

United States Patent

Beckert

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[54] PLATE HEATER

[72] Inventor: **Adolf F. Beckert**, St. Paul, Minn.
[73] Assignee: **Honeywell Inc.**, Minneapolis, Minn.
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[52] U.S. Cl.219/388
[51] Int. Cl.F28f 3/00
[58] Field of Search219/388, 469, 470, 543

[56]

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Primary Examiner—Harold Broome
Assistant Examiner—F. E. Bell
Attorney—Lamont B. Koontz and Omund R. Dahle

[57]

ABSTRACT

A plate heater for use in the process of heat treating travelling synthetic yarns with easily replaceable wear plate.

6 Claims, 3 Drawing Figures

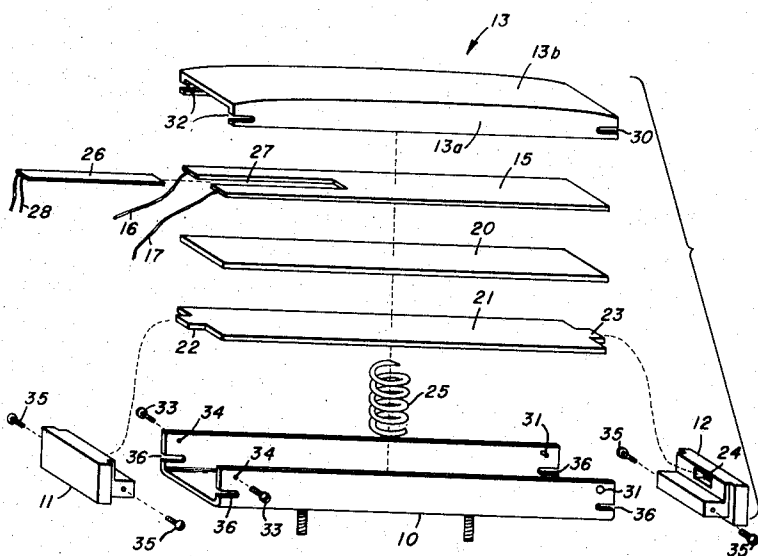


FIG. 1

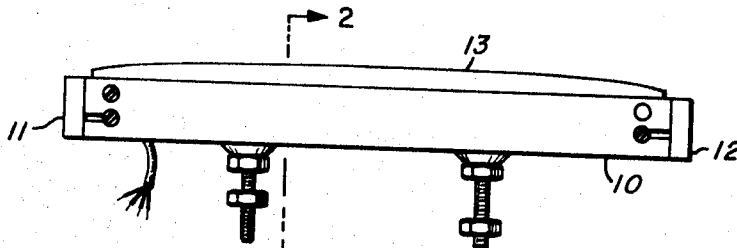


FIG. 2

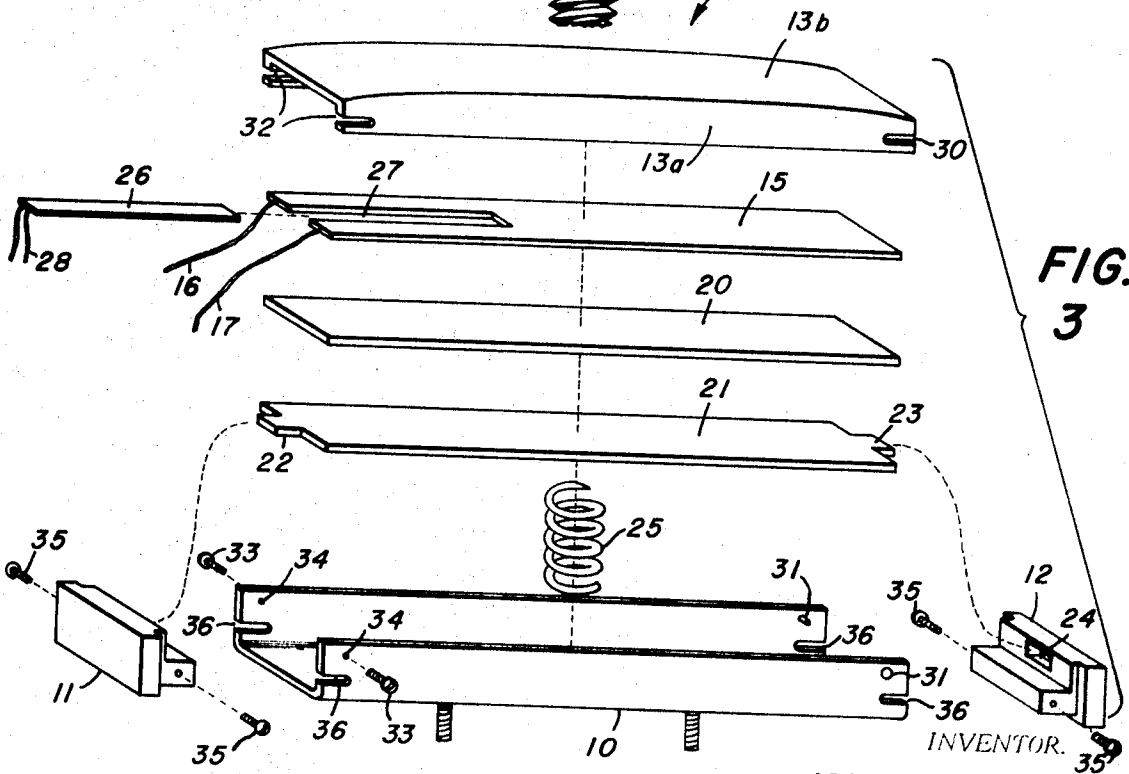
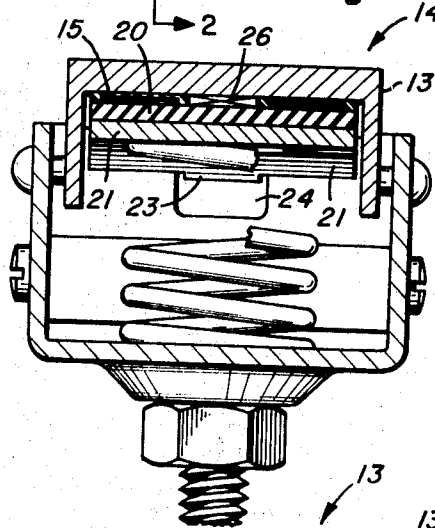


FIG. 3

INVENTOR.
ADOLF F. BECKERT
BY
Osmond A. Dahl
ATTORNEY.

PLATE HEATER

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to the field of plate heaters for use in the synthetic fiber industry. Further the apparatus relates to the use of easily replaceable draw plates or wear plates. In the prior art the wear plate and heating elements were often bonded together or elaborately clamped together so that they had to be removed from the machine together when the wear plate surface became worn. This meant removal of the heater wiring as well as the wear plate and heater elements and much time was consumed in the replacement as well as the high cost of replacing both heaters and wear plate. In the present invention, heater and sensor are mounted on a spring loaded support plate and contained in a sheet metal housing. The heater plate fits on top of the heater/sensor assembly and by pressing against the spring support slips into position, in which it is restrained by two screws. If replating or exchange of the plate becomes necessary, only these two screws have to be loosened and the plate can be easily and quickly removed thereby resulting in a much faster and less expensive replacement of the wear plate.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an overall view of the plate heater;

FIG. 2 is a cross-sectional view taken through FIG. 1 at point 2-2; and,

FIG. 3 is an exploded view of the apparatus of FIG. 1.

DESCRIPTION

Referring not to FIG. 1, there is disclosed a side elevation of the plate heater including a mounting base 10, end plates 11 and 12, and a replaceable channel shaped draw plate or wear plate 13 along the surface of which the yarn or fiber is to be drawn. The plate 13 has channel edges 13a and a longitudinally curved surface 13b so that the moving yarns may be in contact with the heated plate surface for the entire length of the plate.

