(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 257 838 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **87306834.0**

(51) Int. Cl.⁴: **B05C 17/00**

(22) Date of filing: **31.07.87**

(30) Priority: **23.08.86 GB 8620535**

(43) Date of publication of application:
02.03.88 Bulletin 88/09

(84) Designated Contracting States:
DE ES FR GB IT SE

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EP 0 257 838 A2

(54) Hot-melt guns.

(57) Hot-melt gun especially for adhesives with trigger-operated feeding means using at least one continuous feed-belt or-chain to engage a glue-stick so as to feed it to the melt-chamber of the hot-melt gun. Preferably the feed-belt is driven by an electric motor and may be provided with outward-facing hooks adapted to engage a glue-stick. A twin-belt arrangement feeding the glue-stick between the belts is described. The second belt may be positively driven or may function as an idler. A computer logic device may be incorporated.

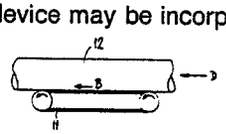


Fig. 1

HOT MELT GUNS

This invention relates to dispensers of hot, molten materials of the kind known as hot-melt guns.

Various proposals have been made to provide apparatus for melting and dispensing thermoplastic material supplied in the form of a rod. Such apparatus is usually provided with a melt-body having a melt-chamber in which thermoplastic material is melted, an inlet for the rod of thermoplastic material and an outlet comprising an orifice for dispensing and applying melted material, and means for heating the melt-body so that thermoplastic material fed as a rod into the melt-chamber, where it is then melted, may be dispensed and applied in molten condition from the orifice. Such apparatus finds use in various fields of application, commonly in the form of applicators for hot-melt adhesives and sealants and especially in hot-melt glue-guns having provision for feeding a rod of adhesive, known as a glue-stick, to the melt-body, for example by trigger-operated means.

The present invention is concerned with hot-melt guns for melting rods of thermoplastic material and dispensing and applying the resulting hot-melt materials, and more particularly is concerned with a hand-held glue-gun comprising improved feeding means adapted to feed hot-melt material in the form of a rod to the melt-body.

Rod-feeding means employed in hand-held glue-guns often include a trigger and associated mechanism arranged to grip a rod of composition to be fed, and to advance it towards the melt chamber. An inlet sleeve of resilient material is often provided at the entrance to the melt-chamber to assist in guiding the rod into the melt chamber and also to grip the surface of the rod as it is fed into the melt-chamber to minimise outflow of melted material from the melt-chamber inlet. For example, a hand-held, hot-melt glue-gun is described in GB Patent Specification 1402648 having feeding means for feeding a rod of solid, hot-melt material into a melt body, under the control of an operator, in which the feeding means comprises a carriage mounted for movement towards and away from the melt-body, a clamp member pivotally mounted on the carriage and a trigger connected to the clamp member by connecting means and arranged to be operated by the operator to pivot the clamp member into engagement with the rod of hot-melt material supported by the carriage to grip the rod and, on further pressure on the trigger by the operator, to feed the rod into the melt-chamber. The clamp member comprises a knife member by which the rod is engaged in the operation of the feeding means to feed the rod into the melt chamber.

Although such feeding means is acceptably effective to feed rod adhesive into the melt chamber, the knife member may tend to indent or otherwise distort the rod when excessive pressure is exerted on the trigger. The problem of outflow of melted material from the melt-chamber has long been recognised and deformation of the rod surface by the knife member renders it impossible to rely upon the inlet sleeve to provide sufficient seal on rod entering the melt chamber to prevent melted material being forced out between the inlet sleeve and the rod.

Problems associated with distortion of the rod are especially relevant in hand guns used for prolonged industrial use and particularly those using a high melt-capacity melt-body which has a particular need for rapid feeding of the rod, and also in those cases where the rod is unusually soft or unusually brittle.

Another disadvantage of available hand-operated glue-guns has been that a comparatively large application of effort is required to maintain the gripping of the rod whilst the carriage and clamp are moved towards the melt-chamber. Not only can this accentuate the distortion of the rod, but also may give rise to control difficulties or operator fatigue in those cases where the glue-gun is used for prolonged continuous periods, especially where a substantially uniform rate of rod feed is required intermittently.

