Aug. 2, 1927. 1,637,442

H. G. DORSEY

ALTERNATING CURRENT SELECTOR

Original Filed Oct. 12, 1917 2 Sheets-Sheet 1.

Fig. 1

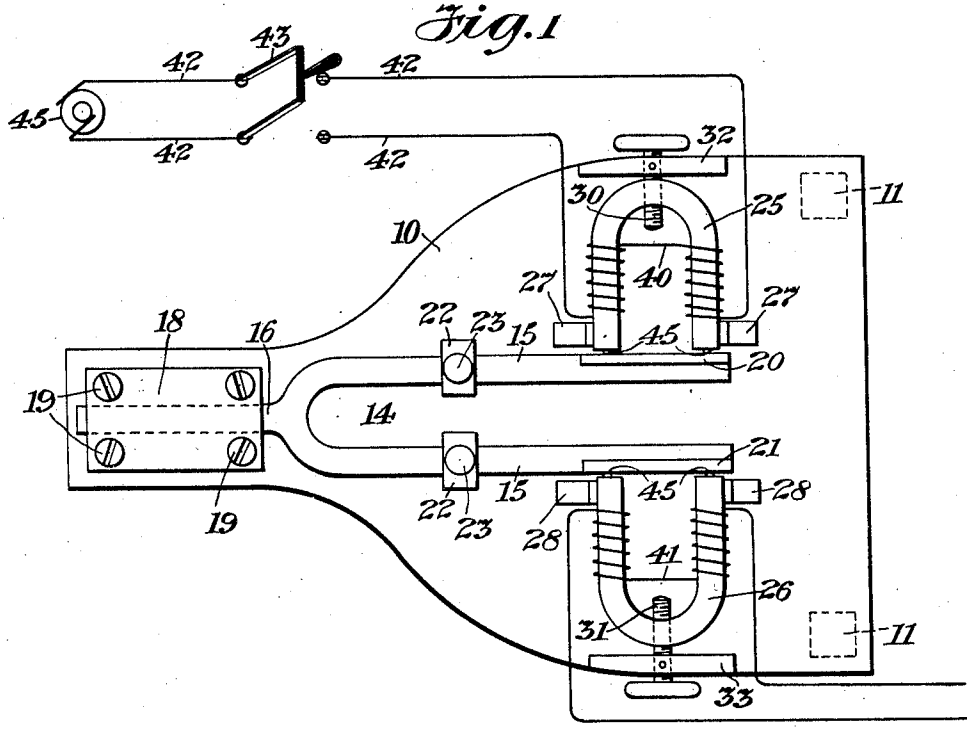

Fig. 2

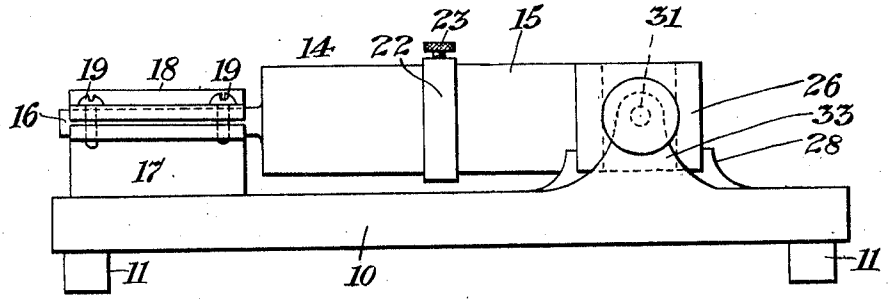

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Fig. 3

