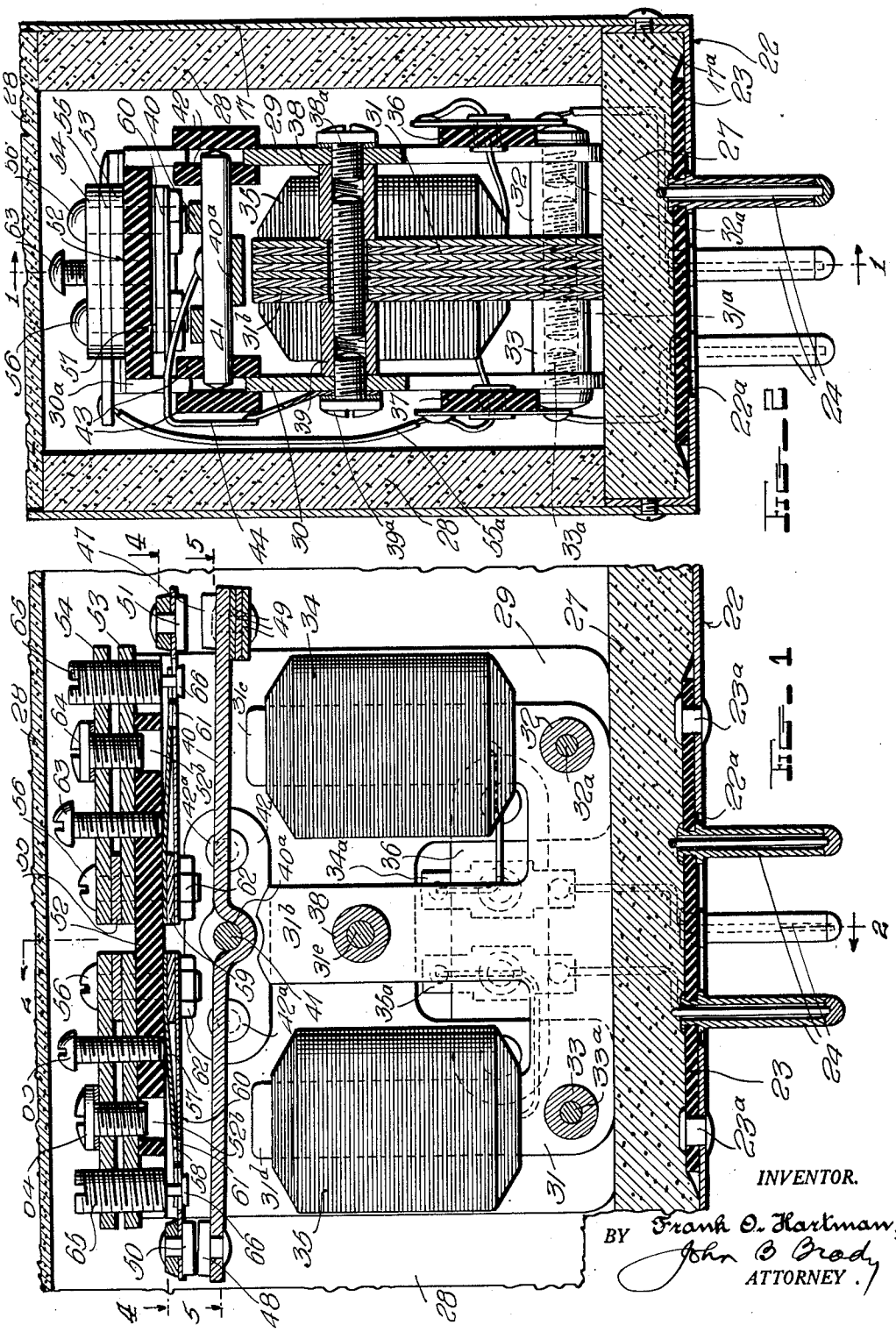
June 1, 1937. F. O. HARTMAN 2,082,493

STATIONARY CONTACT SYSTEM FOR VIBRATORY SWITCHES

Filed May 24, 1933 2 Sheets-Sheet 1



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FIG. 3

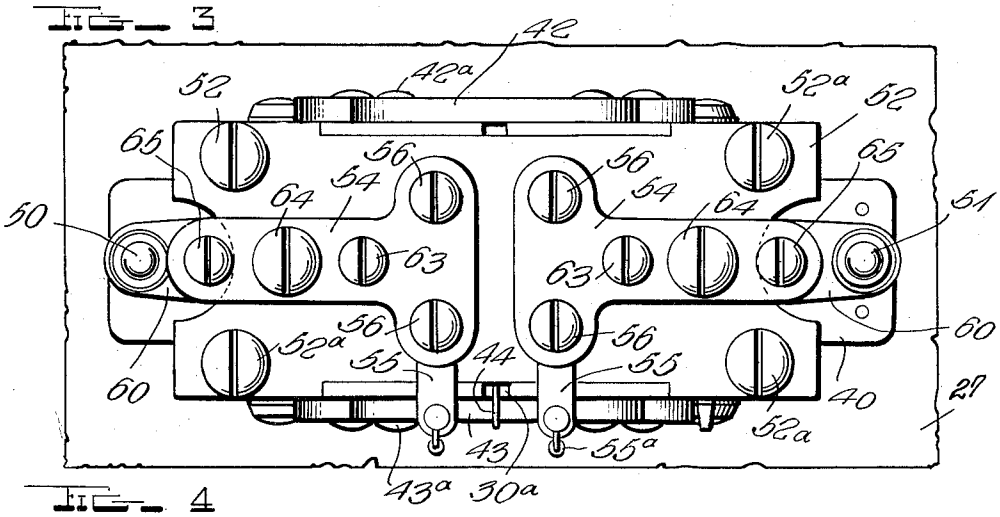


FIG. 4

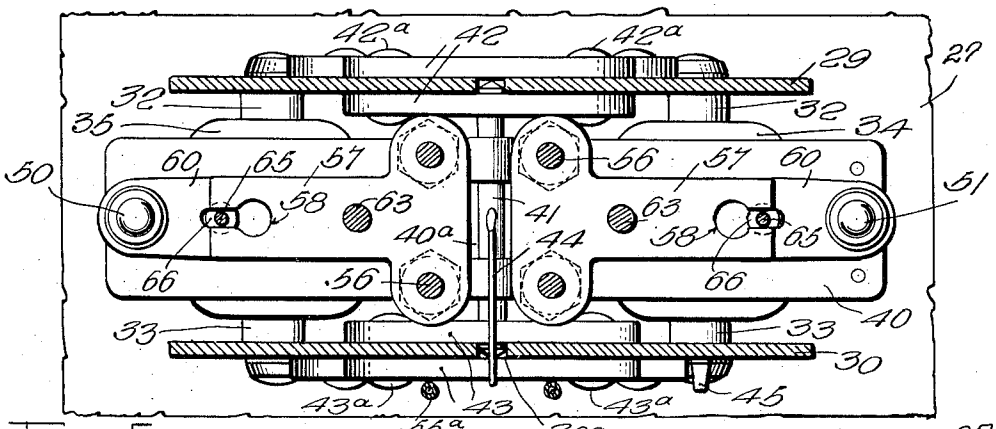


FIG. 5

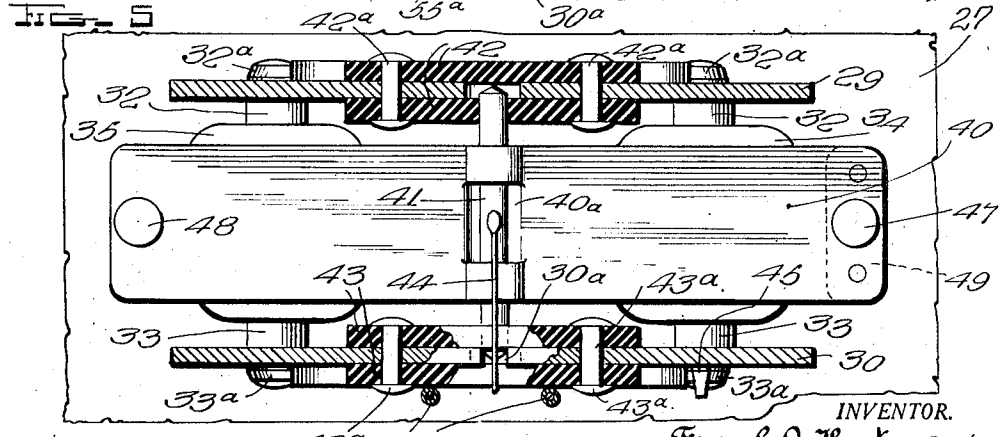


FIG. 6

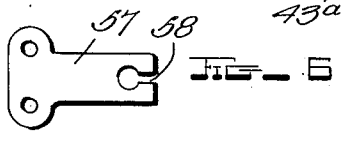
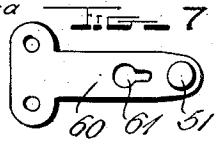


FIG. 7



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STATIONARY CONTACT SYSTEM FOR VIBRATORY SWITCHES

Frank O. Hartman, Mansfield, Ohio, assignor to The Hartman Electrical Mfg. Company, Mansfield, Ohio, a corporation of Ohio

Application May 24, 1933, Serial No. 672,730

5 Claims. (Cl. 200—166)

My invention relates broadly to apparatus for converting low voltage direct current into high voltage alternating current of a character suitable for neon tube advertising sign lighting and more particularly to a stationary contact system employed in such apparatus.

