Nov. 6, 1956 G. VAN GELDER ET AL 2,769,963

HIGH-FREQUENCY COIL OF THE KIND COMPRISING A TAPPING WHICH IS DISPLACEABLE BY MEANS OF A SCREW SPINDLE

Filed Oct. 29, 1952

2 Sheets-Sheet 1

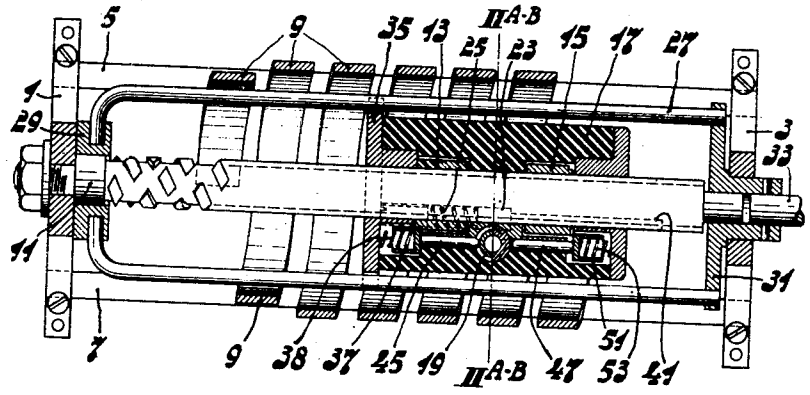

Fig. 1.

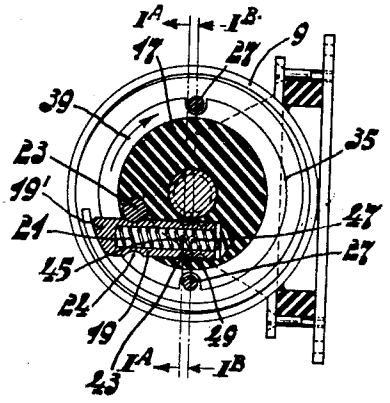

Fig. 2.

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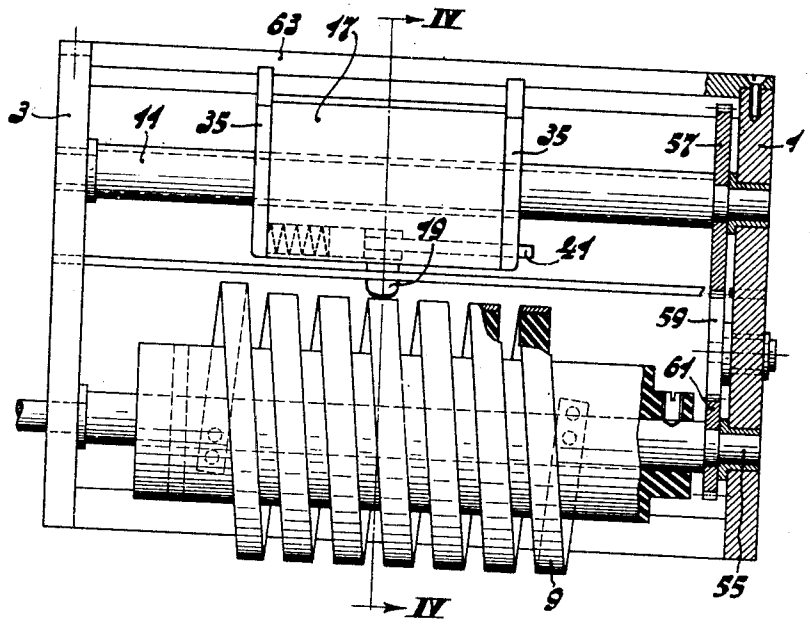

Fig. 3.

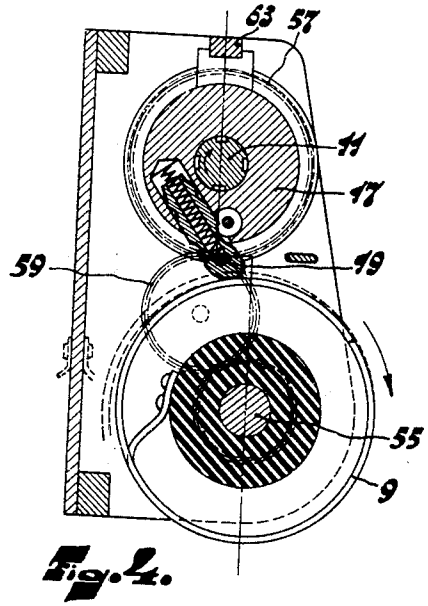

Fig. 4.

