April 23, 1946. G. O. PUERNER 2,399,060

CONTACTOR FOR TUNERS

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Fig. 1.

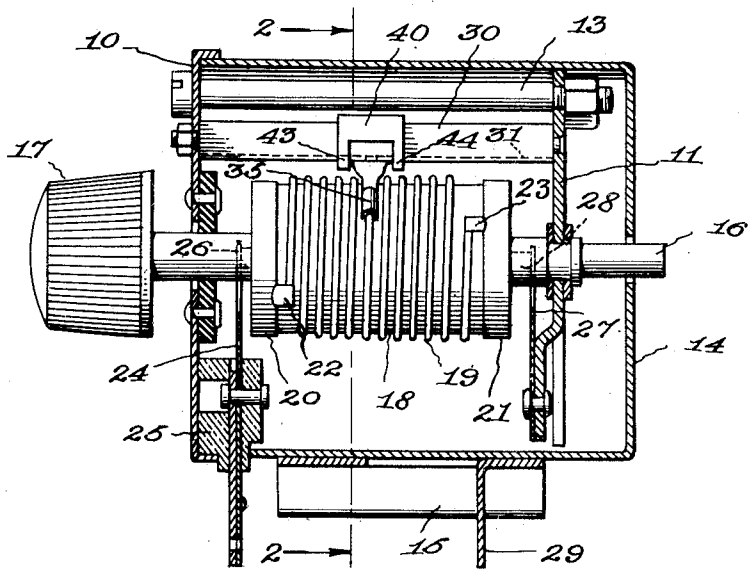
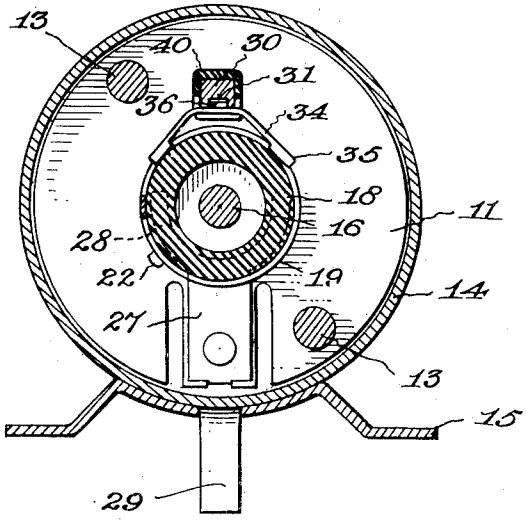


Fig. 2.



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Fig. 4.

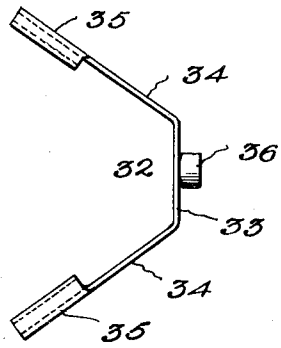


Fig. 3.

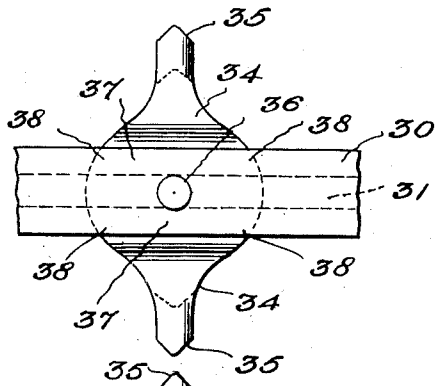


Fig. 7.

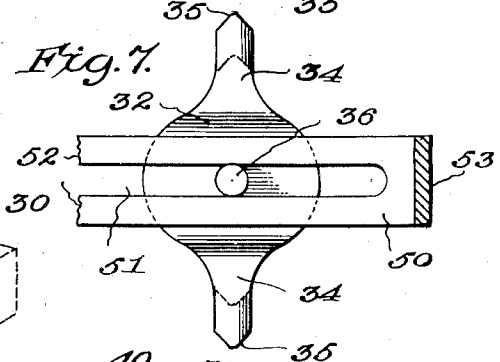


Fig. 5.

