

Nov. 28, 1950

D. J. BINUS ET AL

2,531,764

CONTROLLER FOR DENTAL ENGINES AND THE LIKE

Filed May 24, 1948

4 Sheets-Sheet 1

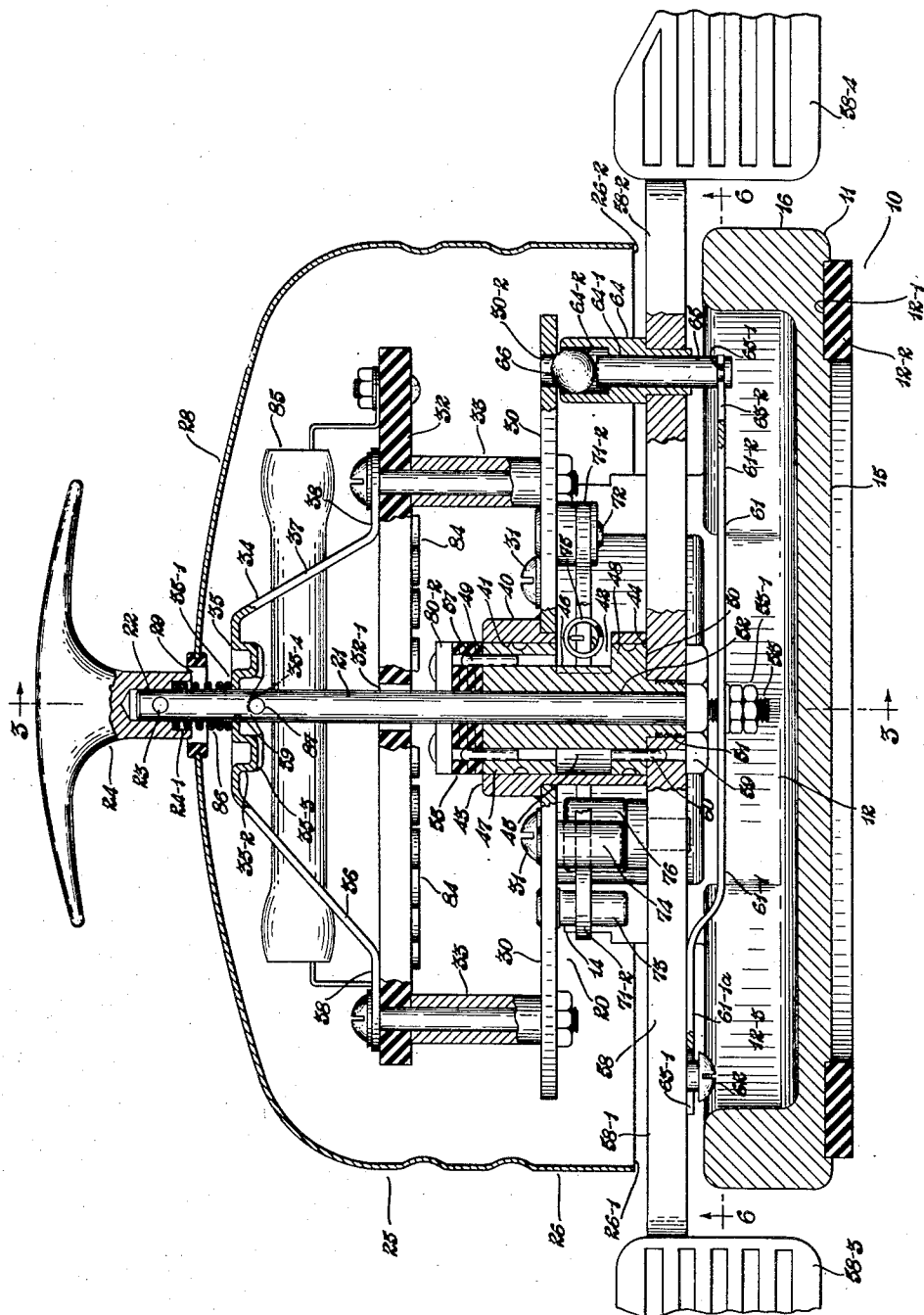


Fig. 1

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4 Sheets-Sheet 2

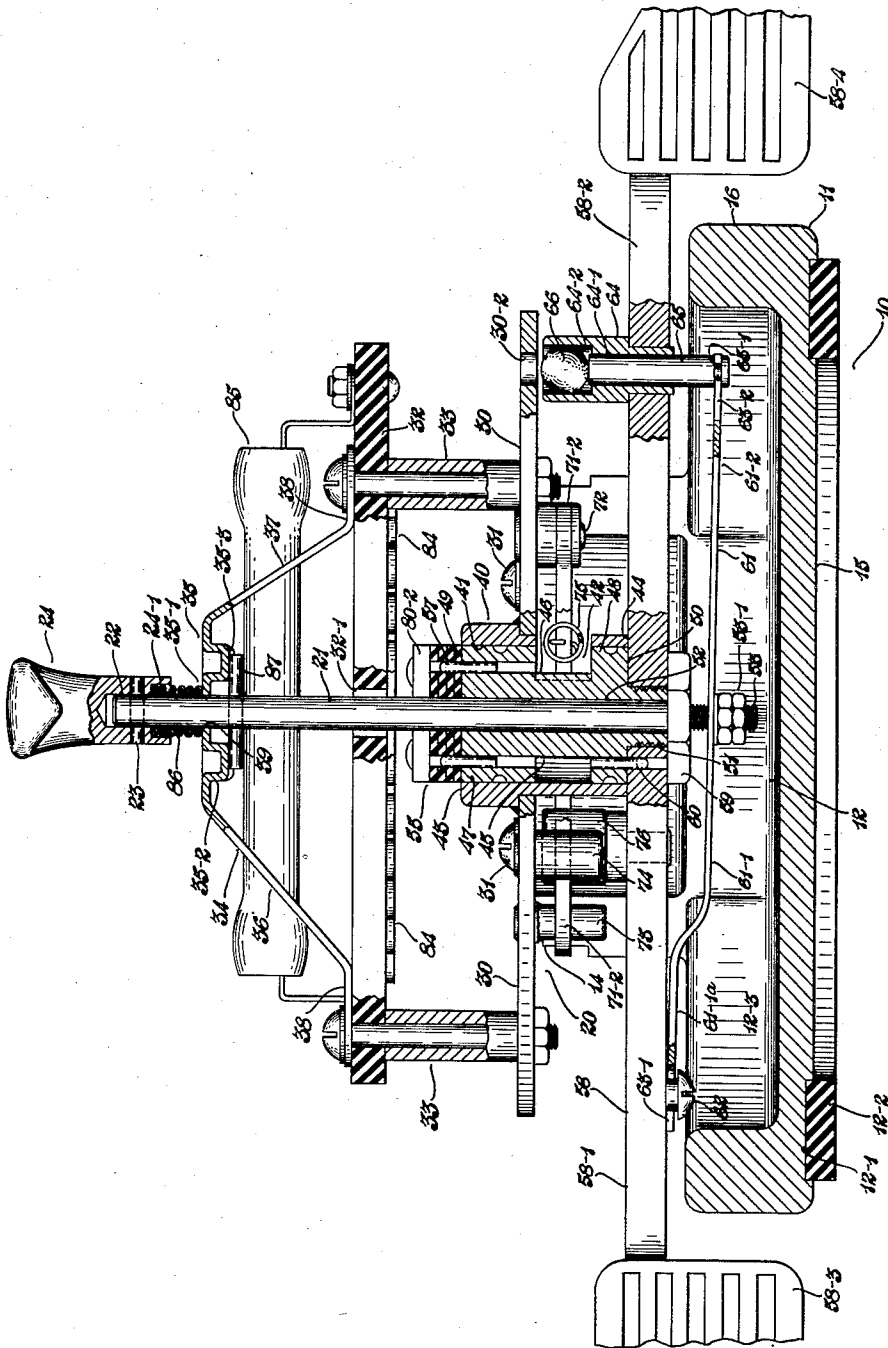


Fig. 2

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4 Sheets-Sheet 3

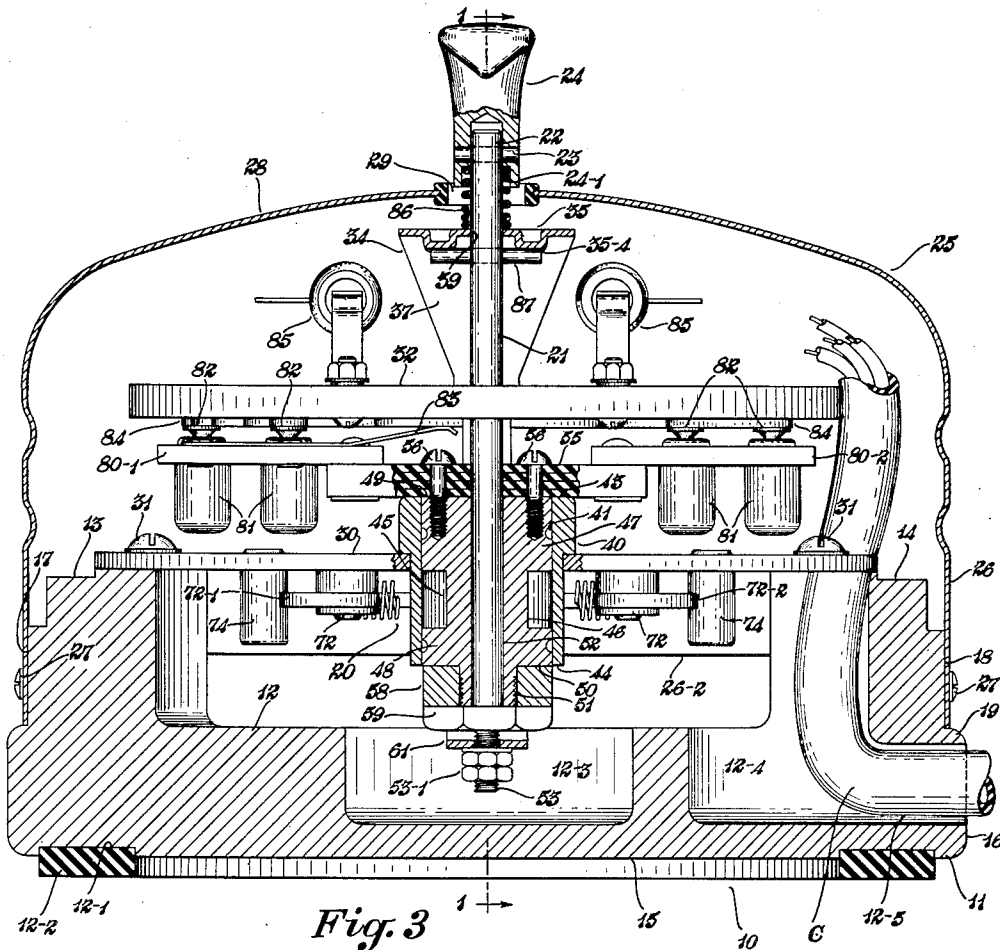


Fig. 3

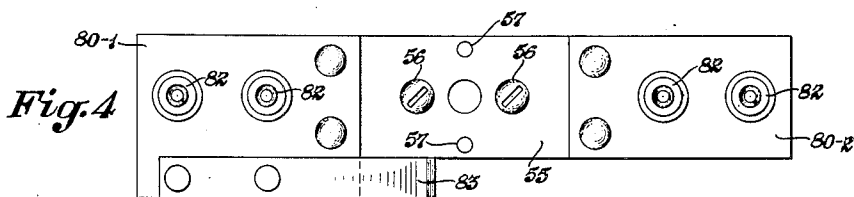


Fig. 4

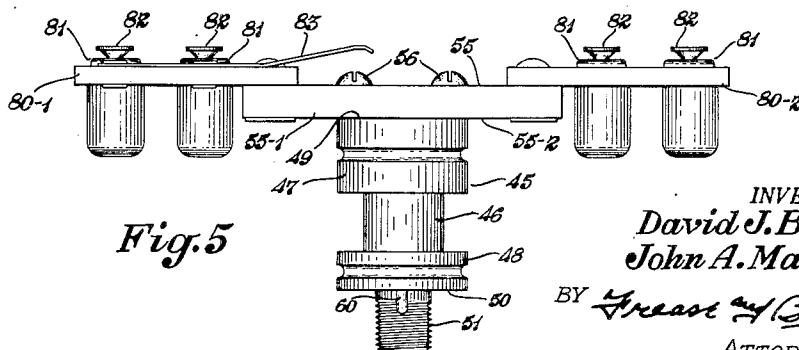


Fig. 5

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4 Sheets-Sheet 4

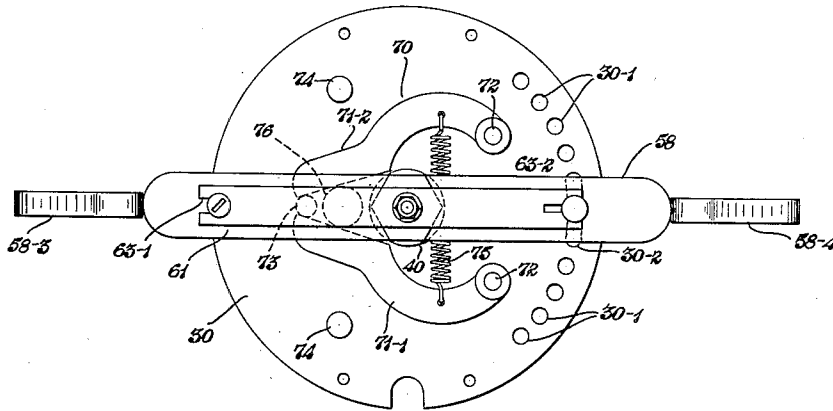


Fig. 6

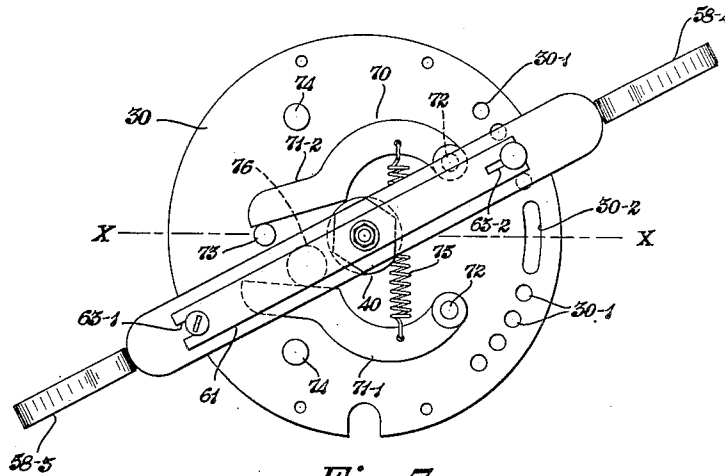


Fig. 7

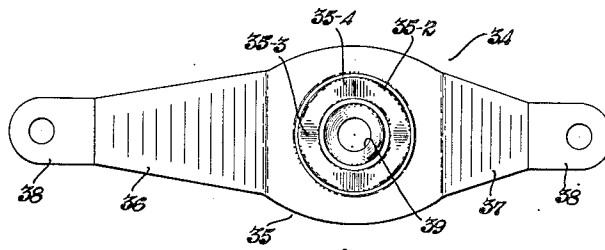


Fig. 8

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UNITED STATES PATENT OFFICE

2,531,764

CONTROLLER FOR DENTAL ENGINES
AND THE LIKE

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Application May 24, 1948, Serial No. 28,926

8 Claims. (Cl. 200—11)

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The invention relates to controllers for dental engines and the like, the controller being a foot operated electrical controller by the use of which the electric power fed to the reversible electric motor which drives the dental engine or other apparatus has its characteristics changed to cause the motor to run selectively, in any one of usually four speeds forward and four speeds backward or reverse.

