D. L. LINDQUIST.

ELECTROMAGNET.

APPLICATION FILED FEB. 13, 1909.

1,038,610. Patented Sept. 17, 1912.

Fig. 1.

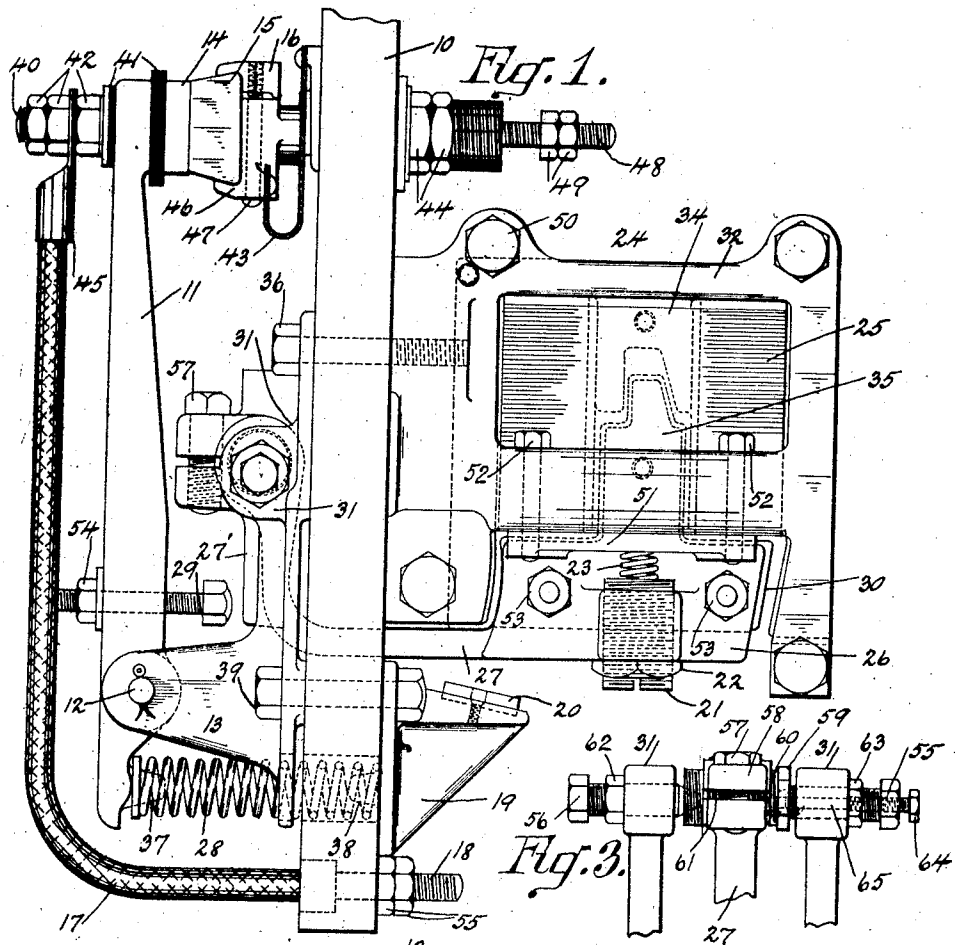
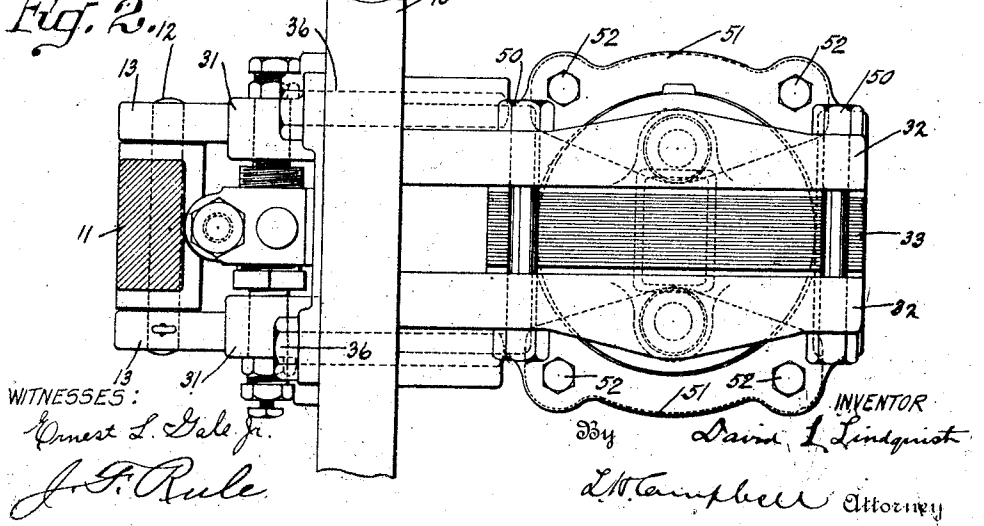


Fig. 3.

