

[54] **APPARATUS FOR APPLYING A FASTENING DEVICE**

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[51] Int. Cl. **H05b 1/00**

[58] Field of Search 219/221, 227-242, 219/243, 245; 156/320, 322, 579, 581, 583, 499, 66, 71; 151/41.7; 228/51-55

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Primary Examiner—A. Bartis

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[57] **ABSTRACT**

This invention relates to a fastening device which has a plate, a layer of hot melted adhesive adhered to one side of the plate and a mechanical fastening means protruding from the other side of the plate, and to an apparatus for applying the fastening device. The apparatus has an electrically heated element having an aperture therein shaped so that the mechanical fastening means can be passed through the heating element, control means for turning the heating element on and off, and gripping means adapted to clamp onto a portion of the mechanical fastening means which has been inserted through the heating element. The gripping means, which can be selectively moved between non-clamping and clamping positions, is adapted to hold the fastening device so that the side of the plate not covered with adhesive is in direct face-to-face thermal contact with the heating element.

2 Claims, 9 Drawing Figures

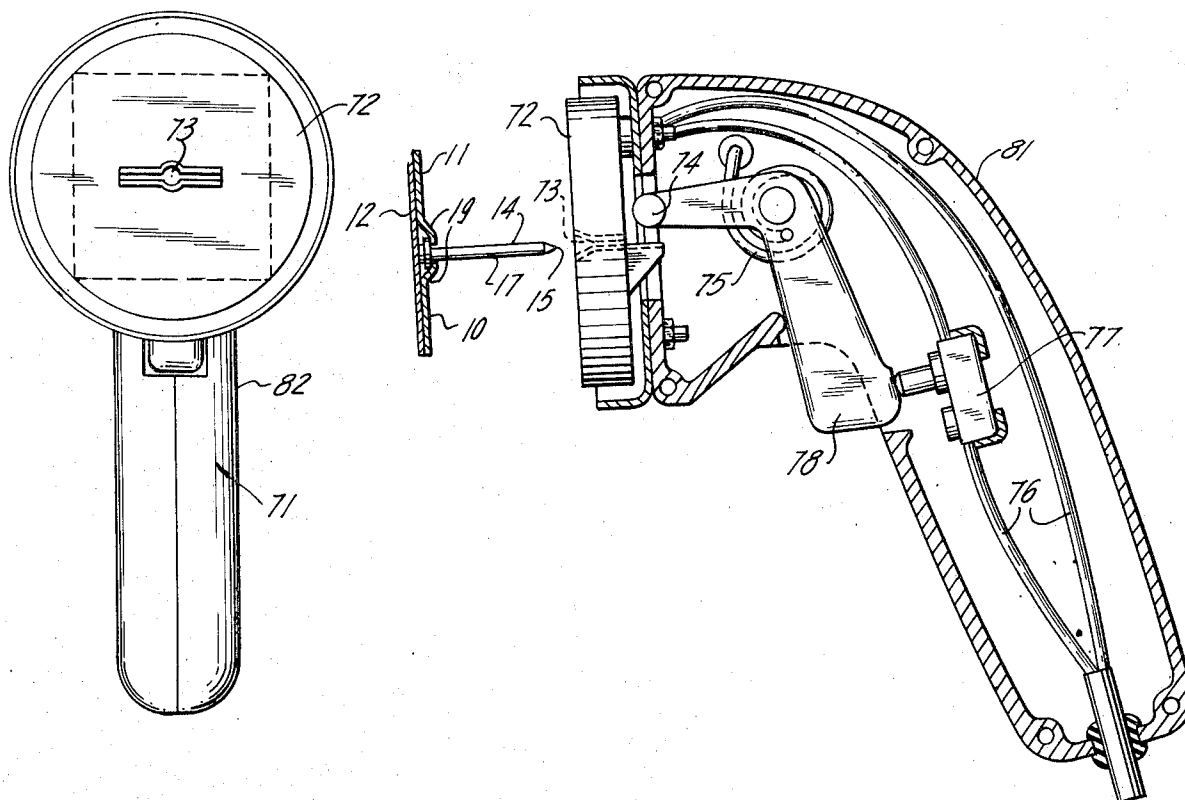


FIG. 1

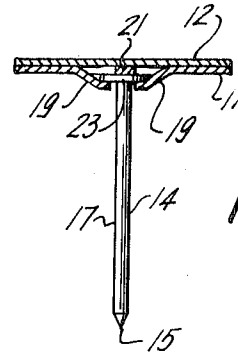
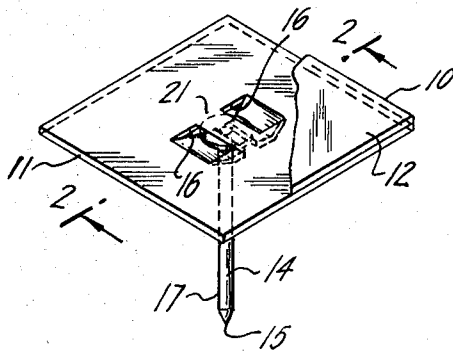


