

[54] **ADHESIVE APPLICATOR**

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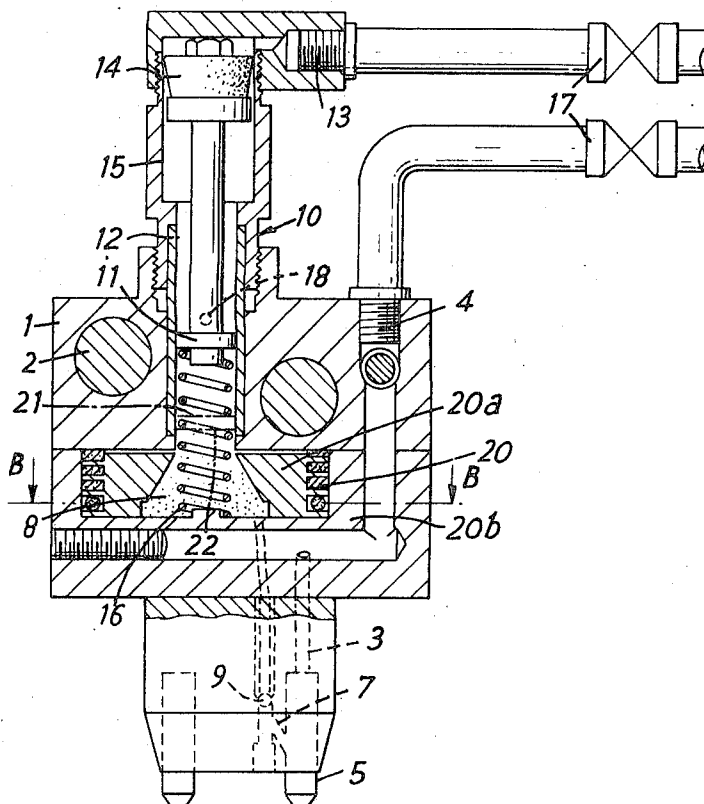
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[57]

**ABSTRACT**

An adhesive applicator for use in the lasting of shoes, the applicator including a reservoir for molten adhesive, an air passage leading to a nozzle through which air under pressure is supplied, a pump for feeding molten adhesive into a moving air stream in the air passage, and means for feeding predetermined quantities of adhesive into the reservoir. In operation the applicator is so controlled that the desired quantity of adhesive is first fed to the reservoir, air under pressure is caused to flow through the air passage and nozzle and the pump is then operated to expel the desired quantity of adhesive into the air passage.

