No. 895,242. PATENTED AUG. 4, 1908.

G. H. DAVIS.

ELECTROMECHANICAL MOVEMENT.

APPLICATION FILED JULY 11, 1907.

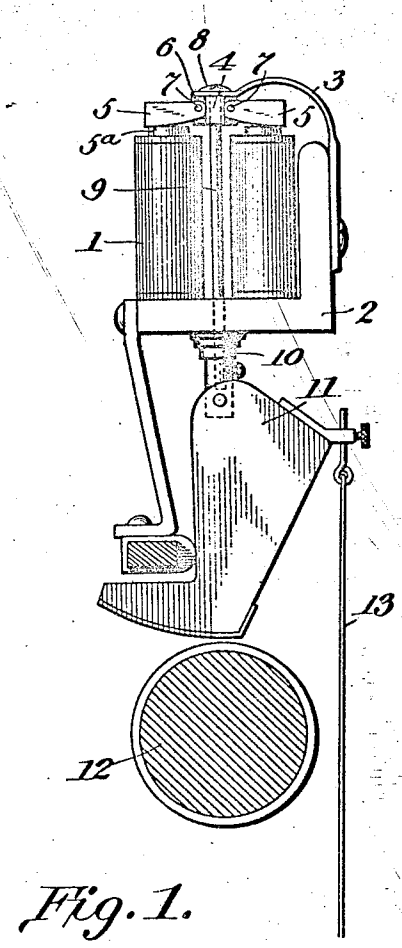


Fig. 1.

Fig. 2.

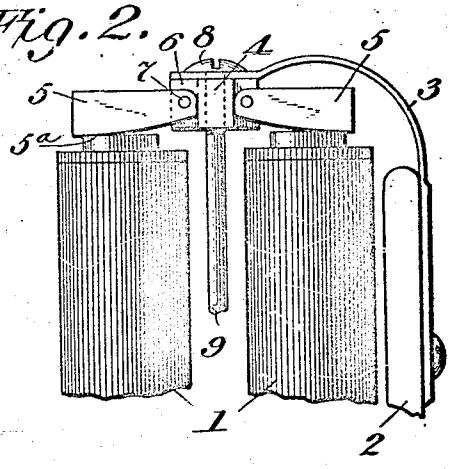


Fig. 3.

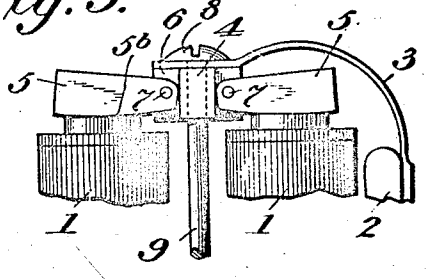
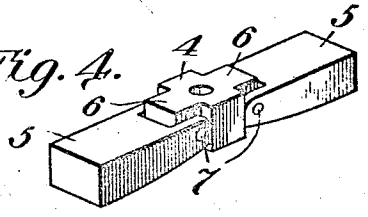


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTROMECHANICAL MOVEMENT.

No. 895,242. Specification of Letters Patent. Patented Aug. 4, 1908.

Application filed July 11, 1907. Serial No. 383,230.

To all whom it may concern:

Be it known that I, GEORGE HOWLETT DAVIS, a citizen of the United States, residing at West Orange, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Electromechanical Movements, of which the following is a specification.

My invention relates to electro-mechanical movements, and more particularly to an electro-magnetic actuator designed to produce a quick strong stroke.

One object of my invention is to provide a device of this character which shall operate with a permanently closed magnetic circuit, and thereby have a much higher efficiency than apparatus employing the usual air gap.

A further object of the invention is to provide an electro-mechanical movement which shall be silent in its operation, and avoid the usual clicking sound incident to the movement of an armature.

With the above and other objects in view, the invention consists in the construction and arrangement of parts hereinafter described and illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevation showing my invention as applied to an electric piano action. Fig. 2 is a side elevation on an enlarged scale, of my improved armature and connected parts, showing the armature in retracted position. Fig. 3 is a similar view showing the armature attracted. Fig. 4 is a perspective view of the armature.