The invention furthermore relates to such a controller including an actuating lever oscillatable about a vertical axis from which the lever extends radially and horizontally, and the lever having usually two opposite pedal extremities to one of which in use pressure is applied by the side of a foot of the dentist or other operator.

Such a controller is furthermore arranged for operation with either "detent on" or "detent off." In operation with "detent on," when the actuating lever is swung from neutral to any position of the controller contacts for any speed forward or reverse, detent and depression means operative between the lever and a stationary part of the controller serve to maintain the lever at such position until released by another foot pressure of the dentist. In operation with "detent off," the actuating lever is swung to any speed position of the controller contacts by the foot pressure of the dentist opposing spring pressure urging the actuating lever to neutral, and the foot pressure of the dentist is always opposing the spring pressure.

In controllers of the above described type, prior to the present invention friction between moving and stationary parts made necessary in their use the application of foot pressures to the pedals which have been undesirably high and have thus annoyed the dentist operators.

Furthermore in controllers of the above described type, prior to the present invention the construction and arrangement of parts has been complicated, with the result that the production and maintenance of such controllers has been difficult and time consuming.

The objects of the present invention include the provision of an improved controller of the above described type and having a construction and arrangement of parts such as to minimize friction between moving and stationary parts, so as to minimize the foot pressure required for the operation of the improved controller.

Further objects of the present invention include the provision of an improved controller of the above described type, and including moving and stationary parts with minimized friction

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therebetween, and having a simplified construction and arrangement of parts whereby the improved controller may be more easily and rapidly produced and maintained than prior controllers of the same general type.

The foregoing and other objects are attained by the electrical controller, parts, combinations, and sub-combinations, which comprise the present invention, the nature of which is set forth in the following general statement, and preferred embodiments of which, together with their mode of use, are set forth by way of example in the following description, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the improved electrical controller for dental engines and the like of the present invention may be stated in general terms as including a base, a unitary controller assembly separably mounted on the base, and a downwardly opening shell cover for the controller assembly and the base, the shell cover being separably secured to the base.