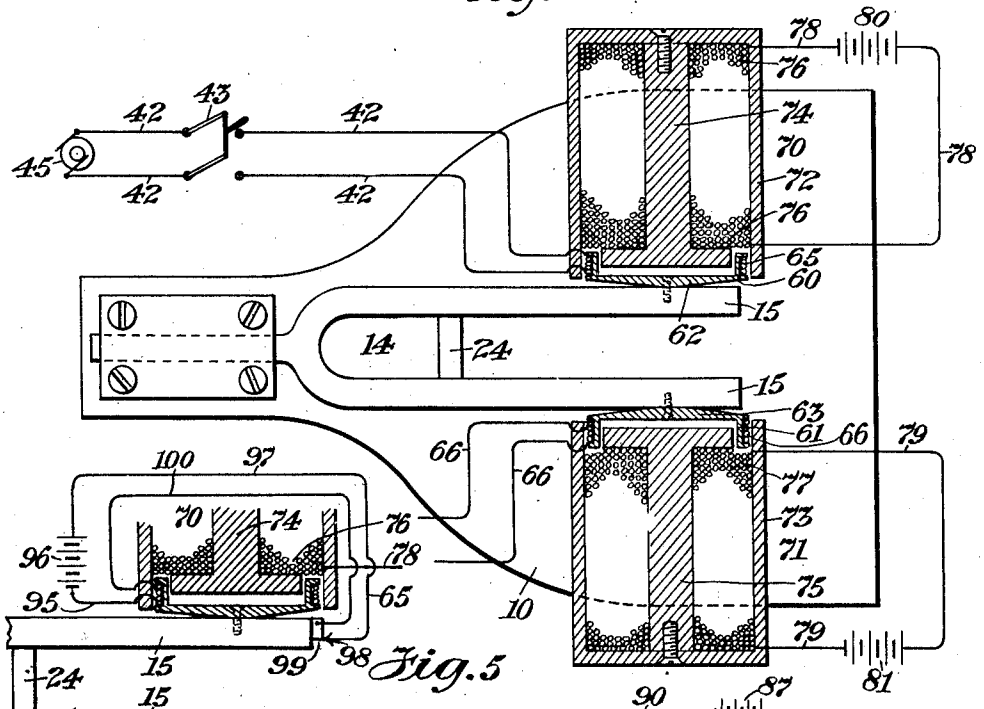

Fig. 5

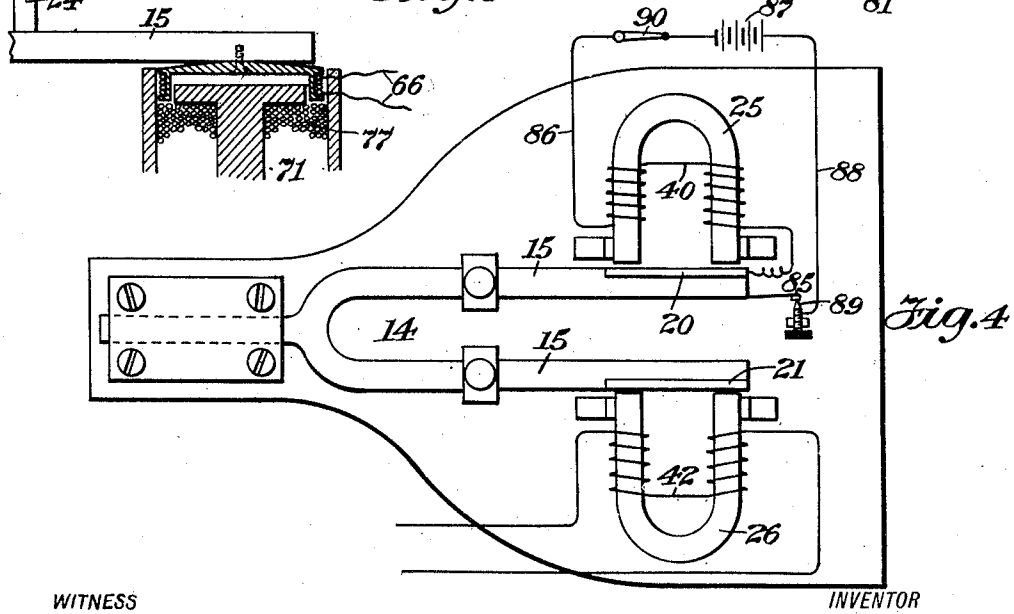

Fig. 4

WITNESS

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UNITED STATES PATENT OFFICE.

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ALTERNATING-CURRENT SELECTOR.

