

April 25, 1961

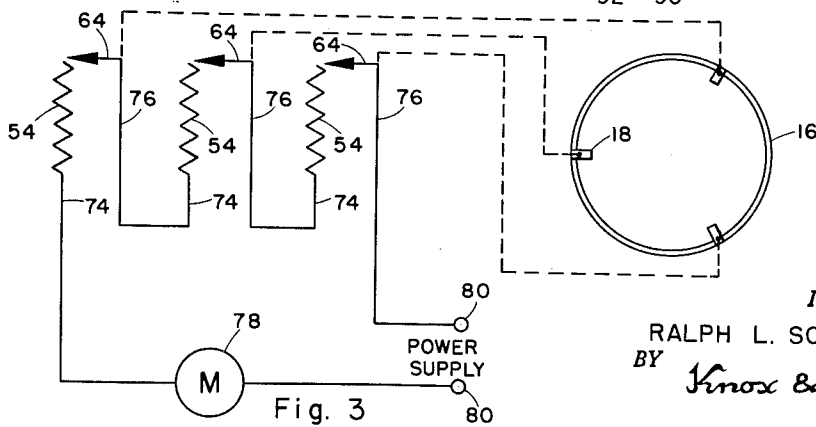
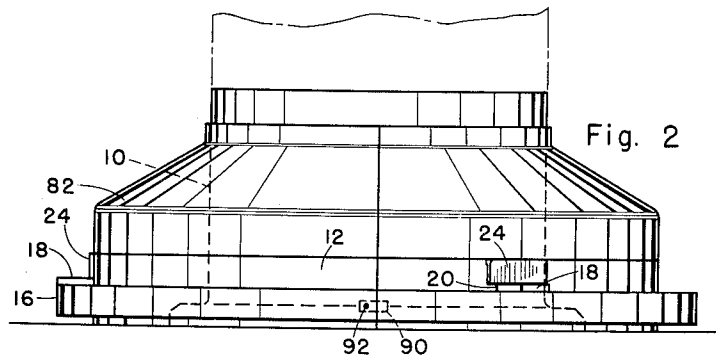
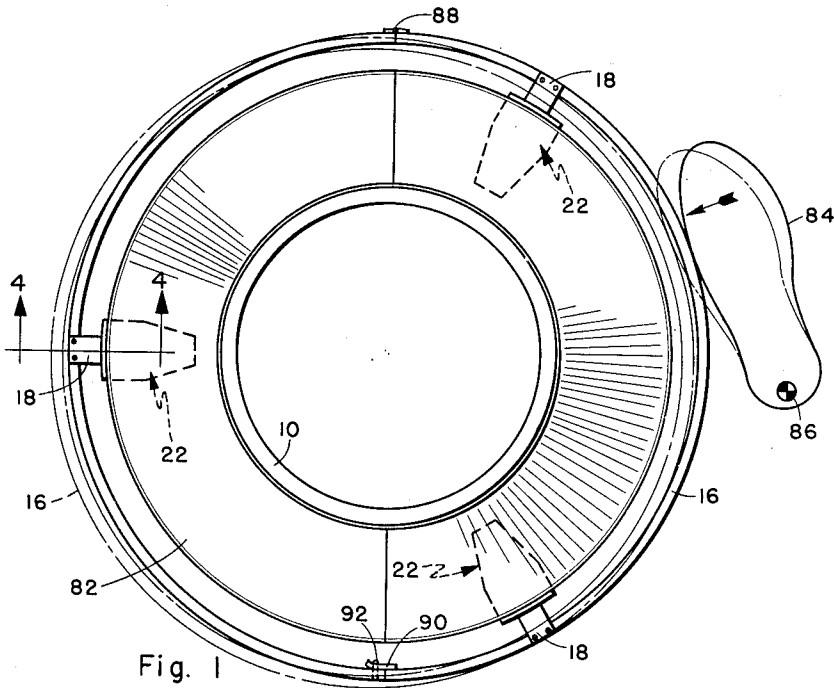
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2,981,915