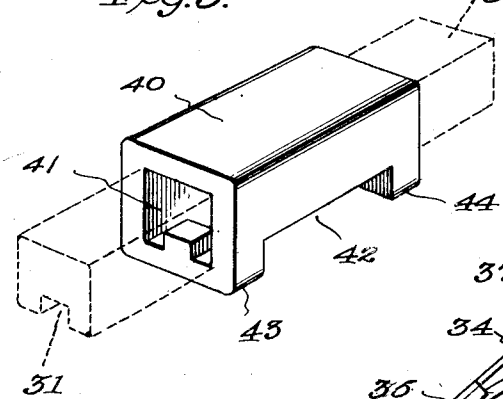
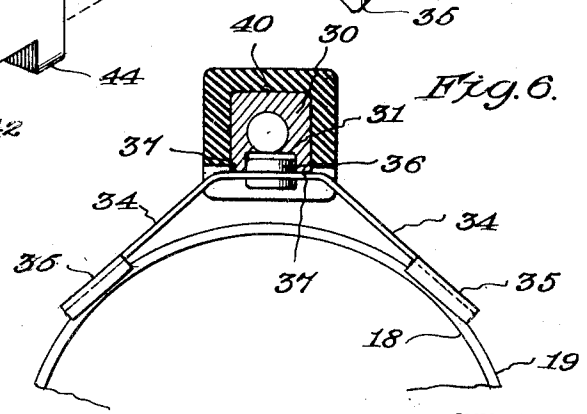


Fig. 6.



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CONTACTOR FOR TUNERS

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Application February 7, 1944, Serial No. 521,338

12 Claims. (Cl. 171—242)

The present invention relates to inductance devices of the continuously variable slide-wire type, and, more particularly, to a contactor for inductive tuners and to a stop mechanism therefor.

It is an object of the present invention to provide an inductive tuner including a novel and improved type of contactor and a positively acting stop mechanism for said contactor for locking the rotatable coil against further rotation when the contactor has arrived to predetermined points on the coil of bare wire.

It is another object of the present invention to provide an improved contactor for inductance devices of the continuously variable slide-wire type engaging the wire of the inductance coil at two spaced points which is capable of sliding displacement along a trolley rod and also of limited rotational displacement about a vertical axis for conforming to varying winding pitch of the coil.

It is a further object of the present invention to provide a stop member of improved character arranged for joint and rotationless displacement by the contactor along the trolley rod, said member having faces engageable by stop projections on the ends of the coil to lock the coil against rotation after the contactor and the stop member have reached the terminal portions of the coil.

The invention also contemplates an inductive tuner contactor and stop mechanism organization which is extremely simple in structure, is positive and foolproof in operation, and which may be readily manufactured and sold on a quantity production scale at a low cost.

Other and further objects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings; in which

Fig. 1 illustrates a side elevational view, having parts in section, of an inductive tuner device embodying the principles of the present invention;

Fig. 2 depicts a vertical sectional view taken on line 2—2 of Fig. 1;

Fig. 3 shows a top elevation of the contactor member embodying the invention;

Fig. 4 is a side elevational view of the contactor member shown in Fig. 3;

Fig. 5 is a perspective view of a preferred form of stop member;

Fig. 6 is an enlarged vertical sectional view, somewhat fragmentary in character, showing the cooperation of the contactor, stop member, and trolley rod; and

Fig. 7 is a top elevation of the contactor member slidably mounted on a modified form of trolley rod.

While a preferred embodiment of the invention is described herein, it is contemplated that considerable variation may be made in the method of procedure and the construction of parts without departing from the spirit of the invention. In the following description, and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit:

Referring now more particularly to Figs. 1 and 2 of the drawings, the preferred form of the slide-wire variable inductance device comprises a pair of end plates 10 and 11 held in spaced parallel relation by longitudinal spacer rods 13. The unit is enclosed in a metal shield can 14 having a flanged mounting base 15 welded to the outside thereof for mounting the unit in the apparatus in which it is to be used. A rotatable control shaft 16 extends through the shield in axial direction and has its bearings in end plates 10 and 11 for rotation by a control knob 17. The shaft carries a coil form 18 constituted of a tubular insulating material, such as a synthetic resin, resin-impregnated fibre, ceramic, glass, or the like.

A bare wire coil 19 is wound on the circumferential surface of form 18 with its adjacent turns spaced from each other. If desired, the form may be provided with a shallow groove in which the wire 19 is held against displacement. Metal caps 20 and 21 are attached over the ends of the coil form and have cylindrical flanges thereon which overlie the terminal portions of the cylindrical surface of form 18 and are provided at their edges with upturned stop projections, or lugs, 22 and 23 to which the ends of coil 19 are also connected. End cap 20 has a central aperture spacing and insulating it from shaft 16. A fork-shaped contact spring 24 is mounted on a suitable insulating block 25 inside end wall 10 and carries a pair of contact brushes 26 on the ends of its fork arms which slide on cap 20, thereby providing a slip ring connection to the corresponding end of the coil. Contact spring 24 extends through a suitable aperture in shield 14 to provide an external circuit connection. End cap 21 is positively grounded to the frame of the unit by contact spring 27 secured to end wall 11 and carrying contact brushes 28 sliding against cap 21. Of course, if desired, contact spring 27 may be likewise insulated from the frame by mounting the same on an insulating block, sim-

ilar to block 25, as those skilled in the art will readily understand. Mounting base 15 is provided with a punched down grounding lug 29.

