

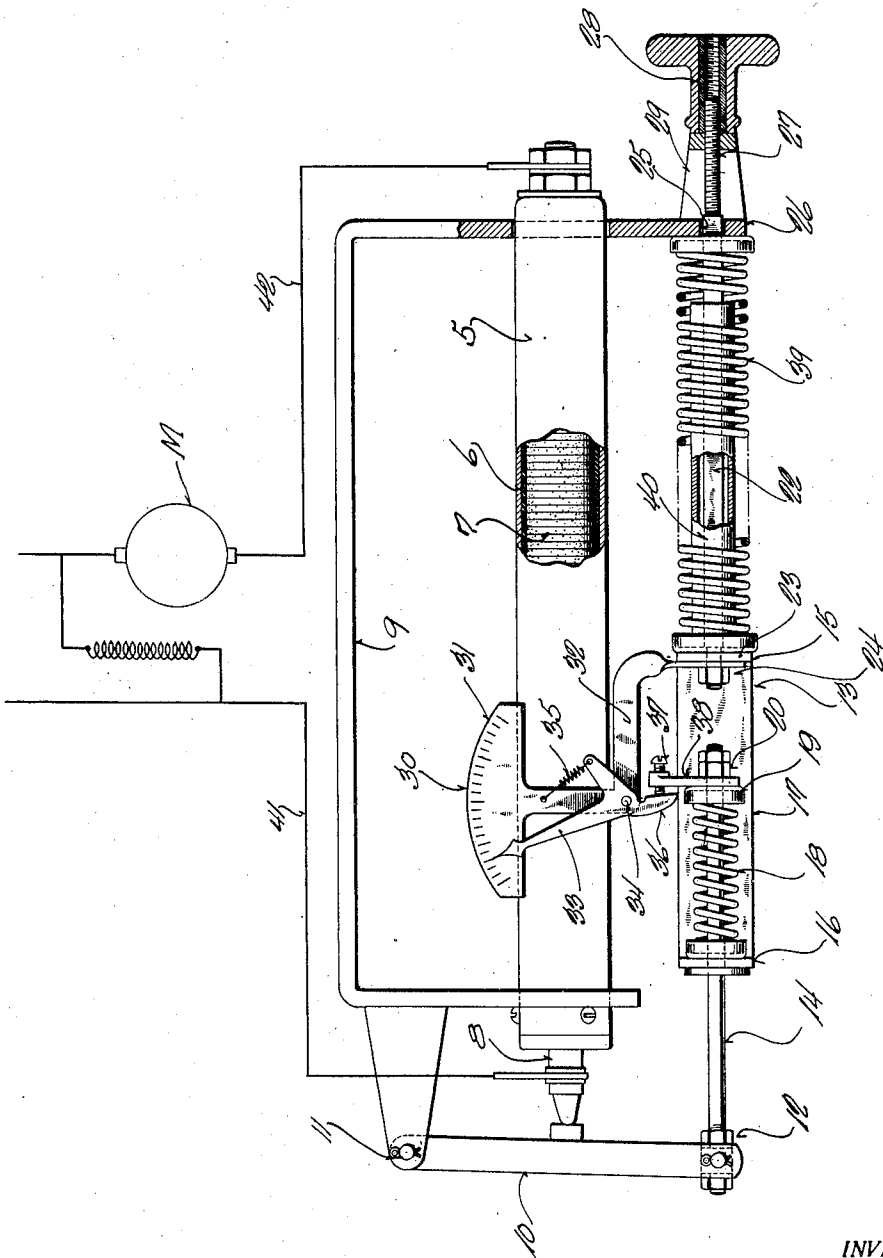
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COMPRESSIBLE ELECTRICAL RESISTOR

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COMPRESSIBLE ELECTRICAL RESISTOR

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This invention relates to certain new and useful improvements in means for actuating variable resistors of the compressible carbon pile type and refers more particularly to means whereby any definite, predetermined pressure may be impressed on the resistor to impose a definite, predetermined resistance in the electrical circuit in which the resistor is included.

