Nov. 12, 1929. O. STURNER 1,735,141

INDUCTANCE DEVICE

Filed July 2, 1926

Fig. 1

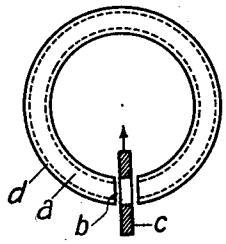


Fig. 2

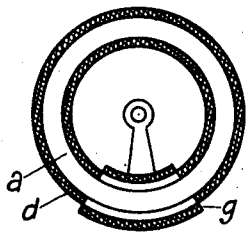


Fig. 3

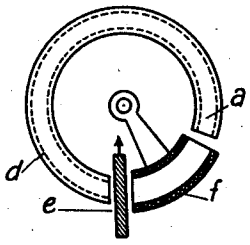


Fig. 4

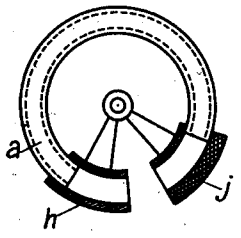


Fig. 8

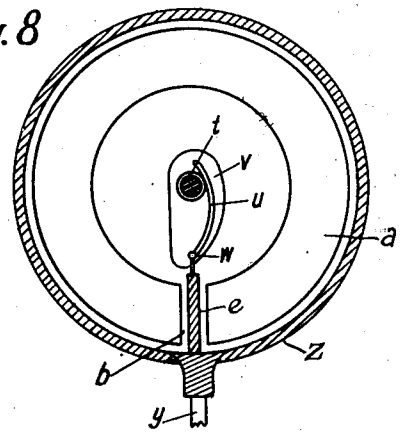


Fig. 7

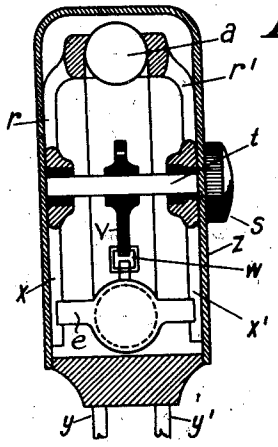


Fig. 5

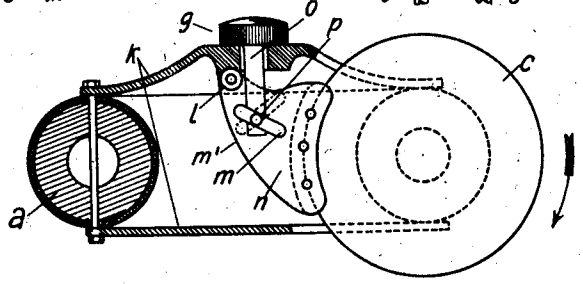
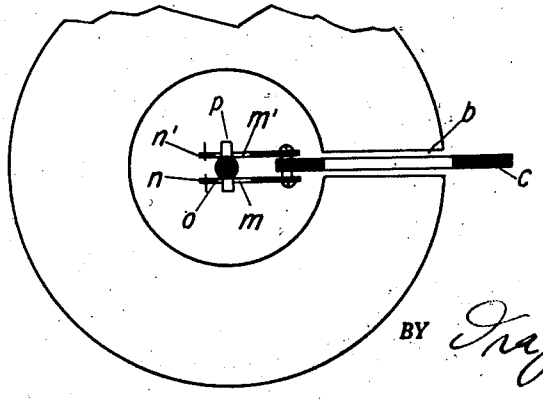


Fig. 6



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UNITED STATES PATENT OFFICE

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INDUCTANCE DEVICE

Application filed July 2, 1926, Serial No. 120,222, and in Germany July 6, 1925.

It has heretofore been almost a general rule in technical work to use cylindrical flat-coil and spherical variometers in various forms of construction. The employment of annular coil for variometer purposes has heretofore not been suggested, although, as will be noted, this latter type offers the advantage that its magnetic field falls almost entirely inside the coil, with the result that far less eddy-current flow is occasioned in conductors and less disturbance is caused in neighboring circuits.

The invention relates to an annular or ring-coil variometer and the same consists substantially in that the ring-coil body carries a fixed ring coil, a second coil being movably disposed inside the magnetic field of the former so that, according to the connection of the two coils, either a coupling or a variometer effect is produced.

In the drawings are shown several embodiments of the invention wherein:

Figs. 1 and 2 show variable coupling,

Fig. 3 and 4 a tuning variometer,

Figs. 5 and 6 show a longitudinal section, and the top view of a tuning device, respectively,

Fig. 7 the longitudinal section, and

Fig. 8 a side view of a short-circuit variometer construction.

It will be noted that the devices shown are capable of being connected either as a variocoupler or as a variometer; the first being when the coils are connected as primary and secondary coils, and the second being when the two coils are connected in series, whereby the currents produced in each coil may tend to add or subtract from the other, depending upon the position at which they are set.