A trolley rod 30 extends along the side of coil 18, parallel to the axis thereof, and is supported at its ends by end walls 10 and 11. As it will best appear from Figs. 2 and 6, this trolley rod is of a generally rectangular cross section and is provided with a longitudinal slot or recess 31 extending throughout the full length thereof and opening towards the surface of coil 18. Along the trolley rod may slide a sliding contact element or contactor 32. This contactor is preferably formed from sheet spring metal having a flat central body portion, or mid-portion, 33, from which extend a pair of elongated arms 34 having grooved contact nibs 35 at their ends, riding on the wire of coil 19. Contactor 32 is positively guided along the trolley rod by means of a rivet 36 inserted into the center of its mid-portion and having a head of such diameter as to slidably fit slot 31 in the rod. The contactor is biased to apply pressure upon the coil wire at its contact nibs 35 and upon the flattened regions 37 of the trolley rod, adjoining slot 31, at its mid-portion 33. Thus, it will be noted that upon rotation of coil 19, the contactor will be guided along the trolley rod by means of rivet or pivot member 36, and electrical connection will be maintained at all times between the rod and the corresponding points of the coil which are engaged by nibs 35. At the same time, the contactor is also capable of limited rotational displacement about the pivot member to conform to varying wire pitch. The stability of the contactor and the positive character of the contact during its displacement along the trolley rod are assured by pressure maintained at points 38 (Fig. 3).

In order to lock the rotatable coil form 18 against further rotation after the contactor has arrived to one of the ends of coil 19, a stop member is provided. This stop member 40 (Fig. 5) is preferably molded from Bakelite or some other suitable material of an insulative character and has a generally rectangular shape. A longitudinal opening 41 extends throughout the length of the stop member and conforms to the cross section of the trolley rod in order to form a sliding and rotationless fit therewith. The central portion of the stop member is cut out, as indicated at 42, so as to expose the lower face of the trolley rod with slot 31 therein. This cut-out portion or recess 42 in the stop member is so dimensioned as to accommodate mid-portion 33 of the contactor and also to permit slight rotational displacement of the contactor about pivot member 36, this being facilitated by the substantially circular edge of said mid-portion of the contactor. As pivot member 36 is preferably provided in the form of a rivet, adjustment of the play between pivot member and slot 31 is best made by tapping the rivet head to enlarge the same for optimum clearance conditions.

From the foregoing description, operation of the inductive tuner embodying the invention will be readily understood by those skilled in the art. When coil form 18 and coil 19 are rotated, and nibs 35 of the contactor engage the wire at two spaced points, the mid-portion of the contactor will be caused to slide along the trolley rod making positive contact therewith at points 37. At the same time, the contactor is capable of slight rotational displacement about pivot member or rivet 36 in order to conform to variations in the wire pitch.

During the sliding displacement of the contactor along the trolley rod, stop member 40 will be likewise taken along as its downwardly depending end portions 43 and 44 are internally engaged by the edges of the mid-portion of the contactor. When the contactor and the stop member reach one of the ends of the coil, portions 43 and 44 of the stop member will act as stop faces protruding into the path of stop projections 22 and 23, respectively, on the terminal regions of the coil. When finally one of these stop faces is engaged by the corresponding stop projection, a further attempt to rotate the coil in the same direction will merely exert pressure on the rotationlessly mounted stop member and thus will be harmlessly dissipated without applying the slightest pressure on the light contactor. Therefore, in this manner positive locking of the coil against further rotation is assured at each end of the full displacement of the contactor.

Fig. 7 illustrates the contactor member in combination with a modified form of the trolley rod. In this modified embodiment of the invention, the trolley rod is constituted of a flat metal strip 50 in which there is punched a longitudinal slot 51, defining a pair of parallel-spaced rods or rails 52. Slot 51 has such dimensions that pivot member 36 of contactor 32 may readily slide therein. In other words, slot 51 has the same function in this embodiment as the longitudinal groove 31 in Fig. 3. The undivided end of a strip 50 is bent upwards, as indicated at 53, and this bent-up portion is used for securing the strip to side wall 11 of the unit with or without the interposition of insulation. Of course, a stop member similar to stop member 42 of Fig. 5 may be combined with this modified embodiment. Bent-up portion 53 may be formed with an extension which constitutes a soldering lug for connecting a lead wire thereto. In view of the similarity of construction and in view of the fact that similar reference characters have been used to denote corresponding parts, the structure and operation of this modified embodiment of the invention will be readily understood by those skilled in the art without any further explanation.