The unitary controller assembly includes, in combination with other parts, a lower laterally extending bearing plate including a horizontal reference plane which may be a flat upper or lower surface of the bearing plate. In the bearing plate there is centrally mounted a bearing having a cylindric bore whose axis is vertical with respect to the horizontal reference plane, and the bearing also having upper and lower end surfaces, the internal surfaces of the cylindric bore including radial bearing surfaces, and the upper and lower end surfaces constituting thrust bearing surfaces. A tubular stub shaft is journaled in the bore of the bearing, and on the lower end of the stub shaft is secured the controller actuating lever which has upper thrust bearing surfaces abutting the lower end thrust bearing surfaces of the bearing. On the upper end of the stub shaft is secured a contact mounting bar extending radially from opposite sides of the vertical axis of the bearing and stub shaft, and the contact mounting arm has lower thrust surfaces abutting the upper end thrust surfaces of the bearing.

The controller actuating lever extends radially on opposite sides of the vertical axis of the bearing and the stub shaft, and an elongated flat spring has one end loosely secured to one side arm of the actuating lever. Centrally in the elongated flat spring there is formed an opening, and at the other end of the elongated flat spring there is formed a notch having a connec-

tion with the lower end of a detent pin which is vertically slidable in a slide bearing tube mounted on the other actuating lever arm. The upper end of the slide bearing tube is counterbored and forms a pocket in which is contained a detent ball which rests on the detent pin.

The bearing plate has formed therein a plurality of arcuately spaced detent apertures which are radially spaced from the vertical axis of the bearing and stub shaft the same distance as the detent ball, the detent ball being adapted, when the controller is in the "detent on" setting, for engagement and disengagement with any of the detent apertures of the bearing.

For changing the setting of the controller from "detent on" to "detent off," a release rod is slidably mounted in the central bore of the tubular stub shaft, and the lower end of the release rod extends below the stub shaft and through the central opening in the elongated flat spring with which the lower end of the release rod has a supporting connection.

A contact plate is located above the bearing plate and supported thereon, and the contact plate has a central opening therein. On the top of the contact plate is secured a cam bracket having a central circular track cam which has an opening therein. The upper end of the release rod extends through the central opening in the contact plate and in the cam bracket, and on the upper extremity of the release rod there is removably secured a handle. Interposed between the lower end of the handle and the upper surface of the cam bracket is a helical compression spring engirdling the release rod. A cam follower rod extends horizontally through a horizontal opening in the release rod below the central circular track cam, the follower cam rod including opposite radial arms contacting the lower cam surfaces of the circular track cam.

When the release rod is in its up position, the other detent parts are in their "detent on" positions, and when the release rod is in its down position the other detent parts are in their "detent off" positions. At all times the detent pin and the detent ball are yieldingly supported on the elongated flat spring, which in turn is supported on the lower end of the release rod, which itself is yieldingly supported on the cam bracket. The cam bracket is supported by the contact plate, and the contact plate is supported by the bearing plate, and the bearing plate is supported on the base. Thus all vertical loads on the detent ball and pin are transmitted to the base, and not to the actuating lever, the stub shaft, and the bearing; and friction, or combined thrust and radial loads on the bearing are substantially reduced when the controller is set for "detent on" operation. This substantially reduces the force required to be applied to pedal of the actuating lever by the dentist's foot.

By way of example, embodiments of the improved electrical controller and parts thereof are illustrated in the accompanying drawings forming part hereof, in which

Fig. 1 is a fragmentary view with portions in side elevation and portions in vertical section as on line 1—1, Fig. 3, of one embodiment of the improved electrical controller, parts being shown in their relative positions with "detent on";

Fig. 2 is a view similar to Fig. 1, with the parts in their relative positions with "detent off," and with the cover removed;

Fig. 3 is another view thereof with portions in

side elevation, and portions in vertical section as on line 3—3, Fig. 1;

Fig. 4 is a detached top plan view of the contact bar;

Fig. 5 is a detached side elevational view of the contact bar and the stub shaft;

Fig. 6 is a detached bottom plan view of the controller assembly showing the actuating lever and other parts in neutral position;

Fig. 7 is a view similar to Fig. 6 showing the actuating lever and other parts in "detent on" position at one of the contact stations of the controller; and

Fig. 8 is a detached bottom plan view of the cam bracket of the controller.

Similar numerals refer to similar parts throughout the several views of the drawings.

The illustrated embodiment of the improved electrical controller of the present invention is indicated generally by 10, and includes a base 11 which is preferably massive and made of heavy material such as cast iron. As shown, the base 11 includes a lower bottom portion 12 from opposite sides of which extend upwardly opposite lugs 13 and 14. The lower bottom portion 12 of the base has a generally flat circular bottom face 15 having a cylindric outer side face 16, and the lugs 13 and 14 respectively have cylindric outer side faces 17 and 18 which have the same vertical center axis as the cylindric side face 16 of the bottom portion 12, but the side faces 17 and 18 of the lugs 13 and 14 are inwardly offset from the side face 16. Thereby there is formed an upper shoulder 19 extending between the lower cylindric face 16 and the upper cylindric faces 17 and 18.

Preferably as shown, the lower bottom face 15 of the base 11 has formed therein an annular groove 12—1 in which is located and secured a rubber pad ring 12—2 which rests upon the floor and serves to prevent displacement of the controller. Also preferably as shown, the bottom portion 12 of the base 11 has a substantial thickness and has preferably formed therein a central transverse recess 12—3 for accommodating lower parts of the controller, and a rear recess 12—4 communicating with a radially extending duct 12—5 opening through the rear of the cylindric side face 16, as shown in Fig. 3. The rear recess 12—4 and the duct 12—5 provided space for and an exit and entrance for a conductor cable C, which conducts the electric power supply to the controller 10 and the electric power output from the electrical controller 10 to the dental engine.

