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G. R. SIEGRIST

INDUCTANCE COIL AND SELECTIVE CONTROL SWITCH THEREFOR

Filed Sept. 14, 1922

2 Sheets-Sheet 1

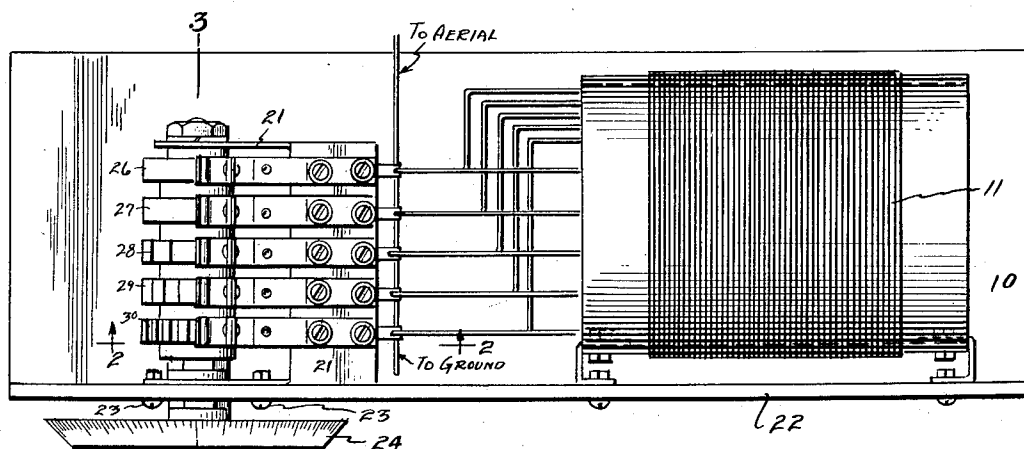


Fig. 1

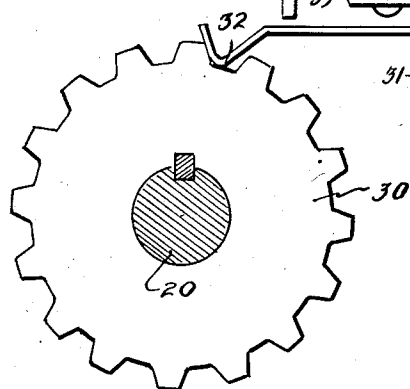


Fig. 2

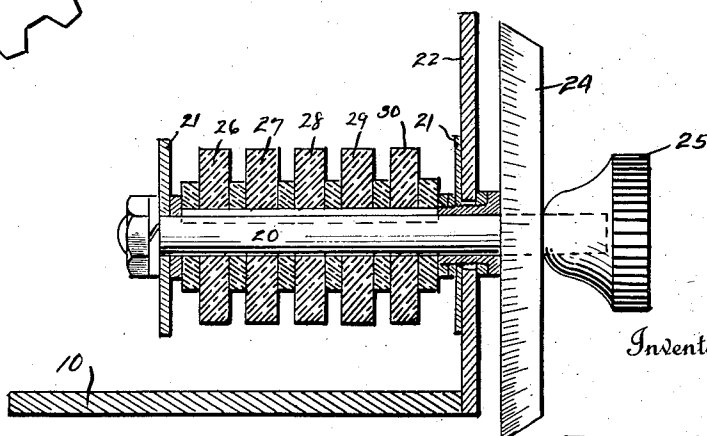


Fig. 3

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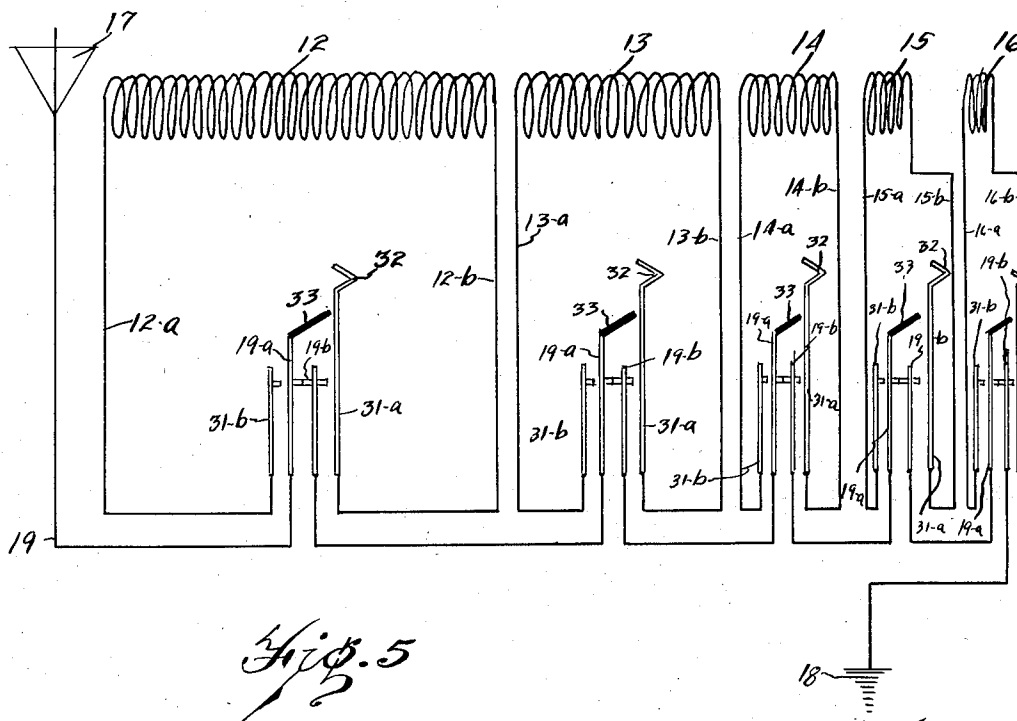
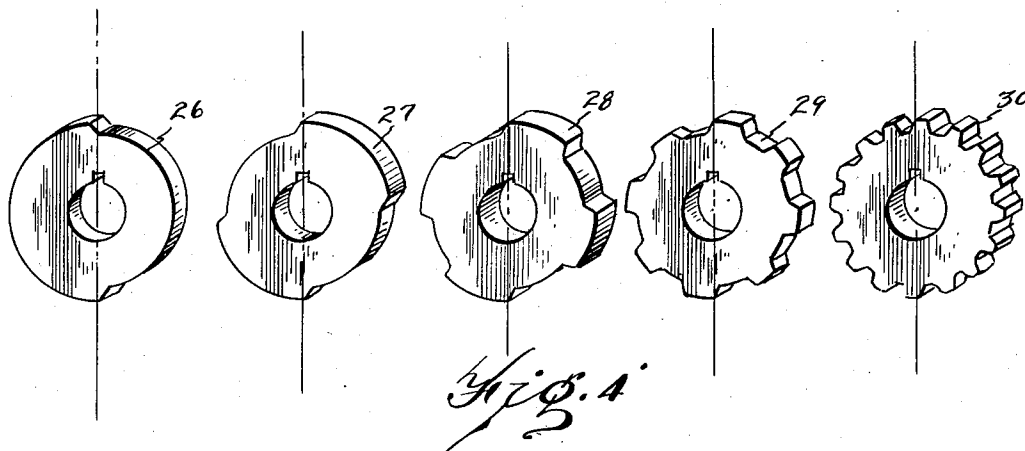
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UNITED STATES PATENT OFFICE.

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INDUCTANCE COIL AND SELECTIVE CONTROL SWITCH THEREFOR.

Application filed September 14, 1922. Serial No. 538,126.

My invention relates to an improved inductance coil and selective multiple control switch mechanism therefor, and an object is to provide such a coil so constructed and arranged and provided with selective control switch mechanism so operatively connected therewith that the inductance of the coil may be varied as desired in a progression based upon a determined unit number of coil windings and the unused portions of the coil may be completely disconnected therefrom.

My invention is intended for use particularly in connection with inductance tuning coils as used in wireless and primarily in connection with such coils as used in receiving outfits in which the coil may be disposed in the circuit between the aerial and the ground or in a secondary circuit.

Such coils usually are provided with a multiplicity of leads and controlled by suitable switches so that the number of turns of wire in the coil which it is desired to place in the circuit may be varied by the operator. The number of combinations possible, however, corresponds with the number of leads and the unused portions of the coil are dead ends which remain connected at all times with the coil.