FIG. 2

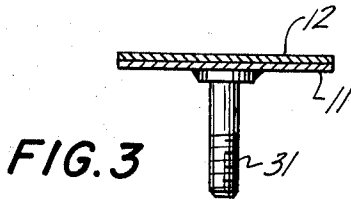


FIG. 3

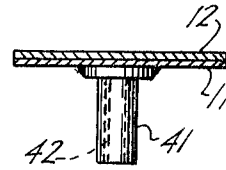


FIG. 4

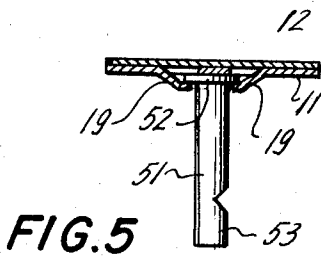


FIG. 5

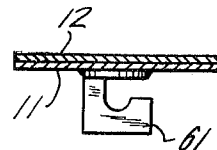


FIG. 6

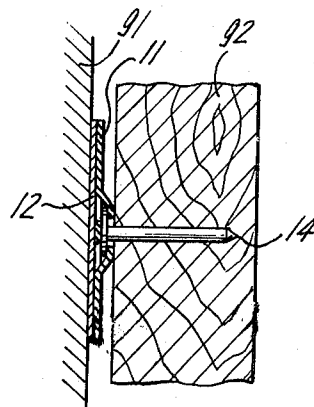


FIG. 9

FIG. 7

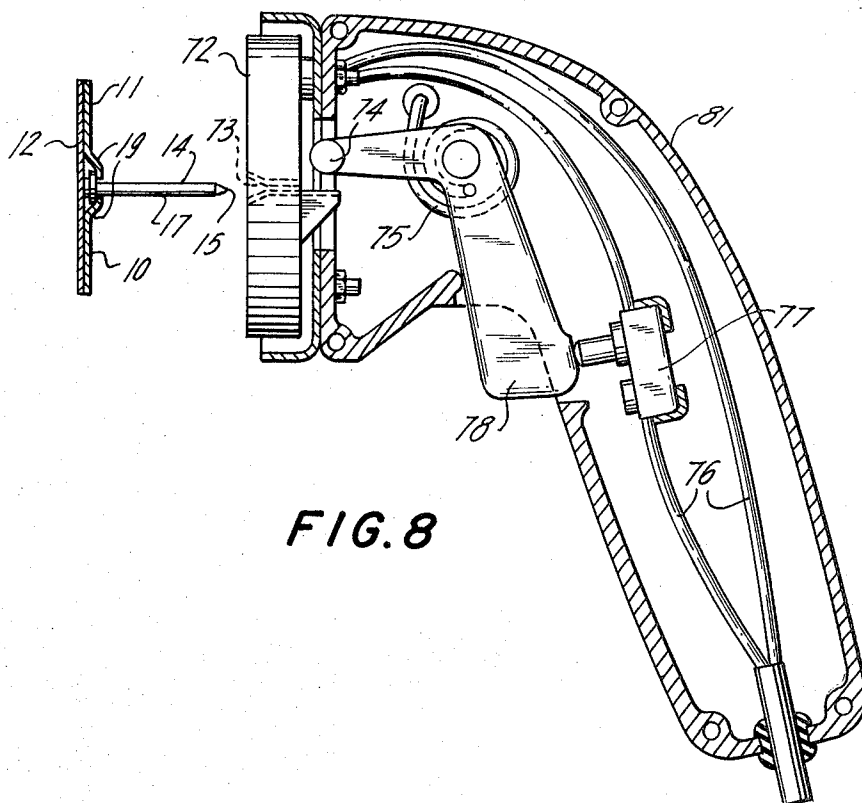
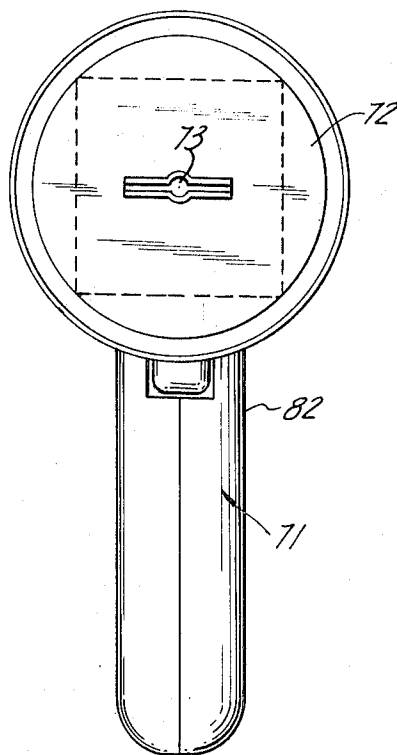


FIG. 8

APPARATUS FOR APPLYING A FASTENING DEVICE

Heretofore, fastening devices have been developed which consist of a plate having a mechanical fastening device protruding from one side. Typical of such fastening devices are those shown in U.S. Pat. No. 2,365,629 in which a nail point protrudes from one side of a plate. In use, the plate is adhered to a surface such as a wall with a liquid adhesive and then a material such as an insulation board is driven onto the nail point. A major drawback to the use of such a fastening device is the fact that the fastening device cannot support any substantial weight until the liquid adhesive has dried or set up. Thus, the general procedure is to adhesively apply the fastening devices to a surface and then wait at least several hours before securing a material to the mechanical fastening means.

The present invention provides a fastening device which can be securely bonded to a surface within seconds and then materials attached to the fastening device immediately thereafter. The fastening device of this invention comprises a plate, a layer of hot melt adhesive adhered to one side of the plate and a mechanical fastening means protruding from the other side of the plate. The fastening device is attached to a surface by activation of the hot melt adhesive following which a material is attached to the plate by the mechanical fastening means.

This invention also includes an apparatus for quickly applying the fastening device. The apparatus comprises an electric heating element having an aperture therein shaped so that the mechanical fastening means can be passed through the heating element, control means for turning the heating element on and off, and gripping means adapted to clamp onto a portion of the mechanical fastening means which has been inserted through the heating element. The gripping means, which can be selectively moved between non-clamping and clamping positions, is adapted to hold the fastening device so that the side of a plate not covered with adhesive is in direct face-to-face thermal contact with the heating element. The heating element is shaped so that it contacts substantially the entire surface of the plate and is capable of activating the layer of hot melt adhesive for activating the hot melt adhesive and a gripping means adapted to clamp on the mechanical fastening means and hold the plate in contact with the heating element.