The improved controller 10 furthermore includes a unitary controller assembly indicated generally by 20 which is separably supported on the base in a manner hereinafter described in detail, and which includes, in combination with other parts hereinafter described in detail, a central vertically extending release rod 21 which has an upper extremity 22 on which is separably connected as by screw pin means indicated generally by 23, a handle 24

The controller 10 furthermore includes a downwardly opening dome shell cover indicated generally by 25 including a cylindric side wall 26 the lower end of the inner face of which fits against the outer cylindric faces 17 and 18 of the lugs 13 and 14, and the lower edge of the cylindric side wall 26 seats on the shoulder 19 of the base 11. Screw means 27 separably connect the cover 25 with the lugs 13 and 14. The cover 25 also includes a dome top 28 extending across the upper end of the cylindric side wall 26, and the

cover top 28 has formed therein a circular center opening 29 through which extends the upper extremity 22 of the release rod 21. For assembling and disassembling the cover 25 and the base 11 on which is mounted the unitary controller assembly 20, the handle 24 is removed from the upper extremity 22 of the release rod 21, thus permitting the extension and withdrawal of the release rod 21 through the circular opening 29 in the top 28 of the cover 25.

The unitary controller assembly indicated generally by 20 includes a lower circular bearing plate 30 which extends across and is supported upon flat top portions of lugs 13 and 14, and the bearing plate 30 is secured to the lugs 13 and 14, as by screw means 31 as shown in Fig. 3. The bearing plate 30 is flat, and spaced above the bearing plate 30 there is located a flat contact plate 32 which is parallel with the bearing plate 30, and which is spaced from and supported on the bearing plate 30 by a plurality of spacer tube and screw and nut means each indicated generally by 33, as shown in Figs. 1 and 2. The contact plate 32 has formed therein a central opening 32-1. On the top of the contact plate 32 there is supported a cam bracket indicated generally by 34 including a central cam portion indicated generally by 35, from opposite sides of which and extending outwardly and downwardly sloping legs 36 and 37 each having at its lower and outer extremity an apertured foot 38 each of which as shown being under the head of the screw of one of the spacer tube and screw and nut means 33. The upper central cam portion 35 of the cam bracket 34 has formed therein a central aperture 39.

The bearing plate 30 as shown has parallel flat upper and lower surfaces either of which may constitute a horizontal reference plane, it being understood that in use, these surfaces are substantially horizontal.

In a central opening in the bearing plate 30 there is located and secured a tubular bearing indicated generally by 40 having formed therein a cylindric bore 41 whose axis is vertical with respect to the horizontal reference plane and substantially vertical in use. The bearing 40 extends above and below the bearing plate 30 and there is formed in one side of the tubular bearing 40 an opening 42, shown in Figs. 1 and 2, for accommodating certain parts of the controller. The tubular bearing 40 has a flat annular upper end face 43 and a flat annular lower end face 44, and the inner face of the cylindric bore 41 constitutes a radial bearing surface and each of the annular end faces 43 and 44 constitutes a thrust bearing surface.

A stub shaft indicated generally by 45 is journaled in the cylindric bore of the tubular bearing 40, the stub shaft 45 having a spool like shape including a central shank 46, an upper enlarged journal head 47 and a lower enlarged journal head 48, each of the journal heads having cylindric surfaces journaled in upper and lower portions of the cylindric bore 41 of the tubular bearing 40. The upper journal head 47 has a flat upper face 49 aligned with the annular end face 43 of the tubular bearing 40, and the lower bearing head 48 has an outer annular flat portion 50 aligned with the annular lower end face 44 of the tubular bearing 40. The stub shaft 45 also includes an externally threaded shank 51 extending below the lower journal head 48.

For the purposes of the present invention the stub shaft 45 is tubular and has a central bore 52

which is axially aligned with the central aperture 32-1 in the contact plate 32 and with the aperture 39 in the cam portion 35 of the cam bracket 34, and the release rod 21 extends through and fits the bore 52 of the stub shaft 45 and extends through the contact plate aperture 32-1 and the cam bracket aperture 39, and, as previously stated, the aperture 29 in the top 28 of the cover 25.

The release rod 21 furthermore includes a reduced lower end shank 53 which is externally threaded and extends below the stub shaft 45 into the recess 12-3 of the base 11.

On the upper end of the stub shaft 45 is secured a contact mounting bar 55 extending radially from opposite sides of the vertical axis of the bearing 40 and the stub shaft 45, and the contact mounting bar 55 has lower thrust surfaces abutting the upper thrust bearing surfaces constituted by the flat annular upper end face 43 of the bearing 40. As shown, screw means 56 are utilized to secure the contact mounting bar 55 on the upper end of the stub shaft 45. Also as shown, dowel pin means 57 are utilized to effect a driving connection between the stub shaft 45 and the contact mounting bar 55.

On the lower end of the stub shaft 45 is secured a controller actuating lever 58 including arms extending radially on opposite sides of the vertical axis of the bearing 40 and the stub shaft 45, and the actuating lever 58 has upper thrust bearing surfaces abutting the lower thrust bearing surfaces constituted by the flat annular lower end face 44 of the bearing 40. As shown, for the purpose of securing the actuating lever 58 on the lower end of the stub shaft 45, the actuating lever 58 has formed therein a central internally threaded aperture which is screwed on the lower externally threaded shank 51 of the stub shaft 45, and below the actuating lever 58 a clamping nut 59 is screwed on the shank 51 and against the lower face of the actuating lever 58. Also as shown, dowel means 60 are utilized to effect a driving connection between the actuating lever and the stub shaft. Moreover as shown, the arms of the actuating lever 58 extend at right angles to the arms of the contact mounting bar 55.

The cover 25 has formed on opposite sides in the lower end of its cylindric side wall 26 opposite side openings 26-1 and 26-2, and the actuating lever 58 includes one arm 58-1 extending through the cover side opening 26-1 and another opposite arm 58-2 extending through the side opening 26-2 in the cover. A pedal 58-3 is secured on the outer end of the arm 58-1, and a pedal 58-4 is secured on the outer end of the arm 58-2.

Below the lever arm 58 there extends an elongated flat spring indicated generally by 61 having formed therein a central opening fitted over the threaded lower end shank 53 of the release rod 21, and lock nut means 53-1 screwed on the threaded shank 53 below the flat spring 61 serve to support the flat spring 61 on the lower end of the release rod 21 and spaced below the actuating lever 58. The elongated flat spring 61 includes on one side of the vertical axis of the release rod 21 an arm 61-1 which has an upwardly offset extremity 61-1a which is loosely connected to the arm 58-1 by a headed screw 62 screwed into a threaded aperture in the lever arm 58-1, the offset extremity 61-1a of the arm 61-1 of the flat spring 61 having a notch 63-1 formed therein which fits about the shank

of the screw 62 between the lever arm 58—1 and the head of the screw 62.

