

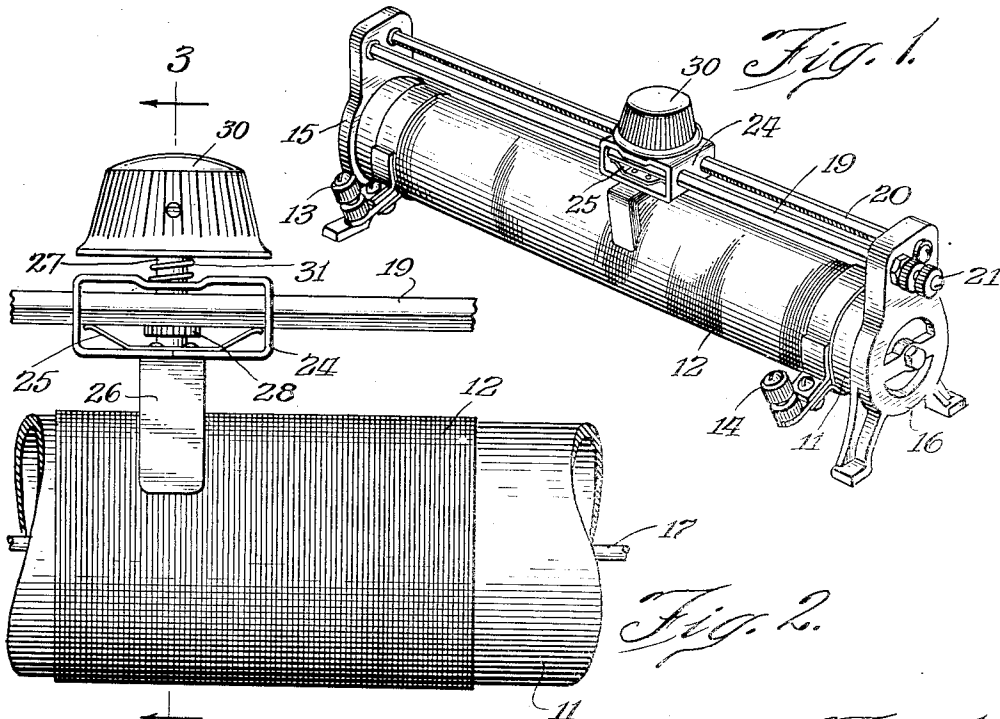
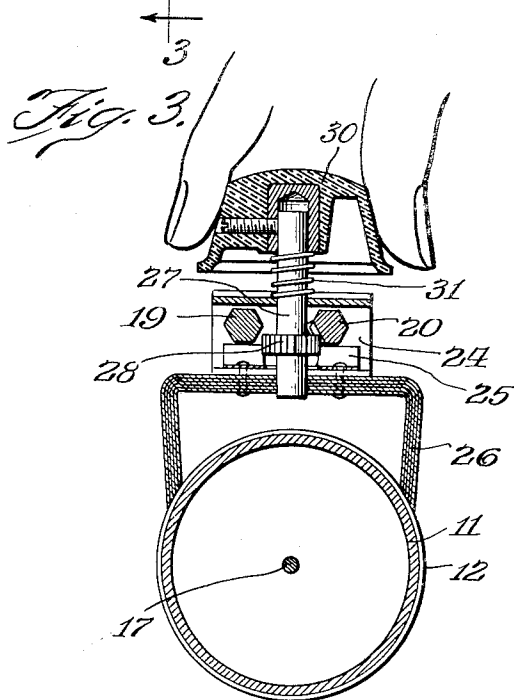
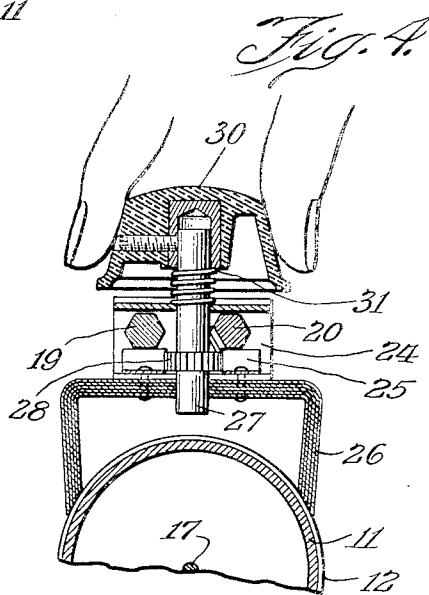
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RHEOSTAT

