

Jan. 19, 1926.

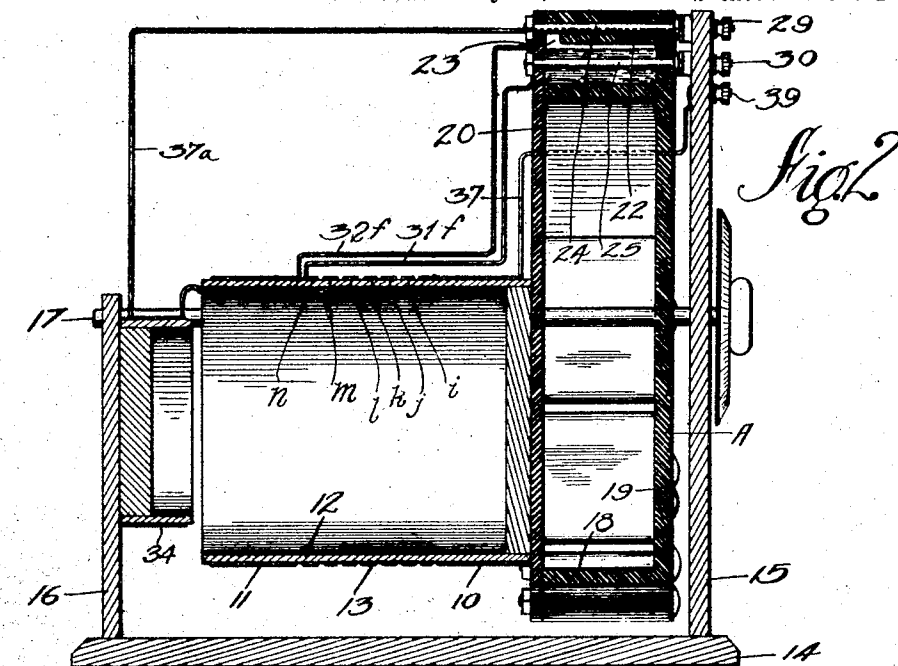
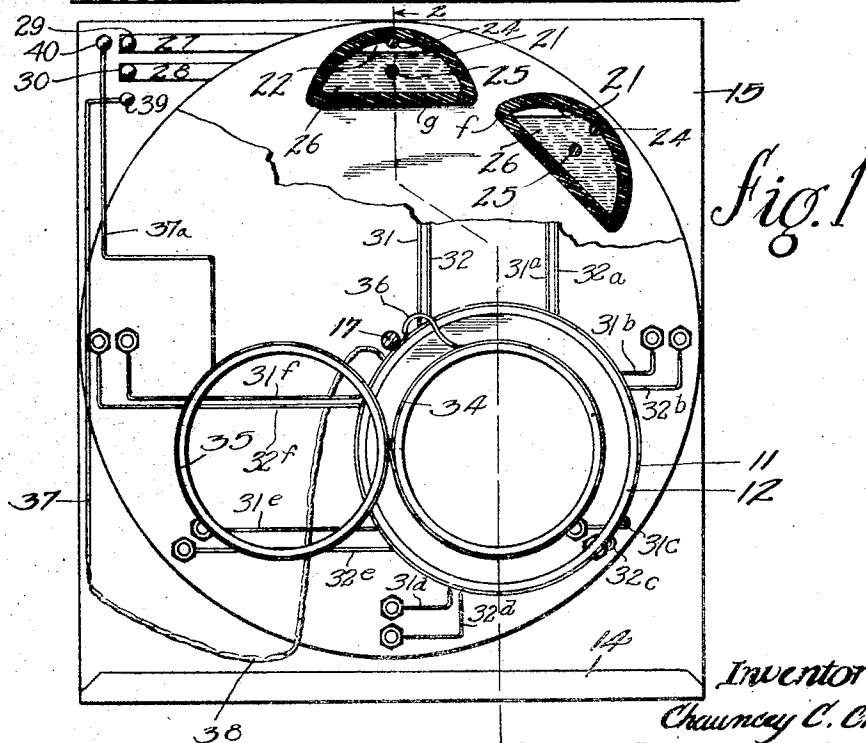
1,569,965