My improved coil is sub-divided into a plurality of independent coil sections having individual terminals which are engaged by a suitable switch mechanism and only the used portions of the coil are connected at any time with the circuit, the unused portions being completely disconnected when not desired for use. The control switch mechanism obviously might be used as effectively with a plurality of independent coils associated for use as with a single coil subdivided into separate sections.

My coil is sub-divided into independent sections of varying size and the relationship between the coil sections is of such a character that the number of turns of wire in any one coil section is double the number of turns of wire contained in the coil section next lower in size; for example, the relative size of the coil sections in terms of turns of wire in a five-section coil might be 2, 4, 8, 16 and 32, as here illustrated. It is apparent the progression might be based on a numeral other than 2. My control switch mechanism is so constructed and operatively connected with the coil sections that the inductance of the coil may be varied additively on the basis of a determined minor unit; for example, two in the case of the sequence of coil windings above set forth; or it may be varied progressively, subtracting the same minor unit from the total number of windings contained in the largest possible combination. The changes in inductance may be progressively varied, therefore, on the basis of the number of turns of wire contained in the smallest unit either by subtraction or addition, and the total number of combinations possible to be effected is vastly in excess of the number of coil sections or independent leads therefrom to the switch.

I have here shown but five independent coil sections and five leads therefrom, while with the mechanism illustrated it is possible to effect thirty-one different combinations as I simultaneously add and subtract from the coil in operating my switch mechanism to vary the inductance. I provide in connection with the switch mechanism a graduated reading dial by means of which it is possible to easily and accurately determine and vary the inductance of the coil.

The above and other objects, together with details of construction, will more fully appear in the following description, appended claims and accompanying drawings, in which:

Figure 1 is a plan view of my switch mechanism connected with my improved coil.

Fig. 2 is a cross-sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a view showing the notched disks in perspective and removed from their supporting spindle but arranged in their regular order.

Fig. 5 is a diagrammatic view of the coil windings in combination with the circuit and switch mechanism.

In the drawings, I have shown the switch mechanism and coil as mounted upon a suitable base 10, though in common practice they would be supported on the instrument panel with which the wireless set is provided. Coil 11 is sub-divided into a plurality of independent coil sections or units varying in size as to number of windings and indicated as 12, 13, 14, 15 and 16, respectively. The size of these units varies,

as shown in Fig. 5, in a direct proportion based upon the number of turns of wire contained in the smallest coil unit, to-wit, two turns contained in unit 16, and each succeeding coil unit contains double the number of turns of wire contained in the preceding coil unit; for example, 15 contains four turns; 14 contains eight turns; 13 contains sixteen turns, and 12 contains thirty-two turns. The progression obviously might be on the basis of a different minor unit. Each coil section is provided with lead wires from each end of the coil indicated with the sub-letters *a* and *b* respectively, which leads terminate in movable contacts carried by a multiple selective switch mechanism hereinafter described. As here shown the electrical circuit in which the switch is located is completed through an aerial 17 and the ground 18, and the line wire thereof is indicated as 19. The switch and coil might be in a secondary circuit inductively energized by the primary, however.

My improved switch mechanism comprises a spindle 20 journaled at each end for rotation in a frame 21, which frame is attached by bolts 23 to an upright standard 22 carried by the base 10. The spindle extends through the main support 22 and upon the outer end is mounted a reading dial 24 and a knob 25, by means of which knob the dial is graduated to indicate the variations in the inductance possible to be effected by the use of the coil. This supporting structure is suitable for the purpose though necessarily variable to conform to the commercial structure of the assembled set in which my improvement is a unit. Mounted upon the spindle 20 to rotate therewith are notched disks 26, 27, 28, 29 and 30, which disks are relatively arranged as shown in Fig. 4 and provided with such a number of notches or cam surfaces that each disk contains double the number of notches of the adjacent disk immediately preceding, as will appear from such figure of the drawing.

Each disk controls a separate section of the coil and though the disks here shown are arranged as to notches or cams in multiples of the same unit as the turns of wire are arranged in the coil, they are disposed relative the coil sections in a reverse order so that the disk 26 containing two cam surfaces controls the coil section containing thirty-two turns of wire, and the disk 30 containing sixteen notches or thirty-two cam surfaces controls the coil section 16 containing two turns of wire.

