(No Model.)

O. H. & A. F. PIEPER.

ELECTRICAL CONTROLLER FOR MOTORS.

No. 541,500. Patented June 25, 1895.

Fig. 1.

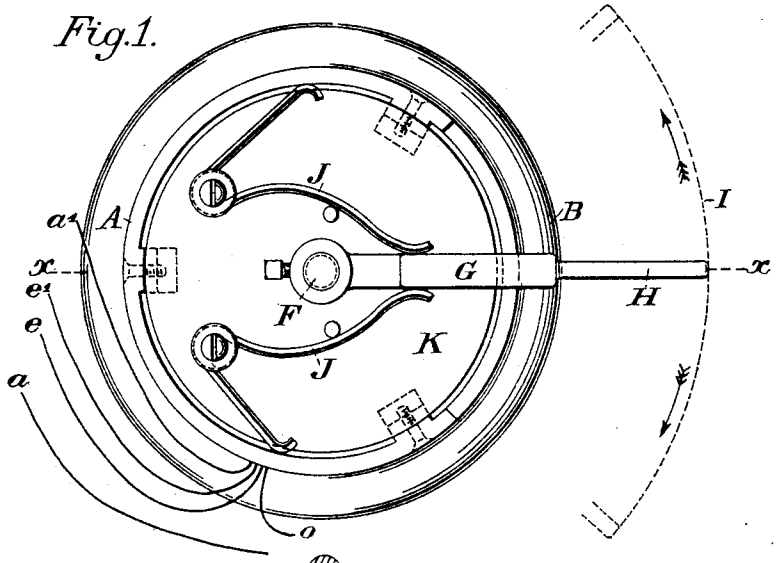


Fig. 2.

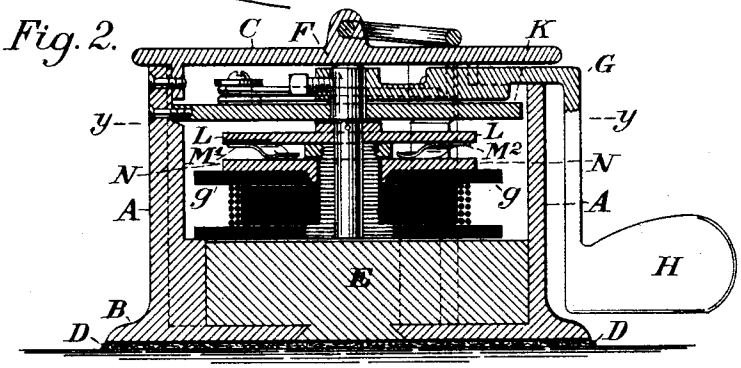
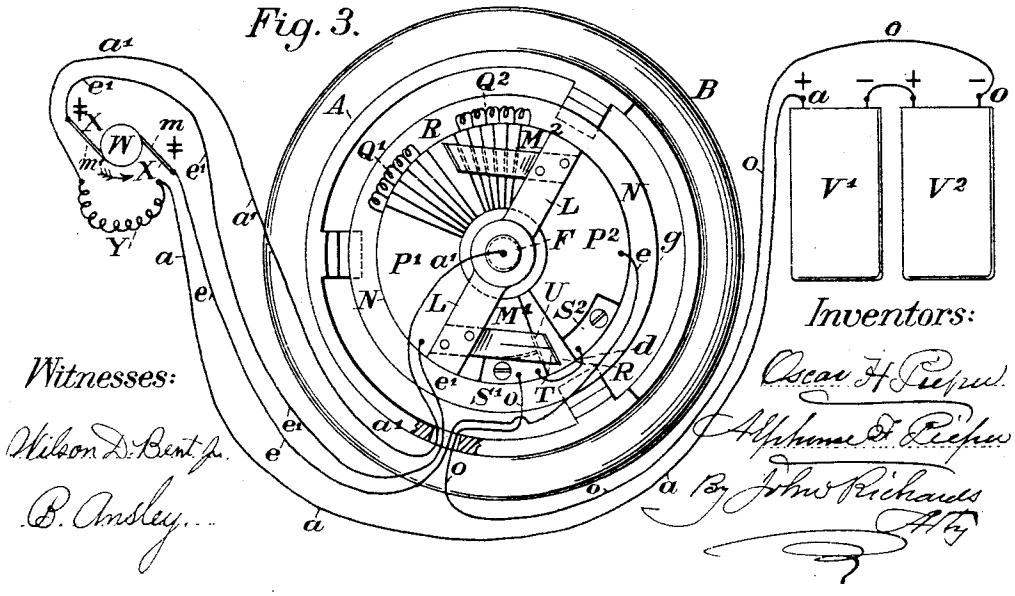


Fig. 3.



Witnesses:

Wilson D. Bent Jr.

B. Ansley

Inventors:

Oscar H. Pieper.