FOOT ACTUATED MULTIPLE RHEOSTAT CONTROL

Filed May 16, 1960

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

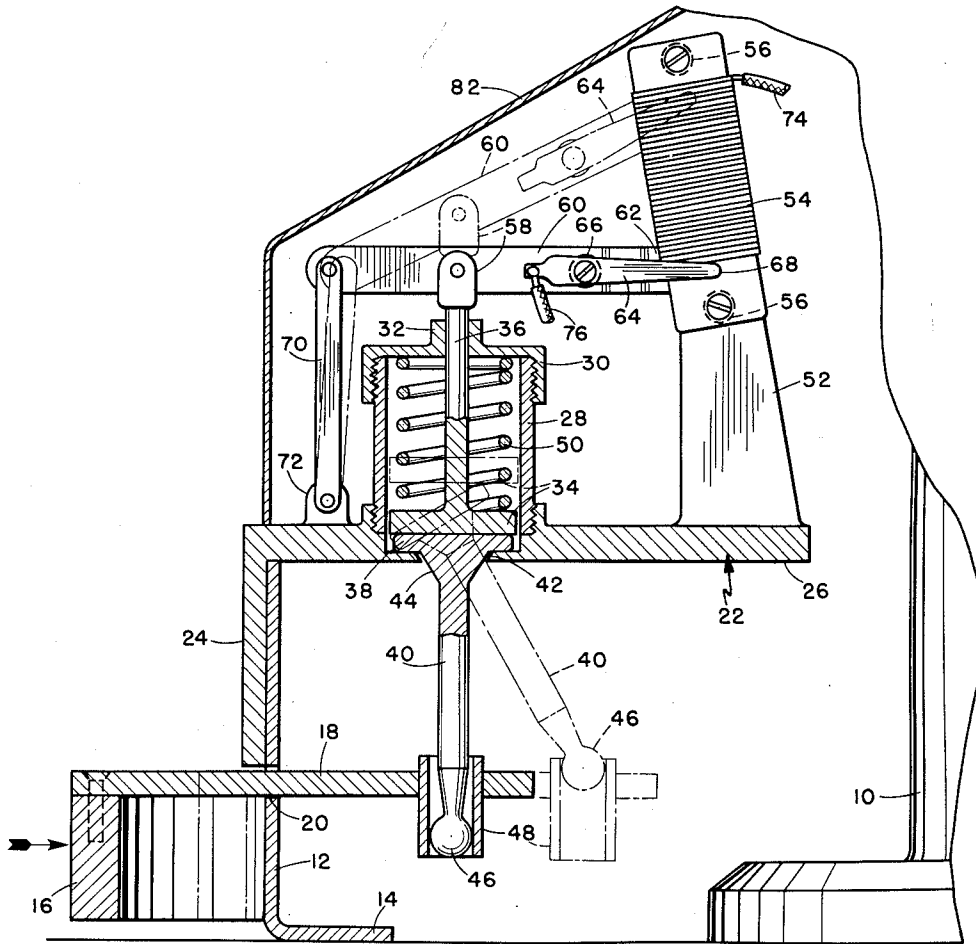


Fig. 4

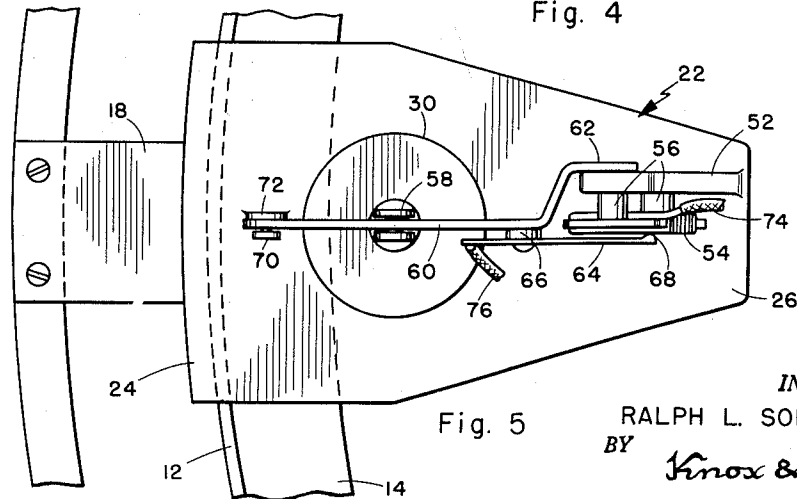


Fig. 5

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FOOT ACTUATED MULTIPLE RHEOSTAT CONTROL

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7 Claims. (Cl. 338—171)

The present invention relates generally to electrical controls and more particularly to a foot actuated multiple rheostat control.