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United States Patent Office 2,769,963 Patented Nov. 6, 1956

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HIGH-FREQUENCY COIL OF THE KIND COMPRISING A TAPPING WHICH IS DISPLACEABLE BY MEANS OF A SCREW SPINDLE

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Application October 29, 1952, Serial No. 317,412

Claims priority, application Netherlands October 30, 1951

11 Claims. (Cl. 336—139)

The invention relates to a high-frequency coil comprising a conductor wound in the form of a spiral, along which a contact member can be moved by a rotary movement with the use of a screw spindle.

These coils permit of varying continuously the inductance within very wide limits. After the control-range had been traversed in a definite direction, it was necessary with the known coils to turn the contact member back.

The object of the invention is to provide a coil of the kind described above, which can always be turned in the same direction. This is desired, if the coil is driven by a so-called pawl knob, i. e. a pawl device which permits a rapid, if necessary, automatic adjustment to a plurality of preselected positions. These devices are usually adapted to turn only in one direction, since in this case the pawl device may be materially simpler and cheaper and operates more rapidly and accurately than in the case of two directions of rotation.

The device, with the use of which this aim is achieved, is characterized in that the screw spindle is provided with combined left-hand and right-hand screw threads and co-operates with a nut having a left-hand thread, a nut having a right-hand thread and a contact-arm carrier, which latter is adapted to move freely along the spindle and which is coupled permanently with the two nuts with respect to axial movement, a coupling device, which becomes operative in the two extreme axial positions of the contact-arm carrier controlling the operation of the nuts in a manner such that the contact-arm carrier is carried alternately forwards and backwards by the two nuts if the sense of rotation remains the same.

In order that the invention may be readily carried into effect, it will now be described in detail with reference to the accompanying drawing, in which

Fig. 1 is an axial sectional view of one embodiment and

Fig. 2 a cross-sectional view of the same,

Fig. 3 is an axial sectional view of another embodiment and

Fig. 4 is a cross-sectional view of this embodiment.

The coil shown in Figs. 1 and 2 has a frame formed by two metal end plates **1** and **3**, interconnected by two ceramic rods **5** and **7**, to which a coil winding **9** formed by a strip-shaped conductor is soldered. Coaxially to this winding a spindle **11** is fixedly secured to the end plate **1**, this spindle being provided through the major part of its length with combined left-hand and right-hand screw threads. A cylindrical nut **13**, having a left-hand thread, and a similar nut **15**, having a right-hand thread, are freely movable along the spindle **11**, if the nuts are permitted to rotate freely. These nuts are enclosed, so as to be freely rotatable, in a cylindrical body **17**, i. e., the contact arm carrier, of insulating material, which is freely rotatable and displaceable along the screw spindle **11** and which supports a partly hollow contact arm **19**, which is at right angles

to the spindle. This contact arm is primarily shaped in the form of a rod and is adapted to slip out of the support of the contact arm in an axial direction under the action of a spring **21** housed inside thereof, so that the free end **19'** of the contact arm finally touches the inner side of one of the turns of the coil winding **9**. In the position shown the displacement of the contact arm **19** is prevented by a pawl **23**, which is displaceable parallel to the spindle **11** and which bears in a circular groove or contraction **24** of the rod **19** and is maintained in this position by a spring **25**.

The contact arm carrier **17** may be set rotating with the use of a catch, primarily constituted by two rods **27**, parallel to the spindle **11**, the ends of these rods being secured in a ring or sleeve **29**, which is freely rotatable about the spindle **11**, and to a flange **31**, which is adapted to be driven by a driving shaft **33**. The catch carries along the contact arm carrier **17** with the use of a flange **35**, secured to the latter, provided with two diametrical recesses, in which the rods **27** glide fittingly.