Application filed October 12, 1917, Serial No. 196,302. Renewed February 20, 1924.

Some of the objects of this invention are to provide an alternating current selector which will respond only to a predetermined definite range of frequencies of alternating current; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a top plan view of an alternating current selector constructed in accordance with this invention; Fig. 2 is a side elevation of the same; Fig. 3 is a top plan view partly in horizontal section of a modified form of this invention; Fig. 4 is a top plan view of the selector as shown in Fig. 1 but arranged to transform a direct current into an alternating current; and Fig. 5 is a fragmentary diagrammatic view of the modified form of selector as shown in Fig. 3 arranged to produce an alternating current from a direct current.

Referring to the drawings, one embodiment of this invention comprises a selector including a heavy rigid base-plate 10 which is preferably approximately triangular in shape and which is preferably mounted upon three resilient or yielding pads 11 which depend from and which are secured to the base 10, the pads 11 being arranged to rest upon any suitable platform or support. Spaced above and parallel to the base 10 is a tuning fork 14 including two resilient, parallel prongs 15 which are integral with or rigidly secured to a handle or rod 16 which is clamped rigidly in a fixed position upon a rigid block 17 by means of a plate 18 which is held in position upon the block 17 by means of screws 19 extending loosely through the plate and threaded into the block 17. The block 17 rests upon and is rigidly secured to the upper surface of the base 10. The tuning fork 14 may be made of steel as is usually done, but preferably is made of non-magnetic material and has secured to its two prongs 15 respectively two magnetic plates 20 and 21 which are preferably made of soft steel, or Norway iron.

For tuning the fork 14 to vibrate at any desired predetermined frequency two sliders 22 are mounted upon and adjustable longitudinally of the two prongs 15 respectively and are arranged to be held adjustably in any desired positions respectively by two set-screws 23. Instead of using two sliders for this purpose, a bridge 24 may be placed snugly between the two prongs 15 as shown in Fig. 3 and may be adjusted in position towards or away from the free ends of the prongs to change the tuning of the fork.

Spaced slightly outside of and facing the two magnetic plates 20 and 21 respectively are two coaxial, oppositely disposed polarized U-shaped electro-magnets, an electro-magnet 25 and an induction coil magnet 26, which are slidable longitudinally in predetermined paths towards and away from their respective plates 20 and 21 in fixed guides 27 and 28 respectively. These magnets 25 and 26 are held adjustably in fixed position respectively by means of two oppositely disposed alined adjusting screws 30 and 31 arranged coaxially with the magnets 25 and 26. These two screws 30 and 31 are rotatably supported but held against longitudinal movement in two fixed standards 32 and 33 carried by the base 10, and are threaded respectively into the two magnets 25 and 26. By rotating either screw 30 or 31 in a suitable direction the corresponding magnet 25 or 26 may be moved either towards or away from the corresponding magnetic plate 20 or 21. The two magnets 25 and 26 are arranged to be energized in a well known manner by two insulated conductors 40 and 41 which are coiled around the arms of the two magnets respectively, each conductor being wound in opposite directions around the two arms of the corresponding magnet.

In the operation of this improved selector in response to an alternating current of a given frequency, the insulated conductor 40 which is wound around the arms of the electro-magnet 25 is connected in series with the circuit carrying the incoming alternating current in such a manner as to cause the current to pass through the conductor. For instance the winding 40 of the electro-magnet 25 may be connected in series with a circuit 42 controlled by a switch 43 and arranged to be energized by an alternating current generator 45. Now, if this alternating current is of the same frequency as the frequency to which the tuning fork 14 is tuned, then both prongs of the tuning fork will be set into vibration and the fork which carries the plate 21 opposite the induction coil magnet 26 will cause the plate 21 to be vibrated towards and away from the induction coil magnet 26 at a frequency equal to the frequency of the incoming current. This vibration of the plate 21 will cause the corre-