The flat spring 61 includes an opposite arm 61—2 having a notch 63—2 formed in its outer extremity. Above the notched outer extremity of the flat spring arm 61—2 there is mounted in the arm 58—2 of the actuating lever 58 a slide bearing tube 64 having a lower vertical bore 64—1 formed therein and an upper enlarged counterbore 64—2 forming a pocket above and communicating with the lower bore 64—1. A detent pin 65 is slidably mounted in the bore 64—1 of the slide bearing 64 and in the lower end of the detent pin 65 there is formed a reduced neck 65—1 fitting in the notch 63—2 of the elongated spring arm 61—2. A detent ball 66 is located in the counterbore pocket 64—2 and seated on the upper end of the detent pin 65.

In the bearing plate 30 there is provided a plurality of spaced recesses for coaction with the detent ball 66 when the controller is in "detent on" setting, and as shown these recesses are in the form of a plurality of arcuately spaced circular apertures 30—1 equally spaced from each other on opposite sides of a central arcuate aperture 30—2. The arrangement and spacing of the apertures 30—1 and 30—2 are best shown in Figs. 6 and 7, the central elongated arcuate aperture 30—2 constituting the detent engaging recess for the detent ball 66 when the actuating lever 58 is at the neutral position or station, and at one side of the central aperture 30—2, each of the four equally spaced apertures 30—1 constitutes a detent engaging recess for the detent ball 66 at one of four positions or stations for one of four forward speeds for the motor of the dental engine controlled by the controller, and at the other side of the central aperture 30—2 each of the apertures 30—1 constitutes a detent engaging recess for the detent ball 66 at one of four positions or stations for one of four reverse speeds of the motor controlled by the controller 10.

The vertical axis of the detent pin 65, which passes through the center of the detent ball 66, lies in the cylindrical surface containing the vertical axes of the apertures 30—1 and constituting the center surface of the arcuate apertures 30—2.

Usual means indicated generally by 70 are located and operative below the bearing plate 30 and provide for yieldingly urging the actuating lever 58 to the neutral position, as best shown in Figs. 6 and 7, and include a pair of neutralizing arms 71—1 and 71—2 each having one end pivotally mounted at the detent side of the bearing 40 on and below the bearing plate 30 by a pivot pin 72. The pivot pins 72 are similarly spaced on opposite sides of the vertical neutral plane indicated by the dot-dash line X—X in Fig. 7 and passing through the vertical axis of the bearing 40 and stub shaft 45 and the midpoint of the arcuate aperture 30—2. In the same vertical central plane X—X on the other side of the bearing 40, there depends from the base plate 30 a center stop pin 73.

At the same side of the bearing 40 and stub shaft 45 and on opposite sides of the vertical plane X—X there depend from the base 30 a pair of stop pins 74. The center stop pin 73 limits the swinging movement of each of the arms 71—1 and 71—2 towards the vertical neutral plane X—X and the movement of these arms away from this plane is limited by the stop pins 74.

Between the pivot pins 72 and the bearing 40, 75

there extends a tension helical spring 75 having one end connected with the arm 71—1 and the other end connected with the arm 71—2, and urging these arms toward the center stop pin 73. On the top of the arm 58—1 of the actuating lever 58 there is mounted a roller bearing 76 having a vertical axis of rotation and which is located between the neutralizing arms 71—1 and 71—2 and which has an outer cylindric surface located between and always contacting the inner face of one of the neutralizing arms 71—1 or 71—2, as shown in Fig. 7, when the actuating lever 58 is being swung to one side or the other. In the neutral position the bearing 76 is contacted by the inner faces of both arms 71—1 and 71—2, and as best shown in Figs. 6 and 7, the bearing 76 is located between the bearing 40 and the center stop pin 73. Thus when the actuating lever 58 is displaced from the neutral position, one of the arms 71—1 or 71—2 of the neutralizing means 70 is always pressing against the bearing 76 on the arm 58—1 of the actuating lever 58 and urging the lever toward the neutral position.

The contact bar 55, secured on the upper end of the stub shaft 45, is made of insulating material and includes at one side of the axis of the shaft 45 an arm 55—1 on which is mounted the inner end of a radially extending conductor plate 80—1 made of conducting material such as brass, and which mounts in conducting relationship with each other a pair of usual spring pressed contacts 81 each having an upper contact surface 82, and a flat spring contact 83. The other arm 55—2 of the contact mounting bar 55 mounts a similar conductor plate 80—2. The spring pressed contacts 81 are circuit connecting contacts and the flat spring contact 83 is a ground contact, and these contacts are of usual construction and arrangement and make contacts, when the actuating lever 58 and thus the contact mounting bar 55 is swung from the neutral position to any of the contacting positions or stations of the lever 58, with usual contacts, indicated generally by 84, on the underside of the contact plate 32, which is formed of insulating material and which mounts on its top a pair of resistors, each indicated generally by 85, and which have usual taps and connections with the contacts 84 and with the conductors of the cable C for effecting the desired speed of operation of the motor of the dental engine in the desired direction at any of the positions of stations of the actuating lever 58 and the other parts of the controller.

As above indicated the release rod 21 extends through the central aperture 39 in the cam bracket 34, which includes a central annular flat portion 35—1 in its cam portion 35. The handle 24 has formed in its lower end a counterbored socket 24—1, and a helical compression spring 86 is interposed between the cam bracket flat portion 35—1 and the base of the opposite socket 24—1 in the handle 24, thereby yieldingly urging the release rod 21 upwardly.

The cam bracket 34, as shown, is formed of die cut and pressed metal, and the cam portion 35 thereof includes an endless and preferably circular track cam 35—2 whose track depends downwardly and which has formed in its under face a pair of radially opposite detent depressions 35—3 for the "detent off" setting of the controller, and at right angles to the depressions 35—3 a pair of radially opposite depressions 35—4 for the "detent on" setting of the controller,

there being suitable ridges between the pairs of depressions 35-3 and 35-4.