The leads *a* and *b* from the coil sections terminate in movable contact members 31^a and 31^b controlled by the disks of the switch. The contact member 31^a is extended and provided with a tooth 32 which rides over the

periphery of the corresponding notched disk to be raised and lowered by rotation of the disk to make and break the connection of the coil with the circuit through wire 19. The line wire 19 of the circuit here shown as extending from the aerial to the ground passes through the switch and is provided proximate each rotatable disk with movable terminals 19^a and 19^b having co-operative contact points, which movable terminals are so disposed as to be controlled by the rotation of the corresponding rotatable disks of the switch so as to establish the circuit through the line wire 19 and through the several terminals 19^a and 19^b, as shown in Fig. 5, each of the coil sections being disconnected the member 31^a may be so moved as to bring any one coil or combination of coils into the circuit with line wire 19, as hereinafter described.

When the switch is in such a position that the convex portions of the movable contact members 31^a are seated in the notches of the corresponding disks and in the lowermost position, the movable terminal members 19^a and 19^b are in contact and the circuit is through the line wire 19 and all the coil sections are cut out by the switch. When the dial is rotated, however, sufficiently to move disk 30 one notch, the member 31^a is elevated so that it forms a contact with the member 19^b, the insulated lift portion 33 carried by the end of the movable contact member 19^a is engaged and moved upwardly by the movement of member 31^a to break the connection between terminals 19^a and 19^b, and terminal 19^a is brought into contact with terminal 31^b. This movement of member 31^a, therefore, breaks the circuit between contact members 19^a and 19^b and makes contact between terminals 31^a and 19^b and between terminals 19^a and 31^b and throws the coil 16 controlled by disk 30 into the circuit. The remaining disks up to this point have not been moved sufficiently to change the position of the movable contact members 32 which ride over their peripheries. Therefore, the remaining coil sections are still out of the circuit and it will be noted that these unused coils are not connected as dead ends with the used coil portion. The operation just described brings two turns of wire or the number contained in coil 16 into the circuit.

If the dial is now moved another notch the disk 29 will operate in the same manner to break the contact between the members 19^a and 19^b and make the contacts described in connection with the operation of the disk 30 so as to bring the coil 15 into the circuit and at the same time the disk 30 will have moved forward sufficiently to permit the spring contact member 32 to fall within a notch of such disk and the movable spring terminals 19^a and 19^b will resume their original position and break the contacts previously

formed with the members 31^b and 31^a respectively. There will now be four turns of wire in the circuit.

If the dial is now rotated another notch the coil 16 will be thrown back in the circuit as heretofore described while the coil 15 still remains in the circuit, the disk 29 not having moved forward sufficiently to permit the tooth 32 to ride down in the notch of the disk and break contacts formed with the coil terminals of the movable switch members, and there will be six turns of wire in the circuit.

A further rotation of the dial one notch of disk 30 will place disks 29 and 30 so that the coils 15 and 16 controlled thereby will both be thrown out of the circuit as heretofore described and the disk 28 will operate to throw the coil 14 into the circuit, making eight turns of wire of inductance. Continued operation of the disk will operate in the same manner to throw the successive coils into and out of the circuit so as to build up the inductance on a basis of two turns of wire with each rotation of the dial one notch of the disk 30.

What I claim is:

1. In a radio circuit, in combination with a single tuning coil sub-divided into a plurality of independent inductance sections, a selective control switch adapted to connect in the circuit various sections individually or in desired combinations and at the same time disestablish the connection with the circuit of the unused sections whether lying between or outside the used sections.

2. In an electric circuit, in combination, an inductance coil sub-divided into a plurality of coil winding sections having independent terminals and a selective control switch adapted to co-operate with said terminals to connect desired coil winding sections individually or in combination in said circuit in a direct progression based upon a given predetermined minor unit into which the coil is not naturally sub-divided.

3. In an electric circuit, the combination with an inductance coil sub-divided into a plurality of coil winding sections having independent terminals, of a selective multiple switch adapted to cooperate with said terminals to connect desired coil winding sections individually or in combination in said circuit in a direct progression based upon a given predetermined unit into which the coil is not naturally sub-divided and simultaneously disestablish the connection with the circuit of the unused windings.