Referring to the drawings in detail, 1, 1 represents a pair of magnet coils surrounding pole-pieces set into a yoke 2, thereby forming a "horse-shoe" magnet. The yoke 2 extends up along the side of the magnet and serves to support a bow shaped leaf spring 3, carrying the armature, in a manner hereinafter described.

The armature is best shown in Fig. 4. It consists of three sections, pivoted together, viz.—a block 4, having wings 6, and a pair of rockers, 5, pivoted to said wings, as at 7, thus forming an articulated structure. The rockers 5 are formed with rounded, arc-shaped lower surfaces, and are adapted to rest normally on the tops of the pole pieces, as shown in Fig. 2.

The spring 3 is flattened at its end and shaped to fit the top of block 4, and the spring and block are provided with suitable perforations to receive a bolt 8, which is secured in said block.

The above described arrangement results in a "floating" structure, the several sections being secured together, and to the spring, but having no fixed point of support. By this construction the armature is rendered bodily movable.

The bolt 8 is provided with a shank 9 which extends down between the magnet coils, and is connected to whatever device it is desired to actuate. In Fig. 1 I have shown this shank as passing downwards through the yoke and secured in a cuff 10, to which is pivoted a shoe 11, adapted, when the magnet is energized, to be brought into contact with a revolving drum 12. A connection 13 extends from said shoe to the hammer actuating mechanism of a piano. This is a well known form of electric piano action. It will be understood, however, that this showing is but illustrative of one of the numerous uses to which my invention is adapted.

The operation of my improved armature is as follows:—When in normal position, the rockers 5 rest on top of the polepieces, and the resiliency of the spring 3 holds the block 4 elevated, so that the rockers are in contact with the polepieces near their outer ends, only, as at 5^a, Fig. 2. It will be noted, however, that there is no air gap, but that the rockers are always in contact with the polepieces, thus forming a completely closed magnetic circuit. When the magnets are energized, there is a strong tendency for the lines of force, which thread through the rockers 5 and block 4, to shorten. As a result of this tendency, the rockers are caused to roll downward at their pivoted end, so as to contact with the polepieces at a point nearer their inner ends, as at 5^b Fig. 3. The spring 3 is thus flexed and the block 4 lowered, this producing a thrust on the bolt 8, which is connected with the device to be actuated. This rolling action of the rockers gives an operation which is smooth and noiseless, and at the same time, sharper and less sluggish than that of a solenoid. Also, owing to the fact that the air gap has been eliminated, there is very little magnetic leakage, and a very efficient magnet results.

What I claim is:—

1. A magnetic circuit comprising fixed and

movable parts, said movable parts consisting of a plurality of sections hinged together and bridging said fixed parts.

2. A magnetic circuit comprising fixed and movable parts, the movable part consisting of a plurality of sections hinged together, some of which are always in contact with said fixed parts.

3. In combination, an electro-magnet and an armature therefor comprising a plurality of floating hinged sections.

4. In combination, an electro-magnet, of the horse-shoe type and an articulated armature therefor, bridging the poles thereof.

5. In combination, an electro-magnet of the horse-shoe type, and an armature comprising articulated sections, some of which are in contact with the magnet poles.

6. In combination, an electro-magnet, and an articulated armature therefor forming therewith a permanently closed magnetic circuit.

7. In combination, an electromagnet, and an armature therefor comprising a plurality of pivotally connected parts, some of which are provided with curved faces adapted to roll on the poles of said magnet.

8. In combination, an electromagnet and an armature therefor, said armature comprising a central block movable to and from said magnet and a pair of rockers pivoted thereto.

9. In combination an electro-magnet, and an armature therefor, said armature comprising a central block, and a pair of rockers pivoted thereto and formed with arc-shaped faces adapted to rock on the poles of said magnet.

10. In combination, an electromagnet, an armature therefor comprising a central block and a pair of rockers hinged thereto, and a spring yieldingly supporting said block.

11. In combination, an electro-magnet, an armature therefor comprising a pair of pivoted rockers adapted to rock on the poles of said magnet, a yoke for said magnet, and a bow spring secured to said yoke and serving to hold said armature in its retracted position.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE HOWLETT DAVIS.

Witnesses:

R. E. SMITH,

H. M. ROBERTS.