The invention will be more readily understood when the following detailed description is read in conjunction with the accompanying drawings. The embodiments shown in the drawings are for illustrative purposes and are not intended to in any way limit the scope of the invention, it being apparent from the present description that many additional embodiments can be constructed which fall within the scope of this invention.

FIG. 1 is a perspective view of a fastening device of the present invention in which the mechanical fastening means is a nail;

FIG. 2 is a sectional view on the line 2—2 of FIG. 1;

FIG. 3 is a sectional view similar to FIG. 2 illustrating a fastening device in which the mechanical fastening means is a screw;

FIG. 4 is a sectional view similar to FIG. 2 illustrating a fastening device in which the mechanical fastening

means is a hollow member having internal threads adapted to receive a screw;

FIG. 5 is a sectional view similar to FIG. 2 illustrating a fastening device in which the mechanical fastening means is an element of sheet metal having a bendable tab;

FIG. 6 is a sectional view similar to FIG. 2 illustrating a fastening device in which the mechanical fastening means is a hook-shaped member adapted to receive a wire;

FIG. 7 is a front elevation of the apparatus of this invention for applying the fastening device;

FIG. 8 is a cross section of the apparatus of FIG. 7 with a fastening device shown ready for insertion into the apparatus, and

FIG. 9 is a cross-sectional view showing the fastening device of FIG. 1 adhesively bonded to a wall and attaching a piece of wood thereto.

Referring now to FIG. 1, there is shown a fastening device 10 of the invention, comprising a plate 11, a layer of hot melt adhesive 12 on one side of the plate and a mechanical fastening means in the form of a nail 14 attached to the other side of the plate. The nail point 15 points away from the plate with the nail shaft 17 being at right angles to the plate. There are two sets of slits 16 in the plate 11 each set defining three sides of a rectangle. The area of the plate between the sets of slits forms a supporting strip 21. The areas inside the sets of slits 16 are offset to form a pair of retaining covers 19.

As shown in FIG. 2, the nail 14 is secured to the plate 11 by sliding the nail head 23 between the supporting strip 21 and the retaining covers 19. The nail is preferably locked in place by pounding down the retaining covers.

FIG. 9 illustrates the use of the fastening device 10. The layer of hot melt adhesive 12 has been softened, pressed against a surface 91 and then permitted to cool, thereby bonding the fastening device to the surface. A material 92, which can be penetrated by the nail 14, has then been driven onto the nail.

The nail shown in FIG. 1 can be replaced with many other mechanical fastening means and the slit arrangement used to attach the nail in FIG. 1 can be changed or replaced by soldering or welding. A few of the many possible variations are shown in FIGS. 3 to 6.

FIGS. 3 and 4 illustrate the use of threaded elements as the mechanical fastening means. In FIG. 3 a screw 31 is soldered to the plate 11. This screw can be passed through a hole in a material to be fastened and then a nut placed on the screw. In FIG. 4, a hollow member 41 having internal threads 42 is soldered to the plate 11, the hollow member being adapted to receive a bolt or screw.

FIG. 5 shows another mechanical fastening means which is an L-shaped sheet metal clip 51 having a bendable tab 53 at the end of one leg. The other leg 52 is attached to the plate 11 by a slit arrangement such as shown in FIG. 1. The leg protruding from the plate 11 is then slipped through a slot in the material to be attached and the tab 53 bent 90°.

FIG. 6 illustrates another embodiment of the invention wherein a hook-shaped element 61 is soldered to the plate 11. The hook-shaped member is adapted to hold an electric or telephone wire.

The hot melt adhesive should have a softening point at least about 10°F. higher than the maximum temperature to be encountered in the environment of usage. Particularly good results have been obtained with hot melt adhesives which are mixtures of polypropylene and polyterpene resins containing about 0.1 to 1.5 parts of polyterpene resin for each part of polypropylene. Additionally, these adhesives can contain about 0.1 to 0.5 parts of ethylene/vinyl acetate copolymer for each part of polypropylene. Small amounts of other additives, such as wax, fillers, antioxidants and plasticizers can also be included.