In the position shown (Fig. 1) the contact arm carrier **17** is coupled so as to rotate with the nut **13** with the use of a hollow pawl **37**, enclosed in the body **17** and bearing in a fitting recess of the edge of the nut **13** under the action of a spring **38**, parallel to the spindle **11**. When the shaft **33** rotates in the direction of the arrow **39** (Fig. 2) the contact arm carrier **17** is carried along by the nut **13** in a left-hand screwing movement and the carrier **17** shifts to the right, viewed in Fig. 1. Near the extreme right-hand position of the body **17**, a buffer rod **41**, which is housed in the body **17** so as to be slidable therein and which is parallel to the spindle **11**, touches the flange **31** with its end projecting from the body **17**. Thus, the buffer rod **41** is urged more deeply into the carrier **17**; this movement is transferred to the pawl **23**, which thus disengages the arm **19** against the pressure of the spring **25**. The arm **19** can thus yield to the pressure of the spring **21** and slides over a small distance out of its carrier **17**.

The arm **19** (Fig. 2) has a second circular groove or contraction **43**, in which bears, in the position shown, the end of a buffer rod **45**, which is also parallel to the spindle **11**, as is evident from Fig. 1, of which the left-hand part is a sectional view taken on the line *Ia* of Fig. 2. If the arm **19** shifts slightly to the outside (viewed in Fig. 2 to the left), the slope of the groove **43** urges the buffer rod **45**, which controls the pawl **37**, out of the groove **43**, so that the pawl **37** shifts to the left against the pressure of the spring, so that it disengages the nut **13**. At the same time a third buffer rod **47** falls with its end in a third circular groove **49** of the arm **19**, which is evident from the right-hand part of Fig. 1, which is a sectional view taken on the line *Ib* of Fig. 2. Thus a third pawl **51** may shift to the left under the action of a spring **53**, the pawl **51** then first bearing on the right-hand flank of the nut **15**. Like the nut **13**, this nut **15** has a recess at its flank, which may, for example, be at the top of the nut at this moment and, when the carrier **17** turns on, the pawl **51** falls into this recess at a given moment. Then the carrier **17** is coupled so as to rotate with the nut **15** and carries along this nut in its rotary movement, whilst, conversely, also the nut **15** carries along the nut **13** and the contact arm **19** in its helical movement, the contact arm **19**, which now engages the turns of the winding **9**, brushing in succession past the inner side of these turns.

The last turn, which is brushed, or at least the free (left-hand) end thereof, has a smaller radius of curvature and a smaller distance from the spindle **11** than the other turns, so that the contact arm **19**, when brushing past this turn, is urged slightly into the contact car-

rier 17 into a position in which the pawl 23 can engage the arm 19, under the action of the spring 25. Thus the condition shown in Figs. 1 and 2 is restored, i. e. the pawl 51 disengages the nut 15, the pawl 37 engages the nut 13 and the contact arm carrier 17 is again carried along to the right by the nut 13, when the rotary movement of the shaft 33 continues, so that the procedure described is repeated.

In other words, when the carrier 17 is at the right hand end of its travel along the longitudinal axis of the spindle 11, the buffer rod 41 strikes flange 11 urging pawl 23, which is connected with buffer rod 41, out of engagement with contact arm 19 against the pressure of spring 25. Spring 21 then urges contact arm 19 out of contact carrier 17 moving the contact arm from disengagement with the spiral conductor 9 to engagement therewith. The motion of the contact arm 19 from the disengaged to the engaged position causes another buffer rod 45 to be urged out of its engaged position in recess 43 with contact arm 19 into a disengaged position in which buffer rod 45 is free from contact with recess 43, thereby compressing spring 38 and disengaging the threaded member or nut 13 from the carrier 17. The same motion of the arm 19 also causes another buffer rod 47 to move from a disengaged position wherein it is free from contact with recess 49 to an engaged position in which it engages the recess 49 of contact arm 19 due to the action of spring 53 causing, in turn, the engagement of the threaded member or nut 15 with the carrier 17. Disengagement of the nut 13 and simultaneous engagement of the nut 15 with the contact carrier 17 causes the latter to move to the left, i. e., to move forward with the contact arm 19 engaging the conductor 9.