**11 Claims, 6 Drawing Figures**



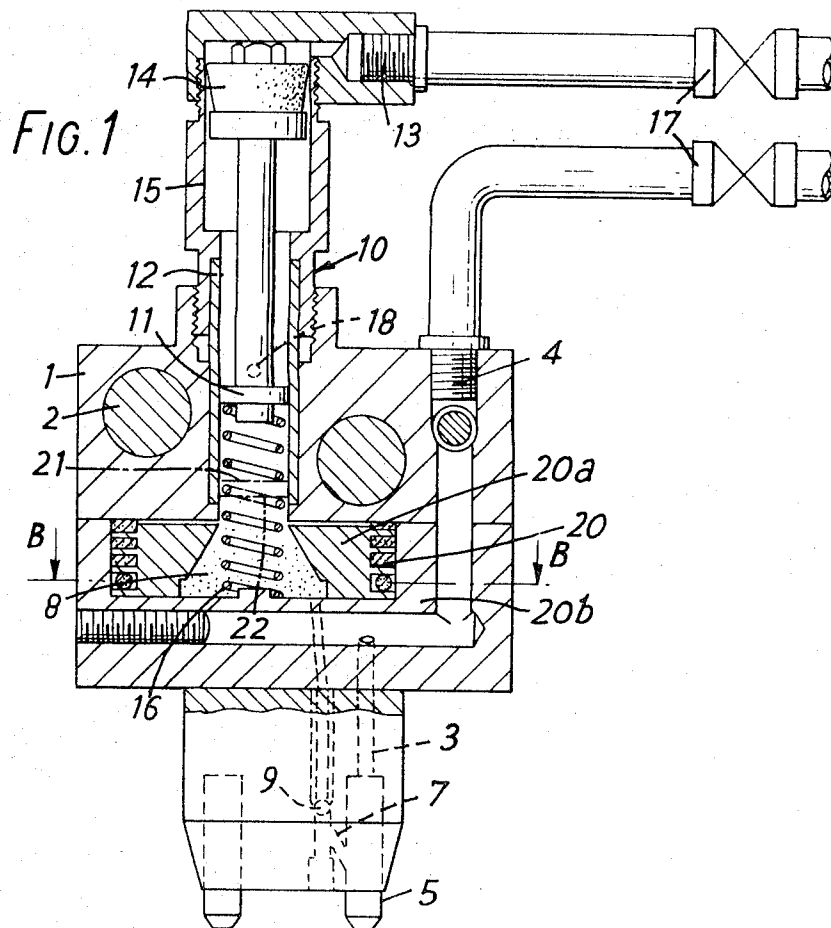
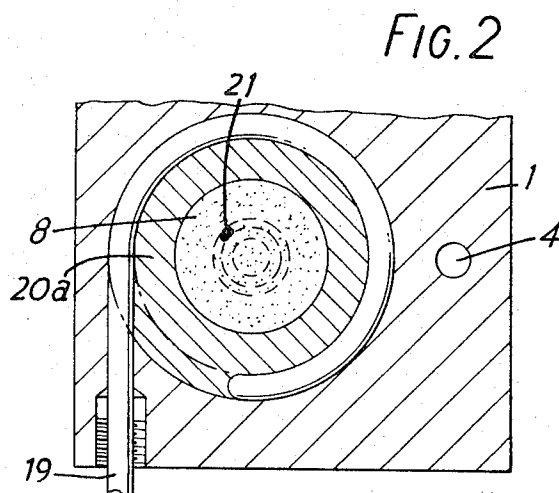