Electrical controlling devices embodying carbon pile resistors usually comprise suitable switch gears and means for subjecting the carbon piles to pressure, which means are often called upon to exert relatively high pressures, in some instances exceeding 1000 pounds, and to operate several hundred times a day. As it is desirable that the space occupied by these devices be as small as possible, the various members are of necessity in close proximity to the resistors and in consequence are subjected to considerable temperature.

It is further desirable that the apparatus be as light in weight as practicable and for that reason a minimum amount of material is used in their construction. As a result, a control device after having been subjected to a considerable amount of use, will frequently have its members more or less deformed both from the stress and heat to which the same has been subjected. Further, the pile itself suffers a reduction in overall height after a period of use due to wear on the contacting surfaces of the component parts of the pile and a general contracting of the pile due to the settling or shaking down of the parts thereof. Also in operation, the carbon pile is subjected to a measurable amount of expansion resulting from heat generated therein so that its overall length varies considerably in use.

For this reason, it has been impractical to provide the hand lever or other pressure applying means with a pointer and an index, as exemplified in the patent to Ray No. 1,092,952 for the purpose of indicating the actual pressure applied to the resistor and, consequently, the resistance value of the resistor at any practical setting of the lever, such a structure accomplishing no other purpose than to merely indicate the position of the lever which is a useless function inasmuch as it is of no value in determining the operating characteristics of the control. This latter information is obtainable only by an index which will actually indicate the pressure applied to the carbon pile regardless of what deformation of the frame work or changes in the height of the carbon pile may take place

due to wear or expansion and contraction or the like.

Therefore, it is a primary object of my invention to provide means whereby the actual pressure applied to a compressible electrical resistor at any position of the operating member, irrespective of the condition of the parts thereof, is accurately determined.

Another object of this invention resides in means for visually indicating the actual pressure applied to a compressible electrical resistor at any position of the pressure applying member.

It is a further object of this invention to provide means associated with the actuating member or pull rod for operating a pressure head to compress a compressible electrical resistor which at all times indicates the actual pressure applied to the resistor.

And a still further object of this invention resides in the provision of a simplified type of pressure indicator for compressible resistors comprising means capable of ready application to a resistor unit either at the time of manufacture or after its manufacture and which readily indicates the true measure of pressure directly impressed on the resistor.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

In the accompanying drawing, I have illustrated one complete example of the physical embodiment of my invention, constructed according to the best mode I have so far devised for the practical application of the principles thereof, and in which:

The single figure is a side view of a compressible electrical resistor unit equipped with one of my improved measuring devices, parts thereof being broken away and in section to more clearly illustrate details of construction.

Referring now more particularly to the accompanying drawing, in which like numerals designate like parts throughout the several views, the numeral 5 designates a compressible electrical resistor comprising an enclosing tube 6 having a pile of carbonaceous material or stack of carbonaceous discs 7 adapted to be compressed within the tube by a plunger 8. The resistor is mounted in a suitable frame 9 and

the plunger 8 is engageable by a compression or actuating head 10, one end of which is pivotally mounted, as at 11, and the other end of which is adjustably connected, as at 12, with a pull rod or actuating element indicated generally by the numeral 13.

The pull rod or actuating element 13 is in two sections 14 and 15 yieldably connected in a manner to be described. The section 14 consists of a rod having one end pivotally connected with the compression head 10 and having its other end portion slidably passed through one laterally directed end 16 of a yoke member 17 which forms part of the actuating element section 15. An expansive spring 18 coiled about the end portion of the rod extended through the yoke end 16 and confined between said end of the yoke member and a cup shaped washer or retainer 19 adjustably secured on the extreme inner end of the rod forming the section 14 by nuts 20, provides the yielding connection between the actuating element sections.

