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ELECTRIC HEATING ELEMENT

Filed Oct. 16, 1929

Fig. 1.

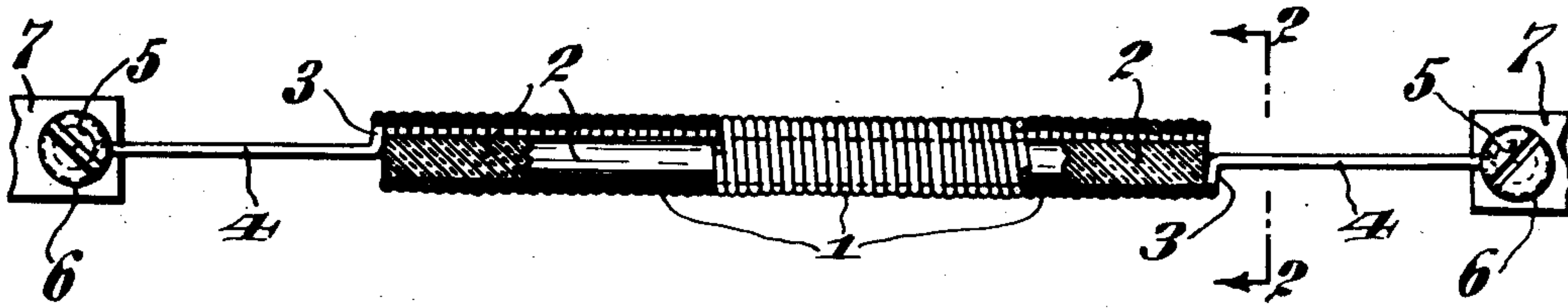


Fig. 2.



Fig. 3.

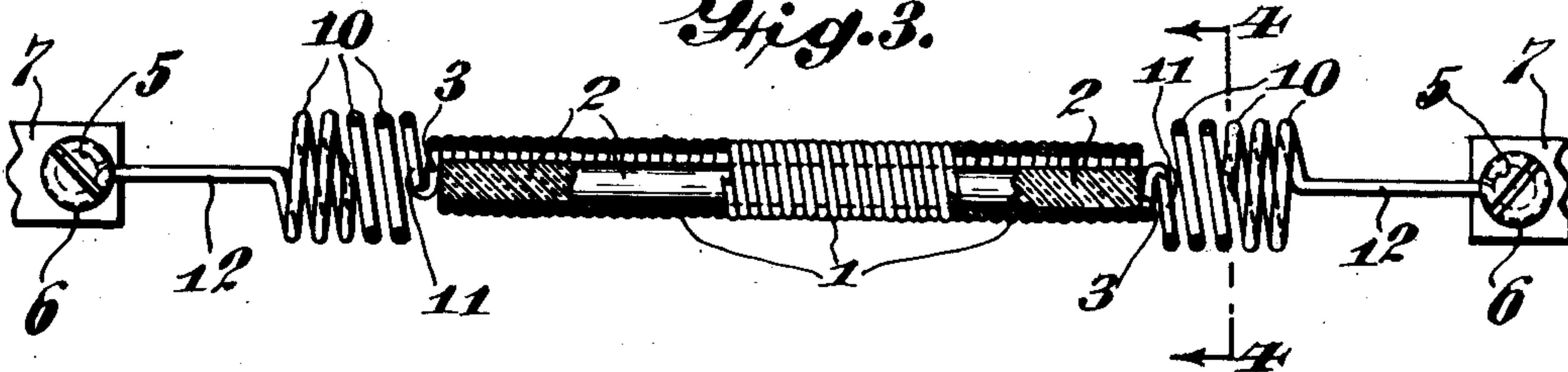
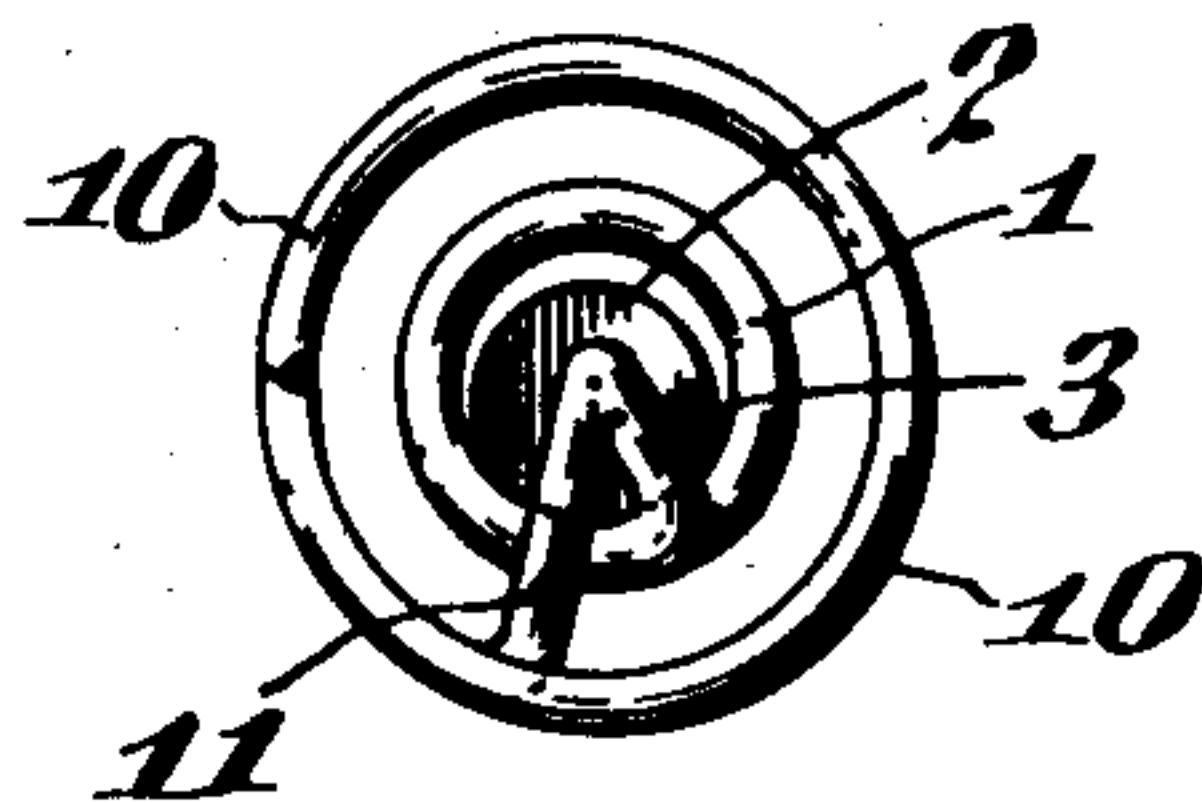


