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Muther

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[54] **PEDAL SWITCH FOR DENTAL DRIVES**

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[30] **Foreign Application Priority Data**

May 23, 1970 Germany ..... P 20 25 226.0

[52] **U.S. Cl.** **200/86.5,** 338/153, 74/512

[51] **Int. Cl.** **H01h 3/14**

[58] **Field of Search** 200/86.5; 317/102; 74/562, 564; 338/47, 153, 215; 74/512, 569

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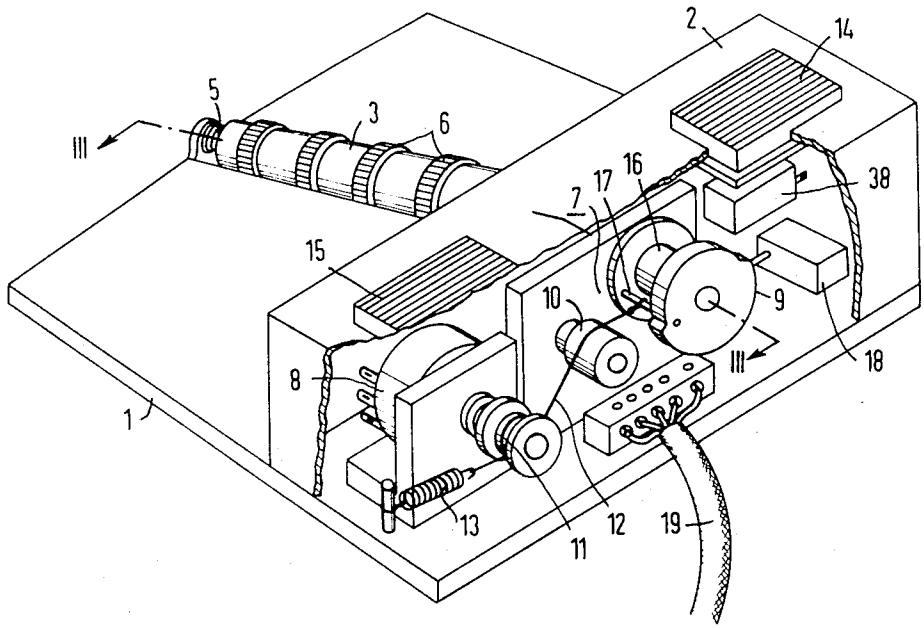
[57] **ABSTRACT**

A pedal switch for electrical drives, particularly dental bore drives has adjusting members operated by foot for releasing several switching and actuating procedures. The invention is particularly characterized by the provision of a lying shaft constituting a common actuating member for setting the speed of rotation and possibly other switching operations, the radial movement of the shaft being transmitted to the switching and/or actuating members.

