Dec. 26, 1967 P. P. JOHNSON 3,360,760

HEATING UNIT

Filed Sept. 30, 1965

Fig. 1

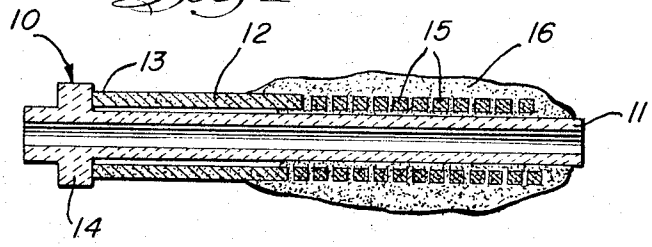
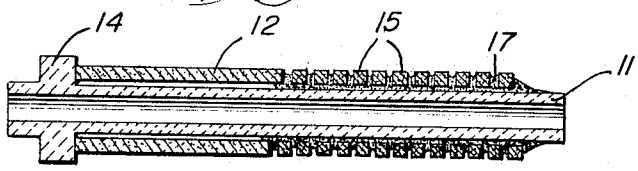


Fig. 2



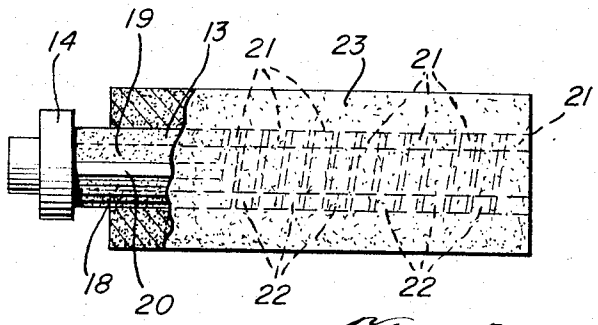


Fig. 3

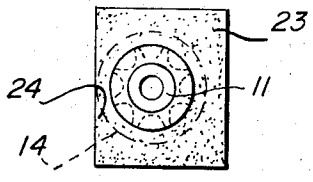


Fig. 4

INVENTOR.

Philip P. Johnson

Hoffgren, Wagner, Allen, Steelman & McCord

BY

ATTORNEYS

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HEATING UNIT

Philip P. Johnson, St. Joseph, Mich., assignor to Whirlpool Corporation, a corporation of Delaware

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7 Claims. (Cl. 338—296)

ABSTRACT OF THE DISCLOSURE

A heating unit such as an electric igniter for gas in which the unit has spaced parts that are frangible and subject to breakage from shock, the parts being spaced in the exemplary igniter for electrical isolation so they can conduct current and thereby be heated to ignite the gas, in which the spaced parts are provided with a reinforcing material between the parts to inhibit this breakage but with the reinforcing material being heat removable by heat generated in the unit itself during the first operation of the unit to its normal operating temperatures.

This invention relates to a heating unit comprising a frangible electric heating element having spaced parts subject to breakage upon agitation or flexure and a readily removable strengthening means to inhibit the breakage.

In many heating units such as electric igniters for a gas fueled clothes dryer the heating element is frangible and subject to breakage on agitation such as during handling, shipment of the unit, installing, assembly with other parts, service replacement and the like. Thus, the principal type of frangible electric heating element for heating units of this construction employ recrystallized silicon carbide or sintered graphite as the resistance heating element itself. Both of these are subject to breakage on agitation even when supported by a ceramic core.

One of the features of this invention therefore is to provide an improved heating unit comprising a frangible electric heating element having spaced parts subject to breakage on agitation and a reinforcing material between said parts, and if desired enclosing said parts, to inhibit this breakage with the reinforcing material being heat removable or destructible during the first operation of the heating unit at normal operating temperatures.

Other features and advantages of the invention will be apparent from the following description of certain embodiments thereof taken in conjunction with the accompanying drawings. Of the drawings:

FIGURE 1 is a longitudinal sectional view through an electric heating element embodying the invention and having heat removable reinforcing material associated therewith.

FIGURE 2 is a view similar to FIGURE 1 but showing a second embodiment of the invention.

FIGURE 3 is a side elevational view partially in section of a third embodiment of the invention.

FIGURE 4 is an end elevational view of the embodiment of FIGURE 3 taken from the right end of FIGURE 3.

In the embodiment of FIGURE 1 the heating unit **10** includes a ceramic tubular support **11** on which is positioned the frangible electric resistance heating element **12**. The element **12** has a terminal end **13** adjacent an enlarged end **14** on the ceramic support **11** and spaced apart helical igniter coils **15** adjacent the other end. Prior to installation and especially prior to first use the igniter helical coils **15** are encapsulated in a reinforcing material **16** which extends between the coils **15** and around them to inhibit breakage, as shown in FIGURE 1.

The heating element **12** being constructed of a frangible material such as recrystallized silicon carbide or sintered graphite is subject to breakage, particularly at

the spaced coils **15**. For that reason the encapsulating material **16** in the embodiment of FIGURE 1 only encloses the coils **15** and a small portion of the terminal end **13** of the element.

