Candidate's examination paper
(Examination paper A/1991 Electricity/Mechanics)

Claims

1. A heating device for a hot melt glue gun, comprising: a heating tube (10) having an inlet (17) through which a solid glue rod (50) can be pushed and an outlet (20) for molten glue;
a heating element (45) for melting the glue as it passes through the tube (10);
and a restoring means (26) for returning the solid glue to its initial position in the absence of applied pressure, so as to suck molten glue back from the outlet (20);

   characterised by the further provision of an axially displaceable intermediate member (14, 16) by means of which the restoring means (26) acts on the glue rod (50).

2. A heating device according to claim 1, in which the intermediate member (14, 16) includes a generally tubular melting chamber (16) arranged for good thermal contact with the heating element (45) and having an internal section adapted to the rod to be introduced.

3. A heating device according to claim 2, in which the melting chamber (16) has internal fins (11) for facilitating heat transmission to the adhesive, the cross-section of these fins increasing in the direction of the outlet (20).

4. ... claim 2 or 3, in which the melting chamber (16) is lubricated within the heating tube (10) by means of a heat-conducting lubricant such as a graphite/silver/oil emulsion.

5. ... any of claims 2 to 4, in which the intermediate member further includes a tubular intermediate piece (14) located forwardly of and fixed under seal to the melting chamber (16), the restoring means (26) acting directly on this intermediate piece (14).

6. ... any preceding claim and including a removable nozzle (22) arranged at the outlet (20) in such a way that when the nozzle (22) is removed the intermediate member (14, 16) can also be removed through the outlet end of the heating tube (10).

7. A heating device for a hot melt glue gun, comprising: a heating tube (10) having an inlet (17) through which a solid glue rod (50) can be pushed and an outlet (20) for molten glue; and a heating element (45) for melting the glue as it passes through the tube (10);
characterised in that the heating element (45) includes a PTC heating resistor (R1, R2, R3).

8. A heating device according to claim 7, in which the or each PTC resistor consists of an axially extending string of resistor elements.

9. A heating device according to the preamble of claim 7, which the heating element is in the form of a cartridge comprising a preferably electrically insulating sleeve (7 housing two or more separately connectable heating resistor (R1a, R1b, R1c) so as to enable different operating temperatures to be set by suitable switching.

10. ... 7, 8 or 9, in which the or each heating resistor is mounted in the heating element (45) by way of a force-fitting means such as a leaf spring (81-83) and one or more contact pieces (61-63; 71-73) giving the heating element an approximately circular cross-section.

11. A heating device according to any of claims 1 to 6 and including a heating element as described in any of claims 7 to 9.

12. A heating device according to claim 11 and having two or more heating elements (45) arranged uniformly around the tube (10).

Heating device for a glue gun

The invention relates to a device such as is used in a hot-melt glue gun for guiding and heating an initially solid rod of adhesive. Such a glue gun melts a solid adhesive which is supplied to it in the form of a rod. The molten adhesive or glue is then dispensed by applying pressure to the adhesive rod to advance the rod and force the molten glue out of the gun.

A known problem with these hot-melt glue guns is that drooling occurs, i.e. the glue continues to come out when the pressure applied to the adhesive rod is released.

In order to prevent drooling it has been proposed to provide a restoring means such as a spring; such a proposal is described in document I. To prevent drooling in this device when the pressure on the solid rod of adhesive is released, the adhesive rod is pushed back by means of a spring, and the resulting reduced pressure in the melting chamber causes the molten glue to be sucked back. This principle has proved successful in reducing the problem of drooling.

However, in this device only the forward portion of the spring is in the region of the heating device and therefore, at the beginning of the heating process, the rear portion of the spring is still embedded in solid adhesive and only the forward portion can be compressed. Consequently, at the start of the heating process the spring exerts an inadequate return force on the adhesive rod.

It is therefore an object of the present invention to provide a heating device for a glue gun in which the restoring means for the glue rod is fully effective.

According to one aspect of the invention there is provided a heating device ... [as claim 1].

The melting chamber as now designed can move axially, i.e. in direction of feed of the adhesive rod, and is slidably mounted within a heating tube. The spring then acts on the melting chamber and not directly on the adhesive rod.

