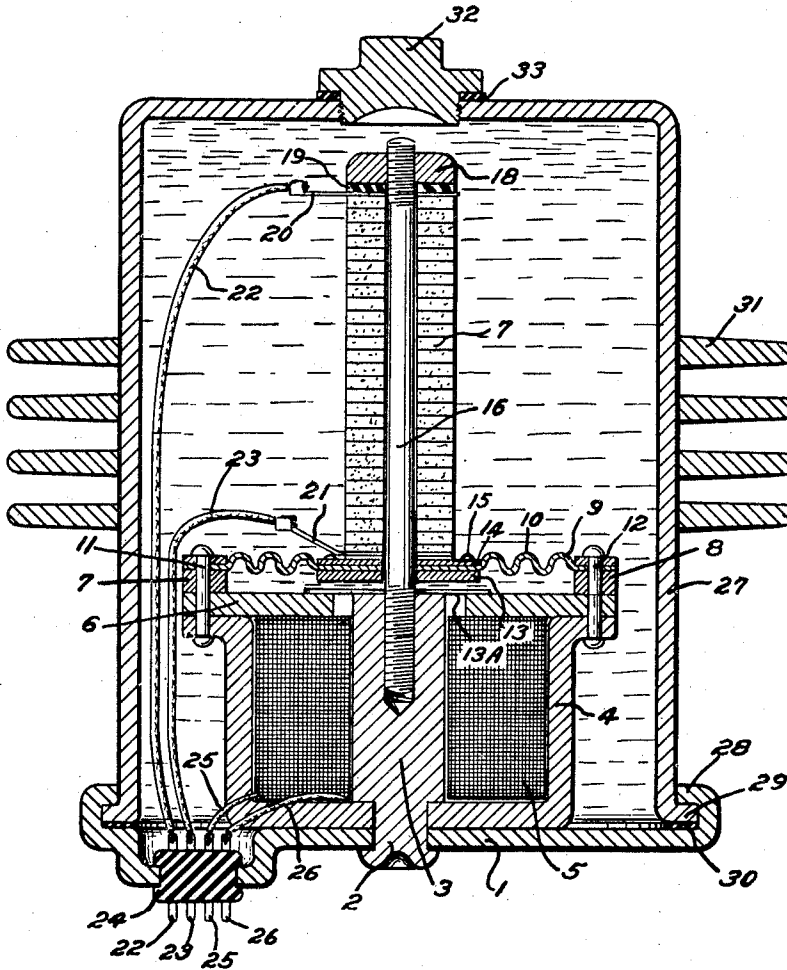


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W. G. NEILD
ELECTRIC REGULATOR
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INVENTOR
WILLIAM G. NEILD
BY *Herbert A. Dampf*
ATTORNEY

UNITED STATES PATENT OFFICE

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ELECTRIC REGULATOR

William Greene Nelid, Warren Point, N. J., assignor to Bendix Aviation Corporation, Teterboro, N. J., a corporation of Delaware

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The present invention deals with electrical regulators and is concerned primarily with regulators of the so-called "carbon pile type."

At the present time carbon pile regulators have come into widespread use for such purposes as controlling the voltage of the output of the generators and also in the governing of currents.

All of these carbon pile regulators operate on the principle of varying the pressure applied to the carbon pile; the range of effective pressure on the pile being the regulating range of the regulator.

There has now come into fairly widespread use a regulator which is characterized as including the usual carbon pile, one end of which is relatively fixed. Operatively associated with the other end to apply pressure on the pile, is an armature and this armature is carried by a spring of the leaf type having a plurality of spring fingers which engage at the extremities thereof, an inclined abutment formed on the electromagnet.

The force of the electromagnet is rendered effective on the armature, and the spring above referred to, tends to urge the armature towards the pile, while the magnetic force tends to withdraw the armature from the pile and to force the spring fingers into abutting relation along the inclined surface of the abutment provided on the electromagnet so as to approximately vary the force exerted by the spring inversely as the square of the distance between the armature and magnet so as to effect basic correspondence with the changes in the magnetic force.

With carbon pile regulators of this type considerable mechanical difficulty has been experienced in obtaining desired regulating effects due to the difficulties incident to calibrating the several spring fingers to the inclined abutment. so as to give the effect desired.

An object of the present invention is to simplify and improve the aforementioned regulator construction.

Another object of the invention is to provide a compact regulator of great efficiency and of such simplicity in construction as to adapt it for manufacture and installation at low cost.

Another object of the invention is to provide in a hermetically sealed container or housing, a carbon pile regulator arranged so that the regulator may be waterproof, dustproof, and fungus-proof and including in the container a liquid medium surrounding the carbon pile and tending to dampen the oscillation of the regulating armature, reduce the unbalanced weight of the car-

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bon pile due to buoyancy and better dissipate the heat from the carbon pile.