The primary object of this invention is to provide a multiple rheostat control designed to fit around the base or pedestal of an electrically driven power tool, such as a dental chair and drill, a drill press, or the like, the mechanism having a control ring adjacent the floor which is operable by either foot from any position around the tool.

Another object of this invention is to provide a rheostat control which can be operated by merely pivoting the foot on the heel without the necessity for raising the foot or disturbing the balance.

Another object of this invention is to provide a rheostat control which has positive self-centering means for the control ring to hold the rheostats in off position when no pressure is applied to the ring.

A further object of this invention is to provide a rheostat control which is compact and adaptable to many different types and sizes of tools, the movable parts being completely enclosed and no external electrical cords being necessary.

Finally, it is an object to provide a foot actuated rheostat control of the aforementioned character which is simple and convenient to build and install and which will give generally efficient and durable service.

With these and other objects definitely in view, this invention consists in the novel construction, combination and arrangement of elements and portions, as will be hereinafter fully described in the specification, particularly pointed out in the claims, and illustrated in the drawings which form a material part of this disclosure, and in which:

Figure 1 is a top plan view of the control assembly built to fit around the base of a power tool;

Figure 2 is a side elevation view of the complete assembly;

Figure 3 is a diagram of the electro-mechanical arrangement of the control;

Figure 4 is an enlarged fragmentary sectional view taken on the line 4—4 of Figure 1; and

Figure 5 is a top plan view of the structure illustrated in Figure 4, the outer cover being omitted.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawings.

The control assembly as illustrated is built as an annular structure around a pedestal 10 of a dental chair, power tool, or the like, the structure including a base skirt ring 12 having an inwardly turned flange 14 which is secured to the floor. Surrounding the base skirt 12 and concentrically spaced therefrom is a control ring 16 supported on a plurality of radially inwardly extending push bars 18, which are horizontally slidable through slots 20 in said base skirt. In the configuration illustrated three push bars 18 are used, although any reasonable number may be utilized, the slots 20 being sufficiently large to

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allow the control ring 16 considerable eccentric displacement in any direction, said control ring being spaced slightly above the floor for easy contact with the feet.

Immediately above each push bar 18 is a current control unit represented as a simple rheostat unit 22 comprising a bracket 24 fixed to the base skirt 12 and having an inwardly extending platform 26. The three rheostat units 22 are identical and one will be described in detail, with particular reference to Figures 4 and 5. Fixed to the upper surface of the platform 26 is an upright cylinder 28 having a top cap 30 with a central boss 32 and within said cylinder is a vertically movable piston 34, having an actuating rod 36 which is axially slidable through said boss. Below the piston 34 is a rocker plate 38 having a downwardly extending lever arm 40, which passes through an opening 42 in the platform 26, the lever arm having a conical portion 44 immediately below said rocker plate to provide a centering action. The lower end of the lever arm 40 is provided with a ball end 46 which rides in a cylindrical sleeve 48 carried by the push bar 18, so that any horizontal movement of the push bar tilts said lever arm and causes the rocker plate 38 to raise the piston 34, as indicated in broken line in Figure 4. It is emphasized that the piston 34 is raised by motion of the push bar 18 in any direction, either inwardly, outwardly, to either side, or combinations of these motions, the rocker plates 38 being universally tilt-able. The piston 34 is biased downwardly by a centering spring 50 which holds the lever arm 40 vertical, the combined springs in all of the rheostat units 22 thus providing a centering or neutralizing action for the control ring 16.

At the inner end of the platform 26 is a generally upright post 52 carrying on its upper portion a resistor 54, illustrated as being a wire wound resistor and mounted on insulated spacers 56 offset from said post. Other types of resistors may be used, with suitable mountings, according to the degree of control required and the electrical power to be handled.

The upper end of the actuating rod 36 has a yoke 58 in which is pivotally mounted a guide bar 60, one end of said guide bar having an offset tongue 62 which slides on the upright face of post 52 on the side remote from the resistor 54. Attached to the guide bar 60 is a resilient contact wiper 64 mounted on an insulated pillar 66 and having a wiper tip 68 which slides over the resistor 54, the wiper tip being held in proper contact by the tongue 62 riding on post 52, as in Figure 5. The other end of the guide bar 60 is pivotally connected to a link 70, the lower end of which is pivotally attached to a lug 72 on the platform 26, so providing a tie-down for one end of the guide bar.

