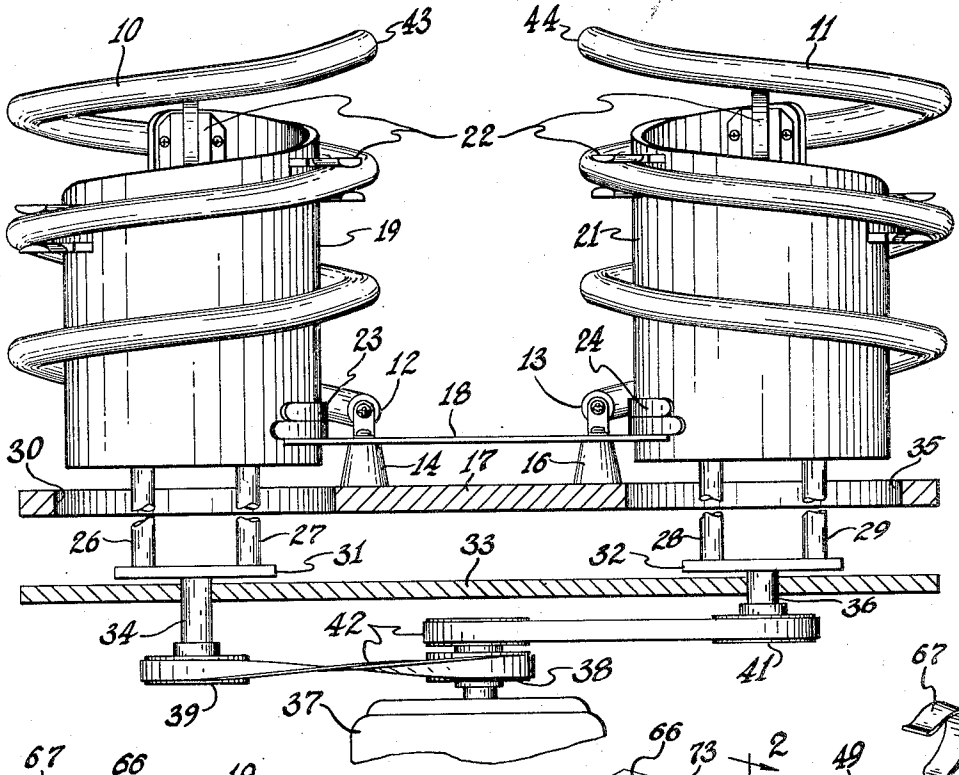
Oct. 5, 1954 J. L. HOLLIS 2,691,141

VARIABLE INDUCTOR

Filed Sept. 23, 1950

Fig. 1



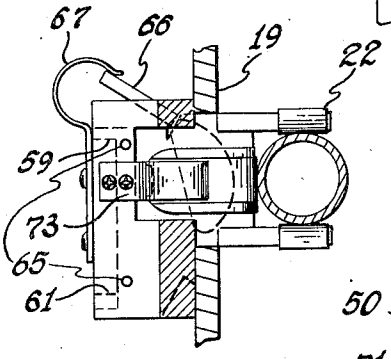


Fig. 2

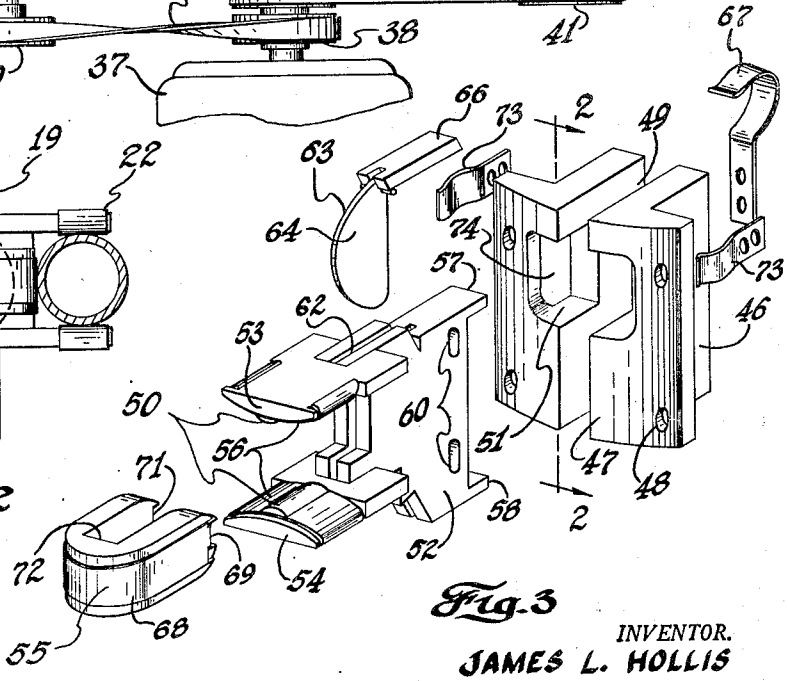


Fig. 3

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VARIABLE INDUCTOR

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6 Claims. (Cl. 336—139)

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This invention relates in general to variable inductors, and in particular to a self-centering, contact-supported, shorting drum.