Fig. 4.



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UNITED STATES PATENT OFFICE

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ELECTRIC HEATING ELEMENT

Application filed October 16, 1929, Serial No. 399,926, and in Germany May 29, 1929.

My invention relates to an electric heating element comprising a coil or helix in which the adjoining turns are located in close or contactual relation with respect to each other and in which also the adjoining turns are insulated from each other by a suitable means of insulation. Heating elements of this character are very efficient in the radiation of heat but are open to the objection that when in use and when heated they may bend or sag, which bending or sagging may result in short circuiting the heating coil and thereby rendering the device ineffective and inoperative.

The general object of the invention is to provide means whereby coils of suitable electric current resisting material may be supported against sagging or bending and thereby rendered more practical for use as the heating elements of a heating means for an electric heater or other structure or structures.

It also is an object of the invention to provide a heating coil of the character indicated having means located within and supported by the coil to retain the same in normal condition by preventing distortion or displacement of the turns of the coil relatively to each other.

Other objects and advantages of the invention will be pointed out in the detailed description thereof which follows or will be apparent from such description.

In order that the invention may be readily understood and the practicability thereof rendered more apparent reference should be had to the accompanying drawing wherein I have illustrated certain embodiments of the invention in forms which at present are preferred by me.

In the drawing:

Fig. 1 is a view partly in side elevation and partly in longitudinal section of a heating element embodying the invention;

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to that shown in Fig. 1 but showing a somewhat different embodiment of the invention; and

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3.

or helix of wire of relatively small gauge, the turns of the said coil being in close or approximate relation to each other and the metal of the turns being prevented from contact by suitable insulation. Such insulation may and preferably does consist of a coating of oxide, preferably of the metal of which the wire consists, about the said wires. The insulating properties or characteristics of such coating of oxide are sufficient to prevent short circuiting between the adjoining turns of the coil or helix.

The wire of which the coil may be formed may consist of any suitable material but I prefer to employ for the wire a chrome-nickel alloy.

For preventing distortion of the coil or helix and for preventing substantial displacement of one turn of the coil relative to an adjoining or adjacent coil I have located within the coil or helix a rod 2 of suitable electric insulating material such as magnesia or other suitable material.

Materials of this character are brittle and if employed as the resistance element of an electric heating device are liable to break and thereby render the device inoperative. However, rods of such material may be employed as sustaining means within the coils, as indicated in Figs. 1 and 3, for retaining and sustaining the said coils in normal position. The presence of such a rod within a coil or helix prevents bending of the coil or helix and also prevents sagging in case the said coil or helix should be held in a horizontal position. By the prevention of bending and sagging the coil is protected against short circuiting.

The rod 2 is retained within the coil or helix 1 by extending the opposite end portions 3 of the wire of which the coil is formed partway across the adjoining ends of the coil. The relation of the extended portions 3 of the portions of the wire at the opposite ends of the coil to the said coil is clearly shown in Figs. 2 and 4 of the drawing.