It is therefore an object of the present invention to provide improved rod feeding means for a hot-melt gun.

According to the present invention, a hot-melt gun provided with trigger-operated feeding means for feeding a solid rod of thermoplastic material to the melt-chamber of said hot-melt gun is characterised by a positive feed mechanism comprising a driven elongated feed member controlled by drive means operated by the trigger, said elongated feed member comprising a driven continuous feed-belt arranged with its longitudinal axis parallel to the axis of the rod of thermoplastic material being fed to the melt-chamber. The feed-belt may be arranged so that one outer face contacts the rod along a substantial part of its length. Preferably a second belt is arranged in parallel to contact the opposite side of the rod so that the rod is engaged between the two parallel belts. The second belt may also be driven either by the same motor that drives the feed-belt or by a separate motor or it may function as an idler.

Alternatively, the feed-belt may be provided with at least one out-facing engagement member arranged to contact the rod so that the rod is urged to move in the direction of travel of the feed-belt. Preferably such a "hook-belt" is provided with a plurality of outfacing engagement members (hooks), preferably equispaced around the belt.

The driven belts may be powered by suitable means e.g. by hydraulic, pneumatic or clockwork devices but preferably are electrically driven by electric motors which can be arranged to drive one or more belts. The trigger may control the operation of the motor by conventional switching arrangements and these may incorporate control elements such as electronic computer chip devices. Such devices facilitate control of feed rate, can provide for pressure relief to inhibit unwanted outflow from the nozzle ("drool"), enable pre-set amounts to be extruded and also provide safeguards against overload pressures, over-heating, operation at below optimum temperature and similar undesirable conditions.

Throughout this specification the term "belt" is used to include all similar, continuous structures such as chains which are equally effective. For example, a so-called gripper chain lends itself very well to the incorporation of outfacing stud elements to form a hook-belt.

In order that the invention be better understood, preferred embodiments will now be described by way of example and with reference to the accompanying drawings in which:-

Figures 1, 2 and 3 are schematic representations illustrating alternative arrangements for feeding means for a hot-melt gun according to the invention, each showing a rod and associated feed mechanism,

Figure 4 is a side view of a glue-gun according to the invention, part in section, part broken away,

Figure 5 is a cross-section on line V-V of Figure 4, and,

Figure 6 is a plan view, part broken away, of the glue-gun of Figure 4.

Figure 1 illustrates a single-belt feed, where feed-belt 11 is arranged with its longitudinal axis parallel to the axis of rod 12 which is a 'glue-stick' comprising thermoplastic adhesive material. The outer surface of feed-belt 11, which has a corrugated finish to enhance its grip, is in contact with a significant length of the surface of rod 12 and thus, when the feed-belt moves in direction B, the rod is urged in direction D towards the melt-chamber (not shown) of the hot-melt gun.

The arrangement of Figure 2 is similar to that of Figure 1 with the addition of a second belt 13 arranged with its axis parallel to that of feed-belt 11 and that of rod 12. Second belt 13, which has the same corrugated finish as feed-belt 11, is in contact with a length of rod 12 opposite to that in contact with feed-belt 11 so that the rod 12 is gripped between the belts 11 and 12 and, when the belts move in direction B, again the rod is urged in direction D.

Figure 3 illustrates the so-called "hook-belt" drive in which a driven hook-belt 14 is provided with outfacing projections 15. The hook-belt is similarly arranged with its axis parallel to that of a rod 12 and arranged so that as hook-belt 14 moves in direction B, a projection (or hook) 15 engages end 16 of rod 12 and pushes it in direction D.

The glue-gun illustrated in Figures 4, 5 and 6 is a conventional, hand-held glue-gun wherein a handle 21 supports a body 22 containing a melt chamber 23 into which thermoplastic glue material is fed in solid (stick) form through sleeve portion 24. The glue material is melted in melt-chamber 23 by PTC heaters (not shown) and the resulting molten material is expelled from nozzle 25 by pressure applied to melt-chamber 23 by the feed of solid glue material through sleeve portion 24.