Alphonse F. Pieper

By John S. Richards

Atty

UNITED STATES PATENT OFFICE.

OSCAR H. PIEPER AND ALPHONSE F. PIEPER, OF SAN JOSÉ, CALIFORNIA.

ELECTRICAL CONTROLLER FOR MOTORS.

SPECIFICATION forming part of Letters Patent No. 541,500, dated June 25, 1895.

Application filed April 30, 1894. Serial No. 509,584. (No model.)

To all whom it may concern:

Be it known that we, OSCAR H. PIEPER and ALPHONSE F. PIEPER, citizens of the United States, and residents of San José, in the county of Santa Clara, State of California, have invented certain new and useful Improvements in Electrical Apparatus; and we hereby declare the following specification and the drawings therewith to be a full, true, and exact description of our invention, with the manner of constructing and applying the same.

Our invention relates especially to means for controlling electric dental, surgical or other electrical apparatus of the kind, wherein the speed, direction of rotation, also stopping and starting, have to be at the immediate and instant control of an operator or attendant.

Our invention consists of a switching device and resistance coils arranged in a circular form, and inclosed in a case, connected by flexible wires to the motive apparatus and to some source of electrical supply, the whole portable, so as to be moved to any convenient position, the adjustments being made by means of switch apparatus moved by a pedal or lever having lateral motion, so the operator can, without raising his foot, and while sustaining a part of his weight thereon, stop or start the motive apparatus in either direction and at any desired speed, or various rates of speed, as the nature of the work may demand, and so the current and motion will be instantly and automatically arrested by simple release of the pedal.

The object of our invention is greater convenience in operating than hitherto attained, permitting an operator to sustain his weight on both feet, so as to not interfere with his manual work going on at the same time, and so that the motive apparatus, when running in either direction, will stop automatically upon release of the pedal or lever by the operator, and without other act or movement on his part.

Referring to the drawings, Figure 1 is a plan view of one of our controlling devices with the covering-plate removed. Fig. 2 is a section taken on the axis or center of the device on the line $x\ x$ of Fig. 1. Fig. 3 is a plan view on the line $y\ y$ of Fig. 2.

Similar letters of reference indicate corresponding parts on the different figures of the drawings.

For the purpose of perspicuity in explanation, the controlling device, as shown in the drawings and to be herein described, is arranged for what is technically called series winding, but with modifications, such as are well known to those skilled in the construction and use of such apparatus. It will be understood that similar methods of construction are equally applicable to shunt winding, and do not affect the nature of our invention, or the functions of the apparatus, in respect to its control of an electric motor, to which the device is attached.

The main case A is cylindrical in form, having a flange B at the base, and removable covering plate C, as shown in Fig. 2.

To give the apparatus stability or adherence to a carpet or floor, the bottom is covered with a felt or india rubber facing D, and its weight increased by a filling E, of lead or other heavy metal, as shown in the drawings, which weight is independent of the case and is secured within the same and if found necessary a portion of the case A can be extended so as to increase the surface, and at the same time allow the operator to rest a portion of his weight thereon, and so assist in giving stability and adherence. In the center is an axis F, to which is attached a lever G having a pedal H, so this lever G, by side pressure of the foot, can be moved to the right or left in the arc I, indicated by dotted lines in Fig. 1, and when released is, by means of the springs J J, moved automatically back to the central or neutral position, as seen in Fig. 1. The central stud or axis F is held in position by a plate K, and beneath is attached a switch-bar L, to which is attached the two sliding contact brushes $M'\ M^2$, the former being insulated from the bar L, as will hereinafter be explained.

The contact brushes $M'\ M^2$ are elastic and press upon the surface of the commutator plate N, the latter being divided into two sectors, P' and P^2, each of which is again divided into a series of smaller sectors, to which are connected the resistance coils, as shown at Q' Q^2 in Fig. 3, R R being neutral or insulated spaces.

$S'\ S^2$ are segments insulated from $P'\ P^2$, but in

electrical connection with each other through the wire *d*, as seen in Fig. 3.

It will be observed that the brush M′ is slit or divided into two limbs T and U, the former bearing upon and coming in contact with the segments S′ S² as the bar L is turned to the right or left, and the other part or branch U coming at the same time in contact with, and bearing upon the sectors P′ or P². As the pedal H and lever G are moved to the right or left in the arc I the brush M′ forms electrical connection between the elements S′ and P′ or S² and P² for purposes hereinafter to be explained.

Referring again to the commutator plates P′ P², and the resistance coils Q′ Q² forming a part thereof, these latter are passed around the insulated spool *g*, as seen in the section Fig. 2, and attached to the commutator bars in the usual manner of arranging such coils.