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RHEOSTAT

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The present invention relates generally to rheostats and more particularly to the type of rheostat known as a slide wire rheostat.

Slide wire rheostats are commonly used in laboratories both for experimental and permanent "set-ups" where it is desired to have adjustable or variable resistance elements in an electric circuit. Such a rheostat commonly comprises a tubular member about which is wound a helix of resistance wire, and a contact member is arranged to be adjusted longitudinally of the tubular member making contact with the wire so as to adjust the amount of wire resistance included in the circuit. In making adjustments it is frequently desired that means should be provided for slowly moving the slider along the wire in order to enable the operator to conveniently adjust the slider accurately to some desired resistance value. It is also desirable that a rapid motion should also be permitted to enable the operator to quickly move the slider from one portion of the resistance element to another, so as to avoid the necessity of operating the slow motion device through a considerable distance. To this end, means may be provided for dis-engaging the slow motion device so as to leave the slider free to be pushed quickly from one position to another.

In rheostats heretofore known to the art the sliders have been provided with a number of operating handles for executing the several types of motion. Thus, certain types of rheostats equipped with slow motion devices have provided as many as three separate control handles, for effecting slow motion, for disengaging the slow motion drive and for effecting rapid motion.

In using rheostats of this type it is frequently desirable and convenient to employ first a rapid motion to bring the slider to approximately the desired position and then to employ the slow motion drive in order to conveniently bring the slider accurately to the proper position. Furthermore, it is frequently desirable that this be done while the operator directs his attention to some other piece of apparatus, as for example a meter, and it is frequently a source of considerable inconvenience to the operator to have to shift his hand from one operating handle to another even where they are so closely spaced that he might with practice shift his hand from one operating handle to another without taking his eyes off the meter which he is watching.

The primary object of the invention is to provide an improved rheostat of the character described. A more specific object is to provide a

rheostat slider equipped with a slow motion drive in which all operations may be made by the manipulation of a single handle or knob.

It is a further object of the invention to provide a rheostat slider equipped with a slow motion drive in which the handle is so formed with respect to the manipulations required for operation that the knob fits firmly, easily and naturally into the hand or fingers of the operator for all purposes of control.

A still further object is to provide such a rheostat having "finger tip" control.

Other objects and advantages will appear hereinafter.

In order to better acquaint those skilled in the art with the teachings and practice of the present invention, I shall now describe a specific embodiment thereof, reference being had to the accompanying drawing, forming a part of this specification, and in which:

Figure 1 is a pictorial view of the rheostat embodying the present invention;

Figure 2 is a fractional side elevational view of the rheostat of Figure 1 showing a detail of the slider carriage;

Figure 3 is an end section taken through the carriage along the line 3—3 of Figure 2;

Figure 4 is a view similar to Figure 3 showing the operating mechanism in a different position.

The rheostat comprises a tubular insulating support member 11 about which is wound a helix of wire 12, the ends of which are secured to a pair of terminals 13 and 14. The insulating member 11 is supported in end brackets 15 and 16 which are secured in place by a rod 17 running between them through the center of the tubular support member 11. The end brackets 15 and 16 also carry a pair of guide rods 19 and 20. The guide rod 20 has a rack cut in one of its faces. These guide rods are electrically insulated from the end brackets 15 and 16 by suitable insulated washers, and a terminal 21 is electrically connected to one of the rods.