When the piston 34 is raised, the actuating rod 36 swings the guide bar 60 upwardly and slides the wiper tip 68 over the resistor 54. For maximum efficiency the resistor 54 may be disposed at a slight angle from the upright, to lie generally tangential to the arc of motion of wiper tip 68.

One end of each resistor 54 is open, or not connected, the other end thereof having a lead 74, and each contact wiper 64 is provided with a lead 76. With reference to Figure 3, it will be seen that the resistors 54 are connected in series by coupling the lead 74 of each resistor to the lead 76 of the contact wiper 64 in the next adjacent rheostat unit. The two ends of the series resistance circuit are connected through the motor 78, which is to be controlled, to power supply terminals 80. The mechanical linkages from contact wipers 64 to the control ring 16 are indicated in broken line. The mechanism is preferably enclosed by a cover 82 resting on top of the base skirt 12, the cover being suitably shaped to clear the

rheostat units 22 and connect with the pedestal 10 to form an integral portion of the lower structure thereof.

In the neutral position with the control ring 16 centered, the contact wipers 64 are all positioned at the lower ends of resistors 54, just clear of the resistance windings, so that the circuit is open and motor 78 is off. Any eccentric displacement of the control ring 16 by the foot, indicated at 34 in Figure 1, starts to tilt all the lever arms 40 and causes all of the contact wipers 64 to move the slight distance necessary to make contact with their respective resistors 54 and complete the circuit. In this position, substantially the full length of each resistor 54 is in the circuit, the total resistance being at maximum for low motor speed. As the control ring 16 is deflected further, the tilted rocker plates 38 raise the pistons 34 and slide the contact wipers 64 along their respective resistors 54, so reducing total resistance and increasing motor speed.

By turning the foot on a heel pivot point, as indicated at 86 in Figure 1, the control ring 16 can be deflected as needed for accurate motor control. Since the motor speed is governed by the sum resistance of all the rheostat units 22, the control ring 16 can be deflected in any direction by either foot, without the necessity for shifting the feet or losing balance. By spacing the rheostat units 22 around the periphery of the structure, any heat generated in the resistors 54 is widely distributed and therefore more easily dissipated, so avoiding overheating of any particular area.

The control assembly is particularly suitable for use with dental chairs, where both the dentist's hands may be occupied in a delicate operation which requires a steady stance, such as in the "plantar position" with both feet firmly on the floor. Normally a foot operated, pedal type switch is used which provides several different speeds of the dental tool. With the multiple rheostat control, infinite speed variation, within the operating range of the motor, can be obtained and, when the control ring 16 is released, power is automatically shut off as the mechanism is centered by springs 50. Foot pressure on top of the control ring 16 has no effect, so that inadvertent stepping or standing on the ring cannot operate the motor. The operation of the control assembly from any position around the control ring 16 is also especially advantageous when a revolving dental chair is used, since no shifting of a separate foot controlled switch is necessary, as with conventional controls.

The fully enclosed mechanism is virtually jam free and no exposed wiring or cables are present. No part of the control means need be touched by the hands, which is important in maintaining sterile conditions.

The mechanism is equally useful in conjunction with power tools such as a drill press, bandsaw, or the like, where both hands may be occupied in holding and guiding a work piece. For such purposes, the control ring 16 need not necessarily be circular, but can be shaped to suit the particular tool and operating area, the rheostat units 22 being positioned to suit. As a simplification, the piston and rocker plate structure may be used merely as a centering mechanism and the contact wipers 64 mounted directly on the push bars 18, to slide over suitably positioned resistors, thus eliminating the pivoted linkage, the actual coupling of the resistances being a matter of choice. Since the rheostat units are universally actuated by the control ring, various means of coupling may be used for different installations.