8 Claims, 5 Drawing Figures



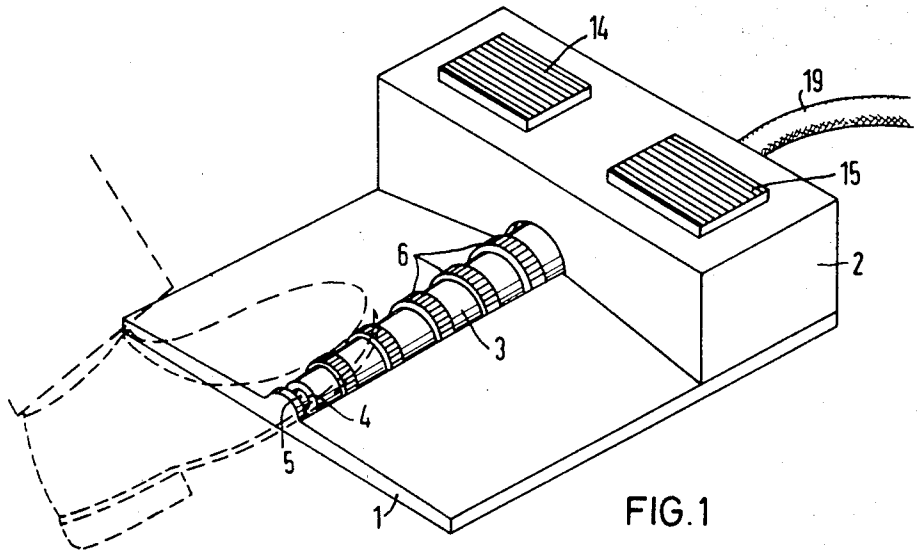


FIG. 1

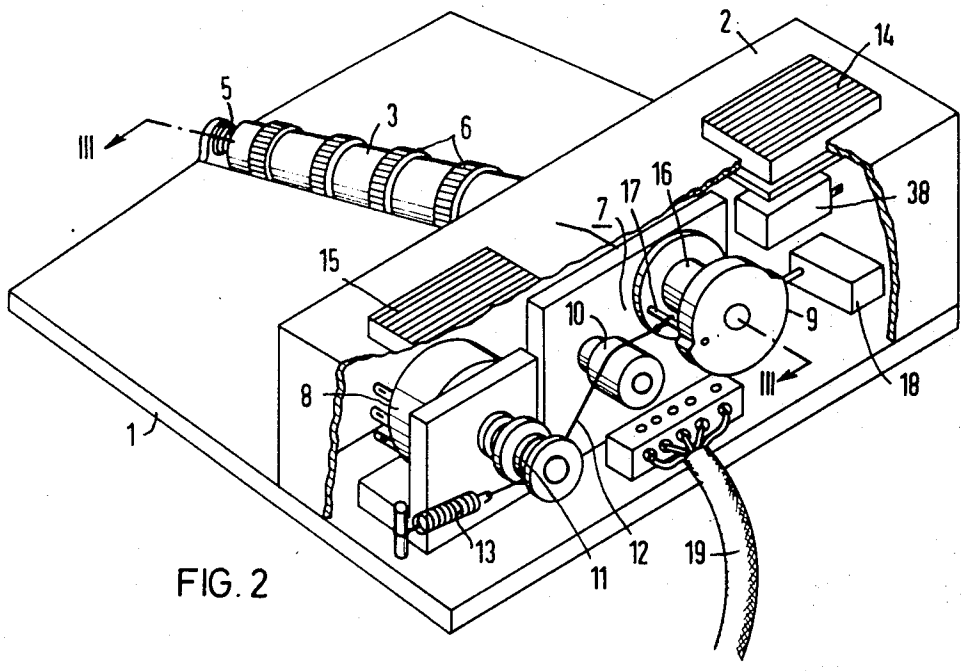


FIG. 2

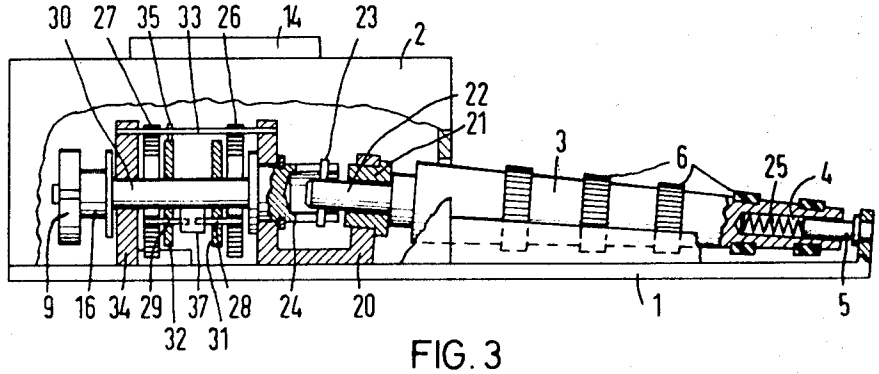


FIG. 3

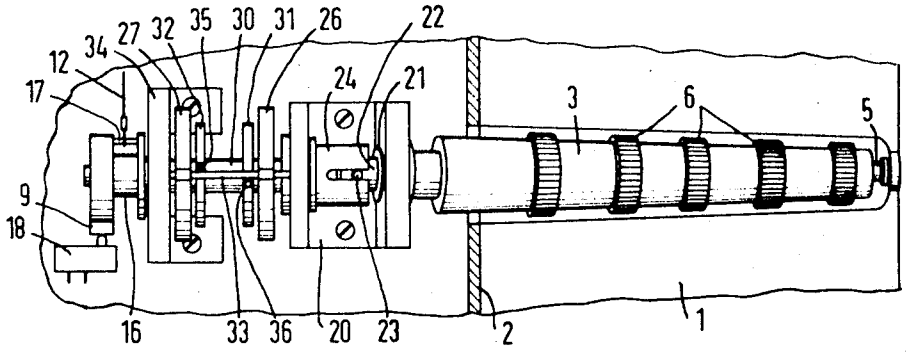


FIG. 4

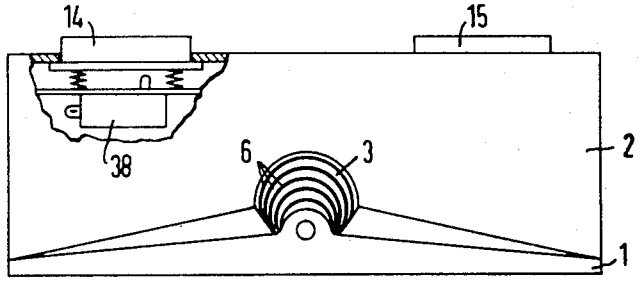


FIG. 5

PEDAL SWITCH FOR DENTAL DRIVES

This invention relates to a pedal switch for electrical drives, particularly dental borer drives which adjusting members operated by foot for releasing several switching and actuating procedures.