sponding fluctuations in the magnetic reluctance through the induction coil magnet 26 which will generate in the conductor 41 which is wound around the two arms of the induction coil magnet 26 an alternating current of the same frequency as the frequency of the incoming alternating current which is acting upon the electro-magnet 25. If the frequency of the incoming alternating current which acts upon the electro-magnet 25 is not the same as the frequency to which the fork 14 is tuned, then the prongs of the fork will not be set into vibration and consequently no current will be set up in the conductor 41 which is wound around the induction coil magnet 26. Even if the alternating current which acts upon the electro-magnet 25 is of such a strength that it forces the corresponding prong 15 of the magnet 14 to vibrate in a period different from the period to which the fork is tuned, very few vibrations will be carried to the other prong of the tuning fork and hence no appreciable effect will be produced in the winding of the induction coil magnet 26.

During the operation of this selector the tuning fork 14 may be damped by placing drops 45 of oil between the magnetic plates 20 and 21 and the poles of the corresponding magnets 25 and 26, or the entire selector may be immersed in an oil bath.

In the modified form of this invention shown in Fig. 3 the tuning fork 14 is mounted as hereinbefore described, but instead of having the prongs 15 of the tuning fork provided with two magnetic plates 20 and 21 as hereinbefore described, the prongs 15 in this modified form are provided respectively with two oppositely disposed annular cylindrical carriers 60 and 61 which are rigid respectively with two spiders 62 and 63 which are rigidly secured respectively to the outer ends of the two prongs 15. Surrounding and carried by the two carriers 60 and 61 respectively are two coils 65 and 66 of insulated wire. Loosely surrounding the two coils 65 and 66 and their carriers 60 and 61 and fixed upon the base 10 are two electro-magnets 70 and 71 comprising two coaxial inwardly facing hollow soft iron cylindrical body portions 72 and 73 and two soft iron cores 74 and 75 coaxial therewith and rigidly secured thereto respectively. Two insulated coils 76 and 77 are wound respectively around the two core 74 and 75, and are arranged in series respectively with two circuits 78 and 79 arranged to be energized respectively by two batteries 80 and 81 or other sources of direct current.

In the operation of the modified form of this invention shown in Fig. 3 the coil 65 of the primary carrier 60 is connected in series with the circuit 42 which carries the incoming alternating current from the alternator 45, which may be from a wireless telegraph signal, and when this alternating current is the same in frequency as the frequency to which the electro-magnet 14 is tuned to vibrate then the prongs 15 of the fork 14 will be caused to vibrate and vibration of the secondary carrier 61 and its coil 66 in the field of the secondary electro-magnet 71 will cause an alternating current to be set up in the coil 66 of the secondary carrier having a frequency equal to the frequency of the incoming alternating current.

Either the form of this invention shown in Figs 1 and 2 or the modified form shown in Fig. 3 may be utilized to produce an alternating current from a direct current. For instance, when it is desired to utilize the form of this invention shown in Fig. 1 for producing an alternating current from a direct current, the winding 40 of the primary magnet 25, instead of being connected to a source 45 of alternating current as shown in Fig. 1, is connected as shown in Fig. 4 at one end to the fork and an electrical contact 85 which is flexibly secured to one side of one of the prongs 15 of the tuning fork 14, and the other end of the winding 40 is connected by a conductor 86 to one pole of a battery 87 the other pole of which is connected by a conductor 88 to the adjustable contact 89 which is arranged to engage normally against the contact 85 in such a position that when the prong 15 to which the contact 85 is connected is vibrated, the contact 85 will vibrate out of and into engagement with the fixed contact 89 to alternately open and close the circuit through the battery 87 and the winding 40 of the primary magnet 25. For convenience of operation the circuit through the battery 87 is arranged to be controlled by a switch 90.

