

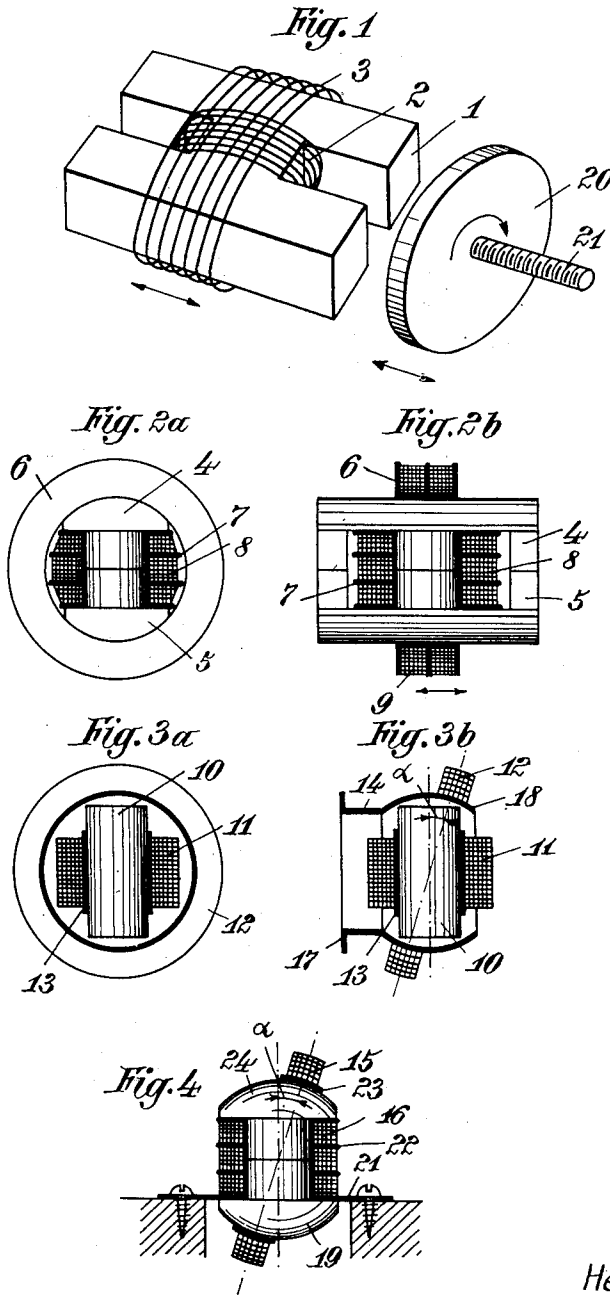
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INDUCTANCE COIL

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INDUCTANCE COIL

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This invention relates to an arrangement of inductance coils for radio receivers. It is the object of the invention to effect a small and inexpensive arrangement of two inductance windings which must be magnetically discoupled or nearly discoupled.

Another object is to reduce the amount of magnetic material required for high frequency iron cored coils.

Still another object is to render possible the construction of a simple intermediate frequency transformer with adjustable magnetic coupling.

According to the invention two inductance windings are arranged on a common magnetic core in such a way that their axes are forming an angle of about 90° , one of said inductance windings enclosing the magnetic core and the other inductance winding.

The invention will be better understood by reference to the accompanying drawing in which—

Fig. 1 shows the embodiment of the principle of the invention;

Fig. 2a shows an arrangement of coils in section;

Fig. 2b shows the same arrangement of coils in another section;

Fig. 3a shows another arrangement of coils in section;

Fig. 3b shows the same arrangement in another section;

Fig. 4 shows still another arrangement.

Referring now to the drawing and first to Fig. 1, 1 is an H-shaped magnetic core, 2 is the interior inductance winding and 3 is the exterior inductance winding. The two windings are so arranged to form an angle of about 90° to each other and the winding 3 is arranged substantially symmetrical on the magnetic core and around the winding 2. By changing the distance between the core and the magnetic plate 20, movable by the screw 21, the inductance of the interior winding may first be adjusted and by moving the exterior winding in an axial direction on the core the inductance of the exterior winding may be adjusted subsequently.

An arrangement of this kind may be used for various purposes. For instance high frequency iron cored coils having a core of low losses consisting of small magnetic particles and an insulating binder may be arranged in this manner. The composition and manufacture of such magnetic cores of low losses is described in Patents 2,064,773 and 2,064,771, and in the co-pending application of Hans Vogt, Serial No. 721,757, filed April 21, 1934, but other compositions and other

processes of manufacturing the cores may be used if the core losses are sufficiently small. The constructional arrangement, kind of insulating material, kind of wire and form of winding and core is also described in the Vogt Patent No. 2,064,774, and in the Patent No. 1,978,568 of Crossley and Neighbours.

