F. V. SMITH.

MAGNETIC VIBRATOR.

APPLICATION FILED NOV. 28, 1911.

1,111,038.

Patented Sept. 22, 1914.

2 SHEETS—SHEET 1.

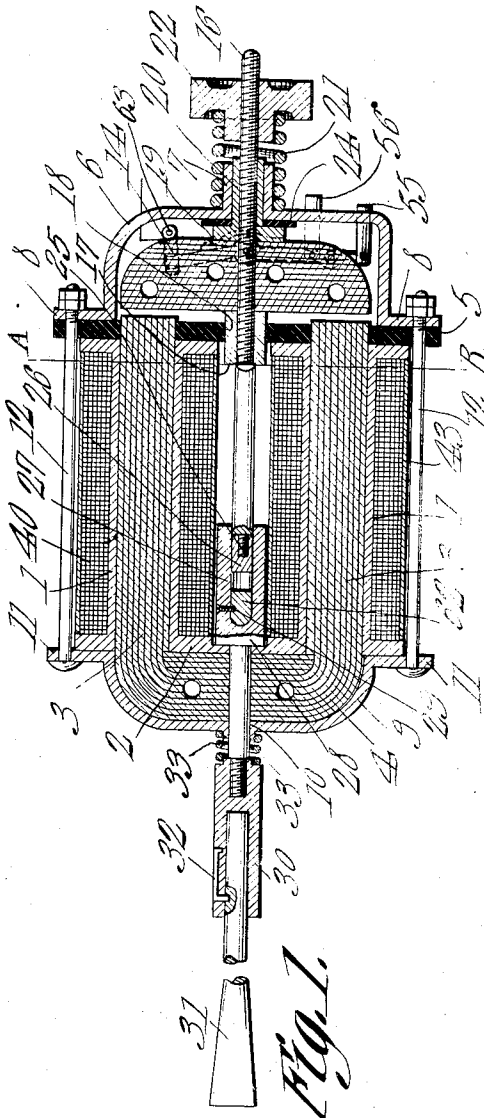


Fig. 1.

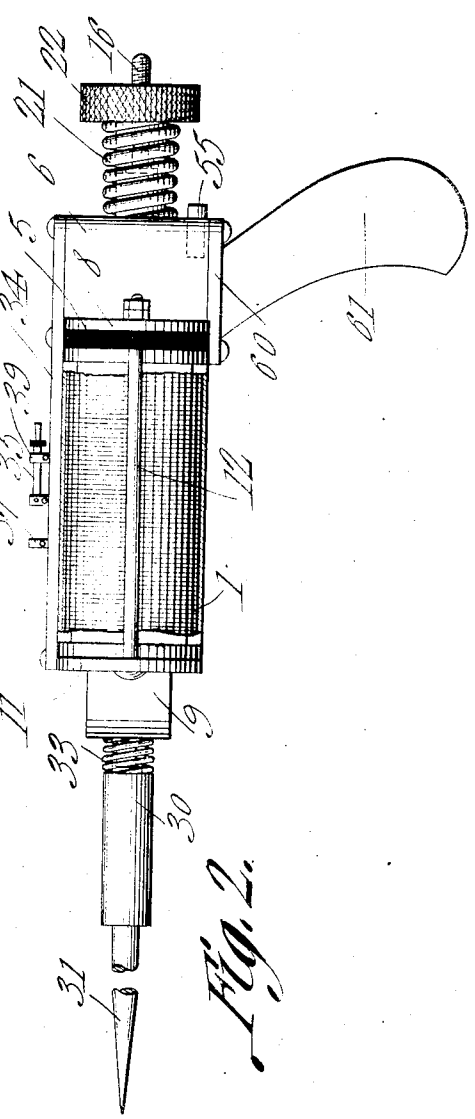


Fig. 2.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

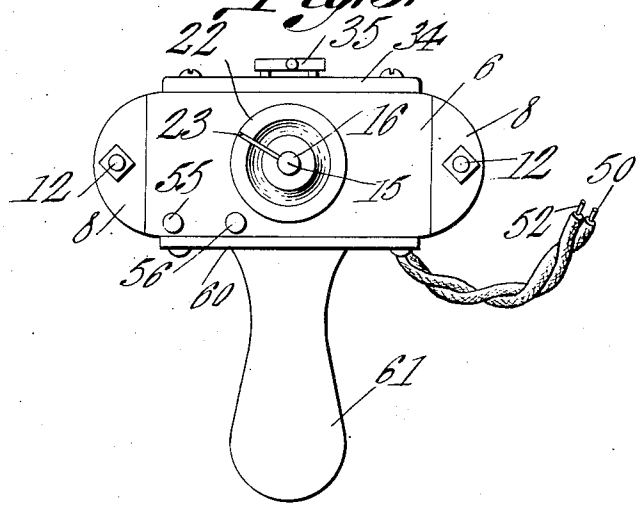


Fig. 4.