It will be noted that the present invention provides a number of important advantages. Thus, first of all, a contactor element of novel and improved character has been provided which has an extremely simple structure and which not only assures at all times positive contact and electrical connection between the various portions of the coil and the trolley rod but is also rotatable about its vertical axis so as to compensate for variations in the wire pitch. Experience has shown that this type of structure is valuable in preventing slipping off of the contact nibs from the wire which would otherwise frequently occur unless the wire is wound with great precision at substantial additional expense.

It is also to be observed that the stop member disclosed is readily adaptable for quantity production as a result of its simple shape and provides positive locking action at the ends of the coil without exerting any pressure on the light contactor.

An additional advantage of the improved contactor and stop member structure is that it greatly simplifies assembly of the unit. The contactor may be slipped into the completed unit without giving it a weakening set and may be readily removed therefrom for adjustment or cleaning.

While the present invention, as to its objects

and advantages, has been described herein as carried out in specific embodiments thereof, it is not desired to be limited thereby but it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod mounted in parallel-spaced position with respect to the side of said coil and having a longitudinal slot therein, and a contact element of sheet spring metal having a pair of grooved contact nibs at its ends engaging the wire of said coil in the grooves therein and having a member in its mid-portion extending into said slot of the trolley rod and slidably engaging said slot, said contact element being biased to produce spring pressure against said coil at said nibs and against said rod at its mid-portion.

2. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod mounted in parallel-spaced position with respect to the side of said coil and having a longitudinal recess therein opening towards said coil, a contact element of sheet spring metal having a pair of grooved contact nibs at its ends engaging the wire of said coil at two spaced points in the grooves therein, and a pivot member extending from the mid-portion of said contact element into the recess of said trolley rod and forming a sliding fit therewith, said contact element being biased to produce spring pressure against said coil at said nibs and against said rod at two regions of its mid-portion adjoining said recess.

3. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod mounted in parallel-spaced position with respect to the circumferential surface of said coil and having a longitudinally extending recess therein facing said coil, a contact element of sheet spring metal having a pair of grooved contact nibs at its ends engaging the wire of said coil at two spaced points in the grooves therein, and a pivot member of substantially cylindrical character extending from the mid-portion of said contact element into the recess of said trolley rod and forming a sliding fit therewith, said contact element being biased to produce spring pressure against said coil at said nibs and against said rods at two regions adjoining said recess and being capable of rotational displacement about said pivot member to conform to variations in the pitch of the windings of said coil.

4. In a slide wire variable inductance device wherein a coil unit made up of a form of circular cross section and an inductive coil of bare wire wound thereon is mounted for rotation about a longitudinal axis and a trolley rod is mounted parallel to a side of said coil unit in spaced relation thereto, the improvement which comprises a longitudinal recess in said trolley rod opening towards said coil, a contact element of sheet spring metal having a pair of grooved contact nibs at its ends engaging the wire of said coil at two spaced points in the grooves therein, and a pivot member in the form of a substantially circular rivet in the mid-portion of said contact element extending into the recess of said trolley rod and forming a sliding and rotary fit therewith, said contact element being biased to produce spring pressure against the wire of said coil at said nibs and against said rod at two flattened regions of its mid-portion adjoining said recess and being capable of limited rotational displacement about said pivot member to conform to variations in the pitch of the windings of said coil.

5. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod mounted in parallel-spaced position with respect to the circumferential surface of said coil and having a longitudinally extending slot therein facing said coil, a contact element of sheet spring metal having a pair of grooved contact nibs at its ends engaging the wire of said coil, a generally circular pivot member in the mid-portion of said element extending into and forming a sliding and rotary fit with the slot in said trolley rod, a stop member slidably and rotationlessly mounted on said rod and engageable by said contact element for joint sliding displacement therewith along said rod, and stops at the ends of said coil engageable by surfaces of said stop member to stop rotation of said coil when said contact element and stop member approach the ends of said coil, said contact element being capable of slight rotational displacement about said pivot member with respect to said rod and said stop member to conform to variations in the pitch of the windings of said coil.

6. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod of generally polygonal cross section mounted in parallel-spaced position with respect to the circumferential surface of said coil and having a longitudinal slot therein facing said coil, a stop member having a hole therein forming a sliding and rotationless fit with said rod and having a contact-receiving recess, a resilient contact member interposed between said rod and said coil having its mid-portion within the recess of said stop member and having its ends extending into contacting position with the wire of said coil, a pivot member on said contact member forming a sliding and rotary fit with the slot in said rod, and stop projections at the ends of said coil engageable by said stop member to stop rotation of said coil when said contact and stop members approach the ends of said coil, said contact member being capable of slight rotational displacement with respect to said rod and said stop member to conform to variations in the pitch of the windings of said coil.

7. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod of generally rectangular cross section mounted in parallel-spaced position with respect to the side of said coil and having a longitudinal slot therein facing the coil, a stop member of insulating material having a hole in each of its ends conforming to the shape of said trolley rod and forming a sliding and rotationless fit therewith and having its center portion cut out towards said coil, a contact member of sheet spring material interposed between said rod and said coil having its mid-portion engaging said rod within the cut-out portion of the stop member in the flattened regions of said rod adjoining said slot and having its ends engaging the wire of said coil, a pivot member of circular cross section extending from the mid-portion of said contact member into the slot of said rod and

forming a sliding and rotary fit therewith, and stop projections at the ends of said coil engageable by the ends of said stop member to stop rotation of said coil when said contact and stop members approach the ends of said coil, said contact member being capable of slight rotational displacement with respect to said rod and within the cut-out portion of said stop member to conform to variations in the pitch of the windings of said coil.

8. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod mounted in parallel-spaced position with respect to the side of said coil and having at least one flat longitudinal surface with a slot therein facing the coil, an insulative stop member having a longitudinal channel therein forming a sliding and rotationless fit with said rod, a cut out portion in said stop member exposing part of the flat surface of said rod and the slot therein, a contactor interposed between said rod and said coil engaging the rod at its mid-portion and the wire of said coil at its ends and having a member positively guided in said slot for sliding and limited rotational displacement, and stop projections on the ends of the circumferential surface of said coil engageable by said stop member when said contactor and said stop member reach the ends of the coil to lock the coil against further rotation.

9. In a variable inductance device including a bare helical conductive coil mounted for rotation about its lonigtudinal axis, a trolley rod mounted in parallel-spaced position with respect to the side of said coil, and a resilient contactor interposed between said coil and said rod to maintain sliding contact therewith, the improvement which comprises a longitudinal slot in said rod, a stop member with a channel therein forming a sliding and rotationless fit with said rod, a cut-out portion in said stop member exposing part of said rod and the slot therein and substantially covering said contactor for joint sliding displacement therewith, a pivot member in said contactor slidably and rotatably engaging said slot in the rod, and stop projections on the ends of said coil engageable by terminal regions of said stop member when said contactor and said stop member approach the ends of said coil to positively lock said coil against further rotation.

10. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod in the form of a flat metal strip mounted in parallel-spaced position with respect to the side of said coil and having a longitudinal slot extending through the major portion thereof, and a contact element of sheet spring metal having a pair of grooved contact nibs engaging the wire of said coil in the grooves therein and having a member in its mid-portion extending into the slot of said metal strip and slidably engaging said slot, said contact element being biased to produce spring pressure against said coil at said nibs and against said metal strip at its mid-portion.

11. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod in the form of a flat metal strip mounted in parallel-spaced position with respect to the side of said coil and having a longitudinal slot punched therein defining a pair of parallel-spaced rails, a contact element of sheet spring metal having a pair of grooved contact nibs at its ends engaging the wire of said coil at two spaced points in the grooves therein, and a pivot member extending from the mid-portion of said contact element into the slot of said metal strip and forming a sliding fit with said rails, said contact element being biased to produce spring pressure against said coil at said nibs and against the underface of said rails at two regions of its mid-portion.

12. A variable inductance device comprising in combination a bare helical conductive coil mounted for rotation about its longitudinal axis, a trolley rod in the form of a flat metal strip in parallel-spaced position with respect to the circumferential surface of said coil and having a slot extending throughout the major portion of the length thereof and defining a pair of parallel-spaced rails, the integral end portion of said strip being bent upwards to constitute a combination mounting bracket and soldering lug for said strip, a contact element of sheet spring metal having a pair of grooved contact nibs at its ends engaging the wire of said coil at two spaced points in the grooves therein, and a pivot member of substantially cylindrical character extending from the mid-portion of said contact element into the slot of said metal strip and forming a sliding fit with said rails, said contact element being biased to produce spring pressure against said coil at said nibs and against the underface of said rails at two spaced regions of its mid-portion and being capable of rotational displacement about said pivot member to conform to variations in the pitch of the windings of said coil.

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