According to the invention two tuning coils forming part of different circuits or intended for different wave ranges may be applied on a common magnetic core without influencing each other. Also immediate frequency transformers may be arranged in this way, the two coils of the band pass filter circuit being applied to the same core. By arranging the coils at an accurate angle of 90° to each other the magnetic coupling may be fully eliminated or if small magnetic coupling is required they may be arranged to differ somewhat from rectangular position.

Another application of the arrangement may be to avoid magnetic saturation of the magnetic material which is mainly occurring in low frequency or audio frequency range; for instance chokes for the mains such as used in radio receivers may be better utilized by arranging two windings magnetically discoupled on a common core. The saturation of the magnetic material produced by one of the windings reduces the permeability in the direction of the lines of magnetic force only, while the permeability is not or not so much reduced in the direction at right angles to the lines of magnetic force. Accordingly the magnetic core may be utilized twice without undue saturation.

According to Figs. 2a and 2b the core consists of two symmetrical parts 4 and 5 between which is arranged the interior coil 8 of multilayer cylindrical shape and wound in sections on an insulating material form 7 which includes a cylindrical sleeve and radial flanges. The exterior winding 9 is also of multilayer cylinder shape and on a similar sectionalized coil form 6 which surrounds the two core halves. The yokes of the core are circularly shaped to closely fit the exterior coil. The core may be a three limb core with the centre limb of circular cross section and the exterior core surfaces are of cylindrical shape. By displacing the form 6 and its winding 9 on the core in axial direction the inductance of the coil 9 may be adjusted within certain limits.

Figs. 3a and 3b show a somewhat different arrangement. The core 10 in this case is of rod shape and fitted with a multilayer cylindrical winding 11 of the universal type which is sep-

arated from the core by an intermediate dielectric layer 13. The whole is enclosed in a second universal winding 12 which may be separated from the core by an intermediate insulating piece 14, having a globular part 18, so that the winding 12 can be inclined on the insulating piece 14 to displace the central plane of winding 12 from coincidence with a plane through the axis of the core 10. The insulating piece 14 may be so shaped to support the whole arrangement and fix it by the flange or border 17. To keep the interior diameter of the winding 12 as small as possible and to fully utilize the circular shape within this exterior winding, the axial length of the core should be substantially equal to the interior diameter of the exterior winding 12 and to the exterior diameter of the winding 11; also the interior diameter of the winding 11 should be substantially equal to its axial length; also the axial length of the core should be 60 to 100 per cent longer than the axial length of the winding.

Another arrangement is shown in Fig. 4. An insulating coil form 22 is provided with a mounting flange 21 and bears the winding 16 and the two mushroom shaped core halves 19 and 24 forming together part of a ball and thus rendering it possible to turn the axis of the winding 15 fitted on an insulating sleeve or ring 23.

The assemblies shown in Figs. 3 and 4 are particularly suitable for immediate frequency transformers with adjustable coupling or for providing a tuning coil with adjustable antenna coupling device, the antenna coil preferably being represented by the exterior coil 12 or 15 respectively.

To reduce high frequency losses all insulating material being used should have small dielectric loss angle below tangens delta= $15 \cdot 10^{-4}$; for the same purpose thin litz wire should be used of 10 to 30 strands of substantially 0.05 mm. diameter each.

I claim:

1. An arrangement of inductance coils comprising an exterior winding, a magnetic core forming the support of said exterior winding, and an interior winding arranged on and substantially coaxial to a portion of said magnetic core, the central plane of said exterior winding passing approximately through but being displaced from the axis of said interior winding and associated portion of said magnetic core by an amount sufficient to adjust the inductance value of said exterior winding to the correct value.

2. An arrangement of inductance coils for radio receivers comprising an exterior winding, a magnetic core within said winding with its centre axis at an angle of about 90° to the axis of said winding, an interior winding co-axially arranged on said magnetic core, and end pieces of ball cap shape on said magnetic core.

3. An arrangement of inductance coils for radio receivers comprising an exterior winding, a magnetic core within said winding with its centre axis at an angle of about 90° to the axis of said winding and an interior winding symmetrically arranged on said magnetic core and within said exterior winding, the axial length of said magnetic core being substantially equal to the outer diameter of said interior winding and to the inner diameter of said exterior winding, the axial length of said interior winding being substantially equal to its inner diameter, and the axial length of said core being 60 to 100% longer than the axial length of said interior winding.