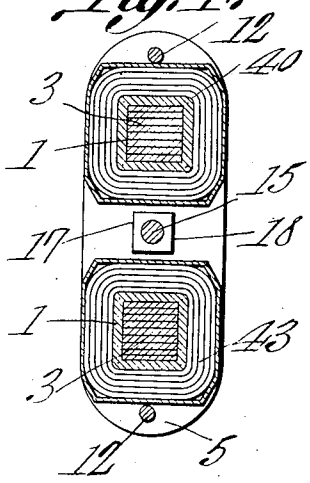


Fig. 5.

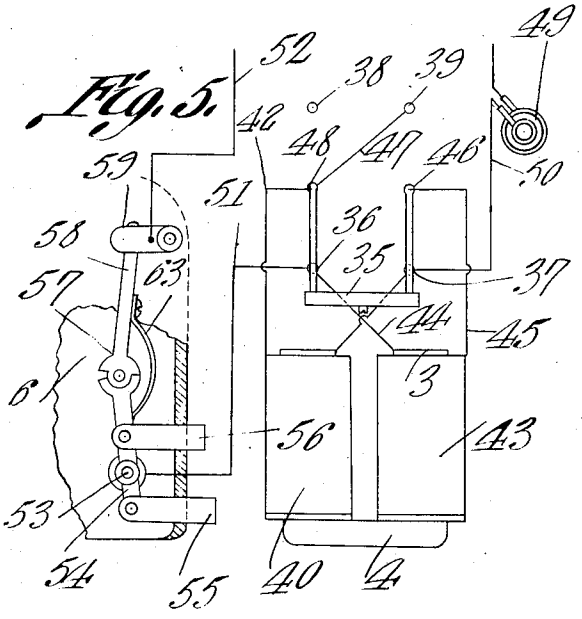
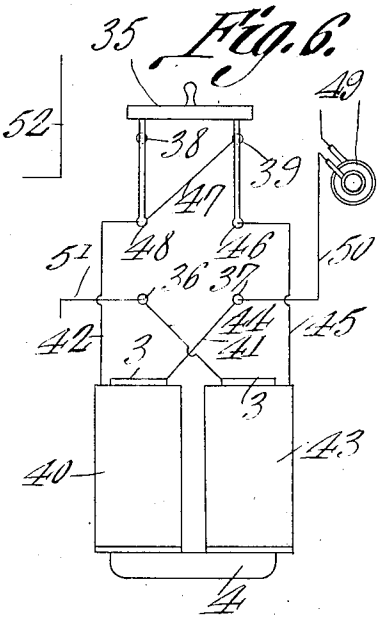


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

FRANK V. SMITH, OF FLORISTON, CALIFORNIA.

MAGNETIC VIBRATOR.

1,111,038. Specification of Letters Patent. Patented Sept. 22, 1914.

Application filed November 28, 1911. Serial No. 662,951.

To all whom it may concern:

Be it known, that I, FRANK V. SMITH, a citizen of the United States, residing at Floriston, in the county of Nevada and State of California, have invented a new and useful Magnetic Vibrator, of which the following is a specification.

The present invention aims to provide improved means for mounting and actuating a tappet, and to provide a novel form of holder, adapted to coöperate with the tappet.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the accompanying drawings,—Figure 1 shows the invention in longitudinal section; Fig. 2 is a side elevation; Fig. 3 is a top plan; Fig. 4 is a transverse section upon the line A—B of Fig. 1; and Figs. 5 and 6 are diagrammatic views showing one method of wiring up the device, Fig. 5 showing, as an added detail, and in elevation, a switch whereby the reciprocation of the tappet may be controlled.

In carrying out the invention there is provided a pair of spools, denoted by the numeral 1, the spools at one end being connected by a base 2. Pole pieces 3 of a core 4 are thrust through the spools 1. The free ends of the pole pieces 3 extend through an insulating yoke 5 which rests upon the spools 1.

Superposed upon the insulating yoke 5 is a hollow cover 6, having an outstanding neck 7 and flanges 8 which bear against the yoke 5. Another hollow cover 9 is shown, the same being equipped with an opening 10, in alinement with the neck 7, the cover 9 having outstanding flanges 11 which rest against the opposite ends of the spools 1, from those ends of the spools which receive the yoke 5. It is within the cover 9 that the intermediate portion of the core 4 is housed. The covers 9 and 6 are bound together by bolt and nut structures 12, passing through the flanges 11 and 8.