The illustrated glue-gun is fitted with feeding-means according to the present invention by means of which a glue-stick 12 is fed through sleeve portion 24 to melt chamber 23. The feeding means comprise a pair of endless belts 11,11' which are located with their longitudinal axes parallel to the axis of glue-stick 12 with their outer, corrugated faces (having transverse ridges) in contact with opposite sides of glue-stick 12. Belt 11 is driven by a drive wheel 26 connected to electric motor 27 through bevel gearing 28. Motor 27 is controlled by trigger 29 through an electronic control device (not shown) which responds not only to trigger 29 but also to the temperature of the molten material in melt-chamber 23, the pressure in melt chamber, the quantity of material fed into melt-chamber 23 through sleeve portion 24, the amount of molten material extruded through nozzle 25 etc.

Free-running idler wheels 30 support belt 11 along its length and at the other end. Belt 11' acts as an idler and is supported on free-running idler wheels 31. In operation, glue-stick 12 is gripped between parallel faces of belts 11,11' and thereby constrained to move in the direction of driven belt 11. Usually motor 27 is used to carry glue-stick 12 towards sleeve portion 24 but the electronic control device can be used, for example, to reverse motor 27 so that partial withdrawal of glue-stick 12 reduces the pressure on the material in melt-chamber 23 and so reduces unwanted extrusion ("drooling") of molten material through nozzle 25.

Claims

1. A hot-melt gun provided with trigger-operated feeding means for feeding a solid rod of thermoplastic material to the melt-chamber of said hot-melt gun characterised by a positive feed mechanism comprising a driven elongated feed member controlled by drive means operated by the trigger, said elongated feed member comprising a driven continuous feed-belt arranged with its longitudinal axis parallel to the axis of the rod of thermoplastic material being fed to the melt-chamber.

2. A hot-melt gun according to claim 1, wherein the feed-belt is arranged to that one outer face contacts the rod along a substantial part of its length.

3. A hot-melt gun according to claim 1 or 2, wherein a second belt is arranged in parallel to contact the opposite side of the belt so that the rod is engaged between the two parallel belts.

4. A hot-melt gun according to claim 3, wherein the second belt is driven by the same motor that drives said feed-belt or by a separate motor.

5. A hot-melt gun according to claim 3, wherein the second belt functions as an idler.

6. A hot-melt gun according to claim 1, wherein the feed-belt is provided with at least one outfacing engagement member arranged to contact the rod of thermoplastic material so that the rod is urged to move in the direction of travel of the feed-belt.

7. A hot-melt gun according to claim 6, wherein the feed-belt is provided with a plurality of outfacing engagement members, preferably equispaced around the belt.

8. A hot-melt gun according to any one of the preceding claims, wherein the drive means is electrically powered.

9. A hot-melt gun according to any one of the preceding claims, wherein the feed member is controlled by a computer logic device.