Another object of the invention is to provide a low cost regulator having parts readily made and assembled on a punch press and embodying an insulated stud for carrying the carbon discs rather than the heretofore expensive porcelain tubes.

Another object of the invention is to provide a sheet metal rectangular shaped corrugated armature spring having a spring characteristic which substantially matches the electromagnetic force acting upon the armature as the air gap varies and a fluid medium cooperating with the spring so as to retard vibration of the armature spring.

These and other objects and features of the invention are pointed out in the following description in terms of the embodiment thereof which is shown in the accompanying drawing. It is to be understood, however, that the drawing is for the purpose of illustration only, and is not designed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

Figure 1 is a fragmentary sectional view of a regulator embodying the invention.

Referring to the drawing there is provided a base plate 1 having riveted thereto at 2 an electromagnetic core 3. The core 3 is positioned within an electromagnet case 4 formed of a suitable ferromagnetic material and wound about the core 3 is an electromagnetic winding 5.

Fastened to the upper end of the case 4 is a top plate 6 and at opposite ends of the top plate 6 are bars 7 and 8. Extending between the bars 7 and 8 is a sheet metal spring 9 having corrugations 10 formed therein. The opposite ends of the sheet metal spring 9 are fastened to the bars 7 and 8, respectively, and the top plate 6 by rivets 11 and 12.

There are provided at opposite sides of the spring member 10 armature plates 13 and 14 which are fastened thereto by rivets 15. The armature plate 13 cooperates with the iron core 3 and a suitable disc 13A of copper, fish paper or other suitable non-magnetic material is arranged to prevent sticking of the armature 13 in the extreme downward position.

There is screw threadedly engaged in the core 3 a stud 16 which projects from the core 3 and through suitable openings formed in the armature plates 13 and 14 and the sheet metal spring member 9. The armature plates 13 and 14 are freely mounted on the stud 16.

The invar stud is electrically insulated in a suitable manner well known in the art or may in its preparation be dipped in vitreous enamel, baked, and then processed in a centerless grinder.

Slidably mounted on the insulated stud 16 are a series of carbon discs 17 arranged so as to form a carbon pile having a lower end bearing upon the armature plate 14 while the opposite or upper end is held by a self-locking adjustment nut 18 screw threadedly engaged on the stud 16. In this connection an insulating member 19 is positioned between the nut 18 and the upper end of the carbon pile 17.

An electrical connector 20 leads from the upper end of the carbon pile 17, while an electrical connector 21 leads from the lower end of the carbon pile 17. Electrical conductors 22 and 23 lead from the connectors 20 and 21, respectively, to an insulated terminal board 24 mounted in the base plate 1. Conductors 25 and 26 also lead from the terminal board 24 to the electromagnetic winding 5. The conductors 22, 23, 25 and 26 extend through the terminal board 24 for suitable external connection.

It is notable that the ends of the sheet metal spring member 9 are fastened to the bars 7 and 8 and suspend the armature 13 therebetween. Thus while the ends are closed by the bars 7 and 8 the sides are open.

It will be seen that axial movement of the armature 13 is accommodated by the kinks or corrugations 10 formed in the spring member 9. As set forth in my copending application Serial No. 612,691, filed August 25, 1945, now Patent #2,481,771, issued September 13, 1949, it has been found that by providing the sheet metal spring member 9 of suitable material and thickness and the corrugations 10 of proper depths basic correspondence with the varying magnet pull results, due to changes in the distance across the air gap, may be effected.

The entire regulator thus described may be assembled in a suitable can-like container or housing indicated by numeral 27 and the outer edge 28 of the base plate 1 rolled over a flange portion 29 of the can-like container 27. A sealing gasket 30 is interposed between the flange 29 and base plate 1.

Cooling fins 31 are fastened to the exterior surface of the can-like container 27 and a removable plug 32 is provided at the upper end of the container 27 so that adjustment of the pile 17 by nut 18 may be effected. The plug 32 has a sealing gasket 33.

The can-like container 27 may be filled upon removing plug 32 with a suitable gaseous medium or electric insulating liquid such as a suitable oil.

If such a liquid is used the same will tend to dampen any armature oscillation and reduce the unbalanced weight of the carbon pile 16 due to buoyancy and thereby permit the use of larger diameter carbon discs. Heretofore it has been necessary to make the piles of small diameter in order to reduce its effective weight.

Moreover the latter arrangement provides a compact and efficient regulator of such simplicity in construction as to readily adapt the same to mass production at low cost.