When the contact carrier 17 has moved to the left hand end of its travel, the contact arm 19 is moved to the disengaged position by the last turn of coil 9, which forces the contact arm to be urged into the contact carrier 17. The pawl 23 yields to the pressure of spring 25 and seats in the recess of arm 19 provided therefor, which is now aligned with the pawl 23, locking contact arm 19 in that disengaged position. During the motion of contact arm 19 from the engaged position to the disengaged position, the buffer rods 45, 47 selectively reverse their positions from the engaged to the disengaged whereby pawls 37 and 51, respectively, effect engagement of the contact carrier 17 with the threaded member or nut 13 and disengagement with the nut 15 to move the contact carrier backwards, i. e., to the right, with the contact arm 19 out of engagement with the conductor 9.

Consequently, the coil described above, having a variable tapping, may be driven by means of a pawl device known per se to adjust an adjusting member to a plurality of predetermined positions, this device having only one direction of rotation.

Contrary to the construction described above, the spindle 11 may, as shown in Figs. 3 and 4, be arranged outside the coil winding 9. The spindle 11 and the winding 9 are then rotatable about their own shafts 11 and 55 respectively and are coupled to one another, for example, by toothed gears 57, 59 and 61; the contact arm carrier 17 is, owing to a guide rail 63, not rotatable, but only slidable along the spindle 11 in such a position that the end of the contact arm 19 may brush along the outside surface of the winding 9. In order to ensure that the last turn urges the arm 19 inwards into the carrier 17, the radius of curvature of this turn, or at least that of its free end, must exceed that of the other turns.

What we claim is:

1. A high frequency coil comprising a support, a spindle having a right and a left handed screw thread, said spindle having a given longitudinal axis and being mounted on said support, a contact carrier displaceable along said longitudinal axis, a right hand threaded member supported by and freely rotatable within the contact carrier, a left hand threaded member also supported by and freely rotatable within the contact carrier, both of said threaded members being mounted in engagement with the threaded spindle, a spiral shaped conductor, a contact member mounted on said carrier, said contact member having an engaged position in which said contact member engages said conductor, and coupling means responsive to the position of the carrier to link the contact carrier alternately with the right hand threaded member when at one end of said conductor and then with the left hand threaded member when at the opposite end of said conductor, whereby rotation in only one direction causes a forward and backward motion of the carrier.

2. A high frequency coil comprising a support, a spindle having a right and a left handed screw thread, said spindle having a given longitudinal axis and being mounted on said support, a contact carrier displaceable along said longitudinal axis, a right hand threaded member supported by and freely rotatable within the contact carrier, a left hand threaded member also supported by and freely rotatable within the contact carrier, both of said threaded members being mounted in engagement with the threaded spindle, a spiral shaped conductor, a contact member mounted on said carrier, said contact member having an engaged position in which said contact member engages said conductor and a disengaged position in which said contact member is free from engagement with said conductor, means to move said contact member from the engaged position to the disengaged position, and means responsive to the position of the contact member to couple the contact carrier alternately with the right hand threaded member at one end of said conductor and then with the left hand threaded member at the opposite end of said conductor, whereby rotation in only one direction causes a forward motion of the carrier with the contact member in the engaged position and a backward motion of the carrier with the contact member in the disengaged position.

3. A high frequency coil comprising a support, a spindle having a right and a left handed screw thread, said spindle having a given longitudinal axis and being mounted on said support, a contact carrier displaceable along said longitudinal axis, a right hand threaded member supported by and freely rotatable within the contact carrier, a left hand threaded member also supported by and freely rotatable within the contact carrier, both of said threaded members being mounted in engagement with the threaded spindle, a spiral shaped conductor with turns thereof having a given diameter and one turn at the end thereof being positioned closer to the contact carrier than the other turns of the conductor, a contact member mounted on said carrier and carried thereby and having an engaged position in which said contact member engages said conductor and a disengaged position in which said contact member is free from engagement with said conductor, means including said one turn to move said contact member from the engaged position to the disengaged position, and means responsive to the position of the contact member to couple the contact carrier alternately with the right hand threaded member at one end of said conductor and then with the left hand threaded member at the opposite end of said conductor, whereby rotation in only one direction causes a forward motion of the carrier with the contact member in the engaged position and a backward motion of the carrier with the contact member in the disengaged position.