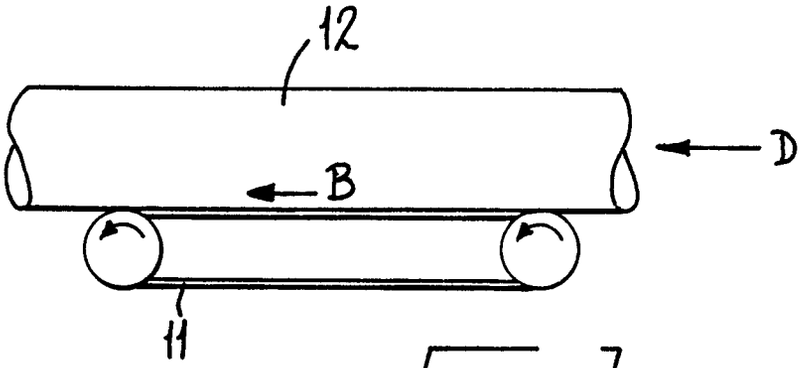


Fig_1

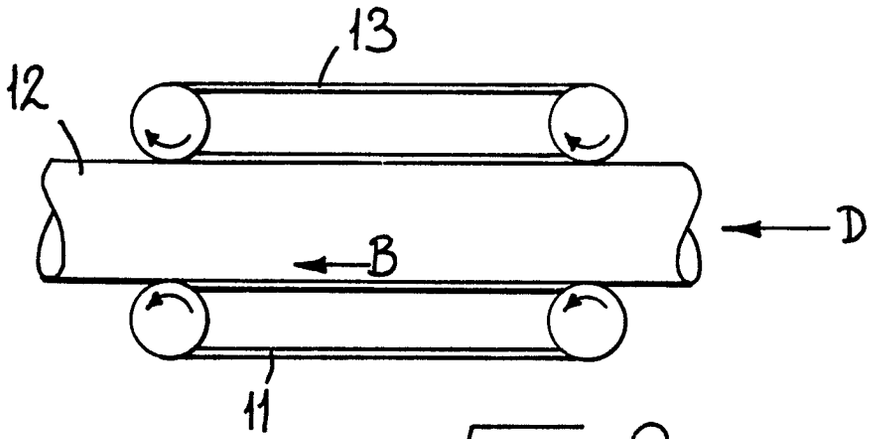


Fig_2

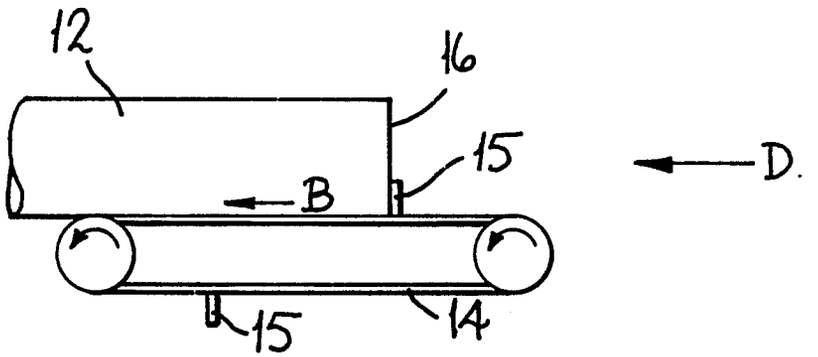
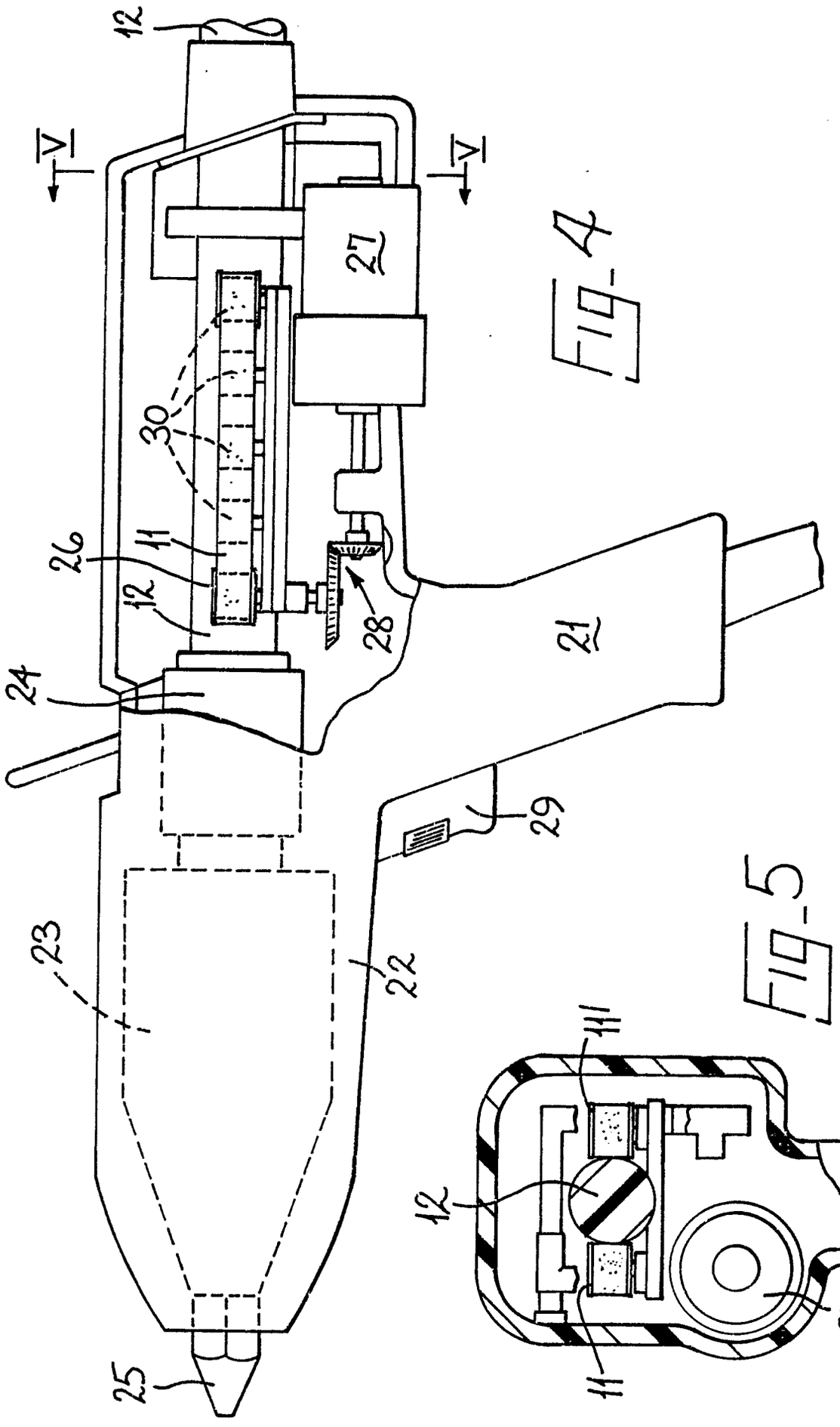