The guide rods 19 and 20 carry a slider which comprises a formed metal frame 24 having a pair of opposed apertures to receive the guide rods 19 and 20. The two apertures for receiving the guide rod 20 are slightly enlarged near the rack so as to avoid any possibility of the engagement with the teeth of the rack. A spring 25 located within the frame 24 bears upwardly against the smooth surfaces of the two guide rods 19 and 20 to provide a good electrical connection between the carriage and the guides at all times. A stack of formed contact springs 26 is

secured to the underside of the frame 24, and these springs individually bear against the wire of the helical winding to make electrical contact therewith. Generally, the helix may consist of a wire having a thin insulated coating so as to insulate the adjacent turns of wire from each other, in which case a portion of the insulation will be removed after the helix is wound to provide a track of exposed metal for contact with the spring 26 to permit electrical contact between the slider and the individual turns of wire. The frictional drag occasioned by the spring 25 and the contact springs 26 provides a sufficient braking action so that the operator will not inadvertently move the slider when taking hold or letting go of the knob or handle.

Located centrally in the frame 24 of the slider carriage, is a vertical shaft 27 carrying a spur gear 28. As will be noted, from Figures 3 and 4, the guide rods 19 and 20 are positioned unsymmetrically with respect to the center of the carriage, guide rod 20 which carries the rack being positioned closer to the center than the guide rod 19. The guide rod 20 is so oriented as to incline the face which has the rack and to face the same downwards towards the center of the carriage. The upper corners of the teeth of the spur gear 28 are adapted to engage this inclined rack. The shaft 27 and spur gear 28 are further adapted to shift axially of the rod 27 to move the gear 28 out of and into engagement with the rack.

The shaft 28 extends vertically from the slider carriage and has a knob or handle 30 secured thereto. A spring 31 encircling the shaft 27 is interposed between the knob 30 and the frame 24 of the slider carriage to urge the shaft, gear and knob upwards and to normally hold the gear in engagement with the rack.

Rotation of the knob 30 rotates the gear 28 and since this gear is normally held in engagement with the rack, this rotation drives the slider along the rack and along the resistance element 12 to provide the slow motion drive. Depressing the knob shifts the gear out of engagement with the rack and permits the slider to be pushed or shoved rapidly along the resistance element.

The spur gear conveniently may be provided with standard involute teeth having a $14\frac{1}{2}$ degree pressure angle. The teeth of the rack will have the same pitch as the teeth of the gear but will have a greater pressure angle and will be cut shallower so that the horizontal section through the inclined rack will show the outline of a standard tooth.

The spur gear and inclined rack cooperate to provide a drive which is positive in operation, free from back-lash and convenient to manipulate. Any mechanical variations or imperfections in the gear or rack, whether they be due to manufacturing tolerance or wear, is automatically taken up by the spring 31. Furthermore, when the gear is being engaged with the rack, and interference of the teeth occurs at their narrow tips so that they readily and easily slip into mesh.

Knob 30 is slightly tapered being larger in its lower portion than its upper to facilitate the manipulation thereof by the operator. Thus, when it is desired to effect the slow motion of the slider along the resistance element, the operator merely turns the knob 30, gripping it lightly with the ends of his fingers as is shown in Figure 3. To effect a rapid motion of the carriage,

the operator may place his fingers in the same position on the knob 30 and depress the same. In so doing there will be very little tendency for his fingers to slide off the knob because of its taper. Furthermore, the entire upper surface of the knob is available for the operator to bear against with his fingers in depressing the knob. With the knob depressed, the operator may quickly and easily move the slider to any part of the resistance element by exerting a pressure on one side of the knob.

Because the knob is tapered, it presents an inclined surface to the fingers of the operator, so that the force exerted to move the slider along the resistance element also tends to hold the knob and gear depressed. Usually, the operator will actually exert a force substantially normal to the surface in order to minimize the tendency of his hand to slip on the knob and in so doing he will direct the force against the knob partially downward thus providing a downward component of force for holding the knob depressed. The operator may also place one finger on the top of the knob 30 in addition to the fingers grasping the tapered sides thereof and then by pressing both on the top and side of the knob effect the same result.