C. C. CHAPIN

TRANSFER SWITCH

Filed July 18, 1924

2 Sheets-Sheet 1



Inventor

Chauncey C. Chapin

By *Dwight Newman* Att'y

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2 Sheets-Sheet 2

Fig. 3

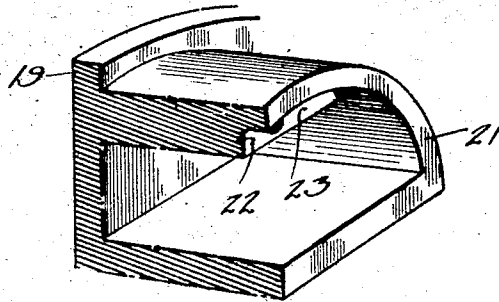
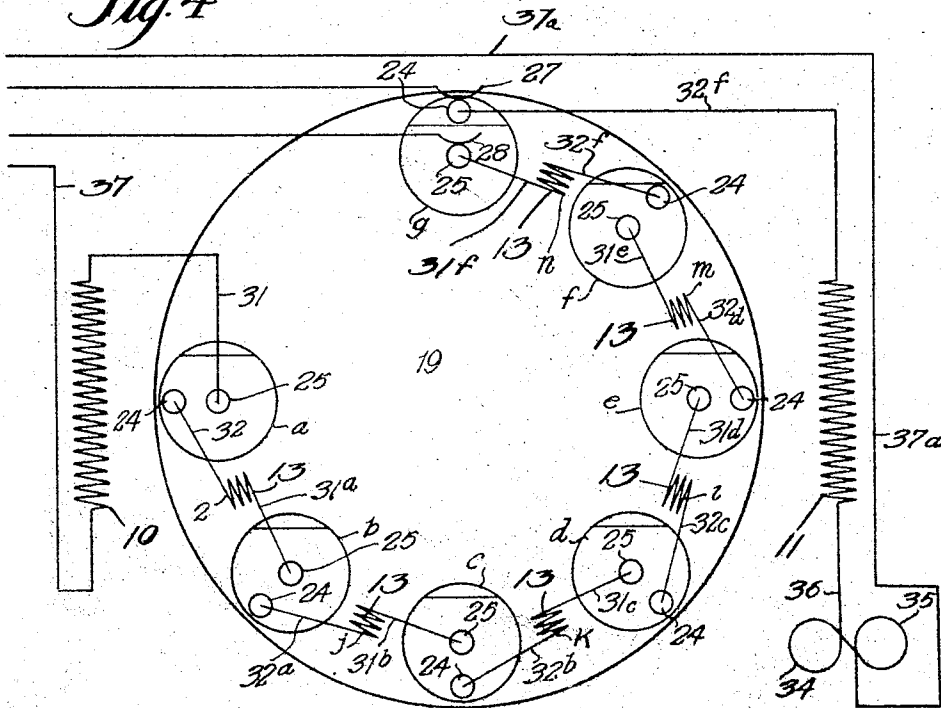


Fig. 4



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UNITED STATES PATENT OFFICE.

CHAUNCEY C. CHAPIN, OF STERLING, COLORADO.

TRANSFER SWITCH.

Application filed July 18, 1924. Serial No. 726,755.

To all whom it may concern:

Be it known that I, CHAUNCEY C. CHAPIN, a citizen of the United States, and a resident of Sterling, in the county of Logan and State of Colorado, have invented certain new and useful Improvements in Transfer Switches, of which the following is a specification.

My invention relates to induction coils wherein there are primary and secondary circuits, and has for its object to provide means for transferring portions of the coils from the primary to the secondary, or from the secondary to the primary.

Another object is to utilize such means in a practical application, such as, for instance, a radio tuning coil.

A further object is to provide such a mechanism which is of simple, durable and inexpensive construction.

A still further object is to provide a radio tuning coil in which the inductance of the primary and secondary circuit may be varied through the medium of a single controlling member, the respective inductances being automatically adjusted to predetermined values.

More specifically it is my object to provide an induction coil mounted on a rotatable drum, the drum carrying at its periphery a series of transfer switch units, each unit serving to connect a transferable section of coil to an adjacent transferable section when in one position, and to connect the adjacent sections to the extremities of an external circuit when in another position.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Fig. 1 is a rear view of a wireless tuning coil embodying my invention, the rear support being removed and parts of the switch drum being broken away to better illustrate the parts.

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

Fig. 3 is a detail sectional view of one of the transfer switch units.

Fig. 4 is a diagrammatic view illustrating the electric circuit in which my invention may be embodied.

In order to illustrate first the principle involved in my invention and the problem sought to be solved, I will refer to the diagram in Fig. 4. I have used the reference character 10 to indicate the primary of an induction coil such as is used for tuning purposes in wireless telegraphy or radio. The secondary of the induction coil is shown at 11. The two coils are preferably wound on the same tube, 12, as shown in Fig. 2, and between the primary and secondary coils proper are a number of sectional coils, 13, which are designed to be transferred from the primary to the secondary, or vice versa.

It will be understood that by increasing the size of the primary and decreasing the number of turns of the secondary that the self inductance of the primary will be increased and that of the secondary will be decreased.