Below the bottom face of the track of the circular cam 35-2 there is mounted in the release rod 21 a cam follower pin 87 which extends and fits laterally in a transverse bore in the release rod 21, and the cam follower pin 87 has opposite radial arms each contacting, under the action of the spring 86, the lower track face of the circular cam 35-2.

"Detent off" depressions 35-3 are at a lower level than the "detent on" depressions 35-4. Consequently, when, as shown in Fig. 2, the handle is turned to the "detent off" position, the release rod 21 is pressed downwardly lowering the supporting nut means 53-1 and permitting the elongated flat spring 61 to drop, whereby the detent pin 65 and the detent ball 66 drop to the position shown in Fig. 2 permitting "detent off" operation of the controller.

When the handle 24 is turned to the position shown in Figs. 1 and 3 the operation of the cam 35-2 and the spring pressed cam follower pin 87 is such as to lift the release rod 21 and cause the supporting nut means 53-1 to lift the elongated flat spring 61 so as to yieldingly press the detent pin 65 and the detent ball 66 upwardly against the bottom face of the bearing plate 30 and into any of the detent engaging depressions formed therein by apertures 30-1 and 30-2, with which the detent ball 66 may be aligned by swinging the actuating lever 58 by pressure applied by the foot of the dentist or other operator.

When the improved controller 10 is in the "detent on" setting, as shown in Figs. 1, 3, 6, and 7, all vertical loads on the detent ball 66 and the detent pin 65 are transmitted to the base by the independent yielding support of the detent pin 65 on the outer end of the elongated flat spring 61, which in turn is supported on the lower end of the release rod 21, which in turn is supported through the compression spring 86 on the cam bracket 34 carried on the contact plate 32, which is itself supported by the spacer tube and screw and nut means 33 on the bearing plate 30, and the bearing plate 30 is supported on the base 11. There is thus no vertical eccentric load on the actuating lever 58 with respect to the vertical axis of the bearing 40 and the stub shaft 45 during operation of the controller in the "detent on" setting, whereby the radial and thrust loads are substantially eliminated which would otherwise be imposed upon the bearing 40 and would produce undesirable friction and would require the use of excessive operating pressure on the pedal of the actuating lever 58.

The bearing plate 30 may be more broadly termed "a first laterally extending mounting member," and similarly the contact plate 32 may be more broadly termed "a second laterally extending mounting member."

The embodiments of the present invention illustrated and described herein are by way of example, and the scope of the present invention is not limited to the same or to the particular details thereof but is commensurate with any and all novel subject matter contained herein which may at any time properly under the patent laws be set forth in the claims hereof or originating herein, and the elements of any such claims are intended to include their functional, structural, and mechanical equivalents.

We claim:

1. In electrical controller apparatus and the

like, a plurality of connected mounting members, a bearing mounted on one of the mounting members and the bearing having a bore having a longitudinal axis and opposite annular end faces, a tubular stub shaft journaled in the bearing bore and having opposite end faces aligned with the end faces of the bearing, a laterally extending actuating lever secured on one end of the stub shaft, a laterally extending contact mounting bar secured on the other end of the stub shaft, the lever and bar each having an annular face portion abutting one of the annular end faces of the bearing and having an aperture registering with the bearing bore, an elongated spring member spaced from and extending laterally in the same direction along the outside of the lever and across the bearing bore axis, means connecting one end of the spring member with the lever at one side of the axis, slide bearing means mounted on the lever at the other side of the axis, detent means slidable in the slide bearing means, the detent means having at one end a connection with the spring member and at the other end a detent head, one of the mounting members having formed therein a plurality of arcuately spaced detent engaging depressions, each detent engaging depression being located for engagement by the detent head upon swinging of the lever when the spring member is supported in one position, an endless track cam member supported on another of the mounting members, the cam member having a central circular aperture concentric with the bearing bore axis and being spaced beyond the contact mounting bar, the tubular stub shaft having a bore coaxial with the bearing bore, a release rod slidable and rotatable in the bore of the stub shaft and extending through the registering apertures of the lever and bar and cam member, a cam follower pin on the release rod including an arm opposite the cam member, spring means urging the cam follower pin in abutment with the cam member, the cam member having arcuately spaced depressions at different levels, and the release rod having a connection with the elongated spring member.

2. In electrical controller apparatus and the like, a plurality of connected mounting members, a bearing mounted on one of the mounting members and the bearing having a bore having a longitudinal axis and opposite annular end faces, a tubular stub shaft journaled in the bearing bore and having opposite end faces aligned with the end faces of the bearing, a laterally extending actuating lever secured on one end of the stub shaft, a laterally extending contact mounting bar secured on the other end of the stub shaft, the lever and bar each having an annular face portion abutting one of the annular end faces of the bearing and having an aperture registering with the bearing bore, an elongated spring member spaced from and extending laterally in the same direction along the outside of the lever and across the bearing bore axis, means connecting one end of the spring member with the lever at one side of the axis, slide bearing means mounted on the lever at the other side of the axis, detent means slidable in the slide bearing means, the detent means having at one end a connection with the spring member and at the other end a detent head, one of the mounting members having formed therein a plurality of arcuately spaced detent engaging depressions, and each detent engaging depression being located for engagement by the detent head upon swinging of the lever.

3. In electrical controller apparatus and the like, a plurality of connected mounting members, a bearing mounted on one of the mounting members and the bearing having a bore having a longitudinal axis and opposite annular end faces, a tubular stub shaft journaled in the bearing bore and having opposite end faces aligned with the end faces of the bearing, a laterally extending actuating lever secured on one end of the stub shaft, a laterally extending contact mounting bar secured on the other end of the stub shaft, the lever and bar each having an annular face portion abutting one of the annular end faces of the bearing and having an aperture registering with the bearing bore, an elongated spring member spaced from and extending laterally in the same direction along the outside of the lever and across the bearing bore axis, means connecting one end of the spring member with the lever at one side of the axis, slide bearing means mounted on the lever at the other side of the axis, detent means slidable in the slide bearing means, the detent means having at one end a connection with the spring member and at the other end a detent head, one of the mounting members having formed therein a plurality of arcuately spaced detent engaging depressions, and each detent engaging depression being located for engagement by the detent head upon swinging of the lever, and means for selectively displacing the spring member and the detent means between positions in which the detent head engages and clears the detent engaging apertures.