The opposite ends of the rods 2 of the insulating material are located in contact or substantially in contact with the crosswise extending end portions 3 of the wire so that

it is prevented from sliding back and forth in the coil. The diameter of the rod should be slightly less than the diameter of the interior of the coil in order to permit contraction and expansion of the coil without endangering the rod. If the turns of the coil 1 were wound around the rod 2 so as to closely fit against the same the latter would be liable to be broken as a result of the expansion and contraction of the wire of the coil due to the wide differences in the temperatures to which it would be subjected. Such variation in temperature would range from ordinary room temperature to incandescence and it will be seen, therefore, that there would be relatively wide variations in the diameter of the coil due to wide variations and changes in the temperature thereof.

In the construction as shown in Figs. 1 and 2 of the drawing the wire of which the coil consists is extended from the inner ends of the portions 3, as indicated at 4, and the outer ends of the extensions 4 terminate in eyes, as indicated at 5, and are fastened by means of screws 6 to stationary supports 7. The wire extensions 4 are of considerable length and afford sufficient yielding and spring action to prevent the rod 2 from being subjected to shocks or concussions of such force as to cause breakage thereof.

In some cases the yielding or spring action of the wire extensions 4 as shown in Fig. 1 is not sufficient to prevent breakage of the brittle rods 2 of insulating material, and hence I have conceived and designed the construction shown in Figs. 3 and 4 wherein the wire extensions from the opposite ends of the coil or helix for supporting the latter comprise sections of coils 10 of relatively great diameter and with the turns thereof relatively widely separated as indicated. The inner ends of the coils 10 are connected to the inner ends of the portions of wire 3 by sections 11 of the wire. The outer ends of the coils 10 of relatively large diameter are extended, as indicated at 12, in a line substantially coincident with the axis of the coil 2 of Fig. 3 and terminate at their outer ends in bends to form eyes 5 through which screws 6 extend for securing the same to stationary supports 7.

It will be noted that the turns of the coils 10 extend in reverse directions to the turns of the coil 1. The advantage of the coils 10 with their turns in opposite directions to the turns of the coil 1 and with their turns in spaced relation to each other is that thereby the humming noise which often occurs in devices of this character when alternating current is used is prevented.

The presence of the coils 10 provides a spring or cushion support for the coil 1 and the rod 2 so that the latter is fully protected against shocks due to vibration or to other

causes that might result in the breakage thereof.

It will be seen that I have provided means whereby the employment of an electric heating coil for heating purposes is rendered practical and economical. These factors are important because they render commercially practical the use of electrically heated wire coils which are highly efficient, as the heating elements of electric heating means for electric heaters, furnaces and other structures.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. An electric heating element comprising a coil of wire, the said wire having a coating of insulating material, a rod of insulating material mounted within and supported by said coil the diameter of said rod being slightly less than the internal diameter of said coil to leave an appreciable space therebetween, portions of the said wire at the opposite ends of said coil extending crosswise of the said coil to retain the said rod therein, and means having connection with said coil at its opposite ends for supporting said coil.

2. An electric heating element comprising a wire having a coil of relatively small diameter therein, the turns of said coil being insulated from each other and the opposite ends of the wire of said coil extending crosswise of the said coil and having extensions axially of the said coil, supports to which the said extensions are connected, and a rod of insulating material mounted within and supported by said coil, the said rod being of slightly less diameter than the internal diameter of said coil to leave an appreciable space therebetween.

3. An electric heating element comprising a coil of wire the turns of which are located in contactual relation with respect to each other and the wire of said coil having a coating of insulating material for preventing short circuiting of adjoining turns of said coil, portions of the wire at the opposite ends of the coil extending part way across the latter and then being extended outwardly and axially of the said coil, a rod of insulating material mounted within and supported by said coil to retain the same in normal condition, and supports to which the opposite ends of the wire extensions are connected.

4. An electric heating element comprising a coil of wire the turns of which are located in proximate relation to each other, the said turns being separated from each other by electric insulating material, a rod of insulating material and of rigid structure mounted within and supported by said coil and being of a diameter slightly less than the internal diameter of said coil, portions of the wire at the opposite ends of the said coil

extending crosswise thereof to retain there-
in the said rod, the opposite end portions of
the said wire being extended and provided
with coil sections in adjoining relation to
5 the opposite ends of the said coil and of sub-
stantially greater diameter than the diameter
of the first named coil, the turns of said coil
sections extending in a direction the re-
verse of that of the first named coil and the
10 wire of said coil sections being extended axial-
ly thereof and of the first named coil, and
supports to which the said wire extensions
are connected.

In testimony that I claim the foregoing as
15 my invention, I have hereunto signed my
name this 25th day of September, A. D.
1929.

RUDOLPH VON BROCKDORFF.

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