The ring-coil body *a* of Fig. 1 is broken by a small air-gap *b*. In the said air-gap *b* is a flat (pancake) coil *c* which is capable either of being displaced or turned. On annular body *a* is the ring-coil winding *d*. When the two coils are in coupling connection, then, upon moving the flat coil *c* in the magnetic field of the ring-coil *d*, the coupling between the said two coils is varied. In the variometer connection of the two coils, the self-inductance is varied upon the pancake coil *c* being shifted. Instead of the flat coil, a metallic disk *e* could be provided (see for example Fig. 3). In case of radial displacement, such disk would likewise cause a change in the self-inductance of the fixed coil *d* arranged on the coil body *a*. In order that the damping losses occasioned in such metal disk may be compensated for as far as possible, a separate back-coupler coil *f* may be disposed in the ring-coil gap *b*. Also, in this case it is possible to use a flat coil instead of a ring coil, said flat coil being adapted to be displaced in a separate air-gap.

As shown in Fig. 2, a fixed ring coil *d* and the movable ring-coil *g* are disposed about the solid ring-coil body *a*, said movable coil *g* being capable of being shifted upon the fixed coil *d*. Also, in this case, according to the connection chosen, tuning by self-induction adjustment or a variation in coupling can be accomplished. The movable coil *g* could also be replaced by a metallic cylinder *h*; turning the latter about the fixed coil *d* then causing variation in self-inductance of the fixed coil *d*. The damping losses of the metallic cylinder *h* may be compensated for also in this scheme by the disposition of a movable back-coupler ring-coil *j* provided on the ring-coil body. (Fig. 4).

Figs. 5 and 6 show a variable coupling arrangement. The ring-coil body *a* carried by supporting body *k* has an air-gap *b*. In this air gap *b* is disposed a pancake coil *c* which is connected to the disks *n*, *n'*. These disks which are pivoted about point *l* are furnished with slots *m* and *m'*, respectively. Through the said slots *m* and *m'*, which extend in opposite directions with reference to each other, is passed a pin *p* attached to a rotatable axis or spindle *o*. Upon the spindle *o* being turned by knob *p* in clockwise direction, the pancake coil *c* is turned in the direction of the arrow as indicated in the drawing, and the coupling is made looser.

Figs. 7 and 8 show in more detail the constructional features of a ring-coil tuning inductance. Ring-coil body *a* is held by two lateral plates *r*, *r'* to which a spindle *t* connected with an adjustment button *s* is mounted. The spindle *t* carries a cam-shaped disk *v* having a curved slot *u*. In the curved

slot *u* formed in disk *v* is a chain ring *w* which is united with metal disk *e* fitted in guides *x x'* of the lateral plates *r*, *r'*. Set button *s* may be connected with a pointer which slides over a graduated scale. By turning spindle *t* in either direction by means of button or knob *s*, the said metal disk *e* will be radially shifted in the said guides due to the fact that the chain ring *w* moving in the curved path *u* is raised or lowered. This results in a variation of the self-inductance. Air-gap *b* of the ring-coil body *a* could also be made larger and a back-coupler coil of the kind shown in Fig. 3 be inserted, the latter being furnished with a lifting link which is attached to a tubular piece shifted over the spindle *t*. Then by turning the said tubular piece, the back-coupler coil would be shifted over and about the fixed ring coil. The entire structure is inserted in a protective metallic casing *z*, and is provided with plug pins *y*, *y'* to insure replaceability.

By suitable construction of the parts, any desired shape may be obtained for the self-inductance or coupling curve, for instance, so that the self-inductance, the mutual inductance, or the wave-length vary uniformly with the scale adjustment.

Having described my invention, I am entitled to all modifications thereof that fairly fall within its spirit and scope defined by the following claims:

1. An inductance device comprising an annular coil fixedly mounted between a pair of supporting plates, a member positioned in the magnetic field of said coil, a spindle journaled in one of said plates, and means operated from said spindle for shifting said member radially relative to said annular coil so as to vary the self-inductance of the device.

2. An inductance device comprising an annular ring-coil mounted between a pair of supporting plates, a disk like member of metallic material mounted in the magnetic field of said coil, a spindle journaled in one of said plates and adapted to be turned by a knob external to said plates, a slotted cam member carried by said spindle and means by which the rotation of the said spindle may be made to vary the self-inductance of the said annular coil.

3. An inductance device comprising a split annular coil fixedly mounted between a pair of supporting members, a movable member mounted in the air space provided by the split portion of the annular coil, a spindle journaled in one of said supporting members, a cam member associated with said spindle, a cam slot in said cam member and means on said spindle coacting with said cam slot for causing movement of said movable member in said air space.

4. An inductance device comprising an annular coil, an air gap in said coil, a movable member positioned in said air gap for varying the inductance of said coil, means for supporting said annular coil, and a cam member for actuating said movable member supported by said means.

5. An inductance device comprising an annular coil, an air gap in said coil, a member pivoted for movement radially of said coil disposed in said air gap and means for moving said member about its pivot point for varying the inductance of said coil.

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