It is thus seen that the present invention provides a rheostat having a slow motion drive with true "finger tip" control. The operator may change quickly and naturally from rapid motion to a micrometer precision control or vice versa by means of a slight change in pressure on the control knob. The operator may shift the carriage immediately to any part of the rheostat winding and then without changing the position of his hand, shift to the slow-motion, micrometer adjustment.

It will be apparent to those skilled in the art that the form and embodiment herein described is merely illustrative. I therefore do not wish to be limited except by the scope of the appended claims.

I claim:

1. In a rheostat, a resistance element, a slider movable along said element, a slow motion device on said slider for driving it along said element, a handle extending from said slider, and means operatively connecting said handle to said slow motion device, said handle being rotatable about an axis which is substantially perpendicular to the direction of motion of said slider along said resistance element to drive said slow motion device, said handle being also shiftable in the direction of said axis towards said slider to disable said slow motion device.

2. In combination, a guide, a carriage movable along said guide, a driving element in said carriage rotatable about an axis substantially perpendicular to the direction of motion of said carriage along said guide, said driving element being shiftable in said carriage in a direction substantially parallel to said axis into and out of driving engagement with said guide, a spring urging said driving element into driving engagement with said guide, a handle carried by said driving element shiftable and rotatable therewith for manually rotating and shifting said element and for manually pushing said carriage along said guide while holding said driving element out of driving engagement with said guide.

3. In combination a guide, a carriage movable along said guide, a rotatable driving element on said carriage normally engaging said guide for driving said carriage along said guide, and a

handle on said driving element for permitting manual rotation of said rotatable driving element and manual shifting thereof out of driving engagement with said guide and permitting manual shoving of said carriage along said guide, said handle having a surface for engagement with the hand of an operator which is so inclined to the direction of motion of said slider along said guide and to the direction in which said handle moves to shift said driving element as aforesaid that a force exerted against said surface in a direction normal thereto may have both a component urging said driving element out of engagement with said guide and a component urging said carriage along said guide.

4. In a rheostat, a resistance element, a slider movable along said element, a slow motion device on said slider for driving it along said resistance element, a handle rotatable about an axis for driving said slow motion device, and shiftable in one direction of said axis for disengaging said slow motion device, a spring for urging said handle in the other direction of said axis, said handle having a surface portion which has one diameter at one point of said axis and has a smaller diameter at another point of said axis, said other point of said axis being in said other direction of said axis from the first point.

5. In a rheostat, a resistance element, a slider movable along said element, a rack, a gear carried by said slider and shiftable into and out of engagement with said rack, and a handle attached to said gear, said gear being rotatable about an axis inclined to the face of said rack.

6. In a rheostat, a resistance element, a slider movable along said element and a slow motion device on said slider for driving it along said element including a member extending from said slider, said member being rotatable about an axis which is substantially perpendicular to the direction of motion of said slider along said resistance element to drive said slow motion device, said member being also shiftable along said axis to disable said slow motion device, said member including a handle portion adapted to be engaged by the hand of an operator.

7. In combination, a guide, a carriage movable along said guide, a slow motion device for driving said carriage along said guide, and a handle on said carriage operatively connected to said slow motion device, said handle being rotatable about an axis substantially perpendicular to the direction of motion of said carriage along said guide for driving said slow motion device, said handle being shiftable in a direction substantially perpendicular to the direction of motion of said carriage along said guide for disabling said slow motion device.

8. In a rheostat, a resistance element, a slider movable along said element, a rack, a spur gear carried by said slider and shiftable into and out of engagement with said rack, said gear having substantially standard involute teeth, said gear being rotatable about an axis inclined to the face of said rack at an angle of approximately thirty degrees.

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