4. An arrangement of inductance coils for radio receivers comprising a common magnetic core, an exterior multilayer cylindrical winding around and movably supported on said magnetic core, and an interior multilayer cylindrical winding arranged approximately symmetrically within said exterior multilayer cylindrical winding and supported upon said common magnetic core with its axis in an angle of about 90° to the axis of said exterior inductance winding, so that said common magnetic core is traversed by magnetic flux in two directions at right angles to one another.

5. An arrangement of inductance coils for radio receivers comprising a common magnetic core of H-shaped cross section having outer limbs with exterior surfaces of cylindrical shape and a center limb of cylindrical form, an inner inductance winding supported on the centre limb of said H, an outer inductance winding surrounding both of the outer limbs of said H and said inner winding, so that said common magnetic core is traversed by magnetic flux in two directions at right angles to one another, and a sleeve of insulating material carrying said exterior winding and slidable upon said outer limbs for adjusting the inductance of said exterior winding.

6. An arrangement of inductance coils for radio receivers comprising a magnetic core having a portion of H-shaped cross section, an inner inductance winding supported on the centre limb of said H and an outer inductance winding surrounding both of the outer limbs of said H and said inner winding, and insulating means movably supporting said exterior winding on said outer limbs, whereby said common magnetic core is traversed by magnetic flux in two directions at right angles to one another and said exterior winding may be adjusted on said core to vary its inductance without affecting the inductance of the interior winding.

7. An arrangement of inductance windings, comprising a common magnetic core including a cylindrical portion, an exterior multilayer cylindrical winding around and supported on said magnetic core and an interior multilayer cylindrical winding the outer diameter of which is smaller than the inner diameter of said exterior winding, said interior winding positioned substantially symmetrically within said exterior winding and supported upon said cylindrical portion of the common magnetic core with its centre axis at an angle of about 90° to the centre axis of said exterior winding, so that said common magnetic core is traversed by magnetic flux in two directions at right angles to one another, each winding being carried by a sleeve of insulating material.

8. An inductance arrangement for radio receivers comprising a magnetic core having spaced portions extending transversely across the ends of and symmetrically disposed with respect to a central core section, an exterior coil extending around and arranged upon said magnetic core in the region of the central core section, a sleeve of insulating material carrying said coil and adjustable on said core to control the inductance of said exterior coil, and an interior coil positioned between said spaced core portions and surrounding the central core section, the axes of said coils being approximately at 90° to each other, whereby said magnetic core is traversed by magnetic flux in two directions at right angles to each other.

9. An inductance arrangement as claimed in 75

claim 8, wherein said central core section is cylindrical and said interior coil is coaxial therewith.

10. An inductance arrangement as claimed in claim 8, wherein said central core section is cylindrical, with said spaced portions having exterior surfaces of cylindrical contour and extending laterally of said central core section in H-form, said inner coil is coaxial with the central core section, and said sleeve carrying the exterior coil is cylindrical and slidable axially on said spaced portions of the core.

11. An inductance arrangement as claimed in claim 8, wherein said central core section is cylindrical and said spaced portions have exterior surfaces of spherical form, said interior coil is coaxial with said central core section, and said exterior coil is adjustably mounted on the spherical surface of said core portions for angular adjustment with respect to the axis of the interior coil.

12. An arrangement of inductance coils for radio receivers comprising a rod-shaped core of magnetic material, an inner coil on and coaxial with said core, an exterior coil having the axis thereof approximately at right angles to the axis of said core and the interior coil, and means supporting said exterior coil around said core and interior coil with the central plane of the

exterior coil approximately coinciding with a plane through the axis of the core.

13. In an inductance device for use in radio receivers, a magnetic core having a cylindrical portion of circular cross-section, an interior coil of multilayer cylindrical form on said cylindrical core portion, an exterior coil of multilayer cylindrical form extending around said core with its axis at approximately 90° to the axis of the interior coil, and insulating means supporting said exterior coil for adjustment of the central plane thereof with respect to the axis of said cylindrical core portion, thereby to control the inductance of said exterior coil.

14. The invention as claimed in claim 13, wherein said core includes transverse portions extending across the ends of said cylindrical portion, and said insulating means comprises a sleeve adjustable upon said transverse portions and carrying said exterior coil.

15. The invention as claimed in claim 13, wherein said cylindrical portion comprises the entire core, and said insulating means comprises a member of globular form enclosing said core and interior coil, said exterior coil being adjustable upon said globular-shaped member.

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