No. 671,287. Patented Apr. 2, 1901.

A. D. LUNT.

END PLAY DEVICE.

(Application filed Feb. 9, 1900.)

(No Model.)

Fig. 1.

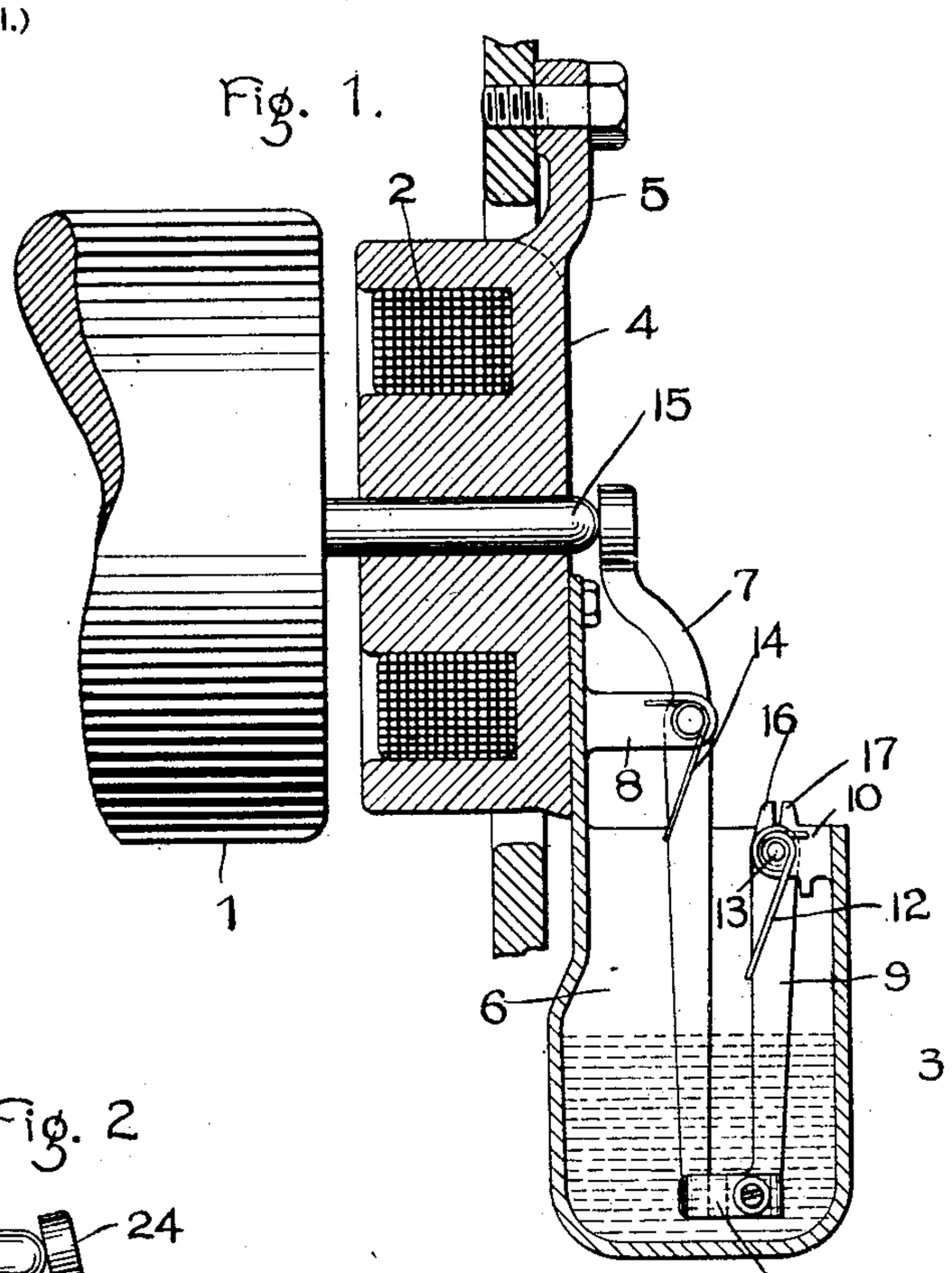
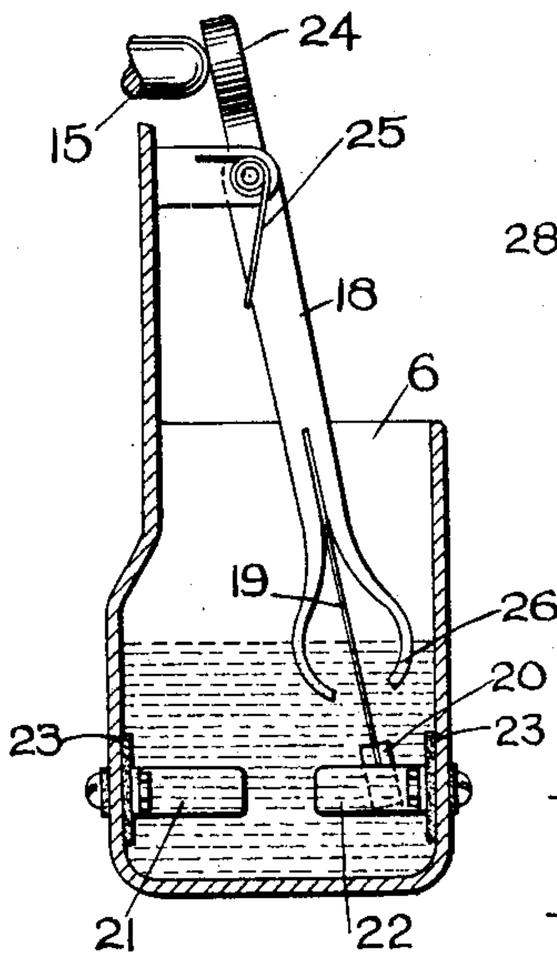