FIG. 3

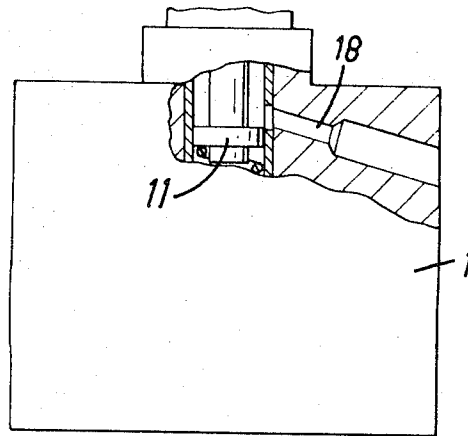
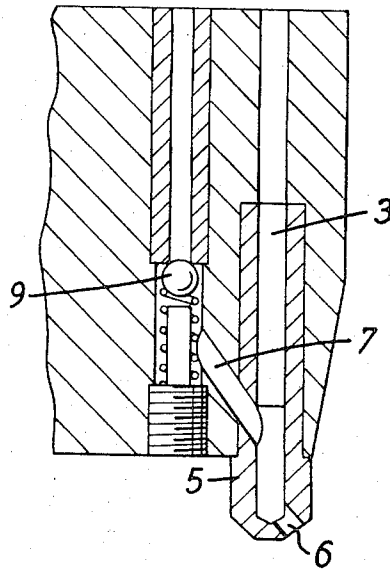
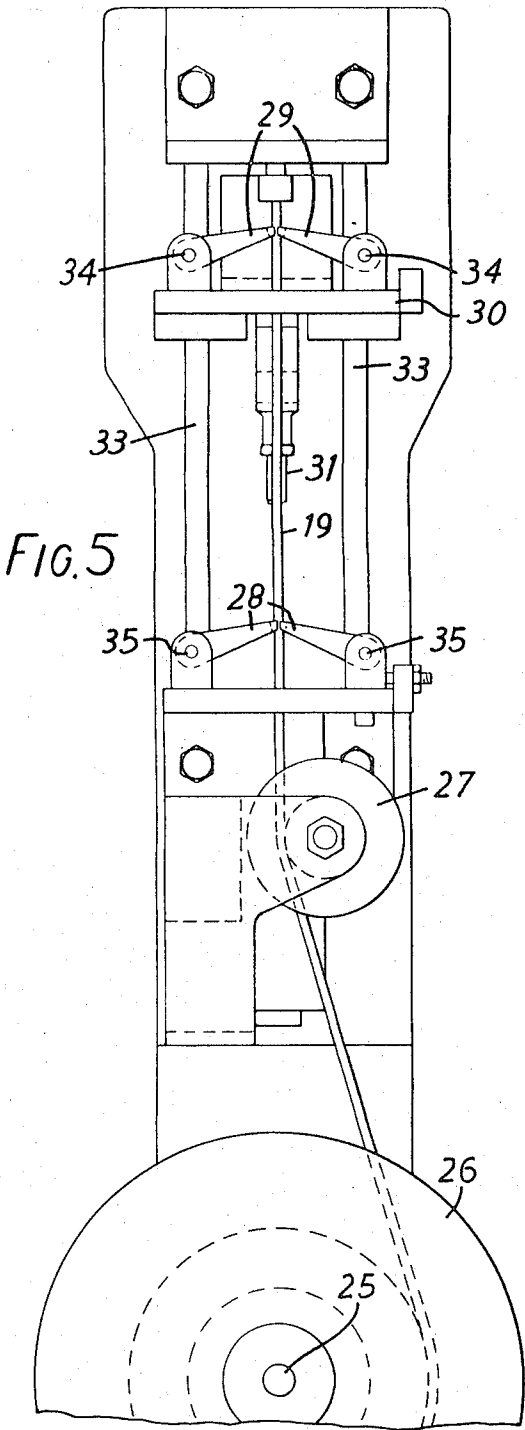
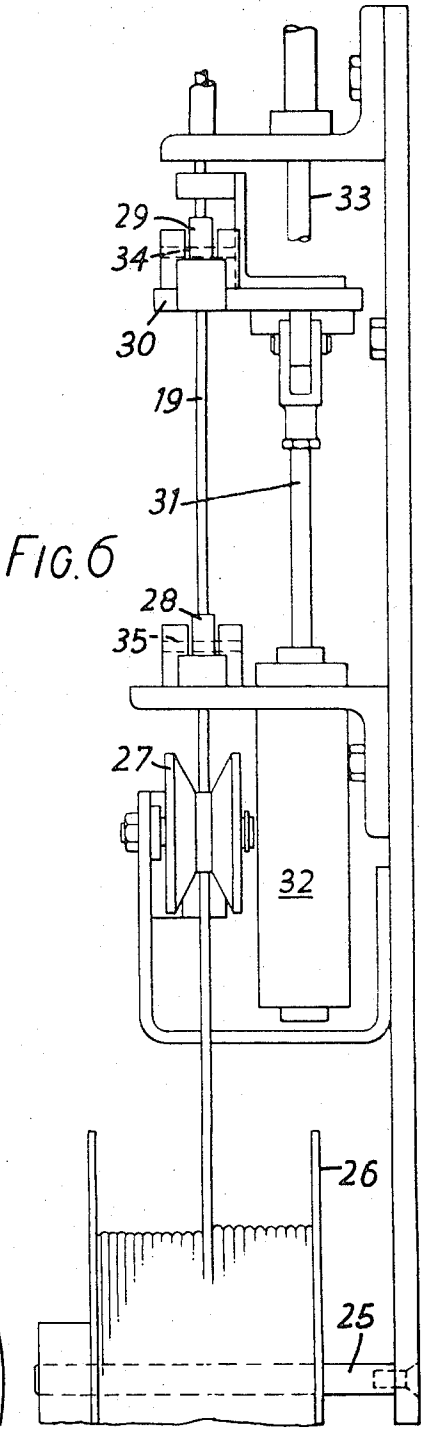


FIG. 4





## ADHESIVE APPLICATOR

The invention relates to an adhesive applicator of a kind for applying adhesive to stick the marginal parts of shoe uppers to shoe insoles during lasting. In particular, the invention is concerned with an applicator of the kind which spits quantities of hot melt thermoplastic adhesive from a nozzle by means of air under pressure.