Fig. 2.



WITNESSES:

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ELECTROMAGNET.

1,038,610. Specification of Letters Patent. Patented Sept. 17, 1912.

Application filed February 13, 1909. Serial No. 477,763.

To all whom it may concern:

Be it known that I, DAVID L. LINDQUIST, a subject of the King of Sweden, residing at Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Electromagnets, of which the following is a specification.

My invention relates to improvements in electro-magnetic switches, and, while the same may have a general application, it is particularly adapted to the use of alternating currents.

One object of my invention is to provide simple and efficient means for adjusting the magnet armature with respect to the magnet.

Another object is the provision of means whereby the lateral pull of the magnet is balanced, the tendency toward vibration is prevented, and the friction is reduced.

Other objects will appear hereinafter, the novel combination of elements being pointed out in the appended claims.

In the accompanying drawings, Figure 1 illustrates a side elevation of an electromagnetic switch embodying my invention; Fig. 2 is a plan view partly in section of the apparatus shown in Fig. 1; Fig. 3 illustrates an adjustable device by means of which the magnet armature is pivoted.

Referring more particularly to the accompanying drawing, the switch and the electromagnet 24 are mounted upon the board 10, the switch preferably being on one side of the board, and the magnet on the opposite side. The magnet frames 32, and the buffer frame 19, on one side, and the switch support 13 on the other side are suitably secured to each other and to the board by the bolts 36, 39, or other suitable devices.

The switch lever 11 is pivoted to the switch support 13 by the pin 12. A coil spring 28 is suitably located to bear against an arm of the lever 11; thereby tending to force the contact 14 on the lever 11, in engagement with the fixed contact 15.

The spring 28 is held in position by the knobs 37 and 38 located respectively on the lever 11 and the buffer frame 19. The contact 14 is insulated from the switch lever 11, by insulation 41, and secured thereto by means of the threaded rod 40 and the locknuts 42. A conductor 17 is also electrically connected to the contact 14 by means of the lug 45 and said locknuts 42.

The fixed contact 15 is held in place by the contact holder which comprises a fixed jaw member 46, a movable jaw member 16 and a screw 47 for joining the two jaws and clamping the contact 15 in its fixed position. The contact rod 48 connected with the said contact holder extends through the board 10, and is secured thereto in any well known manner, such as by the locknuts 44. The nuts 49 are for holding a contact lug or clip in the ordinary manner. The flexible conductor 43 makes additional electrical connection between the contact holder and the rod 48.

The magnet laminations 33 are held between the magnet frames 32 by the bolts 50. The downward projecting part 34 of these laminations is surrounded by the magnet winding 25. Bolts 52 through the magnet frames 32 hold the buffer plates 51 in position.

The magnet armature 26 is supported by the arm 27; the latter being suitably pivoted between the projections 31 on the opposite side of the board 10. This armature 26 is composed of laminations 30 held together by the bolts 53 in the ordinary manner, and a tongue shaped portion 35 of the laminations extends upwardly in the opening left in the center of the magnet winding, and corresponding with the downwardly extending portion 34.

A device for lessening the jar caused by the operation of the magnet, consists of the spring 23, the adjusting screw 21, and the locknut 22. When the magnet is energized, the armature is drawn up, and the spring 23 engages the buffer plate 51, thereby reducing the force of the impending collision.

The switch lever 11 is provided with the adjustable screw 29, which is locked in any desired position by the nut 54. This screw 29 is so adjusted that the shoulder 27′ of the arm 27 will engage the said screw when the arm 27 falls back to its unoperated position; thereby forcing the switch lever 11 to be moved, and the contacts 14, 15 to be separated.

When the armature 26 is released and with the arm 27 falls back, it first engages the screw 29 as stated above. But this is not sufficient to hold the armature, so the buffer 19 is provided, having an elastic buffer 20, preferably of rubber or leather, but may be of any suitable material. This buffer is so placed that the armature 26 will

not fall out of the influence of the magnet, or so far that an excessive current will be required to attract the armature when the magnet is energized.

The terminal of the flexible conductor 17 which passes through the board 10 is secured thereto by the locknuts 55, and the threaded portion 18, or by other suitable well known means.