Fig. 2



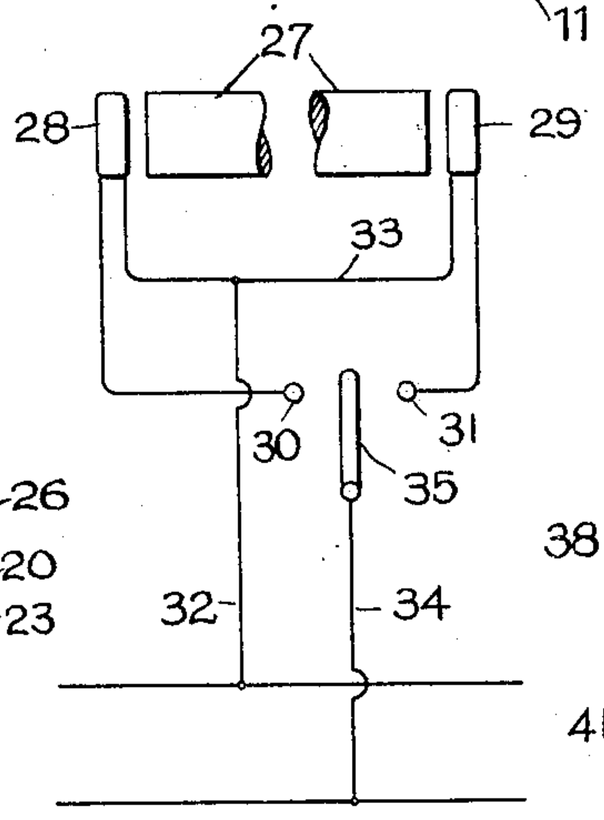
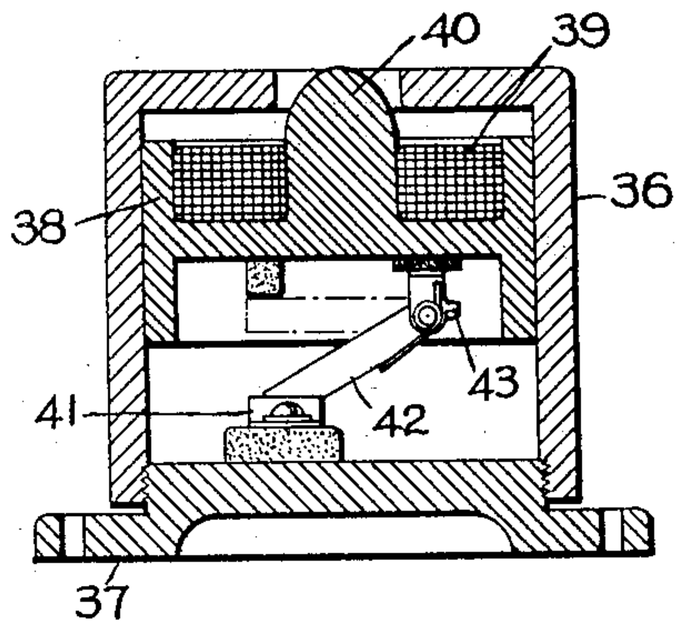


Fig. 3.

Fig. 4



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UNITED STATES PATENT OFFICE.

ALEXANDER D. LUNT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

END-PLAY DEVICE.

SPECIFICATION forming part of Letters Patent No. 671,287, dated April 2, 1901.

Application filed February 9, 1900. Serial No. 4,586. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER D. LUNT, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in End-Play Devices, (Case No. 1,127,) of which the following is a specification.

My present invention relates to end-play devices for shafts, and is particularly valuable in connection with rotary converters or other dynamo-electric machines in which a reciprocating motion of the shaft is for any reason found desirable.