Although only one embodiment of the invention has been illustrated and described, various changes in the form and relative arrangements of the parts, which will now appear to those skilled in the art, may be made without departing from the scope of the invention. Reference

is, therefore, to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. An electric regulator comprising an electromagnetic including a core and an electromagnetic winding about said core, an armature operated by said electromagnet and cooperating with said core, a spring member opposing movement of said armature by said electromagnet, an electric resistance pile including a pile assemblage of resistance elements, a stud extending through said assemblage and fixedly mounted at one end to said core, said stud extending through said armature and spring member, said pile assemblage operably connected at one end to said armature, and a member positioned at the other end of said stud for securing said pile assemblage at its other end.

2. An electric regulator comprising an electromagnet including a core and an electromagnetic winding about said core, an armature operated by said electromagnet cooperating with said core, a spring member opposing movement of said armature by said electromagnet, an electric resistance pile including a pile assemblage of resistance elements, a stud extending through said assemblage and fixedly mounted at one end to said core, said stud extending through said armature and spring member, said pile assemblage operably connected at one end to said armature, a member positioned at the other end of said stud for securing said pile assemblage at its other end, a base plate having said electromagnet fixedly mounted thereon, and a housing for said regulator fastened to said base plate.

3. An electric regulator comprising an electromagnet including a core and an electromagnetic winding about said core, an armature operated by said electromagnet and cooperating with said core, a spring member opposing movement of said armature by said electromagnet, an electric resistance pile including a pile assemblage of resistance elements, a stud extending through said assemblage and fixedly mounted at one end to said core, said stud extending through said armature and spring member, said pile assemblage operably connected at one end to said armature, a member positioned at the other end of said stud for securing said pile assemblage at its other end, a base plate having said electromagnet fixedly mounted thereon, an insulated terminal board fastened in said base plate and having electrical conductors leading to said electromagnet and pile assemblage, and a can-like housing surrounding the electromagnet and pile assemblage in spaced relation and fastened to said base plate.

4. An electric regulator comprising an electromagnet including a core and an electromagnetic winding about said core, an armature operated by said electromagnet and cooperating with said core, a spring member opposing movement of said armature by said electromagnet, an electric resistance pile including a pile assemblage of resistance elements, a stud extending through said assemblage and fixedly mounted at one end to said core, said stud extending through said armature and spring member, said pile assemblage operably connected at one end to said armature, a member positioned at the other end of said stud for securing said pile assemblage at its other end, a base plate having said electromagnet fixedly mounted thereon, an insulated terminal board fastened in said base plate and having electrical conductors extending through said base plate to said electromagnet and pile assem-

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blage, a cam-like housing surrounding the electromagnet and pile assemblage in spaced relation and fastened to the base plate, and a liquid medium carried by the can-like housing adjacent the pile assemblage and armature to balance in part the weight of the pile assemblage.

5. A device of the character described, comprising, in combination, a base plate, a regulator assemblage fixedly mounted on said base plate including, an electromagnet having a core and an electromagnetic winding about said core, an armature operated by said electromagnet and cooperating with said core, a spring member opposing movement of said armature by said electromagnet, an electric resistance pile including a pile assemblage of resistance elements, a stud extending through said assemblage and fixedly mounted at one end to said core, said stud extending through said armature and spring member, said pile assemblage operably connected at one end to said armature, a member positioned at the other end of said stud for securing said pile assemblage at its other end; and a can-like housing for receiving said regulator assemblage, said housing surrounding said regulator assemblage in spaced relation and containing a liquid medium in which said regulator assemblage may be immersed so as to reduce the effective weight of the pile assemblage, and means fastening said base plate in said housing in sealing relation.

6. A device of the character described, comprising in combination, a base plate, a regulator assemblage fixedly mounted on said base plate including, an electromagnet having a core and an electromagnetic winding about said core, an armature operated by said electromagnet and cooperating with said core, a spring member op-

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posing movement of said armature by said electromagnet, an electric resistance pile including a pile assemblage of resistance elements, a stud extending through said assemblage and fixedly mounted at one end to said core, said stud extending through said armature and spring member, said pile assemblage operably connected at one end to said armature, a member positioned at the other end of said stud for securing said pile assemblage at its other end; and a can-like housing for receiving said regulator assemblage, said housing surrounding said regulator assemblage in spaced relation and containing a liquid medium in which said regulator assemblage may be immersed so as to reduce the effective weight of the pile assemblage, means fastening said base plate in said housing in sealing relation at one end of the housing, and a removable plug in the opposite end of said housing whereby the housing may be filled with the liquid medium and adjustment of said pile assemblage securing member may be effected upon removal of the plug.

WILLIAM GREENE NEILD.

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