One of the objects of my invention is to provide a stationary contact system in a construction of converter for changing low voltage direct current (for example, 110 volts) into high voltage alternating current (for example, 5000 volts) suitable for neon tube lighting for operating advertising signs and the like in districts where only direct current power supply is available.

Another object of my invention is to provide a construction of a stationary contact system in a vibratory switch for use in connection with a suitable transformer in supplying alternating current from a direct current source.

Still another object of my invention is to provide a construction of stationary contact systems for use in electromagnetically controlled switching apparatus and having means for adjusting the movement of a pivoted armature for insuring continuous vibratory operation thereof with respect to the stationary contact systems.

A further object of my invention is to provide a construction of adjustment mechanism for the stationary contacts of a vibratory switch for insuring successive opening and closing of a pair of coacting electrical circuits at a relatively high continuous rate of speed.

Other and further objects of my invention reside in the construction of contacts for a vibratory switching system as set forth more fully in the specification hereinafter following by reference to the accompanying drawings, in which:

Figure 1 is a central vertical longitudinal section through a vibratory switch embodying the stationary contact system of my invention; Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1; Fig. 3 is a top plan view of the vibratory switch, showing the contact system of my invention; Figs. 4 and 5 are horizontal sectional views taken through the vibratory switch on lines 4—4 and 5—5, respectively, of Fig. 1; and Figs. 6 and 7 are detailed plan views of the vibratory springs employed in the stationary contact system of my invention.

My invention is directed to an inexpensive construction of contacts for a vibratory switch for use in a converter which will enable neon tubes such as used in advertising signs to be operated in districts where only direct current power supply is available. To light a neon tube requires high voltage alternating current from 1200 to 15,000 volts or more, depending on the number of feet of tubing to be lighted. Where alternating current is available, this is accomplished by means of a transformer delivering the proper voltage from the secondary winding. In a number of cities, however, there is no alternating current available in certain districts, and in such districts it is necessary to use a rotary converter when it is desired to install a neon sign. The cost of this rotary converter makes it almost prohibitive in the case of the small show-window sign. The device of my invention is intended for use in connection with these small show-window signs in direct current districts. The apparatus of my invention is extremely simple in its construction and is rugged in its design and inexpensive in construction.

Another practical use for the vibratory switch structure of my invention is in a converter system for producing 110 volt alternating current from a low voltage direct current supply such as an automobile storage battery or house lighting system (32 volts).

Referring to the drawings, the casing 17 encloses a vibratory mechanism and has the side portions thereof extending telescopically over a base portion 22 as shown more clearly in Fig. 2. Screw members 17*a* are passed through casing 17 and engage with base 22 for securing the casing 17 in position with respect to the base 22. The base 22 is apertured at 22*a* and over this aperture there is secured the plate of insulation material 23. Any suitable method of securing plate 23 with respect to the base 22 may be employed, such as the rivets shown at 23*a*. The insulated plate 23 carries a set of prongs 24 which provide connectors for the electromagnetic means within the casing 17. The interior of the base 22 is lined by means of a resilient shock absorbing pad 27 which fits within the up-turned side walls of the base 22 and provides a cushion for the vibratory mechanism within casing 17 and substantially prevents the transmission of undesired vibrations or sound from the casing 17.

The interior of casing 17 is lined with resilient material similar to the lining 27 of base 22. I have shown the lining for the interior of casing 17 in the form of sheets of material 28 forming a substantially sound-proof covering for the top and side walls of the casing 17. The resilient sheets of material 28 adjacent opposite sides of the vibratory mechanism also serve to absorb the shock of the mechanical vibration for the rea-

son that the side frames of the vibratory mechanism are in close contact with the resilient sheets of material 28 which line the interior side walls of the casing 17.