My invention comprises certain improvements whereby a shaft may be given a longitudinal motion backward or forward at intervals bearing no definite relation to the speed of rotation of the shaft itself.

In accordance with one feature of my invention I make use of a magnetizing-coil mounted in operative relation to an end of the shaft, and open and close the circuit through the magnetizing-coil by means depending upon the longitudinal motion of the shaft itself. This and other features of my invention will be better understood by reference to the following description, taken in connection with the accompanying drawings, while the scope of my invention will be particularly pointed out in the claims appended hereto.

In the drawings, Figure 1 illustrates my invention as applied to the end of a shaft. Fig. 2 is a modification. Fig. 3 is a diagram of circuits, and Fig. 4 is still another modification.

In Fig. 1 an end-play device is shown as mounted in operative relation to the shaft 1. This device consists of a magnetizing-coil 2 and a switching apparatus 3, controlled by longitudinal movement of the shaft. The magnetizing-coil 2 is mounted within an annular recess in a disk or cylinder of magnetizable material 4, this disk being mounted in operative relation to the end of the shaft 1 and held in position by means of arms or lugs 5, screwed or otherwise suitably secured to the bearing for the shaft 1. A depending oil-receptacle 6 is bolted to the disk 4 and serves to support the several parts of a snap-switch which is placed in circuit with the coil 2. This switch consists, generally speaking, of two pivoted levers, one lever, 7, being pivoted to a lug 8, projecting from one side of the receptacle 6, and the lever 9 pivoted to another lug 10, projecting from the opposite side of the receptacle 6. The lever 9 at its free end carries a spring-clip 11, with which one end of the lever 7 is adapted to engage. A spring 12, wound about the pivot 13, presses at one end upon the lug 10 and at the other upon the lever 9 and serves to urge the end of the lever 9 toward the nearest wall of the receptacle 6, as will readily be seen from the drawings. A spring 14 acts upon the lever 7 in a similar manner and tends to move the lower end of the lever 7 toward the lever 9. Motion of the lever 7 due to the spring 14 is, however, restrained by reason of the engagement of the upper end of the lever 7 with the pin 15, projecting longitudinally from the center of the shaft 1. As the shaft 1 moves backward and forward the pin 15 is similarly moved and serves to rotate the lever 7 about its pivot, the spring 14 acting at all times to press the upper end of the lever 7 against the free end of the pin 15. Assuming the switch to be closed, as indicated in the position shown in Fig. 1, current will then flow through the magnetizing-coil 2, and the shaft 1 will be attracted and will move in its bearings toward the said coil. The pin 15, carried by the shaft 1, will then rotate the lever 7 about its pivot, and the lower end of the lever, by reason of its frictional engagement with the clip 11, will draw the lower end of the lever 9 along with it until a point is reached where the projecting end 16 of the lever 9 engages the stop 17 on the lug 10. A further movement of the lever 8 causes it to be disengaged from the lever 9, and the latter, urged by its spring 12, snaps back and breaks the circuit of current previously flowing through the two levers. This break is preferably made under oil, so as to reduce the amount of sparking, the oil being contained in a receptacle 6, as indicated in dotted lines. As soon as the circuit of the magnetizing-coil 2 is broken the attraction exerted upon the end of the shaft 1 ceases, and in the case of dynamo-electric machines the shaft returns to its original position by reason of the magnetic pull between the two

relatively-rotating members of the machine. On the return movement of the shaft 1 the lever 7 follows it, and its lower end therefore moves back and into engagement with the spring-clip 11, whereupon the circuit through the magnetizing-coil 2 is completed, and the whole action above described is then repeated.

Fig. 2 shows an arrangement of switch somewhat different from that in Fig. 1. It consists of a switch-arm 18, mounted upon a lug projecting from the oil-receptacle 6. The lower end of the arm 18 is forked, and between the arms of the fork extends a spring 19, carrying at its end a suitable contact 20. The contact 20 is arranged to coöperate with two contact-clips 21 22, secured, respectively, to opposite sides of the oil-receptacle 6 and separated therefrom by suitable insulating material 23. The projecting upper end 24 of the arm 18 engages the pin 15, which is carried by a shaft in the same way as shown in Fig. 1. A spring 25 urges the end 24 of the lever 18 against the pin 15 and keeps the parts constantly in contact with each other. The contact 20 when in engagement with either of the clips 21 or 22 serves to complete an electric circuit through a magnetizing-coil mounted in inductive relation to a shaft, as shown in Fig. 1. Supposing the circuit to be closed, as indicated by the position of parts in Fig. 2, then the shaft will be attracted and the upper end 24 of the lever 18 will be moved toward the right, thus putting stress upon the spring 19, which bends until it engages one of the forks 26 of the lever-arm 18. As soon as this positive engagement takes place the contact 20 is forcibly slid out of contact with the clip 22, and as soon as it is free to move the stress upon the spring 19 causes it to be snapped rapidly away from the clip, thus securing a quick breaking of the circuit and a minimum amount of sparking.

