March 28, 1944. D. C. SIMPSON ET AL 2,345,300

HEATING PAD

Filed Nov. 13, 1941

Fig. 1.

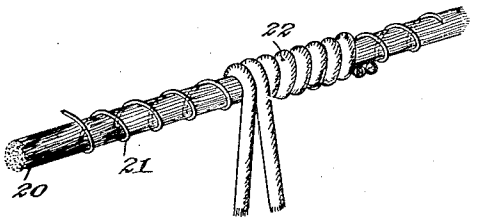
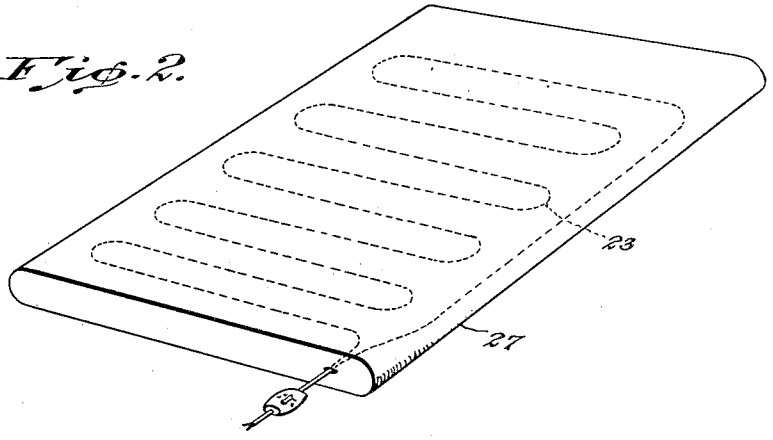


Fig. 2.



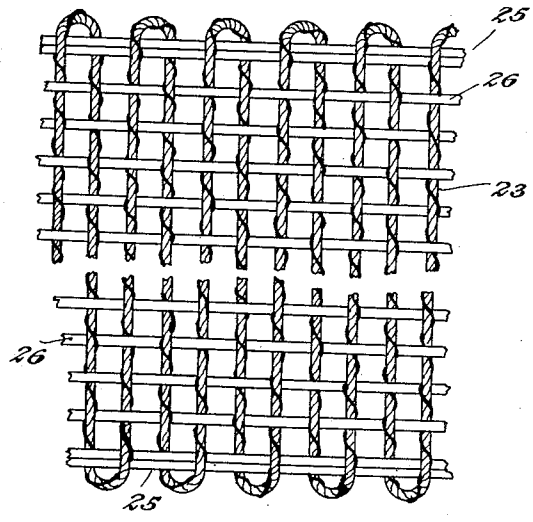


Fig. 3.

INVENTORS
D. C. Simpson and
BY A. L. Simison
Carl G. Staelin
ATTORNEY

Patented Mar. 28, 1944

2,345,300

UNITED STATES PATENT OFFICE

2,345,300

HEATING PAD

Donald C. Simpson, Toledo, and Allen L. Simison, Newark, Ohio, assignors to Owens-Corning Fiberglas Corporation, a corporation of Delaware

Application November 13, 1941, Serial No. 418,928

5 Claims. (Cl. 219—46)

The present invention relates to heating pads and heating elements therefor, and more particularly to such pads and elements using fibrous glass as a constituent thereof.

The subject-matter of this application has been divided out of copending application Serial No. 169,500, filed October 16, 1937, jointly by Games Slayter, Jesse L. Tucker and ourselves.

Heating pads have heretofore been constructed by enclosing an electrical resistance heating element within a fabric covering made of cotton or wool. In some instances the heating element comprised a strand of cotton fibers about which an electrical resistor was spirally wrapped. The element thus formed was coiled on the interior of the cloth covering for the pad or in some cases the element was interwoven with cotton or the like yarns to form a heating unit in the form of a woven fabric. This latter construction is shown, for instance, in the Hewitt Patent 1,703,005.

The disadvantage of organic fibrous material in the construction of heating pads and elements is found chiefly in the fact that any moisture penetrating into the pad follows along the organic fibers and penetrates into the heating unit. This sometimes results in a short circuit with consequent damage to the article. The moisture penetration provides a conducting path to the outside of the pad which is especially serious in an article of this type that is continually handled. Further, the currents of the short circuit cause overheating whereupon the organic fibrous material may be ignited. In order to overcome these objections to pads as previously constructed it has been found necessary to provide fireproof and other coatings which increase the expense and the size and weight of the article materially.

It is an object of the present invention to overcome these shortcomings of the prior art construction and provide a heating pad made from a material having a high dielectric value and ohmic resistance. For this purpose we form at least the portion of the heating element or of the pad adjacent the heating element of fibrous glass but it is preferable to form the entire pad of fibrous glass to thereby avoid all danger of fire.

In the use of fibrous glass for electrical insulation, it has been found that the dielectric value and ohmic resistance of the glass gradually go down as the material is in service. The presence of moisture or the exposure of the fibrous glass to the atmosphere has been found to have a deleterious effect upon the electrical insulating value of the fibrous glass. We have found that this has been principally caused by the presence of alkali oxides which are common ingredients in glass composition.

