

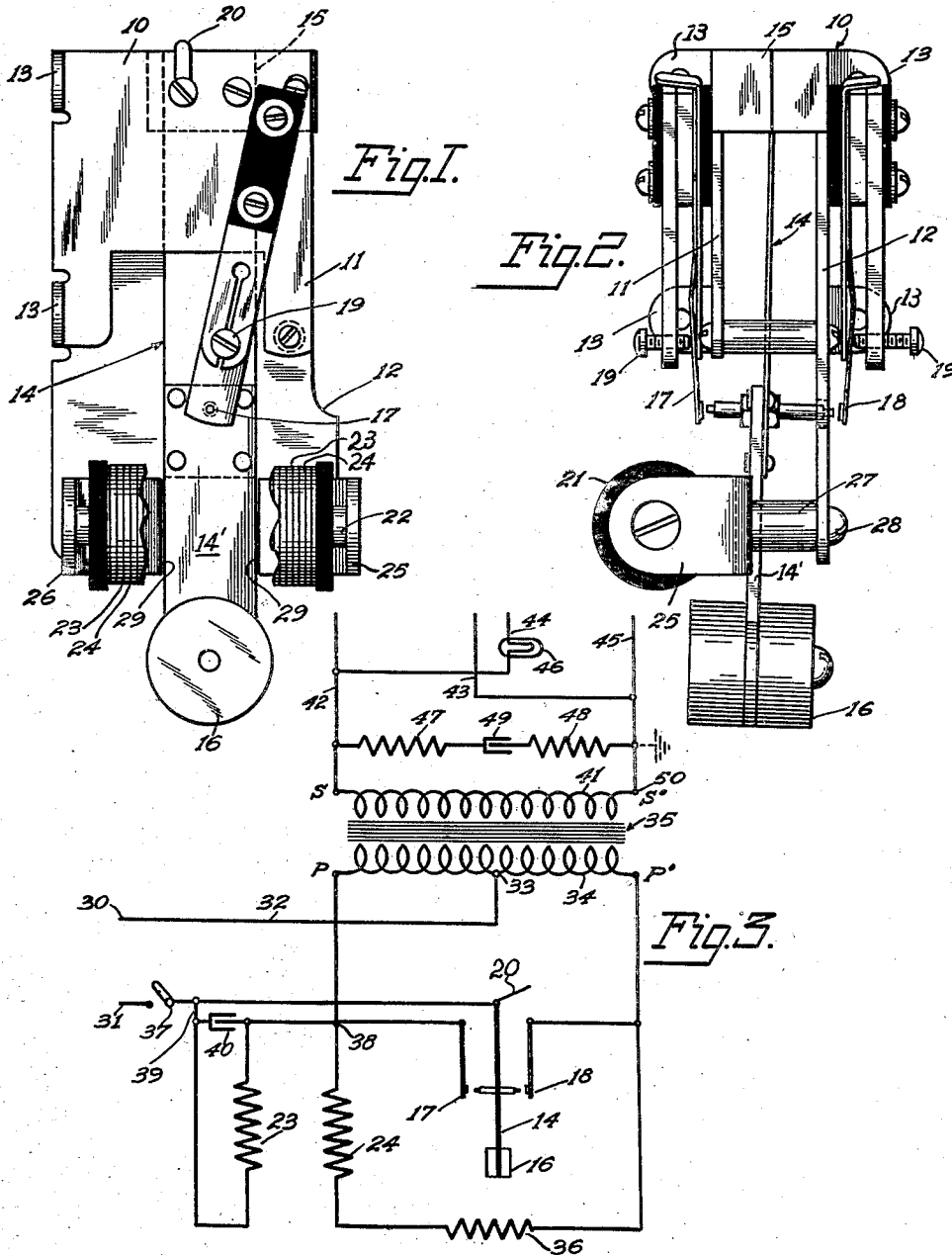
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POLE CHANGER

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POLE CHANGER

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This invention relates to pole changers and more particularly to a pole changer used in connection with telephone ringing circuits.

One object of the invention is to provide a pole changer which does not require an adjustable motor coil.

Another object of this invention is to provide a device of the class described which does not require mechanical adjustment for varying the amplitude of vibration of the reed and in which such adjustment may be accomplished electrically.

A further object is to provide a vibrating element or reed which cannot strike the motor magnet.

Yet a further object is to provide an electrical circuit arrangement whereby a separate actuating or starting contact will not be required.

Yet another object is to provide a pole changer in which the vibration amplitude avoids critical contact adjustments.

Still another object includes the provision of means giving a high starting torque greatly in excess of the running torque, but which does not require special starting circuits or coils.

Other objects and advantages of this invention will appear from the following description taken in connection with the accompanying drawing.

In the drawing, wherein like reference characters indicate corresponding parts in the various figures,

Fig. 1 is a side elevation of a device embodying features of this inventive concept.

Fig. 2 is a front view of the same.

Fig. 3 is a wiring diagram illustrating certain features of the invention.

Considering the drawing in greater detail, the pole changer comprises a framework 10 including frame members 11 and 12 which are spaced apart and have a plurality of apertured bosses 13 to mount it upon a switchboard or other supporting structure. The vibrating element 14 is rigidly secured at 15 in a substantially central position in the framework and carries, at its lower end, weights 16 to vary the natural frequency of the vibrating element.

Appropriate contacts 17 and 18 are insulatably mounted at each side of the framework and are provided with adjusting screws 19 for varying the degree of movement required in completing the circuits. In Figs. 1 and 2, these contacts are shown mounted in insulated relationship with respect to the frame, which latter is provided with a contact terminal 20 for securing appropriate lead wires.