The vibratory mechanism is mounted in a frame structure constituted by the frame members 29 and 30 which are erected vertically within the casing 17. Frame members 29 and 30 provide supports for the laminated core structure 31 which is disposed centrally between frame members 29 and 30 by means of spacer members 32 and 33 and coacting screw members 32a and 33a and central screw member 31a which extends through the laminated core structure 31. By reason of the assembly of the spacer members 32 and 33 on each side of the laminated core structure 31 by means of screw device 31a, the assembly of the frame members 29 and 30, with respect to spacer members 32 and 33, is greatly simplified, as frame members 29 and 30 can be readily secured to spacer members 32 and 33 by means of screws 32a and 33a in the manner shown. The laminated core structure 31 has a central pole piece 31b and opposite pole pieces 31c and 31d. On pole pieces 31c and 31d, I provide electro-magnetic windings 34 and 35 well insulated from the pole pieces 31c and 31d, respectively. The windings 34 and 35 have their ends brought out independently and secured to terminal strips mounted on insulated panels carried by frame members 29 and 30, as shown. That is to say, frame member 29 carries a horizontally disposed insulated panel 36 secured thereto by suitable means such as rivets. Panel 36 carries terminal members 34a and 35a which provide terminal connections for one end of each of the windings 34 and 35 respectively. On the opposite frame member 30, I provide a horizontally disposed strip member 37 secured to frame member 30 by suitable means such as rivets and carrying terminal members to which the other ends of the respective windings 34 and 35 are connected.

The central pole piece 31b of laminated core structure 31 is apertured for the passage of a screw device 31e which provides connecting means for sleeve members 38 and 39 extending on opposite sides of the core structure and intermediate the windings 34 and 35. Screws extend through frame members 29 and 30 respectively and engage sleeves 38 and 39 thereby rigidly centering the intermediate pole 31b between frame members 29 and 30. Above the pole pieces 31b, 31c and 31d, I provide a pivot for the vibratory armature 40. The vibratory armature 40 is constructed from a strip of magnetic material which is centrally extruding in opposite directions to provide an axially extending recess 40a through which the pin member 41 extends. The pin member 41 is journaled at opposite ends in insulated bearings formed by insulated plates 42 and 43 and suitable means such as rivets 42a and 43a to opposite sides of the vertically disposed frame members 29 and 30. By reason of the arrangement of the insulated plates 42 and 43 which receive the opposite ends of pin 41, the armature 40 is electrically insulated from the frame members 29 and 30 at all times. In order to provide for a good electrical connection to the vibratory armature 40, a positive bonded connection is made through lead 44 electrically connected to the pin 41 and extending through a slot 30a in frame member 30 to a position beneath screw 39a by which connection is made to the frame member 30. A connection is taken from frame member 30 at screw 32a through lead 45 to one of the prongs 24. The opposite ends of armature 40 carry contact members which I have shown at 47 and 48. One end of the armature 40 is weighted, as shown at 49 which thereby tends to maintain contact 48 initially in electrical connection with the stationary contact 50 upon starting of the apparatus. The stationary contact 51, located at the opposite end of the apparatus, is disposed in alignment with movable contact 47 for the establishment of successive connection therewith. The method of mounting the stationary contacts is extremely important as control of the rate of operation of the apparatus may be made by adjustment of the stationary contacts. The supports for the stationary contacts are mounted on in-turned upper portions of frame members 29 and 30. A stationary plate 52 is mounted by means of screw 52a on the in-turned upper edge portions of frame members 29 and 30. The two stationary contact systems are insulated from each other and mounted on the insulated plate 52.

The insulated plate 52 provides a support for all of the several members constituting the stationary contact system of my invention. The two stationary contact systems employed are identical in their construction and arrangement of parts so that one set of reference characters has been employed to designate corresponding members in the sets of parts constituting the contact systems. That is to say, a plate member 53 is supported directly upon the upper surface of the insulated plate 52. A parallel plate 54 is arranged immediately above plate 53 and is spaced therefrom by spacing member 55 which forms an integral part of the connecting lug by which connection is established with the stationary contact forming part of the contact system. The connectors 55a leading from the lugs forming part of the spacer member 55 connect with the terminal plates which are carried on the insulated strip 37. The superimposed plate members 53 and 54 are secured with respect to the insulated plate 52 by means of screws 56 which extend therethrough as shown. Screws 56 pass through the resilient reed 57, the threaded spacer 59 and the spring reed 60 which carries the stationary contact 50. Nuts 62 serve to secure the spring reed 60 in position on screws 56. It will be observed that the end of spring reed 57 is slotted and apertured at 58, whereas spring reed 60 contains an intermediate slot and aperture 61. The T-head 66 of set screw 65 is engaged in the apertures and slots 58 and 61 in the spring reeds 57 and 60, respectively which are aligned one with the other to permit the passage of T-head 66 of the set screw 65 which is adjustable in screw threaded apertures formed in plate members 53 and 54. In order to insure the permanent setting of the stationary contact in a given range of angular displacement, I provide a binding screw 64 which extends through screw threaded and aligned apertures in plate members 53 and 54 and is free to enter an aperture 52b in insulated plate 52. By tightening the binding screw 64 after the set screw 65 has been adjusted to a desired position, a permanent position of the set screw 65 may be maintained. An independent adjustment is provided for spring reed 57 through adjustment screw 63 which extends through plate members 53 and 54 and bears against spring reed 57 for permitting spring reed 57 to be angularly shifted within limits determined by the position of spring reed 60 and the lower face of insulated plate 52.