4. A high frequency coil comprising a support, a spindle having a right and a left handed screw thread, said spindle having a given longitudinal axis and being mounted on said support, a contact carrier displaceable along said longitudinal axis of said spindle, a right hand threaded member supported by and freely rotatable within the contact carrier, a left hand threaded member also supported by and freely rotatable within the contact carrier, both of said threaded members being mounted in engagement

with the threaded spindle, a spiral shaped conductor with turns thereof having a given diameter, a contact member supported within said carrier and having an engaged position in which said contact member projects a given distance from said carrier whereby said contact member engages said conductor and a disengaged position in which said contact member projects a distance less than said given distance whereby said contact member is free from engagement with said conductor, said conductor including means at one end to move the contact member from the engaged to the disengaged position, a pawl device mounted on said carrier and adapted to lock the contact member in the disengaged position, means located at the other end of the conductor for causing the pawl device to release the contact member to engage the conductor, and means responsive to the position of the contact member to couple the contact carrier alternately with the right hand threaded member at one end of said conductor and then with the left hand threaded member at the opposite end, whereby rotation in only one direction causes a forward motion of the carrier with the contact member in the engaged position and a backward motion of the carrier with the contact member in the disengaged position.

5. A high frequency coil comprising a support including a terminal plate at one end thereof, a spindle having a right and a left handed screw thread, said spindle having a given longitudinal axis and being mounted on said support, a contact carrier displaceable along said longitudinal axis of said spindle, a right hand threaded member supported by and freely rotatable within the contact carrier, a left hand threaded member also supported by and freely rotatable within the contact carrier, both of said threaded members being mounted in engagement with the threaded spindle, a spiral shaped conductor with turns thereof having a given diameter and one turn at the end thereof being positioned closer to the contact carrier than the other turns, a contact member supported within said carrier and having an engaged position in which said contact member projects a given distance from said carrier whereby said contact member engages said conductor and a disengaged position in which said contact member projects a distance less than said given distance whereby said contact member is free from engagement with said conductor, means including said one turn at one end of said conductor to move the contact member from the engaged to the disengaged position, a pawl device mounted on said carrier and adapted to lock the contact member in the disengaged position, a buffer rod located at the other end of said conductor, said buffer rod being connected to said pawl device, said buffer rod being located in a position at which the movement of the carrier at one end of the conductor causes the buffer rod to strike said terminal plate causing the pawl device to release the contact member to engage the conductor, and means responsive to the position of the contact member to couple the contact carrier alternately with the right hand threaded member at one end of said conductor and then with the left hand threaded member at the opposite end, whereby rotation in only one direction causes a forward motion of the carrier with the contact member in the engaged position and a backward motion of the carrier with the contact member in the disengaged position.

6. A high frequency coil comprising a support including a terminal plate at one end thereof, a spindle having a right and left handed screw thread, said spindle having a given longitudinal axis and being mounted on said support, a contact carrier displaceable along said longitudinal axis of said spindle, a right hand threaded member supported by and freely rotatable within the contact carrier, a left hand threaded member also supported by and freely rotatable within the contact carrier both of said threaded members being mounted in engagement with the threaded spindle, a spiral shaped conductor having a central axis with turns thereof having a given diameter and one turn thereof being positioned closer to the contact carrier than the other turns, a contact member supported within said carrier and having an engaged position in which said contact member projects a given distance from said carrier whereby said contact member engages said conductor and a disengaged position in which said contact member projects a distance less than said given distance whereby said contact member is free from engagement with said conductor, means including said one turn at one end of said conductor to move the contact member from the engagement to the disengaged position, a first pawl device mounted on said carrier and adapted to lock the contact member in the disengaged position, a buffer rod connected to said pawl device and mounted in said carrier in a position at which the movement of the carrier at one end of the conductor causes the buffer rod to strike said terminal plate thereby causing the pawl device to release the contact member to engage the conductor, and second and third pawl devices positioned symmetrically on both sides of said contact member within the contact carrier to couple the carrier alternately with the right hand threaded member at one end of said conductor and then with the left hand threaded member at the opposite end, whereby rotation in only one direction causes a forward motion of the carrier with the contact member in the engaged position and a backward motion of the carrier with the contact member in the disengaged position.