4. In electrical controller apparatus and the like, a laterally extending mounting member including a laterally extending reference plane, a combined radial and thrust bearing mounted on the mounting member, a tubular shaft having an axis of rotation vertical to the reference plane, means mounting the shaft for rotation in the bearing and for transmitting radial and thrust loads to the bearing, a laterally extending actuating lever secured on the shaft on one side of the mounting member, an elongated spring member spaced from and extending laterally in the same direction along one side of the actuating lever, means connecting the spring member with the actuating lever at one side of the vertical axis, slide bearing means mounted on the actuating lever at the other side of the vertical axis, detent means vertically slidably mounted by the slide bearing means, the detent means having at one end a connection with the spring member and at the other end a detent head, the mounting member having formed therein a plurality of arcuately spaced detent engaging depressions, and each detent engaging depression being located for engagement by the detent head upon swinging of the actuating lever when the spring member is supported so as to maintain the detent head in abutment with the mounting member, the tubular shaft having a bore whose longitudinal axis coincides with the vertical axis of rotation, a release rod slidable and rotatable in the bore of the shaft, and cam and cam follower means operatively interposed between the release rod and the mounting member for selectively shifting the release rod longitudinally between two longitudinally spaced "detent on" and "detent off" positions by selective rotations of the release rod, and means on the release rod providing a supporting connection with the spring member, whereby in the "detent on" position of the release rod the spring member is positioned to maintain the detent head in abutment with the mounting

member and in the "detent off" position of the release rod the detent head clears the mounting member.

5. In electrical controller apparatus and the like, a laterally extending mounting member including a laterally extending reference plane, a combined radial and thrust bearing mounted on the mounting member, a shaft having an axis of rotation vertical to the reference plane, means mounting the shaft for rotation in the bearing and for transmitting radial and thrust loads to the bearing, a laterally extending actuating lever secured on the shaft on one side of the mounting member, an elongated spring member spaced from and extending laterally in the same direction along one side of the actuating lever, means connecting the spring member with the actuating lever, slide bearing means mounted on the actuating lever at one side of the vertical axis, detent means vertically slidably mounted by the slide bearing means, the detent means having at one end a connection with the spring member and at the other end a detent head, the mounting member having formed therein a plurality of arcuately spaced detent engaging depressions, and each detent engaging depression being located for engagement by the detent head upon swinging of the actuating lever when the spring member is supported so as to maintain the detent head in abutment with the mounting member, and means supporting the spring member so as to maintain the detent head in abutment with the mounting member.

6. In electrical controller apparatus and the like, a laterally extending mounting member including a laterally extending reference plane, a combined radial and thrust bearing mounted on the mounting member, a shaft having an axis of rotation vertical to the reference plane, means mounting the shaft for rotation in the bearing and for transmitting radial and thrust loads to the bearing, a laterally extending actuating lever secured on the shaft on one side of the mounting member, an elongated spring member spaced from and extending laterally in the same direction along one side of the actuating lever, means connecting the spring member with the actuating lever, slide bearing means mounted on the actuating lever at one side of the vertical axis, detent means vertically slidably mounted by the slide bearing means, the detent means having at one end a connection with the spring member and at the other end a detent head, the mounting member having formed therein a plurality of arcuately spaced detent engaging depressions, and each detent engaging depression being located for engagement by the detent head upon swinging of the actuating lever when the spring member is supported so as to maintain the detent head in abutment with the mounting member, and movable means selectively operative for supporting the spring member at a position so as to maintain the detent head in abutment with the mounting member or at a position in which the detent head clears the mounting member.

7. In electrical controller apparatus and the like, a laterally extending mounting member including a laterally extending reference plane, a combined radial and thrust bearing mounted on the mounting member, a shaft having an axis of rotation vertical to the reference plane, means mounting the shaft for rotation in the bearing and for transmitting radial and thrust loads to the bearing, a laterally extending actuating lever secured on the shaft on one side of the mounting

member, an elongated member spaced from and extending laterally in the same direction along one side of the actuating lever, means hinge connecting the elongated member with the actuating lever, slide bearing means mounted on the actuating lever at one side of the vertical axis, spring pressed detent means vertically slidably mounted by the slide bearing means, the detent means having at one end a connection with the elongated member and at the other end a detent head, the mounting member having formed therein a plurality of arcuately spaced detent engaging depressions, and each detent engaging depression being located for engagement by the detent head upon swinging of the actuating lever when the elongated member is supported so as to maintain the detent head in abutment with the mounting member, and means supporting the elongated member so as to maintain the detent head in abutment with the mounting member.

8. In electrical controller apparatus and the like, a laterally extending mounting member including a laterally extending reference plane, a combined radial and thrust bearing mounted on the mounting member, a shaft having an axis of rotation vertical to the reference plane, means mounting the shaft for rotation in the bearing and for transmitting radial and thrust loads to the bearing, a laterally extending actuating lever secured on the shaft on one side of the mounting member, an elongated member spaced from and extending laterally in the same direction along one side of the actuating lever, means hinge con-

necting the elongated member with the actuating lever, slide bearing means mounted on the actuating lever at one side of the vertical axis, spring pressed detent means vertically slidably mounted by the slide bearing means, the detent means having at one end a connection with the elongated member and at the other end a detent head, the mounting member having formed therein a plurality of arcuately spaced detent engaging depressions, and each detent engaging depression being located for engagement by the detent head upon swinging of the actuating lever when the elongated member is supported so as to maintain the detent head in abutment with the mounting member, and means supporting the elongated member so as to maintain the detent head in abutment with the mounting member, and means selectively operative to move the elongated member supporting means to a position in which the detent head clears the mounting member.

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