In the operation of the modified form of this invention shown in Fig. 4, when the switch 90 is closed the primary electro-magnet 25 will be energized and will draw the corresponding prong 15 of the tuning fork 14 towards the magnet to such an extent as to move the contact 85 carried thereby out of engagement with the fixed contact 89 and consequently break the circuit through the battery 87 and winding 40 of the electro-magnet 25, thus deenergizing the electro-magnet and permitting the prong 15 to move away from the electro-magnet and to close the circuit through the battery 87 and winding 40 whereupon the electro-magnet 25 will be reenergized and the cycle of operations will be repeated and will cause both prongs 15 of the tuning fork 14 to vibrate in their natural frequency, and the prong 15 adjacent the induction coil magnet 26 will cause an alternating current to be set up in the winding 42 of the secondary magnet 26, assuming that the induction coil magnet 26 is permanently magnetized.

The modified form of selector shown in

Fig. 3 may be arranged to produce alternating current from a direct current as shown in Fig. 5, and in this case instead of connecting the movable coil 65 of the primary magnet 70 to an alternator 45, as shown in Fig. 3, one end of the coil 65 is connected by a conductor 95 to one pole of a battery 96, the other pole of which is connected by a conductor 97 to a fixed contact 98 which is arranged to normally engage slidably against a contact 99 which is rigidly secured to but insulated from the corresponding prong 15 of the tuning fork 14 and which is connected by a conductor 100 to the other end of the coil 65. The two stationary coils 76 and 77 of the electromagnets 70 and 71 are connected as hereinbefore described to be energized by the batteries 80 and 81.

In the operation of the arrangement shown in Fig. 5 the prong 15 adjacent the primary electro-magnet 70 is drawn towards the primary electro-magnet 70 as a result of the energization of the coil 65 and until the movable contact 99 is moved out of engagement with the fixed contact 98 whereupon the current through the movable coil 65 and battery 96 is broken and the prong 15 is permitted to swing outwardly from the primary magnet 70 to bring the movable contact 99 into engagement with the fixed contact 98 and to again close the circuit through the movable coil 65 and the battery 96, whereupon the cycle of operations will be repeated thus causing the two prongs 15 of the tuning fork 14 to vibrate in their natural period and to set up an alternating current in the movable coil 66 of the secondary magnet 71.

In many forms of telegraphic or electric signalling where a large number of alternating currents of different frequencies are used, it is desirable to separate the different frequencies in the respective apparatus, and it is evident that this invention provides a selector which is particularly adapted for this purpose. Also in signalling with one definite frequency this selector may be used to exclude other frequencies and hence eliminate interfering currents. This selector may also be used in the ordinary transmission of currents over wires and may be used in all forms of wireless selective work. This selector may also be used as hereinbefore described as a generator of alternating currents of a definite frequency.

Although only a few of the many forms have been described herein in which this invention may be embodied, it is to be understood that the invention is not limited to any specific construction but might be applied in various forms without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described this invention, I claim:

1. The combination of a tuning fork comprising a pair of prongs having the same predetermined rate of vibration, an electro-magnet having its poles in close proximity to a single prong of said fork whereby said fork is influenced by the electro-magnet, a circuit including said electro-magnet and means having the same frequency as the prongs for controlling the current flow in said circuit, a second electric circuit and means controlled by the vibration of the second prong for generating alternating current in said second circuit of a frequency determined by the vibration of the first prong.

2. The combination of a tuning fork comprising a pair of prongs having the same predetermined rate of vibration, an electro-magnet having its poles in close proximity to a single prong of said fork whereby said fork is influenced by the electro-magnet, a circuit including said electro-magnet and means having the same frequency as the prongs for controlling the current flow in said circuit, a second electric circuit and a magnetic circuit effected by the vibration of the second prong for generating alternating current in said second circuit of a frequency determined by the vibration of the first prong.

3. The combination of a tuning fork comprising a pair of prongs having the same predetermined rate of vibration, an electro-magnet having its poles in close proximity to a single prong of said fork whereby said fork is influenced by the electro-magnet, a circuit including said electro-magnet and means having the same frequency as the prongs for controlling the current flow in said circuit, a second electric circuit and a magnetic circuit the magnetic reluctance of which is increased and decreased by the vibration of the second prong for generating alternating current in said second circuit of a frequency determined by the vibration of the first prong.

Signed at Gloucester in the county of Essex and State of Massachusetts this second day of October A. D. 1917.

HERBERT GROVE DORSEY.