The frequency of vibration of the armature 40 is primarily determined by its own inertia and by the natural frequency of the spring reeds 57 and 60 to which the contacts 50 and 51 are secured. However by operation of the several adjusting screws which I have described, the natural frequency of these reeds can be altered. The frequency at which the switching operation is performed is directly controllable by adjustment of screw 63 and set screw 65, which adjustment when initially selected is set by means of binding screw 64.

The casing 17 is metallic and serves as an electromagnetic shield for preventing radiation of undesired interference which might prove a source of annoyance in the circuits of radio broadcast receivers used in close proximity to the vibratory switch.

I have illustrated in the drawings the method of acoustically shielding the vibratory apparatus for preventing the vibratory mechanism from becoming a source of annoyance by emitting a continuous buzzing sound. The shielding material shown at 27 in the base 22 and forming the lining 28 in the casing 17, provides a tight enclosure around all four sides of the vibratory mechanism. The sound deadening material may be sponge rubber, felt, or other suitable material having sound absorbing and deadening qualities. The sound absorbing material at the sides of the mechanism fits closely around the apparatus thereby assisting in the vertical mounting of the vibratory unit at the same time that the sound proofing qualities of the lining material are utilized.

The vibratory switch employing the contact system of my invention has proven to be highly practical in manufacture, production and use. Converters are very convenient for the inexpensive operation of neon tube signs in districts where only direct current is available. From the standard low voltage direct current circuits, as for example, 110 volts, I am able to obtain by use of my apparatus, voltages within such ranges as 3,000 to 15,000 volts suitable for neon tube lighting.

Systems employing my invention make it possible for the standard alternating current midget radio receiver to be placed directly in an automobile and connected to the storage battery for operation.

Although I have shown the apparatus of my invention in one of its preferred embodiments, I desire that it be understood that modifications and changes may be made in the construction and assembly of the parts and I intend no limitations upon my invention other than are imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In a vibratory switch, a stationary contact system including a pair of spring strips, an adjustable guide engaging one of said spring strips for regulating the position of both said spring strips, a tension adjusting screw adjustable against the other of said spring strips, and locking means common to said adjustable guide and said tension adjusting screw.

2. In a vibratory switch, a panel of insulation material, a stationary contact system mounted on said panel, said stationary contact system including a pair of parallel disposed supporting strips mounted on top of said panel in spaced relation, a pair of resilient strips mounted beneath said panel in spaced relation, a contact carried by the lower face of one of said resilient strips, a screw-threaded adjusting device extending through said parallel disposed supporting strips and through said panel and engaging said one of said resilient strips for limiting the angular displacement thereof, and a binding screw extending through said supporting strips for locking said supporting strips in binding relation with respect to said screw-threaded adjusting device.

3. In a vibratory switch, a panel of insulation material, a stationary contact system mounted on said panel, said stationary contact system including a pair of parallel disposed supporting strips mounted on top of said panel in spaced relation, a pair of resilient strips mounted beneath said panel in spaced relation, a contact carried by the lower face of one of said resilient strips, a screw-threaded adjusting device extending through said parallel disposed supporting strips and through said panel and engaging said one of said resilient strips for limiting the angular displacement thereof, an independent adjusting device extending through said supporting strips and engaging the other of said resilient strips for controlling the effective tension thereof, and a binding screw extending through said supporting strips for locking said supporting strips in binding relation with respect to both said adjusting devices.

4. A stationary contact system for vibratory switches, comprising a resilient member having a contact member at one end thereof and being fixed at the other end thereof, means cooperative with said resilient member adjacent the free end thereof for determining the position of said contact member, means bearing on said resilient member for adjusting the effective degree of resiliency in said resilient member, and locking means common to both said means for locking both said means in the selected positions.

5. In an electrical vibratory switch, a stationary contact system including a pair of resilient strips mounted in spaced relation, a contact carried by one of said strips, means engaging the aforesaid strip for adjusting the position of said contact, means including the other of said strip members for adjusting the effective tension of the aforesaid strip member, and means common to both said adjusting means for locking both said means in the adjusted position.

FRANK O. HARTMAN.