The actuating element section 15 comprises the yoke member 17 and a rod 22 secured at one end to the other laterally directed end 23 of the yoke member by a nut 24. The other end of the rod 22 is freely slidably received in an opening 25 formed in a suitable support 26 which may be part of the frame 9, and has its extreme end portion externally threaded, as at 27, to receive a pressure applying hand wheel 28. The inner end of the hand wheel 28 abuts against a stop member 29 carried by the support 26 and the rod 22, at least at its portion adjacent the opening 25, is square, so that upon rotation of the hand wheel in one direction, section 15 of the pressure applying element which consists of the rod 22 and the yoke member 17, is pulled toward the hand wheel. This motion of the section 15 is imparted to the section 14 through the spring 18 to impose pressure on the resistor and as spring 18 yields during the application of pressure to the resistor, relative motion takes place between the sections 14 and 15 and as this relative motion is in direct proportion to the state of compression of the resistor, it provides means whereby the pressure on the resistor may be accurately measured.

The relative motion between the sections 14 and 15 is visibly indicated by an indicating device 30 which may be of any suitable type or design and in the present instance comprises a dial 31 provided with a scale or other proper indicia and supported by an arm 32 from the pressure applying element section 15, and a pointer 33 pivotally mounted from the dial, as at 34, and normally yieldably urged in one direction by a tension spring 35. A toe 36 carried by the pointer is at all times held against a screw 37 secured in an arm 38 carried by the pressure applying element section 14, by the spring 35, so that upon relative motion between the sections 14 and 15 the pointer will be caused to swing about its pivotal mounting and indicate the degree of relative motion taking place between the sections, and as this relative motion between the sections is at all times in proportion to the exact state of pressure to which the resistance unit is subjected, the position of pointer 33 on the dial visibly indicates the true pressure on the resistor.

Movement of the actuating member 13 to apply pressure to the resistor unit is yieldably opposed by an expansive spring 39 coiled about the rod 22 and confined between the end 23 of

the yoke member and the support 26. The spring 39 assists the spring 18 in moving the pressure applying element and the compression head to its inoperative position upon retrograde movement of the hand wheel; and to prevent overtravel of the pressure applying element, a sleeve 40 is mounted on the rod 22 and within the convolutions of the spring 39, which is of such length as to permit only the proper degree of motion.

As will be readily apparent the resistor unit 5 may be used to control the current flowing to any electrical translating device and in the present instance is diagrammatically shown connected by lines 41 and 42, with a conventional D. C. motor M.

From the foregoing description taken in connection with the accompanying drawing, it will be readily apparent to those skilled in the art to which an invention of the character described appertains, that in its broadest embodiment my invention resides in interposing a yieldable element or spring between the action and reaction compressing the resistor and in utilizing the motion of the yieldable element to operate an indicating device, and that inasmuch as the yieldable element is bodily movable with the pressure applying structure during the taking up of slack and during any other motion of the pressure applying structure prior to the actual application of pressure to the resistor, or in other words, during any action of the pressure applying structure which performs no actual work, no motion results in the yieldable element until pressure is actually being applied to the resistor so that the indicating device accurately registers the exact pressure on the resistor regardless of what deformation in the supporting frame or changes in the characteristics in the unit may take place. It is further noted that the indicating device responds to movement of either section of the pressure applying element so that a change in the characteristics of the resistor due to expansion or contraction arising from temperature variations after the adjusting device is set and which results in a variation in the pressure on the resistor per se, is also registered on the indicating device. From this it appears that my invention provides a simple and effective means for determining at all times the exact degree of compression to which a compressible rheostat may be subjected.

What I claim as my invention is:

1. In combination with a compressible electrical resistor, means for indicating the pressure on the resistor comprising a member engageable with the resistor, means for adjusting the pressure on the resistor including a member yieldably connected with said first mentioned member, said members moving relative to each other during the application of pressure to the resistor, and an indicator operable by relative motion between said members.