The core 60 within the head 58 of the arm 27 (Fig. 3) is eccentrically centered and mounted upon the adjustable pivots 55 and 56. The core 60 is threaded and may be turned by the aid of the nut 59, which is preferably integral therewith; the internal portion of the head 58 is threaded to correspond with the said core, and provided with a slot 61. Bolt 57 joins the two portions separated by this slot 61, and permits the head 58, and consequently the entire arm 27, to be clamped in any desired position on the core 60. It is evident that the arm 27 may be adjusted in any direction in the same plane, within the limits of the eccentricity of the core 60, and the armature 26, which is secured to the said arm 27 is subject to the same changes.

The cone shaped pivots 55, 56 are threaded, and are provided with the ordinary type of locknuts 62, 63 to hold them in the desired places. One of these pivots, as 55, is bored and threaded to receive the screw-bolt 64. The bored opening 65 continues through the pivot 55 and further communicates with an opening (not indicated on the drawings) through the core 60 in the line of the pivot tips. This opening or chamber 65 is adapted to be filled with lubricating substance for lubricating the tips of the pivots 55, 56; by turning the screw-bolt 64, this lubricating material is forced into the opening in the core 60, thereby lubricating both pivots, 55, 56. Both pivots may be so provided but the above described construction is preferred.

Since the pivots 55, 56 are laterally adjustable and the eccentricity of the support for the arm 27 and the armature 26 permits of a wide variation in a single plane, the range of adjustment for the entire pivoted arrangement is very large, and the armature 26 may therefore be adjusted to secure the best balance, and the position of least resistance to friction. By having the airgap of the magnet thus adjusted, the airgaps may be made equal, the lateral pull is balanced, and the tendency to vibrate is prevented.

In this magnet, as in others similarly constructed, the pull on the armature gradually decreases as the projecting tongue 35 of the armature moves into the operated position, and the current taken by the magnet when operated is less than is consumed when first actuated.

The operation of the switch and magnet is readily understood; when the magnet is energized, the armature 26 is pulled up, and the coil spring 28 forces contact 14 in engagement with the fixed contact 15. When the magnet 24 is deënergized the armature 26 falls back and the shoulder 27′ strikes the bolt 29, thereby forcing the contacts 14, 15 apart; the armature 26 falls until it rests upon the buffer 20.

While this magnet may be used in any desired connection, it is especially adapted for use with alternating current because of the freedom from the tendency to vibrate.

I desire not to be limited to the exact construction and arrangement as herein disclosed, as it is evident that various changes may be made by those skilled in the art without departing from the spirit or scope of my invention.

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

1. The combination of a board, an electromagnet attached thereto, an armature, and an eccentric forming a pivot member for the armature and located at the opposite side of the said board from the electromagnet.

2. The combination of a base, an alternating current magnet attached thereto, an armature, and an eccentric having a pivot bearing for the armature and located on the reverse side of the base from the magnet.

3. The combination of a support, a magnet secured on one side thereof, an armature pivoted on the other side of the support, and rotatably adjustable with respect to the magnet.

4. The combination of a support, a magnet secured on one side of a support, an armature pivoted on the opposite side of the support and adjustable in the direction of its axis, and also rotatably adjustable with respect to the magnet.

5. The combination of a support, a magnet secured to one side thereof, an armature adjustably pivoted on the opposite side, and means for rotary adjustment of the armature with respect to the magnet and in a single plane.

6. The combination of a fixed support, an alternating current magnet secured to one side thereof, an armature, an eccentric carried by the armature on the opposite side of said support, and forming a pivot bearing for the armature, and means for adjusting said eccentric with respect to the armature.

7. The combination of a fixed support, a magnet secured to one side thereof, an armature, an eccentric bearing member carried thereby and pivoted on the opposite side of the support, said eccentric member forming means for adjusting the armature in a single plane with respect to the mag-

net, limited in the said plane by the eccentricity of the said member.

8. The combination of a magnet, a pivoted armature, a support therefor, and an adjustable eccentric forming a pivot member for the armature whereby the armature may be adjusted horizontally and vertically at the same time in the vertical plane of the armature and the support.

9. The combination of a magnet, an armature, a support for the armature, coöperating bearing members carried by the armature and its support, said members being adjustable axially and also adjustable in a direction perpendicular to the pivotal axis of the armature.

10. The combination of a magnet, an armature, a core carried by the armature and formed with a pivot bearing surface eccentric to the core, a coöperating stationary bearing member, said core being rotatable adjustably to change the position of the armature.

11. The combination of a board, a magnet mounted thereon, an armature therefor having a supporting arm extending through the board and terminating in a head, a core rotatably mounted in the said head and formed with a bearing surface eccentric to the core, and means for adjustably pivoting the core on the side of the board opposite the magnet.