Fig_3



Фиг. 4

Фиг. 5

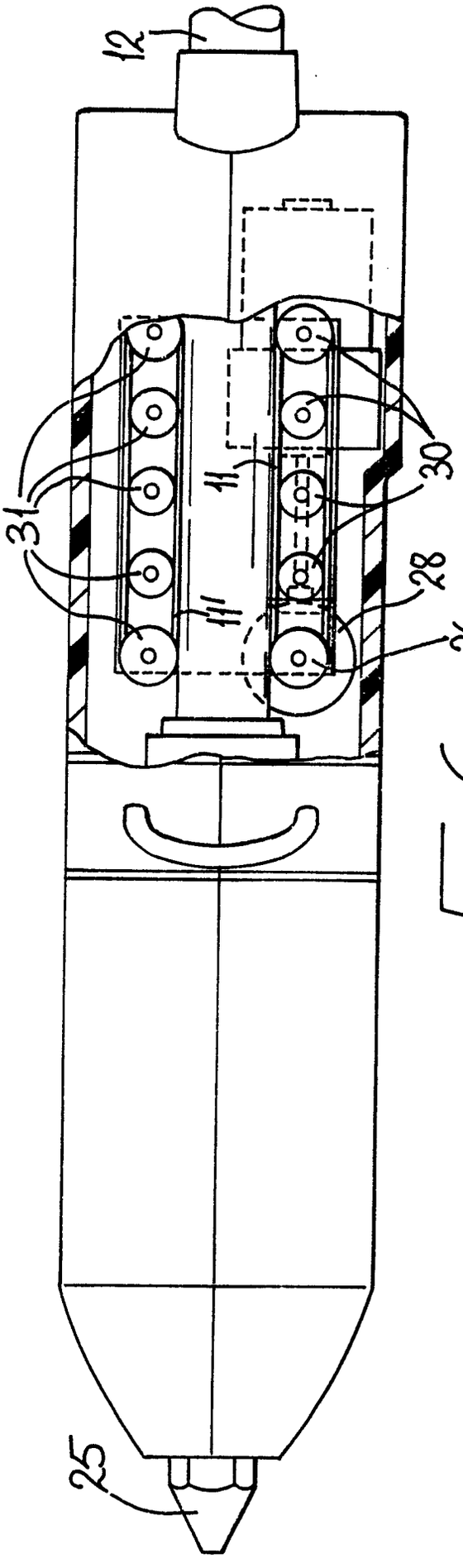


Fig. 6