7. A high frequency coil as claimed in claim 6 in which the screw spindle is located coaxially inside the conductor and is rigidly secured to said support, said one turn at the end of said conductor having a smaller diameter than the other turns thereof, and means are provided to rotate said contact carrier around the longitudinal axis of said spindle.

8. A high frequency coil as claimed in claim 6 in which the screw spindle is located outside the conductor, the longitudinal axis of said screw spindle is parallel to the axis of said conductor, said screw spindle is freely rotatable about its longitudinal axis, said conductor is freely rotatable about its axis, means are provided rigidly mounted on said support in engagement with said carrier for preventing rotation of the carrier, and means are provided to couple the rotation of said conductor and said spindle.

9. A high frequency coil comprising a support including a terminal plate at one end thereof, a spindle having a right and left handed screw thread, said spindle having a given longitudinal axis and being mounted on said support, a contact carrier displaceable along said longitudinal axis of said spindle, a right hand threaded member supported by and freely rotatable within the contact carrier, a left hand threaded member also supported by and freely rotatable within the contact carrier, both of said threaded members being mounted in engagement with the threaded spindle, a spiral shaped conductor having a central axis with turns thereof having a given diameter and one turn thereof being positioned closer to the contact carrier than the other turns, a spring loaded contact member supported within said carrier and having an engaged position in which said contact member projects substantially radially a given distance from said carrier whereby said contact member engages said conductor and a disengaged position in which said contact member projects a distance less than said given distance whereby said contact member is free from engagement with said conductor, said contact member also having two recesses spaced apart a small distance, means including said one turn at the end of said conductor to move the contact member from the engaged to the disengaged position, a first spring loaded pawl device mounted in said carrier and adapted to lock the contact member in the disengaged position, a first buffer rod connected to said pawl device and mounted in said carrier in a position at which the movement of the carrier

at one end of the conductor causes the buffer rod to strike said terminal plate thereby causing the pawl device to release the contact member to engage the conductor, second and third spring loaded pawl devices positioned on both sides of said contact member and mounted within the contact carrier, a second buffer rod connected at one end to said second pawl device and the opposite end of said buffer rod having a portion thereof adapted to engage one of said spaced recesses on said contact member, a third buffer rod connected at one end to said third pawl device and the opposite end of said buffer rod having a portion thereof adapted to engage the other recess of said spaced recesses on said contact member, said second and third buffer rods being positioned in such a manner that the second buffer rod is in engagement with one of said recesses when said contact member extends said given distance from said contact carrier while the third buffer rod is free from engagement with said recesses and the third buffer rod is in engagement with the other recess when said contact member extends less than said given distance from said contact carrier while the second buffer rod is free from engagement with said recesses, said second pawl device having a portion thereof adapted to lock one threaded member to the contact carrier when said second buffer rod is seated in the recess of the contact member provided therefor, said third pawl device having a portion thereof adapted to lock the other threaded member to the contact carrier when said third buffer rod is seated in the recess of the

contact member provided therefor, whereby rotation in only one direction causes a forward motion of the carrier with the contact member in the engaged position and a backward motion of the carrier with the contact member in the disengaged position.

10. A high frequency coil as claimed in claim 9 in which the screw spindle is located coaxially inside the conductor and is rigidly secured to said support, said one turn at the end of said conductor having a smaller diameter than the other turns thereof, and means are provided to rotate said contact carrier around the longitudinal axis of said spindle.

11. A high frequency coil as claimed in claim 9 in which the screw spindle is located outside the conductor, the longitudinal axis of said screw spindle is parallel to the axis of said conductor, said screw spindle is freely rotatable about its longitudinal axis, said conductor is freely rotatable about its axis, means are provided rigidly mounted on said support in engagement with said carrier for preventing rotation of the carrier, and means are provided to couple the rotation of said conductor and said spindle.

References Cited in the file of this patent

UNITED STATES PATENTS

699,963	Lines	May 13, 1902
1,509,620	Taylor	Sept. 23, 1924
2,452,676	O'Brien	Nov. 2, 1948