

July 20, 1954

M. E. BIXLER

2,684,428

ELECTRIC IRON

Filed May 25, 1953

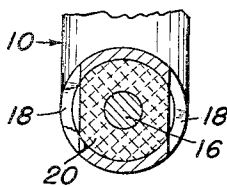
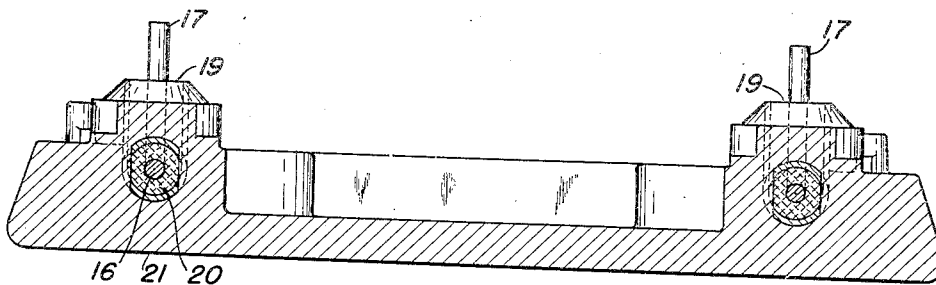
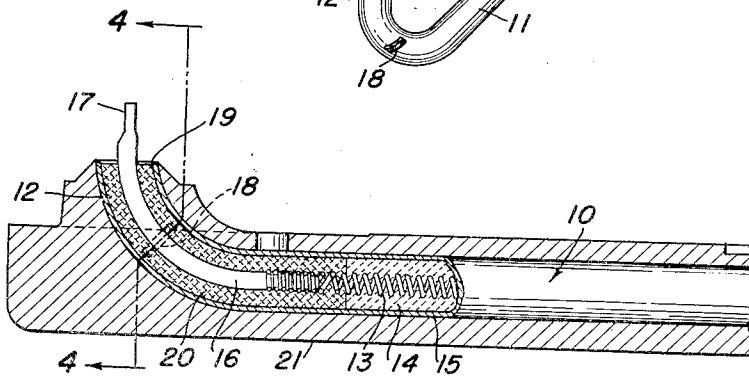
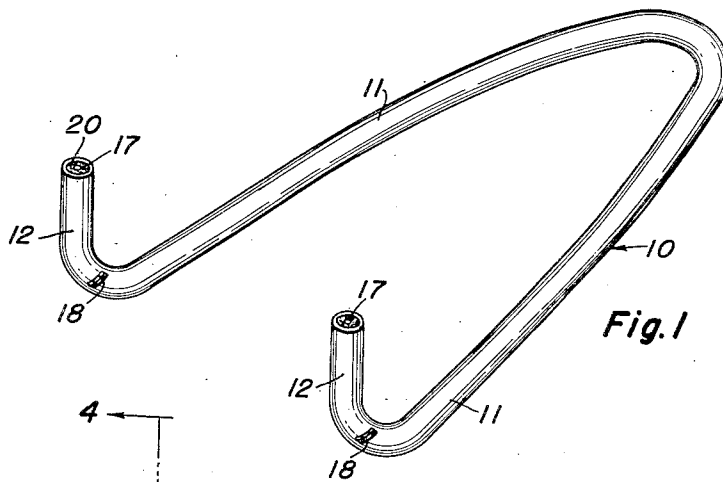


Fig. 2

INVENTOR.
Milo E. Bixler
BY *Richard P. Litzsimmer*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,684,428

ELECTRIC IRON

Milo E. Bixler, North Canton, Ohio, assignor to
The Hoover Company, North Canton, Ohio, a
corporation of Ohio

Application May 25, 1953, Serial No. 357,207

7 Claims. (Cl. 219—25)

1

The present invention relates to electric irons, and to the method of making the same.

In particular, the present invention relates to electric irons of the type in which the heating element is embedded in the sole plate. In such irons the heating element usually consists of a resistance wire embedded in a compacted electrically insulating, heat conducting material, such as magnesium oxide, encased within a metallic sheath and the whole embedded in the metal of the sole plate.

The resistance wire is connected to terminals, which extend beyond the end of the metallic sheath. The metallic sheath itself extends out of the metal of the sole plate with the result that the magnesium oxide, or other electrically insulating material, at the end of the sheath, is exposed to the atmosphere which usually contains moisture. Magnesium oxide, and other such suitable electrically insulating materials, are moisture absorbent and will absorb moisture if the ends of the metallic sheath are not properly sealed against its entrance.

Additionally, during machining operations on the sole plate, after the heating element is cast into it, a liquid coolant is used, which may also add moisture to the electrically insulating material if the ends of the sheath are not properly sealed.

The addition of moisture to the electrically insulating material destroys its effectiveness. As a result, it is essential that the ends of the sheath be sealed against the entrance of moisture and yet have a terminal wire extending therefrom.