Referring now in more detail to the cross section view of FIG. 2 and the exploded view of FIG. 3 it can be seen that the replaceable wear plate 13 forms the outer component of the plate and heater assembly 14. Fork shaped heater element 15 which may be in the order of 0.020 inch thick is designed to fit into uniform thermal contact with the draw plate and comprises a flexible insulating member of glass-fiber-reinforced-silicone rubber having an etched foil type electrical heater element embedded in and extending throughout the strip to provide heating of the entire plate surface 13b, the heating wire terminals being brought out at conductors 16 and 17 for connection to a suitable source of power. Heater element 15 together with a compressible resilient glass-fiber-reinforced silicone member 20 and a backing strip 21 such as a high temperature spring steel or stainless steel backing strip form the heater subassembly sandwich which fits against the draw plate 13. The metal backing strip 21 has end tabs 22 and 23 which fit into slots 24 in the end plates 11 and 12 respectively to locate and hold the ends of the heater subassembly. A coil spring 25 is positioned in the middle of the plate between backing strip 21 and mounting base 10 to urge the heating subassembly tightly against plate 13. The compressible rubber member 20 powered by the spring steel backing strip 21 and the coil spring 25 forces all portions of the heater element against the wear plate. One further component of the plate and heater assembly 14 is temperature sensor 26 which is dimensioned to fit into the slot area 27 of the forked heater 15 and to be pressed against the plate 13 by the heater subassembly to sense the heat of the plate surface 13b and to provide an output which is a function thereof which can be sensed at terminals 28. Sensor 26 may be in the form of a temperature

sensitive wire embedded in a suitable material.

The plate heater is made so that the plate 13 can be easily replaced whenever necessary. Slots 30 in one end of the plate 13 cooperate with projections extending inwardly such as inwardly projecting fixed studs 31 in the mounting base 10, and slots 32 in the opposite end of plate 13 cooperate with screws 33 and threaded holes 34 of the base 10 to detachably secure the plate 13 to the base 10. End plate 11 and 12 are tapped to receive screws 35, these screws being positioned into slots 36 of base 10 and tightened to secure the end plates. This arrangement allows easy assembly and disassembly of the plate heater apparatus for replacement of the plate. To disengage the wear plate from the plate heater, screws 33 are loosened so that they clear slots 32 and then the wear plate pulled out such that studs 31 clear slots 30. When the wear plate is so removed, the heater/sensor subassembly sandwich comprising 15, 20, 21 and 26 remains mounted on base member 10.

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

1. An electrically heated plate heater apparatus for heat treating moving synthetic fibers in which the wear plate can be easily detached from the electrical heating element and the remainder of the apparatus for rapid replacement of the wear plate, the improvement being in a biased sandwich construction assembly comprising in order:

an elongated wear plate member having a curved elongated exterior surface to be heated and upon which heated surface moving fibers pass to be treated;

heater means separate from the wear plate member and having an elongated shape to match said wear plate member and positioned in heating relation to said wear plate member;

metal backing plate means having an elongated shape to match said heater means; and,

elongated base member mounting means for supporting said assembly, said mounting means comprising first means for mounting said heater means together with said backing plate means and removable fastening means for detachably mounting said wear plate member to said mounting means;

said backing plate means forcing said heater means into uniform thermal contact with said wear plate member over the length thereof when said wear plate member is fastened to said mounting means.

2. The invention according to claim 1 in which said heater means comprises:

a flexible heater element having an elongated shape to match said wear plate material positioned in heating relation to said wear plate member; and

a compressible strip having an elongated shape to match said heater element.

3. The invention according to claim 2 in which said compressible strip is a glass-fiber-reinforced-silicone rubber strip.

4. The invention according to claim 2 in which said backing plate means comprises spring means such as a stainless steel backing plate having an elongated shape to match said heater means.

5. The invention according to claim 4 in which said spring means further comprises coil spring means positioned between said steel backing plate and said base member mounting means.

6. The invention according to claim 4 in which said spring means further comprises coil spring means positioned between said backing plate and said base member mounting means so that said coil spring means, said backing plate and said compressible strip are compressed and bias said flexible heater element into uniform thermal contact with said wear plate member over the length thereof when said wear plate member is fastened to said mounting means.

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