2. In combination with a compressible electrical resistor, means for applying pressure to said resistor, including yieldably connected members relatively movable upon any change in pressure on the resistor, and means for determining the pressure on the resistor, comprising an indicator having relatively movable elements one connected with each of said yieldably connected members whereby relative motion between said members produces a corresponding relative motion between said indicator elements.

3. In combination with a compressible electrical resistor, means for indicating the pressure on the resistor comprising a member engageable with the resistor, means for adjusting the pressure on the resistor including a member yieldably connected with said first mentioned member, said members moving relative to each other during the application of pressure to the resistor, and an indicator operable by relative motion between said members.

cal resistor, means for applying pressure to the resistor including means yieldable in proportion to the pressure on the resistor, and indicating means operable in accordance with the motion of said yieldable means to indicate the degree of pressure on said resistor.

4. In combination with a compressible electrical resistor, means for applying pressure to said resistor including a compression head, a pressure applying element, means yieldably connecting the compression head and the pressure applying element whereby relative motion takes place between said compression head and pressure applying element upon any change in pressure on the resistor, and means for determining the pressure on the resistor comprising an indicator having cooperating movable elements one of which is movable with the compression head and the other with the pressure applying element.

5. In combination with a compressible electrical resistor, a support for the resistor, compressing means engageable with the compressible resistor and operable to compress the resistor between it and the support, yieldable means interposed in series with the resistor and including its support and compressing means and yieldable in proportion to the compression on the resistor and indicating means having a part movable with the yieldable means to register the pressure on said resistor.

6. In combination with a compressible electrical resistor including a depressible part, means for applying pressure to the resistor comprising movable means to engage the depressible part, two relatively movable members one of which is connected to said means, a spring to connect said members, and means to actuate the other of said members to apply force to the means engaging said depressible part, the spring yielding during the application of such force and expanding or contracting during any change in the pressure on the resistor whereby said members move relatively proportionately to pressure changes on the resistor, and means to utilize the relative motion between said members to indicate the pressure on the resistor.

7. In combination with a compressible electrical resistor including a depressible part, means for applying pressure to the resistor comprising movable means to engage the depressible part, two relatively movable members one of which is connected to said means, a spring to connect said members, and means to actuate

the other of said members to apply force to the means engaging said depressible part, the spring yielding during the application of such force and expanding or contracting during any change in the pressure on the resistor whereby said members move relatively proportionately to pressure changes on the resistor, and means to utilize the relative motion between said members to indicate the pressure on the resistor, said means comprising a scale movable with one member and a pointer to traverse the scale and movable with the other member.

8. In combination with a compressible electrical resistor including a depressible plunger, means engaging said plunger to impart compression forces thereto, means to actuate said means comprising a rod connected with said means and having an abutment remote therefrom, a member having a part freely slidably engaged with said rod and disposed in line with said abutment on the rod, a spring coiled about the rod and interposed between said abutment and said freely slidably mounted part, actuating means connected to said member to move the same and impart motion to the rod through the spring to apply pressure to the resistor plunger, said rod moving relative to said member connected therewith during the application of such force, and means to indicate the pressure on the resistor comprising cooperating elements relatively movable and one connected with said member and the other movable with the rod.

9. In combination with a compressible electrical resistor having a depressible plunger, a compression head engaging the plunger, means to apply force to the compression head to compress the resistor, comprising a rod connected to the compression head, a member having a part freely slidably connected with said rod, a spring confined between an abutment on said member and an abutment on the rod, actuating means connected with said member to draw the same away from the rod and apply force to the rod through the spring, said spring yielding during the application of such force to permit relative motion between the rod and said member which relative motion is directly proportional to the pressure on the resistor, and means to indicate the pressure on the resistor comprising a scale part and a pointer part movable relative to each other, means connecting one of said parts to said member, and means connecting the other part with the rod.

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