It has been proposed to treat the electrically insulating material at the ends of the sheath with a moisture repellant fluid. However, the depth to which the material can be impregnated with the fluid is limited. After the heating element is cast into the metal of the sole plate, the metal of the sheath is machined away to expose the terminal connections with the result that the greater portion of the treated insulating material is also machined away, thus destroying its effectiveness.

According to the present invention, openings are formed in the metal of the sheath some distance back of the point to which the metal of the sheath will be machined away, and the heating element is immersed in the moisture repellant fluid for a sufficient time to thoroughly impregnate the electrically insulating material at a point back of the final machined ends of the sheath.

Other objects and advantages of the present invention will become apparent as the description

2

proceeds when taken in connection with the accompanying drawings in which:

Figure 1 is a perspective view of the heating element of the present invention showing the openings formed in the sheath back of the ends thereof;

Figure 2 is an enlarged cross-sectional view of the heating element at one of the openings;

Figure 3 is a view, partly in section, showing the heating element of Fig. 1 embedded in the sole plate; and

Figure 4 is a sectional view taken in line 4—4 of Fig. 3.

Referring to the drawings the heating element is generally indicated by the reference numeral 10. It consists of a resistance wire 13, an electrically insulating and heat conducting material 14 and a metallic sheath 15. The insulating material 14 is highly compacted and is preferably magnesium oxide.

The resistance wire 13 is suitably connected to a terminal wire 16, which extends beyond the end of the sheath 15 as shown at 17 so that the extending end 17 may be welded or brazed to suitable terminal connections as is well known in the art.

The heating element 10 is of hairpin shape, having legs 11 which are turned upwardly at 12. Openings 18 are formed in the sheath 15 back of the machined ends 19 thereof. The portion of the insulating material 14 surrounding the terminal wire 16 is impregnated with a moisture resistant fluid as at 23.

The heating element 10 is embedded in an aluminum sole plate 21, preferably by die casting, after it has been treated, as will be explained. It is to be noted that the metal of the sole plate surrounds the openings 18.

Method of making

The heating element 10 is formed in the length desired, in a manner well known in the art, and bent into the shape shown in Fig. 1.

The openings 18 are then formed in the sheath 15. In the example shown, the openings 18 are formed by making saw cuts through the sheath 15, on either side thereof, at a point back of the machined ends 19, so as to expose the electrically insulating material 14.

It has been found to be suitable that the saw cuts be made at a point about $\frac{3}{8}$ of an inch back of the machined ends 19 and that the depth be such that about $\frac{1}{8}$ inch of the insulating material 14 is exposed. Saw cuts of different depths may be made but care must be taken not to

weaken the sheath to too great an extent and yet expose a sufficient area of the insulating material 14 to provide for the entrance of the moisture repellent fluid.

Thus, the depth of the cuts and their position relative to the machined ends 19 may be varied somewhat but the above conditions specified have been found satisfactory.

The heating element 10 as shown in Fig. 1 is immersed in a suitable moisture repellent fluid to thoroughly impregnate the insulating material 14 on either side of the openings 18 as at 20.

Any suitable moisture repellent fluid may be used. One which has been found satisfactory is a silicone fluid which is a siloxane compound well known in the art. The fluid used must have high thermal stability, low volatility, low surface tension, and low viscosity. It must be, non-corrosive to metals, be highly soluble in organic solvents and be insoluble in water. There should be no chlorine present.

The time of immersion necessary to thoroughly impregnate the insulating material 14 will vary somewhat with the fluid and the insulating material used. It has been found that 24 hours is sufficient using the materials suggested above. The immersion time necessary may be less than 24 hours but that time is suggested as it fits nicely into production schedules.

The heating element 10, may then be degreased by subjecting it to the vapor of an organic solvent as trichloroethylene for a period of about 30 seconds. The degreasing time should not be extended much beyond the 30 seconds' period suggested, otherwise, the moisture repellent fluid will also be removed from the electrically insulating material and destroy its effectiveness as a seal against the entrance of moisture.

A liquid organic solvent may be used in the degreasing operation, but the vapor method is preferable because the solvent is always pure in its vapor phase and the degreasing time is lessened.

The heating element 10 is then placed in a die casting machine and the aluminum sole plate 21 cast about it in a manner well known in the art. The metal of the sole plate 21 will surround the sheath 15 and prevent the entrance of moisture into the sheath by way of the openings 18.

The top of the sole plate is then machined to the shape desired, which includes machining off the upturned ends 12 of the heating element 10 down to the machined surfaces 19.

The machining operation requires the use of a coolant fluid. The impregnated portions 20 of the insulating material 14 will prevent the entrance of that fluid into the interior of the sheath 15 during the machining operation.

The openings 18 will be sealed by the metal of the sole plate 21 to prevent the entrance of moisture into the sheath 15 by that route and the impregnated portions 20 of the insulating material will prevent the entrance of moisture from the air into the interior of the sheath through its ends even though the ends of 17 of the terminal wire 16 project therefrom.