According to the invention there is provided an adhesive applicator comprising an adhesive applicator comprising a housing formed to provide a reservoir for molten adhesive, an air passage in the housing extending from an inlet for compressed air to an outlet in at least one nozzle mounted on the housing, an adhesive passage in the housing extending from the reservoir to the air passage, a pump mounted on the housing and operable to expel adhesive from the reservoir through the adhesive passage, means for controlling the admission of air to the air passage and for operating the pump such that adhesive is expelled from the reservoir through the adhesive passage into a moving air stream in the air passage, and means for charging the reservoir with adhesive, the charging means being operable to determine the quantity of adhesive fed to the reservoir and thus the quantity of adhesive expelled therefrom by the pump and ejected through the nozzle.

In a preferred embodiment of the invention the adhesive pump comprises a piston in a cylinder formed in the housing and which is actuated by a pneumatic cylinder. The supply of compressed air to the pneumatic cylinder and to the inlet to the air passage may be controlled by respective valves which are operated to house the adhesive expelled from the reservoir is fed into a moving air stream. In practice it may be sufficient to operate both valves simultaneously as there is some delay in the adhesive being ejected into the air passage because of the viscosity of the adhesive and the operating characteristic of the pump. Accordingly, the air blast down the air passage will precede the ejection of adhesive into the air passage. As an alternative to this arrangement however, it is envisaged that the air blast down the air passage may be continuous and intermittent control may be effected only for the adhesive pump as and when the adhesive is required.

Preferably there is a non-return valve in the adhesive passage.

In a preferred embodiment of the invention the adhesive is supplied in the form of a cement rod which is fed to the heated pump housing where it is melted. Melting is achieved progressively in a melting passage into which the rod is fed and from which the cement emerges in liquid form. The liquid cement from the melting passage is supplied directly to the pump. With this arrangement a preferable form of the charging means comprises a reciprocating feed device which grips the solid rod as it is fed to the pump housing and which controls the length of the rod which is fed at each stroke. Each stroke of the feed device precedes a stroke of the pump to recharge the pump with the required amount of adhesive. In one arrangement the feed device comprises two sets of claws, one set of claws being stop claws which are fixed and which allow the passage through them of the adhesive rod in the forward direction only, the claws gripping the rod to prevent retraction. The other set of claws are feed claws which are moved intermittently forward and back and grip the rod to move it forward the required amount

during the forward stroke. During the return stroke the feed claws rid over the rod. Preferably the stroke of the feed claws is adjustable to determine the precise amount of adhesive fed at each stroke. The means for moving the feed claws may be a pneumatic cylinder with an adjustable stop to determine the length of stroke.

The invention will further be described with reference to the accompanying drawing, of which:

FIG. 1 is a sectional elevation of the pump housing and air passage assembly of an adhesive applicator in accordance with the invention;

FIG. 2 is a part section taken at B—B of FIG. 1;

FIG. 3 is a fragmentary section showing a detail of the housing;

FIG. 4 is an enlarged view of the air passage and nozzle arrangement shown in FIG. 1; and

FIGS. 5 and 6 are respectively end and side elevations of the feed device for feeding the assembly of FIG. 1.