Pedal switches serve in dental practice primarily for switching and setting borer drives, namely for providing the desired number of revolutions as well as the fixing of the direction of rotation of a motor. Furthermore, the pedal switch can be used for releasing other switching functions, for example, the supply of air for drying and blowing out a dental cavity or for providing a spray for the location being bored.

With respect to servicing, two types of foot-operated switches are known in principle, namely, the tangential lever foot switch and the low step foot switch. In the first one the actuating member is a foot lever swingable circularly about a vertical axis. The required switch elements as well as the variable resistance for setting the r.p.m. are combined in a pot-like casing, the foot lever being swingable about the central axis of the casing from a central position into two directions, depending upon the desired direction of rotation of the bore drive. This construction has the drawback that when the swinging lever is operated by foot it can easily slide away from the foot due to its circular movement. Furthermore, the operation is tiring for the doctor since the foot providing the adjusting operation must be turned with its tip about the heel, thus making necessary the shifting of weight from one foot to the other.

In a low step foot switch a foot lever is inclined about a horizontal axis located close to the ground. The actuation of this foot switch requires very precise operation which must be carried out with the foot tip. Furthermore, there is the drawback that the foot releasing the actuating procedure is itself not released, namely, the entire foot surface must be supported uniformly and engage the foot lever and at the same time it should be able to hold the foot lever in different setting positions. The selection of the direction of rotation must then be carried out by a separate switch.

Attempts were also made to provide modifications of these two types of pedal switches with small structural changes, for example, to improve the support of the actuating foot, but their results were not satisfactory.

An object of the present invention is to provide a pedal switch which will not have the above-described drawbacks and which will provide an easy and secure operation of the borer drives without it being necessary to provide a substantial shifting in weight from the switch operating foot to the foot used for standing, so that tiredness and cramps are avoided.

Other objects of the present invention will become apparent in the course of the following specification.

In the accomplishment of the objectives of the present invention it was found desirable to provide a lying shaft constituting a common actuating member for setting the r.p.m. and possibly other switching operations, the radial movement of the shaft being transmitted to switching and/or actuating members.

It is advantageous to place the shaft partly into the ground and to make the shaft conical and arrange it in such manner that the diminishing part of the shaft is directed toward the operating side of the foot switch.

It is also advantageous to mount the shaft under spring tension so that it will be movable in axial direction to balance the axial movement of the foot during actuation of the foot switch.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing showing by way of example only, a preferred embodiment of the inventive idea.

In the drawing:

FIG. 1 is a perspective view illustrating a pedal switch of the present invention.

FIG. 2 is a perspective view illustrating details of the pedal switch.

FIG. 3 is a section of the operating device along the line III—III of FIG. 2.

FIG. 4 is a front view of the device shown in FIG. 3.

FIG. 5 is a front view of the foot operated device.

FIG. 1 shows a foot switch having a ground plate 1 at the rear end of which a desk-like casing 2 is provided. A lying shaft 3 is rotatably mounted in the plate 1 and inside the casing 2 and is axially movable therein. The shaft 3 is provided with a bearing hole 4 engaged by a bearing pin 5. The hold 4 contains a pressure spring 25 which engages the pin 5 and which provides for return movement of the shaft 3 after an axial shifting. A counter bearing corresponding to the bearing 4,5 is provided in the casing 2 at the other end of the shaft 3.

The shaft 3 is conical in shape and its diminishing portion is directed toward the operating side of the foot switch, as indicated by the broken line representation of a human foot in FIG. 1. The shaft 3 carries rubber rings 6 spaced along its axis. The rubber rings 6 serve as a holding support which makes possible a precise well dosed setting of a switching or actuating element with the foot.

As shown in FIG. 2, the rotation of the shaft 3 can be transmitted by a cord drive 7 to a rotary potentiometer 8 constituting the operating member for the r.p.m. of a borer drive. The cord drive 7 consists of a driving disc 9 connected with the shaft, two guide rollers 10, a disc 11 and a pulling cord 12. A drum 16 is driven by the shaft or roller 3 and carries a pin 17 upon which one end of the cord 12 is tied. The disc 11 is mounted upon the axle of the rotary potentiometer 8. The cord 12 is wound around the disc 11 and is tensioned by a pulling spring 13. The cord 12 is guided by the roller 10 and so connected to the drum 16 that when the shaft 3 is rotated in one or the other direction the rotary potentiometer 8 will be turned in the same direction. The rotary potentiometer can be used, for example, to change the number of revolutions of a bore drive. The spring 13 causes continuous tension of the cord 12.