The lever G can be moved various distances on the arc I, so the brush M² will include in the electric circuit one or more of the commutator bars at Q′ or Q², and consequently one or more of the coils on the insulated spool *g*, so the resistance thus set up will modify the force of the current and speed each way of the armature W, and an operator by pressing the pedal various distances either way can regulate the speed of the motive apparatus driven by the current, and, as before pointed out, as soon as the pedal H is released, and without other act or motion of the operator, the lever G instantly moves, by means of the springs J J, to its central position, breaking the electric circuit, thus providing for the exigencies of instant stopping of the motive apparatus, as is necessary in dental or surgical apparatus.

Referring now to the manner of operating, V′ V² are cells of an electric battery or other source of electric supply, the negative and positive poles being indicated by the usual symbols.

W represents the armature of a motor to be controlled; X X, commutator brushes, and Y the field magnet winding of the motor.

a, *a′*, *e*, *e′* and *o*, are the leading wires forming circuits as follows:

Supposing the lever G has been moved toward the end Z of the arc I, then the contact brush M² will occupy some position along sector P², depending on the distance gone over, and thus include more or less of the resistance wire Q². The functions of the series of resistance coils Q′ are the same as those of Q². Starting now to trace the flow of current, from battery cell V′ by way of conductor *a* to coil of field magnets Y, through field winding and wire *a′* to the switch bar L or case A, which is the equivalent, the stud F and bar L being in electrical connection with case A; thence along the bar L and spring M² to some point on P², depending on the amount of movement as explained. The wire *e* being connected with P² the current will follow this wire to one brush of the armature of the motor W, through the same and by way of the other armature brush and wire *e′* to sector P′, thence through the contact brush M′ in the controlling device to the segment S′, from there by means of wire *o* back to the negative pole of the battery V². This produces rotation of the armature in one direction.

The necessary conditions to reverse the direction of rotation of an electric motor consists in changing either the direction or flow of current in the field magnets, or in the armature, but not in both at the same time. With the above or before explained movement of the lever G, the current enters the armature W through the commutator brush *m*, and with the opposite movement of lever G the current will enter at *m′*, as will be explained.

Commencing at a positive pole of the battery following wire *a*, the current will enter the field magnets as before, then pass through the same, and by means of the wire *a′* to a switch bar L and contact spring M², from here to some part of the sector P′, as an opposite movement of the lever G may determine. Contact spring M′ does not then bear on P′ but on P². Consequently the current will pass along *e′* to the armature W, and enter on the other side or through the commutator brush *m′*, and from there along the wire *e* to P², across the contact brush M′ to the segment S², through the wire O and segment S′ back along wire *o* to the negative pole of battery V². This produces rotation of the armature W opposite to that previously described. Thus it will be seen that the motion of the armature W will be accordingly as the lever G is moved to the right or left, and that the resistance to the current and consequent speed of rotation will be as the distance the lever G is moved, or as the position the brush M² occupies in respect to the resistance coils Q′ and Q².

Having thus explained the nature and objects of our improved electric controlling apparatus, what we claim as new, and desire to secure by Letters Patent, is—

1. In an electric controlling device, the combination of a portable case, a rheostat and flexible conducting wires connecting the same to an electric motor, a removable top plate for the case, an independent basal weight within the case which is secured therein and is used for anchoring the device and enabling it to remain stationary when being operated, the laterally-movable operating pedal, and the return springs for returning the pedal to its central position, substantially as described.

2. In an electrical controlling device, a main case, a rheostat and electrical connections as herein described, and in combination therewith a bent lever and pedal moving about a vertical axis, its foot-piece near the surface of the floor so as to be moved to the right or left by the operator's foot, while the same foot is resting upon the floor thus performing by one lever and in one plane, distribution of the

electric current to a motive apparatus, so the latter will revolve in either direction or be reversed, started or stopped, in the manner and for the purposes substantially as described.

3. In an electric controlling apparatus, as herein described, a horizontal moving lever and pedal to be operated by the foot; a rheostat plate and wires connecting to an electric motor so arranged that the movement of the lever right or left will reverse motion of the motive apparatus; on each side of the lever deflecting springs in the manner shown, so that the lever when released by the foot of the operator will return to its central position and thus automatically cut off the electric current in the manner substantially as and for the purpose described.

4. In an electric controlling device, as herein described, the combination of a main casing, a rheostat, a horizontal moving pedal, lever, return springs therefor and switch-bar, and an insulated brush slit into two limbs, the latter forming electric connection between two separate commutator or rheostat plates and insulated segments attached thereto, so that by rotative movement of the switch-bar the return current will be reversed, and the motive apparatus to be controlled driven in either direction, in the manner and for the purposes substantially as described.

In testimony whereof we have hereunto affixed our signatures in the presence of two witnesses.

OSCAR H. PIEPER.
ALPHONSE F. PIEPER.

Witnesses:
GEO. D. SMITH,
CHAS. H. PIEPER.