Referring to FIGS. 1 to 4 the applicator comprises a pump housing 1 which is heated by an electric heating element 2. In the lower part of the pump housing there is an air passage 3 which is coupled at its upper end to an air inlet 4 to receive compressed air. The lower end of the air passage terminates in one or more nozzles 5 each of which may have a number of nozzle outlets 6 (FIG. 4). In use, liquid hot melt thermoplastics adhesive is fed from a passage 7 into the air passage 3 whereby it is ejaculated by the compressed air. The applicator is used for applying adhesive in predetermined small quantities to the marginal parts of shoe uppers in a lasting process which sticks the marginal parts of the uppers to shoe insoles.

The adhesive is maintained in a reservoir 8 in liquid form by virtue of the heating of the pump housing. The required quantities of adhesive are ejected through the adhesive passage 7, by means of an adhesive pump 10. Ejection of adhesive through passage 7 is effected through a non-return valve constituted by a spring-loaded ball 9. This prevents the air in passage 3 blowing back into the reservoir 8. In order to give some indication of the sizes and quantities involved, it is pointed out that typically the volume of adhesive ejected at each application is about 0.0108 cu. ins. The volume of adhesive in the passage 7 between the valve seat and the opening into the air passage 3, including the valve chamber, is about 0.0087 cu. ins.

Pump 10 comprises a piston 11 which moves in a cylinder 12 to act on the adhesive in the reservoir 8. The downward stroke of the pump is caused by the application of air pressure to an air inlet 13 from whence it is applied to the top of an air piston 14 moving in a cylinder 15 and coupled to piston 11. Return of the piston 11 is effected by a return coil spring 16 after the air pressure has been removed. Inlet 13 and inlet 4 are connected to separate air supplies through valves 17 which are operated when it is required to eject adhesive in such manner that the adhesive is delivered through the passage 7 into a flowing air stream. In practice the valves 17 may be operated by the same signal since, because of the viscosity of the adhesive and the relatively slow-acting characteristic of the pump, air will be flowing in the air passage 3 before the adhesive is delivered through the passage 7. In any case the arrangement is such that adhesive is always ejected into a flowing air-stream and the required quantity of adhesive in each

stroke of the pump is ejaculated from the nozzle 6 with the air.

The adhesive is melted in the pump housing 1 in a manner to be described and during melting there is a tendency for gases and liquids to be driven out of the adhesive. In order to allow escape of these gases and liquids the piston 11 is made so that it is not a perfect seal in the cylinder 12. The gases and liquids are allowed to escape past the piston 11 and are drained from a drain passage 18 (FIG. 3) above the upper limit of piston 11.

The hot melt adhesive is fed to the pump housing 1 in the form of a solid cement rod 19. The rod is fed into a helical melting passage constituted by a helical groove 20 in the wall of a cylindrical member 20a, the member 20a fitting closely within a member 20b so that the groove defines a helical passage. The passage has four turns. The first turn of the passage is of a dimension such as substantially to accommodate the circular section of the rod in its solid state. Thus, the first turn of the passage has a depth of five thirty-seconds inch and a width of one-eighth inch, the rod being five thirty-seconds inch in diameter. Because of the heat generated by element 2 the rod melts in the melting passage and after the first turn the groove is reduced in size to have a depth of three-sixteenths inch and a width of three thirty-seconds inch.

After being melted in the melting passage the liquid cement overflows into the reservoir 8 up to a level indicated at 21, which is dependent on the amount of rod fed in as will be explained below. This level is slightly above the lowermost limit 22 of the piston 11 so that in its downward stroke the piston forces a quantity of adhesive into the air passage 3, the quantity being that quantity between the levels 21 and 22.