An operating coil 21, having a core 22, is provided with two windings 23 and 24 comprising series and shunt windings, respectively, and is secured upon the frame member 12 by means of thin, flat, angularly extending pole pieces 25 and 26 which are held in place by means of spacing tubes 27 and securing means 28, as clearly seen in Fig. 2. The juxtaposed ends 29 of the pole pieces provide an air gap through which the armature portion 14' of the vibrating reed may move.

The arrangement of the gap and the direction of movement of the vibrating reed is such that the reed will never strike the pole pieces. This construction avoids any interference with the proper vibrating action of the reed.

The electrical circuits for operation of the pole changer are preferably arranged as in Fig. 3. A 24-volt battery (or other power source) having negative and positive terminals 30 and 31, is connected by conductor 32 to an intermediate tap, for example, the mid-point 33 of the primary winding 34 of the pole changer transformer 35. The primary terminals of the transformer are connected to the shunt coil 24 in series with an adjustable resistance element 36. The contacts 17 and 18 are connected, respectively, to one end of the transformer primary 34 and of the shunt coil 24, and to the other end of the transformer primary 34 and to one end of the resistance element 36. The vibrating element 14 is connected to a battery or power switch 37 which may be manually operable. The series coil 23 of the motor magnet is connected at 38 to a common point between the shunt coil and transformer primary, and by conductor 39 to the switch 37. A condenser 40 is placed across the terminals of the series coil.

The secondary winding 41 has conductors 42 and 43 connected through the switchboard section and may have additional conductors 44 and 45 going through a lamp 46 to each operator's position at the board. The conductors 42 and 43, of course, may extend through the usual operator's ringing key for connecting the source of ringing current i. e., the output conductors of the pole changer, to a ringing circuit. One end of the secondary may be grounded as at 50. Resistance elements 47 and 48 and a condenser 49 are connected across the terminals of the secondary winding to provide a small load and a proper wave form, and to avoid arcing or interference with radio or other apparatus. The resulting wave form is substantially square in form.

In the operation of the device, the switch 37

is closed and a circuit is initially made from the power source over conductor 32 to primary tap 33, the left hand half of the transformer primary winding, terminal 38, the series or motor coil 23, conductor 39, through switch 37 and back to the power source. This circuit, in view of the low resistance of the primary winding, places substantially full voltage across the series coil and effects movement of the vibratory member 14 into engagement with electrical contact 17. The movement of the reed places a temporary shunt circuit about the series coil 23 to cause full current to flow in the left half of the primary winding. The shunt circuit is: 30, 32, 33, left half of the primary winding, P, 38, 17, 14, 20, 37, and 31. This in turn will release the vibrating member and cause it to move into engagement with the contact element 18. The reed then swings back to the left, and the foregoing operations will be repeated. In between each shunting action, the coil 23 will be placed in series with one half of the primary winding. Each time the reed engages contact 17 or contact 18, a direct current pulse flows through the concerned half of the primary winding.

The pulses of direct current moving alternately through the opposite halves of the primary winding, induce an alternating current in the secondary, as well as through the circuit of the shunt coil 24 and resistance 36. The flow of alternating current through the shunt coil acts with the series coil and will thereby control movements of the reed. The alternating current in the shunt coil 24 sets up an alternating magnetic flux in the magnetic circuit of electromagnet 21, which aids the flux set up by series coil 23 when the reed is in the back position, with contact 18 engaged, and opposes the normal flux direction when the reed is in the "in" position with contact 17 engaged. One effect of this alternating flux is to quickly terminate the pull upon the armature 14' at the end of the inswing movement, when the series coil 23 is shunted. Local circulating current in the shunted series coil would otherwise retard the collapse of the magnetic field and tend to hold the armature attracted too long. The aiding action comes when the armature is farthest away from the operating magnet, and is consequently beneficial. The alternating current induces a similar current of higher voltage in the secondary winding which is used for bell ringing purposes in the telephone system. Adjustment of resistance 36 provides means for varying the amplitude or extreme of movement of the reed.

Although a preferred embodiment of the invention is illustrated and described, variations within the true spirit and scope of the invention are to be determined by the appended claims.

Having thus described my invention, what I claim is new and desire to secure by United States Letters Patent is:

1. A pole changer having a vibratory reed, a motor magnet for operating said reed having a series coil and a shunt coil, a transformer having a primary winding provided with an intermediate tap, means including contacts controlled by said reed in its vibratory motion for connecting one pole of a source of current alternately to the outside terminals of the said primary winding, the other pole of said current source being connected to said tap, the series winding of said motor magnet being connected between the said one pole of the current source and one of the outside terminals of said primary winding, means whereby the series coil is alternately energized and short circuited, and circuit connections rendered effective when the series coil is short circuited for energizing said shunt coil in a direction opposite the direction of energization of the series coil to thereby promote the rapid decay of the magnetic field of the then shunted series coil.

2. In combination, a vibratile reed, a motor magnet for operating said reed comprising an operating coil and a shunt coil associated therewith, circuit connections for energizing said operating coil in a direction to attract said reed, and means, including contacts closed by said reed incident to the attraction thereof by said magnet, for short-circuiting said operating coil and for completing a circuit for said shunt coil in a direction to reverse the magnetic field created by said operating coil.

3. In combination, a vibratile reed, a motor magnet for operating said reed comprising an operating coil and a shunt coil associated therewith, circuit connections for energizing said operating coil in a direction to attract said reed, means, including contacts closed by said reed incident to the attraction thereof by said magnet, for short-circuiting said operating coil and for completing a circuit for said shunt coil in a direction to reverse the magnetic field created by said operating coil, and means, including contacts closed by said reed incident to its retractile movement, for closing a circuit for said shunt coil in a direction to assist said operating coil in attracting said reed.

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