To simplify addition of the device to existing dental chairs and power tools, the control ring 16 may be split diametrically and connected at one separation by a hinge 88, the other separation being secured in place by a spring catch 90 and pin 92, or any other suitable fastener. The base skirt 12 and cover 82 are also split diametrically to open with the control ring 16 and fit around a tool pedestal. The base skirt 12 is preferably secured to the floor by screws or the like through the flange 14, which

holds the assembly firmly in place, but both the skirt and cover 82 may be provided with catches similar to catch 90 if necessary to connect the parts tightly.

As an alternative, the control assembly may be made as a separate structure rather than built around the base of a machine, in order to provide an accurate speed control operable from a variety of working positions.

An advantage of the instant invention will now be easily appreciated, namely, the improved health of an operator of equipment with this rheostat control, as compared to the health of an operator of equipment with existing types of rheostat controls. The occupational hazards or diseases involved include "drop shoulder," varicose veins, abnormal curvature of the spine and other skeletal defects, all stemming from improper working posture attributable to unbalanced standing position. Conventional rheostats usually, if not always, demand that the operator stand in some position other than the proper plantar position. This feature will be all the more fully appreciated when it is recalled that the operator, when forced to move from one position to another, is prone to attempt to reach a conventional rheostat at a distance rather than interrupt his work to move the rheostat. In this invention, the rheostat remains positioned for optimum convenience of the operator regardless of his movement around the tool.

The operation of this invention will be clearly comprehended from a consideration of the foregoing description of the mechanical details thereof, taken in connection with the drawings and the above recited objects. It will be obvious that all said objects are amply achieved by this invention.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawings are to be considered as merely illustrative rather than limiting.

I claim:

1. A foot actuated control, comprising: a base element; a control ring mounted on and surrounding said base element; said control ring being movable horizontally about said base element; a plurality of rheostats coupled in series; and universally pivotal coupling means operatively connecting said rheostats to said control ring; said rheostats sensing movement of said control ring in different directions, whereby any horizontal motion of the control ring causes variation in the sum resistance of said rheostats.

2. A foot actuated control, comprising: a base element; a control ring mounted on and surrounding said base element; said control ring being movable horizontally about said base element; a plurality of rheostats coupled in series; and universally pivotal coupling means operatively connecting said rheostats to said control ring; said rheostats sensing movement of said control ring in different directions, whereby any horizontal motion of the control ring causes variation in the sum resistance of said rheostats; and spring means engaging said coupling means to bias said control ring toward a predetermined neutral position.

3. A foot actuated control according to claim 2, wherein said rheostats are spaced circumferentially around said base element.

4. A foot actuated control, comprising: a floor engaging base element; a control ring mounted on and surrounding said base element adjacent the floor; a plurality of spaced push bars fixed to said control ring and extending inwardly into said base element; said control ring being movable eccentrically about said base element; a plurality of rheostats coupled in series; said rheostats being operatively connected to said push bars, whereby eccentric motion of said control ring causes variation in the sum resistance of said rheostats.

5. A foot actuated control, comprising: a floor engaging base element; a control ring mounted on and sur-

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rounding said base element adjacent the floor; a plurality of spaced push bars fixed to said control ring and extending inwardly into said base element; said control ring being movable eccentrically about said base element; universally pivotal lever means connecting said push bars to said base element; centering springs engaging said lever means to hold said control ring in a neutral position; a plurality of rheostats coupled in series; said rheostats being operatively connected to said push bars, whereby eccentric motion of said control ring from said neutral position causes variation in the sum resistance of said rheostats.

6. A foot actuated control, comprising: a floor engaging base element; a control ring mounted on and surrounding said base element adjacent the floor; a plurality of spaced push bars fixed to said control ring and extending inwardly into said base element; said control ring being movable eccentrically about said base element; a rheostat unit mounted on said base element adjacent

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each of said push bars; each of said rheostat units including a bracket having a rheostat mounted thereon; universally pivotal levers mounted on said brackets and coupled to the adjacent push bars; spring centering means engaging said levers to hold said control ring in a neutral position; said rheostats being operatively connected to said levers, whereby eccentric motion of said control ring from said neutral position causes variation in the sum resistance of said rheostats.

7. A foot actuated rheostat control according to claim 6, wherein said rheostats are in open circuit positions when said control ring is in said neutral position and are moved to maximum resistance positions by initial eccentric motion of the control ring; further eccentric motion of said control ring causing a reduction in the sum resistance of said rheostats.

No references cited.