connections 6, 7, 8 and 9. The windings are arranged adjacent each other on a winding former 5. In the winding former 5 is located a magnetisable peg core 1, which is adjustable in its position with respect to the windings. The outer windings 2 and 4 are arranged such that the peg core ends roughly at the outer edges of the coils. They are connected in series such that they act magnetically in opposite senses. The direction of the magnetic fields is indicated by the field lines shown. Because of the spacing of the outer windings 2, 4 from each other and despite their opposite polarity, the magnetic action of the peg core is such that sufficient inductance is still

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achievable. The decoupling of the winding 3 is optimum, if the peg core 1 is adjusted such that the magnetic fields of the outer windings 2,4 are of equal size. Since the peg core 1 fully penetrates into the central winding 3, the field lines of this coil close in a circle in the manner shown, in which the direction of the field lines and the applied frequency may be selected. The central winding 3 induces currents in the outer windings, which are of equal size and cancel each other out due to the opposite polarity.

Fig. 2 shows a part of a horizontal deflection circuit in a television appliance having an input 10, the deflection coils 11, 12, the linear adjuster 14, the tangential capacitor 15, the bridge coil 16, the parallel capacitor 17, the diodes 18,19, the return capacitors 20,21, the east/west control coil 22 and the east/west circuit 23.

In a preferred example of embodiment the central winding 3 is used as an east/west control coil at approx. 6 mH and the series circuit of the outer windings 2,4 is used as a bridge coil at approx. 1.7 mH in a television appliance. It is useful for rational manufacture to implement all windings with the same wire diameter. The outer windings 2,4 may be wound in the same winding sense or in the opposite sense to one another depending on the connection sequence. If different wire diameters are used, then it is better to arrange the east/west control coil in the outer chambers and the bridge coil in the central chamber.

Fig. 3 shows a peg core 1 in a winding former 5 with coil chambers 25,26,27 and the connecting pegs 29. In this example of embodiment the peg core 1 projects beyond the coil chambers 25 and 27. One of the advantages of a coil with the same wire diameter is an optimum winding technique, more particularly in automatically manufactured coils. Therefore the coil chambers 25 and 27 are wound in one operation. This happens as follows:

Chamber 25 is wound, then a transition turn to chamber 27 is wound in chamber 26 in the same winding sense as in chamber 25, chamber 27 is wound with the opposite winding sense to chamber 25. Then in chamber 26 in the same winding sense as chamber 27 a transition turn is wound and carried out. Finally, chamber 26 is wound in any desired winding sense.

Fig. 4 shows a part of a vertical deflection circuit in a television appliance having a vertical integration coil 2,4 and the control part for a horizontal deflection circuit with a line driver transformer 3.

Pulses for controlling the current in the horizontal deflection coils are fed from a pulse generator to the connection A. They are amplified in the transistor 40, the collector of which is connected to a connection of the primary coil 31 of the line driver transformer 3. The other connection is applied to the supply voltage U_s . From the secondary coil 30 the pulses reach the input of the line end transistor 43, from the collector connection C of which the horizontal deflection coils not shown and the line transformer are controlled.

Pulses for vertical deflection are supplied to the connection B from a pulse generator. Thyristor 36 is to be regarded as a switch, the horizontal return pulses, applied to the series circuit of the vertical deflection coils 40 with vertical integration coil 2,4 in time with the horizontal frequency, from the winding 39 of the line transformer, which is also in series, being connected by the said switch. The path of the vertical deflection voltage is so shaped by the vertical integration coil 2,4 that lines with the same vertical spacing are written on the screen. 17

The coils 30,31 and 2,4 are arranged on a peg core which is indicated by the connecting, broken line for the common iron core.

Fig. 5 shows the arrangement of the windings for the line driver transformer 3 and for the vertical integration coil 2,4 according to Fig. 4.

In a winding former 5 with five winding chambers the iron core 1 is arranged in the form of a peg core approximately at the centre of the chambers. The outer chambers house the coil parts of the vertical integration coil 2,4, and are wound in opposite senses. Because of this type of winding in opposite senses, stray fields arise to such an extent that an expensive ferrite cup is not required for shielding purposes.

The line driver transformer is housed in the three centre chambers. The secondary winding 30 lies close to the iron core as the lower winding. The winding distribution is selected so that the centre chamber takes up a larger secondary turn number than the adjacent chambers, as a result of which an optimum field distribution is possible, so that any effects of the line driver transformer and the vertical integration coil on each other may be minimised. Because of the larger wire diameter and because of the high currents it has proved to be useful to arrange the secondary coil in the lower winding layers of the three central chambers. Usefully, it is wound with the same wire, which is also provided for the vertical integration coils.

The primary winding 31 is arranged as the last winding on the secondary winding 30 which lies thereunder.



PATENT CLAIMS
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1. A coil arrangement with magnetisable peg core with several, at least three, adjacent windings (2,3,4) applied substantially symmetrically to the peg core, having the following features:

the outer windings (2,4) have approximately the same number of turns and are so connected electrically in series, that their magnetic fields in the peg core (1) work in opposition to each other;

the peg core (1) penetrates the outer windings in part or completely in such a way that the windings have approximately the same sized inductances;

the series connection of the outer windings (2,4) sets up a dipole of a predetermined inductance which is effectively electro-magnetically decoupled from one or several windings (3,20,31) arranged therebetween, which the peg core (1) wholly penetrates.

2. A coil arrangement according to claim 1, characterised in that all windings (2,3,4) have the same winding senses.

3. A coil arrangement according to claim 1, characterised in that the outer windings (2,4) are wound in opposition to each other.

4. A coil arrangement according to any one of claims 1-3, characterised in that the peg core is adjustable, so that the outer windings (2,4) may be set to equally large inductances.

5. A coil arrangement according to any one of claims 1-4, characterised in that the peg core (1) consists of ferromagnetic material, especially ferrite.

6. A coil arrangement according to any one of claims 1-5, characterised in that all three windings (2,3,4) are wound with equal wire diameters.

7. A coil arrangement according to any one of claims 1-6, characterised in that the middle winding (3) has the greater inductance.

8. A coil arrangement according to any one of claims 1-7, characterised in that the middle winding (3) is an east-west control winding (22) and the series connected outer windings (2,4) are a bridging coil (16) for a television appliance.

9. A coil arrangement according to any one of claims 1-7, characterised in that the middle winding (3) is formed as a line driver transformer with two superimposed winding layers (30,31) and the series connected outer windings are formed as a vertical integration coil for a television appliance.