With the arrangement of parts shown in Fig. 2 the snapping action due to the bent spring 19 is intended to impulsively urge the contact 20 into engagement with the clip 21 as soon as it has moved out of engagement with the clip 22. By reason of this operation one circuit is made as soon as another is broken, the current in these circuits being arranged to act alternately upon two end-play devices. The arrangement of circuits in such a case is shown diagrammatically in Fig. 3. The opposite ends of the shaft to be acted upon are connected at 27, while in operative relation to the ends of the shaft are magnetizing-coils 28 and 29. These coils are connected in series with each other and the free terminals of the coils brought down to fixed contacts 30 and 31, corresponding to the fixed contacts 21 and 22 in the apparatus shown in Fig. 2. A conductor 32, leading from a source of electric current, is permanently connected to a point in the conductor 33 used in joining the coils 28 and 29 together. The other conductor, 34, leading from the source of current, is connected to a switch-arm 35, corresponding to the arm 18 in Fig. 2. It will be seen that when the switch-arm 35 is moved into engagement with the contact 31 current is sent through the magnetizing-coil 29, the circuit of the other magnetizing-coil 28 being then open. On the other hand, if the switch-arm 35 be then moved into engagement with the contact 30 the circuit of the coil 29 will be opened and that of the coil 28 closed. If the apparatus shown in Fig. 2 be used for the purpose of making this change in connections, the coils 28 and 29 will be alternately energized, one of the circuits being first broken before the other is closed. As will be seen from the operation of the switches described, the make and break of circuits can take place only after a full longitudinal movement of the shaft has occurred. The circuit is not broken at intervals having a definite relation to the speed of rotation of the shaft, which is objectionable, since it may happen that the selection of this interval is not such as to cause a maximum reciprocation of the shaft.

Fig. 4 shows a form of circuit-controlling snap-switch which may be arranged external to the shaft to be operated upon. This apparatus consists of a shell 36, of magnetic material, secured to a base 37, of non-magnetic material. A closely-fitting piston 38, of magnetic material, is mounted within the shell and provided with a magnetizing-coil 39. A projecting nose 40 is arranged to register with a hole of similar cross-section in the top of the shell 36 in order to secure a long magnetic pull between the shell 36 and the piston 38. The base 37 carries a clip 41, which is separated from the base by insulating material. A spring-actuated switch-arm 42 is pivoted to a lug projecting from the piston 38. Coöperating jaws 43, formed, respectively, upon the switch-arm 42 and the lug to which it is secured, serve to limit the downward movement of the switch-arm 42 with respect to the piston 38. The electric circuit is completed through the clip 41, the switch-arm 42, then to one end of the coil 39, through the coil 39 to the opposite end of the coil, which is connected to the piston 38, and then through the piston 38 and the shell 36, to which a binding-post is attached in a position not shown in the drawings.

When the circuit is closed, as indicated in the position shown in Fig. 4, the piston is attracted upward, thereby disengaging the arm 42 of the snap-switch and breaking the circuit. The piston then gradually falls, owing to the dash-pot action caused by the close fitting of the piston and shell 36. The weight of the piston and its coöperating parts then causes a reëngagement between the switch-arm 42 and the clip 41, and the action is then repeated.

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

1. The combination of a shaft, a coil in inductive relation to an end of the shaft, a

source of electric energy, and means controlled by longitudinal movement of said shaft for intermittently connecting said coil with said source of energy.

2. The combination of a shaft, a magnetically-actuated end-play device, and means controlled by longitudinal movement of the shaft for energizing and deënergizing said device.

3. The combination of a shaft, a coil in inductive relation to said shaft, a source of electric energy, a switch operated at intervals bearing no definite relation to the speed of the shaft, and electrical connections between the coil, the switch, and the source of energy.

4. The combination of a shaft, a coil in inductive relation to the shaft, a source of electric energy, and means controlled by the longitudinal movement of said shaft for intermittently sending current through said coil.

5. The combination of a shaft, a coil in inductive relation to the shaft, a switch in circuit with said coil, and means controlled by longitudinal movement of said shaft for operating said switch.

6. The combination of a shaft, a magnetizing-coil, a snap-switch in circuit with the coil, and means controlled by motion of the shaft for operating said switch.

7. The combination of a shaft, a magnetizing-coil, a snap-switch in circuit with the coil, and means controlled by the motion of said shaft for operating said snap-switch.

8. The combination of a shaft, end-play devices in operative relation to the shaft, and means for alternately operating said devices.

In witness whereof I have hereunto set my hand this 6th day of February, 1900.

ALEXANDER D. LUNT.

Witnesses:

BENJAMIN B. HULL,

MABEL E. JACOBSON.