It is an object of this invention to provide a variable inductor which has a low value of minimum inductance.

Another object of this invention is to provide a self-centering shorting drum which will always maintain good electrical contact with the inductor.

Still another object of this invention is to provide a shorting contact which, when connected to a movable drum will have self-centering features and always maintain good electrical contact with the inductance.

A feature of this invention is found in the provision for a shorting drum that is threaded to an inductance coil by means of contacts placed about its periphery and driven by driving means to move it longitudinally of the coil and thus vary the inductance by shorting out turns of the coil.

Further objects, features and advantages of this invention will become apparent from the following description and claims when read in view of the drawings, in which:

Figure 1 is a side view illustrating a pair of the variable inductors of this invention ganged together.

Figure 2 is an enlarged sectional view taken on line 2—2 of Figure 3 of the self-centering contacts that are mounted to the drum and engage the inductors, and

Figure 3 is an exploded view of a self-centering contact.

Figure 1 shows a pair of inductance coils 10 and 11 which are mounted closely adjacent to each other. The two inductances might be used where it is desired to obtain two voltages balanced to ground. The lower ends 12 and 13, respectively, of the coils 10 and 11 are attached to insulators 14 and 16, respectively, which are mounted on a base plate 17. A shorting bar 18 extends between the ends 12 and 13. Mounted within each of the coils 10 and 11 are drums 19 and 21, respectively. The drums 19 and 21 are supported and centered within the coils by centering contacts 22. Three of the contacts 22 are mounted near the upper edge of the drums 19 and 21. Two of the contacts are visible and the third one may be seen from the rear extending through the drums. It is to be noted that the top of drums 19 and 21 has an upwardly extending portion to conform to the shape of the coil.

The ends of shorting bar 18 have attached thereta brushes 23 and 24, respectively, that engage drums 19 and 21. The brushes 23 and 24 are spring-urged against the drums 19 and 21 due to their inherent elasticity. The lower ends of drums 19 and 21 are covered by plates, not

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shown. The plates have formed therethrough a pair of openings offset from the center line to receive rods 26 and 27, and 28 and 29, respectively. The lower ends of rods 26 and 27 are connected to an insulating plate 31 and the lower ends of rods 28 and 29 are connected to an insulating plate 32. A base member 33 has rotatably mounted therein the shafts 34 and 36 which are driven by driving means 37 through the pulleys 38, 39 and 41 and the belts 42. The shaft 34 is connected to plate 31 and the shaft 36 is connected to plate 32. The base plate 17 has openings 30 and 35 formed therein to allow the rods 26, 27, 28 and 29 to pass therethrough. The openings 30 and 35 are large enough to allow the drums 19 and 21 to pass therethrough. The rods 26, 27, 28 and 29 are slidably mounted in the plates of the drums and as the driving means 37 rotates them, the self-centering contacts 22 act as threads on the lead screw formed by the coils 10 and 11 and thus raise or lower the drums 19 and 21, depending upon direction of rotation. It is to be noted that one of the belts 42 is crossed so that both coils 10 and 11 will tune in the same direction. If the upper ends 43 and 44 of coils 10 and 11 are connected to a high voltage source, current will flow through the coils 10 and 11 until the first contact 22 is reached. The contact 22 will effectively short out the remaining turns of the inductance and the current will flow through the drums 19 and 21 and through the brushes 23 and 24.

Figures 2 and 3 are enlarged detailed views of the shorting contact 22. It comprises a fastening means 46 which has a convex drum engaging portion 47. It is fastened to the inside of the drum by screws or other holding means which pass through the openings 48.

A slot 49 is formed substantially through the member 46 and is enlarged intermediate the ends to form a cavity 51. A contact member 52 has outwardly extending contacts 53 and 54, to which are attached clips or covers 56. The uppermost contact 22 has a clip 56 which is flexible and has a high current carrying capacity. An example of a suitable material for this purpose is beryllium copper. The uppermost contact also has attached to the center a strip of engaging material 50, which might be a mixture of silver and tungsten, for example. The material 50 removes the current from the coils 10 and 11. The lower contacts 22 do not carry much current and applicant has learned that they may be made of spring steel which has been chromium-plated. The hard finish thus obtained polishes the coils at is moves along. The members 50 engage the coil 10 and short the turns. A center portion of the member 52 is generally flat and is received in a slot 49 formed in the

member 46. Slots 60 are formed in the member 52 and pins are passed therethrough and through openings 65 formed in the member 46 to allow the member 52 to move up and down. Protruding portions 57 and 58 are engaged by stops 59 and 61, as shown in Figure 2. The stops 59 and 61 and slots 60 allow vertical motion of the member 52 relative to the member 46. This allows the contact 22 to remain engaged with the coil, even when an irregularity exists. Flexibility of the clips 56 also allows slight variations in the thickness of the turns of the coil. This is best shown in Figure 2.