An armature 14 is mounted to reciprocate in the cover 6, in close relation to the free ends of pole pieces 3, the armature 14 and the core 4 preferably being of laminated construction. The invention further includes a tappet 15, upon which the armature 14 is mounted, the tappet having a threaded end 16, extended outwardly through the neck 7 of the cover 6, the opposite end of the tappet 15 lying between the spools 1. Threaded upon the portion 16 of the tappet 15 is a primary nut 17. This nut 17 is of polygonal contour, and registers slidably, but against rotation, in an opening 18 in the yoke 5. This nut 17, designated, for convenience, the primary nut, constitutes an abutment for the armature 14. The armature 14 is bound against the primary nut 17 by a secondary nut 19, including a tubular neck 20, threaded to receive the portion 16 of the tappet 15, the tubular neck 20 being slidable in the neck 7 of the cover 6.

Surrounding the neck 7 of the cover 6, and abutting at one end against the cover, is a helical compression spring 21, the other end of which is received by a nut 22, mounted upon the threaded portion 16 of the tappet 15. The nut 22 is preferably split, radially, as shown at 23, to engage the threaded end 16 of the tappet closely, the construction being such that the nut 22 may be clamped upon the threaded end of the tappet, to prevent a displacement of the nut, and a consequent alteration of the tension of the spring 21, when the device is in operation. A resilient buffer 24 is secured to the inner face of the cover 6, and is adapted to receive the impact of the secondary nut 19, when the armature 14 reciprocates.

The inner end of the tappet 15 is reduced and threaded, as shown at 25, to receive a case-hardened tip 26, mounted to slide in a tubular socket 27, formed upon one end of a tool-holder 28 which is slidably mounted in the intermediate portion of the core 4 and in the opening 10 in the cover 9. Located within the socket 27, and secured therein by means of a set-screw 29, is a case-hardened anvil 62, adapted to receive the blows of the tip 26. Removably secured, by threading or otherwise, to the outer end of the tool-holder 28, is a chuck 30, adapted to receive a tool 31, the tool 31 being held in place in the chuck 30 by means of a spring latch 32, or

in any other desired manner. A compression spring 33 surrounds the tool-holder 28 and abuts at one end against the cover 9, the other end of the spring 33 abutting against one end of the chuck 30.

Secured to the covers 6 and 9, at one side of the device, is a plate 34, carrying a double poled switch 35, adapted to coöperate, upon the one hand, with terminals 36 and 37, and to coöperate, upon the other hand, with terminals 38 and 39. The winding 40 which is upon one of the spools 1 is connected at one end, as shown at 41, with the terminal 37. The other end of the winding 40 is connected as shown at 42, with one of the pivots 48 of the switch 35. The winding 43 which is upon the other spool 1 is connected as shown at 44, with the terminal 36, the other end of the winding 43 being connected as shown at 45, with the other pivot 46 of the switch 35. A conductor 47 unites the pivot 48 of the switch with the terminal 39.

The numeral 49 indicates, generally, any suitable source of alternating current, and from the current source 49, a conductor 50 leads to the terminal 37. A conductor 51 leads from the terminal 36 to one terminal of a switch, hereinafter described, and shown in Fig. 5, another conductor 52 leading from the other terminal of the switch onto the line.

The switch shown in Fig. 5 is mounted in the cover 6, the switch being omitted from the showing of Fig. 1, for the sake of clearness. Mounted in the cover 6 is a fulcrum pin 53 upon which is mounted for swinging movement, a lever 54, there being buttons 55 and 56 pivotally connected with the lever 54, upon opposite sides of the fulcrum pin 53. These buttons 55 and 56 protrude outwardly, through one end of the cover 6. Pivotally connected with the inner end of the lever 54, by means of a knuckle joint 57, is a switch blade 58, adapted to engage beneath a spring contact 59. The conductor 51 is connected with the fulcrum pin 53, and the conductor 52 is connected with the spring contact 59. An arched spring 63 is secured to the switch blade 58, and bears against the lever 54.

Secured to the cover 6 is a plate 60, having an outstanding handle 61, the construction being such that when the member 61 is in the hand of the operator, the thumb of the operator will be disposed in convenient relation with respect to the buttons 55 and 56.