In analyzing the situation, we have discovered that the presence of alkali in the glass, particularly in percentages above a fraction of one percent to five percent, according to the activity of the particular alkali ingredients, causes a gradual deterioration, weakening of the fibers, and a reduction in the dielectric strength. By alkali is meant the monovalent elements of the first group of the periodic system, and not the alkali earth metals of the second group. The alkali tends to leach to the surface and etch the fibers. When glass fibers manufactured from a glass containing soda (Na_2O) or similar alkali oxide, such as potash, lithium oxide, or the like, are exposed to moisture, there is a tendency for the moisture to react with the alkali on or near the surface of the glass to form alkali hydroxide solution or other solutions in which there is a high ionic activity of the ingredients. This alkali solution has a tendency to dissolve some of the glass exposed on the surface, which would cause an additional and progressive action on the glass. The temperature cycle encountered in heating pads has been found to materially increase this destructive action by alternately causing moisture to condense and evaporate, thereby first leaching alkali to the surface and then concentrating the solution to a point where its activity further etches the glass.

In order to overcome this difficulty, we employ certain compositions of glass which are alkali free and which have a very high dielectric value when reduced to fine, attenuated fibers.

We have discovered the following range of glass composition makes for a superior grade of fibrous glass which may be readily fabricated into fibers, and which when so fabricated has a relatively high softening point and a high dielectric value:

	Per cent
Alkali metal oxide	[1]0 to 5
Alkaline earth oxide	15 to 40
Alumina	15 to 30
Silica	40 to 65

[1] Preferably 0%.

These compositions may also include 0 to 7% fluorine in place of some of the oxygen. In other words, the various metals may be present partly as fluorides instead of entirely as oxides.

The glass fibers employed in the present invention may be produced by various methods, as, for example, that illustrated and described in the

Slayter and Thomas Patent No. 2,133,236, or by the method and apparatus illustrated and described in the Slayter and Thomas Patent No. 2,234,986. The yarns or threads and fabrics may be constructed by any suitable methods.

Various other objects and advantages of the present invention will become apparent from the following description taken in conjunction with the drawing, in which:

Fig. 1 illustrates a heating element embodying the present invention and particularly adapted for heating pads;

Fig. 2 is a perspective view of a heating pad incorporating the present invention;

Fig. 3 is a fragmentary elevational view of a preferred arrangement of the heating element.

The heating element illustrated in Fig. 1 comprises a core 20 composed of fibrous glass. The fibrous glass may be in the form of a loose strand or may be a twisted yarn of desired weight and size. An electrical resistor 21 is wound spirally about the core to present a maximum surface and be held securely in place. If desired, an additional outer serving of fibrous glass 22 may be wrapped over the outer surface of the electrical resistor 21 although in ordinary practice this is unnecessary.

An electrical heating element constructed in this manner is absolutely fireproof and will withstand high temperatures for great lengths of time without carbonizing and without becoming embrittled or creating a short circuit.

The electrical heating element shown in Fig. 1 may be incorporated into a heating pad such as the one shown in Fig. 2. In Fig. 2 the heating element is designated with reference numeral 23, and is laid in a circuitous path in the interior of the heating pad. The element 23 may be interwoven into place with glass yarn running in transverse directions as shown in Fig. 3.

In this figure the fabric unit 25 is illustrated as formed of glass fiber strands 26 interwoven with an element 23. By employing the heating element as the weft it is possible to weave the fabric in convenient lengths and then divide it into suitable portions, each of which constitutes a complete heating unit with the heating element running continuously therethrough. The strands 26 may be yarns, slivers or rovings, as desired.

The heating pad may be covered with a suitable cover 27, which is preferably composed of a woven glass fabric capable of withstanding high temperatures and moisture for a long period of time.

As an additional feature of the present invention, all of the glass fibrous material incorporated in the pad and especially in the core of the heating element is made from alkali free glass. The finished pad thus has a high resistance to the action of atmospheric moisture and has high dielectric and resistance values to eliminate leakage of current through the core or the other parts of the pad and consequent danger of short circuits.

We claim:

1. An element for a heating pad comprising a strand of alkali free glass fibers, and an electric resistor spirally wound over said strand.

2. A heating pad construction including a heating element, said element comprising an interwoven fabric of strands of alkali free glass fibers, and an electrical resistor spirally wound over the strands extending in one direction in the fabric.

3. As an article of manufacture, an electrical element comprising a strand of alkali free fibrous glass as a core, an electric current-carrying metallic strand spirally wound over said core, and a layer of alkali free glass fibers covering said core and metallic strand.

4. As an article of manufacture, an electrical element comprising a strand of alkali free fibrous glass as a core, an electric current-carrying metallic strand spirally wound over said core, and a layer of insulating material covering said core and metallic strand.

5. A heating pad comprising strands of alkali free fibrous glass, and electric resistors spirally wound over said strands, said strands and resistors wound thereover being interwoven with alkali free fibrous glass yarns adapted to hold said resistors in predetermined spaced relation.

DONALD C. SIMPSON.
ALLEN L. SIMISON.