A slot 62 is formed in the member 52 and a lever 63 is received therein. A semi-circular flat portion 64 of lever 63 partially extends out of the slot 62 between the contacts 53 and 54, and a pivot arm 66 is engaged by a spring 67 which has one end thereof connected to the rear of the member 46. This is best shown in Figure 2.

A side-contact 68 of a generally U-shape is received between the contacts 53 and 54 with its legs 69 and 71 passing on either side of the member 52. The semi-circular portion 64 of the lever arm 63 engages the rear edge 72 of the side-contact to hold it in engagement with the side of the coil 10. It is to be noted that the arm 63, in conjunction with the spring 67, always biases the contacts 53 and 54 downwardly, and the member 68, outwardly against the coil. A clip 55 is received on the side contact and engages the side of the coil. The uppermost side contact may be made of beryllium copper and has an engaging strip, not shown, of silver and tungsten. The lower contacts 68 have chromium plated clips. The side contact 68, in addition to providing a third point of contact for removing the current from the coil, furnishes a self-centering contact wherein any lost motion due to irregularities in the diameter of various turns of the coil is taken up. The members 55 are engaged at either side thereof by wiper contacts 73 shown in Figure 2. Contacts 73 have their rear ends connected to the member 46 and pass through an opening 74 formed in the member 46.

Applicant has installed the apparatus of this invention in a fifty kilowat radio transmitter in the final output tuning circuit and has found that the large inductances required (about 2 feet long and 10 inches in diameter) may be very smoothly tuned by the manner disclosed herein.

It is seen that this invention provides means for shorting the turns of an inductor and simultaneously reducing stray inductance. The insertion of a self-centering metallic cylinder through the shorted turns greatly reduces the stray inductance.

Although this invention has been described with respect to a preferred embodiment thereof, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope of this invention as defined by the appended claims.

I claim:

1. Variable inductance means for varying the inductance of a coil comprising, a drum received within said coil, self-centering contacts mounted about the edge of said drum and formed with upper, lower, and side contacts, spring biasing means biasing said upper, lower, and side contacts into engagement with said coil, a pair of rods extending from a disc, a pair of openings formed through one end of said drum and said rods slidably received therethrough, and means for rotating said disc to move said drum longitudinally of said coil.

2. Variable inductance means for varying the inductance of a coil comprising, a coil with its axis in vertical position, a drum mounted in said coil, a contact supporting structure mounted inside of said drum, a plurality of upper contacts resting on said coil attached to said contact supporting structure and supporting the weight of said structure and drum to maintain constant tension on said upper contacts, a lower contact below each upper contact, a side contact between each set of upper and lower contacts, spring biasing means tensioning each side contact outwardly from said drum to self-center said drum, brush means for removing current from said drum, and means for rotating said drum in either direction.

3. Variable inductance means comprising, a vertically mounted coil, a plurality of upper and lower and side contacts, contact supporting means mounted inside of said drum, upper contacts bearing the weight of said drum and contact supporting means to maintain them under constant pressure, centering means to hold said drum in the center of said coil, and a brush to remove current from the drum.

4. Means for obtaining variable inductance in an electrical circuit comprising, a vertically mounted coil, a drum mounted in said coil, contact supports mounted to said drum, a plurality of contacts mounted on said supports, said contacts in engagement with said coil and bearing the weight of said drum and contact supports to maintain said contacts under constant gravitational pressure, and means to remove current from said drum.

5. A variable inductance in an electrical circuit comprising, a coil mounted vertically, a drum in said coil, a plurality of contact supports mounted inside of said drum, a plurality of contacts extending external to the drum, some of said contacts supporting the weight of said drum and said supports to maintain those contacts under a constant gravitational force, centering means to center said drum in said coil, and a brush means to remove current from said drum.

6. A variable inductance in an electrical circuit comprising, a helical coil mounted vertically, a drum suspended in said coil, a plurality of contact supports attached below the outside surface of said drum, a plurality of upper contacts extending radially outward from said drum near one end and bearing on said coil to support the weight of said drum and contact supports, side contacts extending radially outward against said coil, biasing means on said side contacts to self-center said drum in said coil, and brush means to remove current from said coil.

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