Table 1 gives the compositions of a number of suitable hot melt adhesives. These adhesives bond successfully to a wide variety of materials such as metal, cinder block, brick, wood, plaster board, plaster, ceramic tile and plastic. The adhesive compositions listed are given for illustrative purposes only and are not intended to limit the scope of the invention. In Table 1 the compositions are given in parts by weight.

FIG. 7 illustrates an apparatus 71 of this invention. The apparatus has an electric heating element 72 having an aperture 73 shaped so that the mechanical fastening means of the fastening device can pass therethrough.

Operation of the apparatus 71 can be seen from the cross-sectional view of FIG. 8 which also includes the fastening device 10 of FIG. 1 ready for insertion into the apparatus. A gripping means 74 is located within the apparatus 71 and is normally held in a non-clamping position by a spring 75. The apparatus also includes wires 76 for supplying electrical power to the electric heating element, an on-off switch 77 for controlling the electric power, and a trigger element 78 which when squeezed, both moves the gripping means 74 into clamping position and closes the switch 77.

In operation, the nail 14 is inserted through the aperture 73 until the plate 11 is in contact with the heating element 72. The trigger element 78 is then moved by an operator toward the right in FIG. 8, thereby closing switch 77 and causing gripping means 74 to clamp on the fastening means 14. Closing of switch 77 activates heating element 72 which softens the hot melt adhesive 12. The softened hot melt adhesive is pressed against the surface to which it is to be bonded. The trigger element 78 is released, the hot melt adhesive 12 quickly cools and the apparatus 71 is pulled away from the fastening device 10.

As shown in FIGS. 7 and 8, the operational elements of apparatus 71 are mounted on body member 81 so as to form a unitary, operative apparatus. Body member 81 is shaped to provide a hand-grip portion 82. If desired, the apparatus can be modified so that the electric switch is controlled by the operator independent of the gripping means. Additionally, many different forms of the gripping means 74 can be designed by those

skilled in the art.

TABLE 1

HOT MELT ADHESIVE COMPOSITIONS

	A	B	C	D	E
Atactic Polypropylene	15.0	9.0	11.0	9.0	9.0
Ethylene/Vinyl Acetate	—	2.5	—	2.5	2.0
Terpene Polymer *	10.0	10.0	10.0	10.0	10.0
Micro-wax	—	4.0	4.0	4.0	4.0
Antioxidant **	0.1	0.1	0.1	—	—

* hydrocarbon resin made from alpha pinene

** 2,6-di-tert-butyl-para-cresol

It will be apparent that many modifications and variations can be effected without departing from the scope of the novel concepts of the present invention, and the illustrative details disclosed are not to be construed as imposing undue limitations on the invention.

I claim:

1. An apparatus for applying to a material a fastening device which has a plate, a layer of hot melt adhesive adhered to one side of said plate and a mechanical fastening means protruding from the other side of said plate, said apparatus comprising a body member; an electric heating element carried by said body member and having an aperture therein shaped so that the mechanical fastening means can be passed through said heating element; control means associated with said body member for turning said heating element on and off; gripping means on said body member adjacent said heating element and movable between a first non-clamping position and a second clamping position, biasing means attached to said gripping means for urging said gripping means into the non-clamping position and means comprising an element connected to said gripping means for moving said gripping means into the clamping position, said gripping means being adapted to clamp onto a portion of said mechanical fastening means which has been inserted through the heating element and hold the fastening device in a gripped position in which said other side of said plate is in face-to-face direct thermal contact with the forward face of the heating element, said heating element being shaped so that it contacts substantially the entire surface of said other side of said plate when said fastening device is held in said clamped position.

2. An apparatus as claimed in claim 1 wherein movement of said element connected to said gripping means also actuates the control means for said heating element and turns said heating element on when moved to the clamping position and turns the heating element off when moved to the non-clamping position.

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