The intermediate member preferably includes a tubular melting chamber arranged in good thermal contact with the heating element and of a cross-section adapted to the rod. This ensures both rapid thermal transfer to the glue and a good grip on the solid rod by the intermediate member.

Thermal transfer efficiency can be further increased by the provision of a heat-conducting lubricant between the melting chamber and the main tube body (e.g. a graphite/silver/oil emulsion), and/or of fins projecting into the glue rod on the interior of the melting chamber, the size of the fins increasing towards the outlet so as to provide a progressively larger heat transmission area.

Advantageously the intermediate member is in two parts, namely a tubular heating chamber as described and a further intermediate piece on which the spring acts. The further intermediate piece is itself tubular and guides the molten glue towards the outlet. It may be screwed on to the heating chamber, with the provision of a suitable seal. This two-part arrangement eases manufacture.

At the outlet end of the device a removable nozzle assembly is preferably provided, which may likewise be screw-threaded to the tube. The intermediate piece may then slide in a suitable bore in the nozzle and the spring act between the nozzle and the intermediate piece.

In a particularly advantageous form the external diameter of the nozzle attachment is larger than that of the intermediate member, i.e. than either that of the intermediate piece or that of the heating chamber. This enables the intermediate member to be removed and replaced by a new one, for instance when a different adhesive of different melting point or incompatible properties is to be used.

Two or more individual heating elements, e.g. self-contained cartridges, may be arranged uniformly around the heating tube; this improves uniformity of heating of the glue rod.

In another aspect the invention is directed to a heating device for a hot-melt glue gun comprising a heating tube having an inlet ... [as claim 7].

A heating device of this type is particularly advantageous with a glue gun having a restoring means for the glue rod, as described previously, but may be used with any known glue gun.

Advantages of this arrangement are as follows:

The known hot-melt glue gun has resistance heating with a thermostat to prevent a preset maximum temperature from being exceeded. This resistance heating is located directly on the melting chamber, since there the adhesive must be sufficiently

fluid. This arrangement does not enable the required operating temperature to be reached at the same time in all areas. This results in undesirable delays before the glue gun can function fully.

It has also been found that, when the rod is advanced too rapidly into the heated melting chamber, the temperature drops so far that a delay occurs before the adhesive once more comes up to its operating temperature. This leads to uneven liquefaction of the adhesive.

When a PTC resistor is used for heating, on the other hand, such a PTC heating resistor at constant supply voltage maintains a substantially constant operating temperature a drop in temperature produces a higher current flow through the resistor and thus a higher heat production, and vice versa. Sintered material has proved suitable for the PTC heating resistors.

As a further refinement the or each PTC resistor may be in the form of a string of separate axially spaced resistor elements. In this case the first element will experience a sharp temperature drop as the glue rod is pushed in; the heat production of the string then increases correspondingly, so that the heat production is adapted to the speed of advancement of the adhesive rod.

In a further aspect of the invention, the heating device includes two or more separately connectible heating resistors, which may be conventional resistors or PTC elements as described above. This enables different operating temperatures to be set since, the greater the number of resistors connected, the greater is the total heat output for a given supply voltage, thus enabling the use of adhesives with different melting points.

The resistors may be composed of strings of resistor elements as mentioned above, and are preferably arranged in parallel in a heating cartridge, although wire-wound arrangements are possible.

The or each cartridge may be of generally circular section and include a preferably resilient, electrically insulating sleeve (consisting for instance of silicone [sic] with one or more metal oxides) surrounding the resistors or resistor elements.

The resistors are preferably mounted by a force-fitting device in the sleeve; this device may include a leaf spring and one or more contact pieces enclosing one or more of the resistors so as to provide a generally circular section fitting within the sleeve and urged against it by the leaf spring. This ensures good thermal contact under all operating conditions. The resistor elements themselves may be of any suitable shape, such as square, oblong or semicircular.

For a better understanding of the invention, embodiments will now be described ...

Notes

Claims 7 to 10 have been drafted in independent form, that is to say separate from claims 1 to 6. It seems highly likely that a non-unity objection would be raised to them in their present form. However, I consider that the claims as drafted allow the option of filing a divisional application later while conserving the option of keeping the material of claims 7-10 as subsidiary features in this application (cf. claim 11).

In this respect I am unsure of the instructions to draft claims etc. for only one application; I might well draft the claims in this form anyway initially.