I have provided mechanism, which will hereinafter be described, for automatically opposing the increase or decrease of the inductance in the secondary coil to such an extent that the inductance of the secondary will, in effect, be decreased or increased in step with the inductance of the primary. In effect, then, by transferring coils from the primary to the secondary, the inductance of each may be increased or decreased in synchronism with each other so as to automatically tune the primary and secondary of a radio receiving circuit for adapting it to different periods of vibration.

It will be understood that I do not intend to limit my invention to the specific application embodied in radio tuning instrument, but that it may be applied in any case where it is desirable to transfer a portion of a number of sectional coils from one circuit to another.

In order to transfer a series of coils from one circuit to another a connection must be provided between the adjacent ends of adjacent sections, which may be operated to connect the adjacent coils together, or to connect the adjacent ends to the external circuit.

I will now describe the specific construction of the transfer switch as used in connection with a radio tuning instrument.

I have used the reference character, 14, to indicate generally a base on which various wireless instruments may be mounted. To the front of the base is fixed the upright panel, 15, and at the rear of the base is the

upright support, 16. Journalled in the panel, 15, and the support, 16, is a shaft, 17, to which is fixed the switch drum, A.

The drum, A, which is of insulating material, comprises two parts, one having a lateral flange, 18, formed on a disk, 19, and the other comprising a cover disk, 20. Formed integral with the disk, 19, are the cups, 21, each of which is closed by the disk, 20, so as to form a sealed container. Each cup, 21, is arched at its outer portion and provided on the interior of said arched portion with an inwardly-projecting shoulder, 22, extending from the rear to a point near the front thereof, so as to leave a cavity, 23. The purpose of the shoulder, 22, will be hereinafter described.

Mounted at the top of the arched portion of each cup is an electrode, 24, and mounted near the center of the container is a similar electrode, 25, which electrodes serve to hold the cover, 20, in place, and also as contact elements. The containers are filled with a conducting fluid, 26.

It may be stated generally that the contact electrodes, 24 and 25, are so arranged that when a particular cup is in any position except the uppermost position, as shown in Fig. 1, that the liquid will connect the two electrodes. Each of the respective electrodes, 24 and 25, are connected to the adjacent ends of adjacent sections of coils, or the adjacent ends of a section of coil and the adjacent primary or secondary proper, as the case may be. While the cups, 21, are in any of the lower positions the liquid therein will serve to connect the adjacent ends of all of the sections which terminate therein. Between those particular sections which terminate in the top cup the division between the primary and secondary of the coil occurs.

Referring now to Fig. 4 for a more specific description of the circuit, the primary circuit is shown as including in series with the coil, 10, all of the coil sections, 13. The primary and secondary circuits are shown opened, the other instruments which might be included to form two closed portions of a wireless circuit being omitted. The wire, 37, connects the coil, 10, to such external portion of the primary circuit, a length of flexible conductor, 38, being employed to allow rotation of the drums. A suitable binding post, 39, is provided to facilitate connection of the wire, 37, to instruments. (See Fig. 1.) The other end of the coil, 10, is connected with the electrode, 25, of one of the switch elements by means of a wire, 31, a portion of which is shown in Fig. 1. A wire, 32, leads from the electrode, 25, of the same switch element, back to the coil section, 13, which is next adjacent the coil, 10. The switch element just referred to I will indicate by the reference

character *a*, for convenience in description, and the successive elements by the letters *b*, *c*, *d*, *e*, *f* and *g*, respectively. The coil section just mentioned will be referred to by the additional character *i*, the next *j*, the next *k*, the next *l*, the next *m* and the next *n*. The wire, 31^a, leads from the other side of the section *i*, back to the electrode, 25, of the switch element, *b*, and the wire, 32^a, from the electrode, 24, thereof back to the section *j*. From the other side of the section, *j*, a wire, 31^b, leads to the electrode, 25, of the switch element, *c*, and from the electrode, 24, thereof a wire, 32^b, leads back to the section, *k*. From the other side of the section, *k*, a wire, 31^c, leads to the electrode, 25, of the switch element, *d*, and from the electrode, 24, thereof a wire, 32^c, leads back to the section, *l*. A wire, 31^d, leads from the other side of the section *l*, to the electrode, 25, of the switch element, *e*. From the electrode, 24, of said switch element a wire, 32^d, leads back to the section, *m*. From the other side of the section, *m*, a wire, 31^e, leads to the electrode, 25, of the switch element, *f*, and from the electrode, 24, thereof a wire, 32^e, leads back to the last coil section, *n*. A wire, 31^f, leads from the coil section, *n*, to the electrode, 25, of the last switch element, *g*.