Referring now to FIGS. 5 and 6 there is shown the feed device which controls the length of the rod 19 which is fed into the pump housing 1. This control is effective to determine the amount of adhesive between levels 21 and 22 and thus the amount of adhesive ejected from the nozzle at each stroke. The feed device comprises a reel holder 25 which accepts a supply reel 26 on which is wound the cement rod 19. The rod 19 is drawn over a free-running pulley 27 through two pairs of gripping claws 28 and 29. Claws 29 are feed claws which are mounted on a platform 30. The platform is mounted on a rod 31 which is coupled to a piston (not shown) of a pneumatic piston and cylinder arrangement 32. The piston and cylinder arrangement 32 is effective to reciprocate the platform 30 along guides 33. The claws 29 are thus reciprocated periodically. The claws are free on axes 34 and are arranged to grip the rod 19 when moved into the forward (upward) direction and yet slide over the rod 19 when retracted. It will be seen, therefore, that repeated reciprocal movement of platform 30 moves the rod 19 intermittently forward. Claws 28 are arranged similarly to claws 29, being free on axes 35 and constitute stop claws which effectively prevent retraction of rod 19 during the backward stroke of claws 29.

The forward stroke of the claws 29 is determined by the position of an adjustable stop (not shown) associated with the piston and cylinder arrangement 32. The extent of this forward stroke determines the length of rod 19 fed forward at each stroke and thus determines the quantity of adhesive ejected from the nozzle at each stroke. Typically, the length of the forward

stroke is about  $2\frac{3}{4}$  inch. Actuation of the pneumatic piston and cylinder arrangement 32 is controlled in conjunction with the actuation of the piston and cylinder arrangement 14, 15 (FIG. 1) so that when it is desired to eject a supply of adhesive the pneumatic cylinder arrangement 32 is operated to feed adhesive rod into the pump housing whereby to increase the level of molten adhesive in reservoir 8 and the piston 11 of the adhesive pump is then operated to eject adhesive into the moving air stream.

I claim:

1. An adhesive applicator comprising a housing formed to provide a reservoir for molten adhesive, an air passage in the housing extending from an inlet for compressed air to an outlet in at least one nozzle mounted on the housing, an adhesive passage in the housing extending from the reservoir to the air passage, a pump mounted on the housing and operable to expel adhesive from the reservoir through the adhesive passage, means for controlling the admission of air to the air passage and for operating the pump such that adhesive is expelled from the reservoir through the adhesive passage into a moving air stream in the air passage, means for charging the reservoir with adhesive, and means in said housing for heating and melting said adhesive, the charging means being operable to determine the quantity of adhesive fed to the reservoir and thus the quantity of adhesive expelled therefrom by the pump and ejected through the nozzle.

2. An adhesive applicator as claimed in any preceding claim 1 in which the adhesive passage includes a non-return valve.

3. An adhesive applicator as claimed in claim 1 in which the adhesive pump comprises a piston movable in a cylinder formed in the housing and operable by a pneumatic cylinder.

4. An adhesive applicator as claimed in claim 3 including valve means for controlling the supply of compressed air to the pneumatic cylinder and to the inlet to the air passage in the required sequence.

5. An adhesive applicator as claimed in claim 3 in which the piston is a loose fit in its cylinder to allow for the escape past the piston of gases which are formed during the melting of the adhesive.

6. An adhesive applicator as claimed in claim 1 in which adhesive is supplied to the applicator in the form of a solid rod which is moved intermittently into a melting passage formed in the housing and from which molten adhesive passes into the reservoir.

7. An adhesive applicator as claimed in claim 6 in which the melting passage is formed as a helical passage in the housing.

8. An adhesive applicator as claimed in claim 7 in which the cross-sectional area of an initial portion of the passage is substantially equal to the cross-sectional area of the rod and the cross-sectional area of the subsequent portion of the passage is less than that of the rod.

9. An adhesive applicator as claimed in claim 6 in which the means for moving the rod intermittently comprises a reciprocable feed device which grips the adhesive rod to be fed to the melting passage and controls the length of rod to be fed at each stroke.

10. An adhesive applicator as claimed in claim 9 in which the feed device includes two sets of claws for engaging the rod, one set of claws being stop claws which are in fixed position and allow adhesive rod to move be-

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tween them in a forwards direction but prevent reverse movement, and the other set of claws being feed claws which are movable in a forwards and backwards direction and grip the rod to feed it during their forwards movement.

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11. An adhesive applicator as claimed in claim 9 including adjustable stop means for limiting the forwards movement of the feed claws.

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