The operation of the device is as follows. When the magnets are energized, the armature 14 will be attracted, and the spring 21 will be put under tension, the tension of the spring being adjusted through the medium of the nut 22. When the potential of the alternating current falls, during the reversal of the current, so that the pulling effect of the electro-magnets upon the armature 14 is no longer greater than the thrusting effect of the spring 21, the spring 21, acting against the nut 22, will move the armature 14 away from the magnets. In practice, the foregoing operation will take place with great rapidity, causing the tappet 15 to reciprocate at a high rate of speed, within the socket 27 of the tool-holder 28. The tool-holder 28 and the tool 31 will not, however, be reciprocated, unless the tool 31 is thrust against the work with sufficient pressure to compress the spring 33, and to move the tool-holder 28 inwardly. When the tool-holder 28 is thus moved inwardly, the tool-holder will receive a series of rapid blows from the tappet 15, through the coöperation of the tip 26 which is carried by the tappet 15, and the anvil 62 which is carried by the tool-holder 28.

The primary nut 17 has three separate and distinct functions. Primarily, it constitutes an abutment for the armature 14; it also serves as a guide, reciprocating in the yoke 5; furthermore, owing to the fact that the nut 17 registers against rotation in the opening 18 in the yoke 5, the nut constitutes a means for preventing a rotation of the tappet 15. The secondary nut 19 serves to bind the armature 14 against nut 17, and the portion 20 of the nut 19, sliding within the neck 7 of the cover 6, serves as a bearing.

The switch 35 constitutes a means whereby the magnets may be yoked up parallel or in series, it being frequently necessary, upon fine work, to throw the magnets into series, in order to reduce the power sufficiently to permit the consummation of fine details in stone carving, and like work.

In Fig. 5, the coils are shown in parallel, the circuits being as follows:—The source of current supply 49, the conductor 50, the terminal 37, one arm of the switch 35, the terminal 46, the conductor 45, the winding 43, the conductor 44, the terminal 36, and thence onto the line by the conductor 51. From the terminal 37 there is established another circuit as follows:—the terminal 37, the conductor 41, the winding 40, the conductor 42, the pivot member 48, one arm of the switch 35, and thence through the terminal 36 onto the line conductor 51.

When the magnets are yoked up in series, as shown in Fig. 6 the circuit is as follows:—the source of current supply 49, the conductor 50, the conductor 41, the winding 40 of the one magnet, the conductor 42, the pivot element 48, the conductor 47, the terminal 39, one blade of the switch 35, the pivot member 46, the conductor 45, the winding 43 of the other magnet, the conductor 44, the terminal 36, and thence onto the line conductor 51.

As will be readily understood the buttons

55 and 56 constitute a means whereby the circuit through the structure may be broken at any time, for the purpose of destroying an arc or otherwise. The switch shown in Fig. 5, of which switch the buttons 55 and 56 constitute a part, is intended to be a quick-break structure. In Fig. 5 it has been presupposed that the button 56 has been pushed in part way, and that the spring 63 has been put under tension. Presupposing that the spring 63, in Fig. 5, has been put under a tension equal to the frictional hold of the spring contact 59 upon the switch blade 58, it will be understood that when the button 56 is pushed inwardly to a slightly greater extent than shown, the spring 63 will act against the switch blade 58, to break the circuit at the members 58 and 59, this break occurring with great abruptness. The switch shown in Fig. 5 and above described, may be positioned variously. But, in the present instance, for the sake of illustration, one portion 51 of the line conductor has been connected with the pivot 53, another portion 52 of the line conductor being connected with the contact 59.

The structure herein disclosed is designed to operate in an alternating current, at any commercial lighting voltage, and on frequencies ranging from 15 to 125 cycles. The structure will develop an exceedingly high speed of vibration in the tappet 15, and will be found of use in all cases where it is desired to impart a series of rapid blows, against a tool-carrying member.

Having thus described the invention, what is claimed is:—

1. In a device of the class described, a supporting structure including an electromagnet; a tappet; an armature on the tappet and responsive to the electromagnet; and spaced elements mounted upon the tappet adjustably and engaging the armature, to adjust the position of the armature with respect to the electromagnet, said elements being slidably received in the supporting structure to form bearings for the tappet.

2. In a device of the class described, a supporting structure including an electromagnet; a yoke in which one end of the electromagnet is engaged; a cover secured to the yoke; a tappet slidable in the cover; an armature upon the tappet, responsive to the electromagnet; a primary nut threaded upon the tappet and constituting an abutment for one side of the armature, the primary nut being slidable in the yoke, and being engaged in the yoke against rotation; and a secondary nut threaded upon the tappet, and adapted to bind the armature against the primary nut, the secondary nut being slidably mounted in the cover.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

F. V. SMITH.

Witnesses:
E. D. Brown,
E. G. Hoy.