4. In an electric circuit, in combination, an inductance coil composed of a plurality of independent coil sections the relative size of which varies in direct proportion to the number of windings contained in the smallest coil section, a multiple selective switch controlling said coil sections adapted to connect

the same individually or in combination in the circuit in desired multiples of the smallest coil section and simultaneously disestablish the connection with the circuit of the unused sections of the coil.

5. In a radio circuit, a line circuit having a plurality of pairs of normally engaged contacts, a plurality of side circuits of different magnitudes having a corresponding plurality of terminal contacts disposed to be engaged by the terminal contacts in the line circuit when said terminal contacts in the line circuit are separated so as to bring the side circuits into the line circuit, and means for separating the terminal contacts in the line circuit and bringing the side circuits therein to build up inductance on the basis of a given minor unit into which the side circuits are not sub-divided.

6. In a radio circuit having an aerial and a ground, a line circuit therebetween, a plurality of side circuits of different magnitudes, and a selective control switch for breaking the line circuit and introducing side circuits therein in various combinations to vary the inductance in a progression based upon a minor unit into which the side circuits are not sub-divided.

7. In an electric circuit, in combination, an inductance coil sub-divided into a plurality of coil sections having independent terminals, said coil sections arranged successively so that each coil section contains double the number of turns of wire of the preceding coil section, and a multiple selective switch controlling said coil adapted to connect said coil sections in said circuit individually or in combination and simultaneously completely disestablish the connection with the circuit of the unused coil sections.

8. In a radio circuit, a line circuit having a plurality of pairs of normally closed terminal contacts, a corresponding plurality of side circuits of successively increasing magnitudes, and means for breaking the line circuit and introducing side circuits therein to vary the inductance thereof progressively on the basis of the minor side circuit as a unit.

9. In an electric circuit, an inductance coil, comprising a plurality of coil winding sections of successively increasing magnitudes, and means for breaking and making the circuit and introducing therein various combinations of the coil winding sections to progressively vary the inductance on the basis of the minor coil winding section as a unit.

10. In an electric circuit, the combination with an inductance coil sub-divided into a plurality of independent coil sections of varying size arranged successively in progressive multiples of the number of turns of wire contained in the smallest coil section, of a multiple selective switch controlling said coil sections and comprising a plurality of

rotatable notched disks equal in number to the coil sections and one controlling each coil section and adapted to connect or disconnect the same from the circuit, which disks are
 5 so relatively arranged that the disk containing the fewest number of notches controls the coil section having the greatest number of turns of wire.

11. In an electric circuit, the combination
 10 with an inductance coil composed of a plurality of turns of wire arranged in separate units which vary in size progressively as multiples of the number of turns of wire contained in the smallest unit, of a selective
 15 multiple control switch comprising a plurality of notched disks one for each coil unit adapted to connect and disconnect such unit with the circuit when the switch is operated and in such a manner that the continuous
 20 movement of the switch in a given direction varies the inductance progressively by the number of turns of wire contained in the smallest coil section.

12. In an electric circuit, in combination,
 25 an inductance coil composed of a plurality of coil sections, the relative size of which varies in a direct progressive succession by the number of turns of wire contained in the smallest coil section, which coil sections are
 30 provided with independent terminals adapted to be connected or disconnected with said

circuit, and a selective multiple switch controlling said coil sections and comprising a plurality of notched disks one for each coil section mounted for unitary rotation and
 35 adapted to connect and disconnect said coil sections in the circuit to vary the inductance as determined by the number of turns of wire contained in the smallest coil section.

13. In combination, a plurality of side circuits each having a pair of terminal contacts, a line circuit having a corresponding plurality of pairs of normally-engaged contacts which are separable and each pair of which
 45 is arranged when separated to engage the corresponding pair of terminal contacts to include one of the side circuits in the line circuit, and a multiple switch for separating
 50 desired pairs of the normally-engaged contacts.

14. In a radio circuit, a line circuit, a plurality of side circuits of successively increasing magnitudes, and means for introducing side circuits in various combinations into the line circuit to progressively vary the inductance on the basis of the minor circuit as a
 55 unit and at the same time disestablishing the connection with unused side circuits.

In testimony whereof, I sign this specification.

GEORGE R. SIEGRIST.