In each of the switch elements, *a* to *f* inclusive, the electrodes, 24 and 25, are connected by the liquid, 26, to complete the circuit through the various coil sections arranged in the order just described. A brush, 28, on the panel, 15, contacting with the protruding ear of the electrode, 25, of the switch element, *g*, serves to connect the last coil section, *n*, to the external portions of the primary circuit, which are not shown, a binding post, 30, being provided for this purpose.

The electrode, 24, of the switch element, *g*, is connected to the external portion of the secondary circuit by means of the brush, 27, and binding post, 29. It is connected to the coil, 11, by means of a wire, 32^f. The other side of the coil, 11, is connected by a flexible wire, 36, allowing rotation of the drum, 12, to an auxiliary coil, 34, mounted on a support, 16. The connection is such as to direct the current pulsations in a direction the same as that of the winding of the coil, 11. Mounted on the same support, 16, is the coil, 35, which is a continuation of the coil, 34, and is wound in the opposite direction to the coils, 34 and 11. The coils, 10 and 11, are adapted to rotate with the rotating drum, A, from a point where the coil, 11, is coaxial with the coil, 34, upwardly and through a series of intermediate positions above the coils, 34 and 35, to a position where the coil, 11, is coaxial with the coil, 35.

It will be seen that the respective coils

are so wound that the lines of force created by the coils, 34 and 35, will reinforce the magnetic field around the coil, 11, when the coils are in the respective positions shown in Fig. 1, and will oppose the field of the coil, 11, when the coil, 11, has been rotated to its other extreme position. By a proper positioning of the coils and the proper dimensioning thereof the field of force created by the coils, 34 and 35, may be made such as to negative the added inductance of the coil, 11, at each successive position to such an extent that its inductance will approximate any predetermined value for that position.

From the end of the coil, 35^a, a wire, 37^a, leads to a binding post, 40, which serves to connect the same to external portions of the secondary circuit.

Returning now to the specific construction of the switch units, it will be seen that it is desirable in rotating the switch drum to make and break the circuit as rapidly as possible. For this purpose I provide a shoulder, 22, which, when it is not submerged as in the upper position shown in Fig. 1, will allow the liquid to sink to a lower level and enlarge the vertical area of the air space, 23. As the drum is rotated, the shoulder, 22, will enter the liquid and displace it upwardly so as to considerably decrease the vertical area of said air space. That is, the level of the liquid will be caused to rise relative to the interior of the container. Thus the connection between the liquid and contact bolt is quickened.

The advantages of my device as applied to a radio instrument are several. The transferring of coils from one side to the other of the circuit eliminates what is known as dead end coils and certain losses consequent thereto and uncertainties in calculating inductance which are attendant thereon.

It will be readily seen that when all of the coils are in use the inductance may be readily calculated, whereas the capacity effects of dead end coils make such calculation very difficult.

By arranging the instrument in its proper relation in a radio circuit, the adjustment of the primary and secondary coils of the tuning coil may be effected automatically.

It will be understood that a further and more delicate adjustment of the two circuits may be necessary and may be accomplished by the use of variable condensers, but that the general ratio of the inductances will remain constant, and that a sufficient adjustment may be had automatically in order to pick up the desired station.

Some changes may be made in the construction and arrangement of the parts of my invention without departing from the

real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. In combination with a transformer having a primary coil, a secondary coil and a plurality of coil sections of relative small inductance, a plurality of containers mounted for rotation in a circular path, a pair of contact members in each container, a conducting fluid partially filling each container and adapted to electrically connect the contact members of all of the containers except the one uppermost, and conductors connecting the contact members to the various coils and coil sections in such relation as to form two separate circuits, one circuit including all or a part of the coil sections in series relation with one of said coils, and the other circuit including the remainder of said coil sections in series relation with the other of said coils, the rotation of the coils about the common axis in one direction serving to transfer in succession the coil sections from one circuit to the other.

2. In combination with a transformer having a primary coil, a secondary coil and a plurality of coil sections of relative small inductance, means for connecting the coils and coil sections in two electrical circuits, one of said circuits including all or a part of the coil sections in series relation with one of the said coils, and the other circuit including the remainder of the said coil sections in series relation with the other of said coils, said means being operable to simultaneously change the respective connections so as to subtract a particular coil section from one circuit and add it to the other.

3. In combination with a transformer having a primary coil, a secondary coil and a plurality of coil sections of relative small inductance, means for connecting the coils and coil sections in two electrical circuits, one of said circuits including all or a part of the coil sections in series relation with one of the said coils, and the other circuit including the remainder of the said coil sections in series relation with the other of said coils, said means being operable to simultaneously change the respective connections so as to subtract a particular coil section from one circuit and add it to the other, and means for opposing the increased inductance of the second circuit caused by the adding of the coil sections thereto.

Signed this 8th day of July, 1924, in the city of Sterling, county of Logan and State of Colorado.

CHAUNCEY C. CHAPIN.