The reinforcing material **16** is one that is heat removable either by being burned or melted off while the heating unit is subject to electric current as in normal use. Thus, once the unit is installed the first energization of the unit at normal operating temperatures causes the removal of the reinforcing material **16**. Preferred reinforcing materials include foamed plastics such as polyurethane foam, foamed polystyrene and the like. Polyurethane foam is especially preferred, as it is quite strong, rigid and shock resistant, is easily applied merely by coating the unit with the urethane producing liquid in the customary manner and is easily removed on first use of the unit by the resistance heat causing the urethane to burn off. The polystyrene foam may be applied in the form of beads that are either adhered to the unit and foamed or retained with the unit in a mold and foamed therein by heat in the usual manner.

While the heating element **12** is protected, particularly at the spaced apart coils **15** by the encapsulating reinforcing material **16**, the unit may be shipped, installed or otherwise agitated in a manner that would cause breakage, particularly at the coils **15**, if it were not for the presence of the material **16**. Then, when the heating unit **10** is installed as in the igniter portion of a gas clothes dryer the first use of the unit by passage of electric current therethrough causes the heat generated in the coils **15** to melt or burn off the reinforcing material **16**.

The embodiment of FIGURE 2 is similar to that of FIGURE 1 except that in the FIGURE 2 embodiment reinforcing material **17** merely spans the gaps between turns of the helical heating coil.

In the embodiments of FIGURES 1 and 2 as well as that of FIGURES 3 and 4 the heating element **12** has a pair of spaced apart shank or terminal portions **18** and **19** spaced as indicated at **20** and together constituting the terminal end **13** of the unit. The terminal portion **18** leads into a helical part **21** that leads toward the opposite end of the unit and from there to another helical part **22** which extends to the terminal end **13** of the unit and is joined to the other terminal portion **19**. This provides an electrical circuit from one terminal portion **18** through the internested helical parts **21** and **22** to the other terminal portion **19**.

In the embodiment of FIGURES 3 and 4 the unit is encapsulated by the reinforcing material **23** which may be the same material as described above in connection with the reinforcing material **16**. Here the capsule is rectangular in cross section for convenience in shipping and storing. Again, the encapsulating material is ideally polyurethane which can be easily melted and burned off. Where the unit is encapsulated, as shown in the embodiment of FIGURES 3 and 4, it is preferred that a section **24** be thin so that on electrically energizing element **12** the encapsulating material will quickly melt through here to admit oxygen to the element so that combustion of the combustible encapsulating material is expedited.

As can be seen in the embodiments of FIGURES 1, 2 and 3 with respect to the terminal end **13**, the terminal end **13** is left free of encapsulating materials as this end contains the terminals **18** and **19** so as to permit installation of the heating unit as in the gas fired clothes dryer with the encapsulating material still in place. This not only prevents breakage during installation of the unit but also permits using the normal electrical imput energy to the unit as on its first use to remove the encapsulating material.

The invention of the embodiments of FIGURES 1 and 3 is also applicable to frangible rod or bar type heating

elements wherein the rod or bar is encapsulated over a substantial portion of its length. Thus, the encapsulating material bridges spaced portions of the element and imparts rigidity thereto in order to preclude flexure of the element and resultant breakage thereof.

Having described my invention as related to the embodiments shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A heating unit, comprising: a frangible electric heating element generating heat and having spaced parts, when in use; and a reinforcing material between said parts to inhibit breakage of said parts, said reinforcing material being heat removable by heat generated in said unit during the first operation of said unit at normal operating temperatures.

2. A heating unit, comprising: a frangible electric heating element including a coil generating heat and having parts including spaced turns, when in use; and a reinforcing material between said turns to inhibit breakage thereof, said reinforcing material being heat removable by heat generated in said unit during the first operation of said unit at normal operating temperatures.

3. The heating unit of claim 2 wherein said material is combustible at said temperatures.

4. The heating unit of claim 2 wherein said material comprises polyurethane foam.

5. A heating unit, comprising: a frangible electric heating element including a coil generating heat and having parts including spaced turns, when in use; a reinforcing encapsulating material covering and enclosing completely said element, said reinforcing material being initially meltable and then burnable by heat generated in said element during the first operation of said unit at normal operating temperatures.

6. The heating unit of claim 5 wherein said reinforcing material has a thin area for rapid exposure of the element to oxygen at said area on melting of the encapsulating material.

7. A heating unit comprising: a frangible electric heating element generating heat and having spaced apart portions; a reinforcing foamed plastic material bridging said spaced apart portions, when in use, said material being destructible upon the application of heat thereto by heat generated by said heating element; and terminal means connected to said heating element exteriorly of said reinforcing foamed plastic material for connecting said unit to a source of electrical energy.

References Cited

UNITED STATES PATENTS

1,450,725	4/1923	Hodson	338—269
3,006,794	10/1961	Sheldon	174—110
3,057,603	10/1962	Isreeli.	
3,285,400	11/1966	High	219—271 X

RICHARD M. WOOD, *Primary Examiner.*

J. G. SMITH, *Assistant Examiner.*