12. The combination of a magnet, a rotatable core formed with an eccentric bearing surface, an armature mounted thereby, said core being rotatable relatively to the armature whereby the position of the armature may be changed by rotating the said core, and a clamping device for fixing the core in any desired position.

13. The combination of a board, a magnet mounted thereon, an armature therefor having a supporting arm extending through the board and terminating in a mountable head, a core rotatably inserted in the head and provided with eccentric bearing surfaces, cone shaped pivots supporting the core, and means for securing the core in any rotated position.

14. The combination of a board, a magnet mounted thereon, an armature therefor having a supporting arm extending through the board and terminating in an enlarged portion, a core rotatably inserted therein and formed with eccentric bearings, and cone shaped pivots for supporting the core in any rotated position.

15. The combination of a board, a magnet mounted thereon, an armature therefor having a supporting arm extending through the board and terminating in an enlarged portion, a core rotatably inserted in the said portion and provided with eccentric bearings, longitudinally adjustable cone shaped pivots supporting the core, means for holding the core in any rotated position in the enlarged portion, and means for locking the said pivots in any longitudinal position.

16. The combination of a magnet, a core having an eccentric pivot bearing surface, an armature carrying the said core, a coöperating stationary bearing member, said core being rotatably adjustable relative to the armature, and axially adjustable to permit lateral adjustment of the armature.

17. The combination of a magnet, conical pivots, an eccentrically centered core mounted thereon, an armature mounted upon the core and having a rotative adjustment with respect to the magnet, and means for adjusting the lateral position of the armature.

18. The combination of a board, a magnet mounted thereon, an armature therefor having a supporting arm extending through the board and terminating in a slotted enlarged portion, a core eccentrically centered rotatably mounted in the enlarged portion, a screw-bolt joining the slotted portions, which secure the core in any rotated position when the said bolt is tightened, and longitudinally adjustable cone shaped pivots supporting the said core.

19. The combination of a switch-board, a magnet mounted thereon, an armature therefor having a supporting arm extending through the board and terminating in an enlarged portion, a core eccentrically centered rotatably mounted in said enlarged portion, conical pivots which support the core and which are pivoted with a longitudinal passage partly threaded through the pivots, a threaded thumb screw adapted to fit in said threaded portion, providing means for forced lubrication of the pivot, and separate means for complete adjustment of the armature with respect to the magnet.

20. The combination of a magnet, a conical pivot with a threaded lubricating duct, a second pivot, an eccentrically centered core mounted on said pivots, a lubricating duct connecting the eccentric centers of the core through the same, and means for forcing the lubrication of the pivots and pivoted part.

21. The combination of a magnet, an armature therefor, conical pivots for the armature which are laterally adjustable, an adjustable eccentric carried by the armature and having bearing surfaces coöperating with the said pivots, and means for providing forced lubrication for the pivots and the pivoted parts.

22. The combination of a magnet, an armature therefor, adjustable eccentrics carried by and forming bearings for the armature, laterally adjustable conical pivots, means for providing forced lubrication for the pivots and pivoted parts, a buffer for the armature when the magnet is deëner-

gized, and means for lessening the shock of collision between the armature and the magnet when the armature is attracted.

23. The combination of a magnet, an armature therefor, adjustable bearing eccentrics carried by the armature, laterally adjustable conical pivots, means for providing forced lubrication for the pivots and pivoted parts, a buffer for the armature when the magnet is deënergized, and a coil spring for lessening the shock of collision between the magnet and the armature.

24. The combination of an alternating current magnet, an armature, and adjustable bearing eccentrics carried by the armature.

25. In an alternating current switch magnet, the combination of a magnet frame, a magnet winding, an armature laterally adjustable with respect to the magnet frame, and adjustable bearing eccentrics carried by the armature.

26. The combination of a magnet armature, a stationary member, an adjustable eccentric carried by one of said parts and formed with a bearing surface, a coöperating bearing element carried by the other of said parts, and a magnet with which said armature coöperates.

27. The combination of a magnet armature, a stationary member, and a screw-threaded plug adjustably mounted in one of said parts, and provided with a cone bearing surface eccentric to the plug, the other of said parts being provided with a coöperating cone bearing surface.

28. The combination of an electromagnet, an armature therefor, a plug carried by the armature and rotatably adjustable, said plug being formed with conical bearing surfaces eccentrically located in the ends of the plug, and coöperating stationary bearing cones.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID L. LINDQUIST.

Witnesses:
ROGER W. FLAGG,
OLIVER WILBER DOTY.