According to prior practice, the insulating material was impregnated with moisture repellent fluid at the open ends of the sheath 15. The subsequent machining of the ends of sheath 15 to expose the ends 17 of the terminal wires resulted in the removal of the most effective portion of the moisture seal.

According to the present invention the electrically insulating material is impregnated with

the moisture repellent fluid at a point well beyond the final machined surfaces 19 to prevent the entrance of moisture into the sheath 15 from its ends. The openings 18 being surrounded by the metal of the sole plate 21, entrance of moisture into the interior of the sheath 15 by that route is effectively prevented.

While I have shown and described but a single embodiment of my invention it is to be understood that that embodiment is to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the particular structure and method shown and described but wish to include all equivalent variations thereof except as limited by the scope of the claims.

I claim:

1. A sole plate for an electric iron comprising; a cast metallic sole plate and a heating element therefor cast into the metal of said sole plate; said heating element consisting of a resistance wire encased within an open ended metallic sheath with an impacted moisture absorbent electrically insulating and heat conducting material filling the space between said resistance wire and sheath, said resistance wire terminating short of the open ends of said sheath, and terminal wires connected to the ends of said resistance wire and extending beyond the open ends of said sheath; the portions of said terminal wires which are positioned within said sheath also being separated from said sheath by said electrically insulating material; the walls of said sheath being provided with openings adjacent said open ends to provide for the entrance of moisture repellent fluid into the interior of said sheath adjacent its open ends; said openings being encased within the metal of said sole plate and said electrically insulating material being impregnated with a moisture repellent fluid at and on each side of said openings.

2. An electrical heating element for an electric iron comprising, a resistance wire, an open ended metallic sheath for said wire, a compacted moisture absorbent pulverulent electrically insulating and heat conducting material filling the space between said resistance wire and said sheath, said resistance wire terminating short of the open ends of said sheath, and terminal wires connected to said resistance wire and extending to the end of said sheath, said terminal wires also being separated from said sheath by said electrically insulating material, the walls of said sheath being provided with openings adjacent its open ends to provide for the entrance of a moisture repellent fluid into the interior of said sheath adjacent its open ends.

3. The method of making a sole plate for an electric iron comprising, forming an electrical heating element in the form of a metallic sheath enclosing a resistance wire surrounded by an impacted moisture absorbent electrically insulating material and with terminal wires extending from the ends of said sheath, forming openings in the walls of said sheath adjacent its ends to expose said insulating material, immersing said heating element in a moisture repellent fluid for a time sufficient to impregnate said insulating material with the moisture repellent fluid at and on each side of said openings, degreasing said heating element by subjecting it to the vapor of an organic solvent for a time sufficient to remove oils and the excess moisture repellent liquid from the exterior of said element without removing the moisture repellent fluid from said insulating material, casting a metallic sole plate

5

about said heating element so as to cover said openings and with the ends of said heating element exposed and machining the ends of said element to expose the ends of said terminal wires.

4. The method according to claim 3 in which said openings are formed by making saw cuts through the walls of said sheath to expose said insulating material.

5. In an electric heating element of the metal sheathed type having an electrical heating element embedded in an impacted pulverulent insulating material such as magnesium oxide and with terminal connections extending from the ends thereof, that improvement in the method of moisture proofing the terminal connections which comprises the steps of making cuts to the metal sheath into the insulating material adjacent the terminals and immersing the heating element in a moisture repellant fluid for a time sufficient to impregnate the insulation at the cuts with the moisture repellant fluid.

6. A sole plate for an electric iron comprising; a cast metallic sole plate and a heating element therefor cast into the metal of said sole plate; said heating element consisting of a resistance wire encased within an open ended metallic sheath with an impacted moisture absorbent electrically insulating and heat conducting material filling the space between said resistance wire and sheath, said resistance wire terminating short of the open ends of said sheath, and terminal wires connected to the ends of said resistance wire and extending beyond the open ends of said sheath; the portions of said ter-

6

minal wires which are positioned within said sheath also being separated from said sheath by said electrically insulating material; the walls of said sheath being provided with openings adjacent said open ends to provide for the entrance of moisture repellant fluid into the interior of said sheath adjacent its open ends; said electrically insulating material being impregnated with a moisture repellant fluid at and on each side of said openings.

7. The method of making a sole plate for an electric iron comprising, forming an electrical heating element in the form of a metallic sheath enclosing a resistance wire surrounded by an impacted moisture absorbent electrically insulating material and with terminal wires extending from the ends of said sheath, forming openings in the walls of said sheath adjacent its ends to expose said insulating material, immersing said heating element in a moisture repellant fluid for a time sufficient to impregnate said insulating material with the moisture repellant fluid at and on each side of said openings, degreasing said heating element by subjecting it to the vapor of an organic solvent for a time sufficient to remove oils and the excess moisture repellant liquid from the exterior of said element without removing the moisture repellant fluid from said insulating material, casting a metallic sole plate about said heating element with the ends of said heating element exposed, and machining the ends of said element to expose the ends of said terminal wires.

No references cited.