Further switching and/or actuating elements can be operated by the shaft 3. It is advantageous to couple switches which switch on and off the borer drive with the movement of the shaft. In that case the shaft can be provided in known manner with return springs, for example, omega springs which when the shaft has been moved out of its middle position bring it back into the zero position.

Furthermore, additional switch elements operated by foot can be provided in the foot switch. Thus keys 14 and 15 can be used to actuate various valves. Thus the key 14 is connected to a switch 38 which may be used, for example, for supplying cooling means to the borer head or supplying compressed air for drying or blowing out the cavities.

The cam disc 9 fixed to the drum 16 cooperates with a switch 18. In case of a dental motor drive the switch 18 can be used to set the direction of rotation of the drive. This is accomplished preferably by a relay (not shown) which is connected with the switch 18 and which changes by its contacts the polarity of the contacts of the driving motor, so that the motor is caused to rotate in one direction or the opposite direction. The zero position of the potentiometer 8 corresponds to the central position of the shaft 3 and is defined by the position in which the actuator of the switch 18 is located in a transition from one cam path to the other cam path. When the shaft is rotated the driving motor is thus driven in a direction determined by the position of the switch 18 and that of the relay. If the shaft is rotated in the opposite direction and when the middle location is changed, the cam brings the switch 18 in the other switching position and this causes a relay (not shown) to change the polarity of the voltage of the motor and thus changes the direction of rotation of the motor.

A hose 19 encloses the lines leading to the electrical parts, such as the potentiometer 8, the switch 18, etc.

As shown in FIG. 3, the holder 20 located in the casing 2 carries a bearing 21 supporting the end 22 of the shaft 2. The end 22 carries a pin 23 which engages a sleeve 24 connected with an extension 30 of the drum 16. As shown in FIG. 4 the sleeve 24 has slits on both sides so that the shaft end 22 can move axially without moving out of engagement with the sleeve 24.

Due to the provision of the spring 25 (FIG. 3) the relative movement between the shaft 3 and the bottom of the shoe of the user caused by the swinging of the foot can be substantially compensated.

Two spiral springs 26 and 27 tensioned by pins 28 and 29 are used to hold the shaft 3 in its basic position. The two pins 28 and 29 are fixed upon two discs 31 and 32, respectively, which are fixed upon an extension of the drum 16. A rod 33 fixed in the support 20 and in a support 34 serves as a stop for radial bolts 35 and 36 radially mounted in the discs 31 and 32. Furthermore, a radially extending pin 37 is fixed to the part 30 of the drum 16. The pin 37 transmits the rotary movement of the drum through the two pins 28 and 29 (depending upon the direction of rotation of the shaft 3) to the spiral springs 26 and 27. When the shaft 3 and thus the drum 16 rotate in one direction, the pin 37 takes along the pin 32 and thus tensions the spring 26. The return movement of the shaft takes place by this spring. The greatest angle of rotation is provided by the pins 35 and 36 striking the transverse rod 33.

The drawing shows that the shaft 3 is embedded with a part of the floor 1. This has the advantage that the foot shifting the shaft 3 can easily slide over the shaft without having to be raised.

In the case of an axially movable shaft 3 the axial movement can be advantageously additionally utilized for actuating switching elements, for example, for switching on air and water.

I claim:

1. A foot operated control device, comprising a casing, a rotatable roller extending out of said casing adjacent the base of said casing, said roller being adapted to be directly actuated by a foot engaging its outer surface, a control member located in said casing, and gear means connecting said roller with said control member and transferring the rotary movement of said roller to said control member for changing the control position of said control member.

2. A device in accordance with claim 1, for use with a dental borer drive, wherein said control member comprises a rotary potentiometer varying the number of revolutions of the borer drive, and wherein said gear means comprise a cord drive connecting said roller with said control member in such manner that the rotation of said roller in both directions is transmitted in the same directions to said control member.

3. A device in accordance with claim 1, having a ground plate, said roller being partly sunk in said ground plate.

4. A device in accordance with claim 1, wherein said roller is conical, the diminishing part of the shaft extending toward the operating side of the device.

5. A device in accordance with claim 1, comprising resilient members engaging said roller, said shaft being rotatable about the axis from a defined middle position.

6. A device in accordance with claim 1, comprising resilient members engaging said roller, said shaft being movable in the axial direction.

7. A device in accordance with claim 1, wherein said support is a grip-facilitating cover at least partly covering said roller.

8. A device in accordance with claim 7, wherein said cover consists of spaced rubber rings.

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