This invention relates to a method means for metering a viscous liquid, such as the adhesive known as hot melt, with a sharp accurate cut off at the end of the metering period. The present invention is disclosed illustratively as a nozzle for depositing hot melt in which a moving element such as a sliding piston within the nozzle both shuts off the flow of material from a material source through the nozzle and also partially vacates a cavity in the nozzle. This partial vacating of a nozzle cavity creates a low pressure area into which liquid at the nozzle mouth is forced by the surrounding atmosphere to provide the sudden cut off of metered liquid referred to above. This nozzle action is highly desirable in many applications of viscous liquids and will be described particularly in use with a class of viscous adhesives known as hot melts.

It is desirable, when working with adhesives such as hot melts, to deposit a controlled bead of the material on a surface and cut off the bead with a sharp accurate end. Hot melt depositing devices, when moved away from the surface, the flow stopped and the nozzle will generally trail a string of the adhesive, resulting in a bead protruded beyond the desired limits.

Thus, it is an object of the present invention to provide a means which will deposit a bead of hot melt with a sharp and accurate cut off.

It is a further object of this invention to provide a nozzle which will deposit a bead of hot viscous liquid adhesive within sharply defined limits.

It is a still further object of the present invention to provide a nozzle for depositing a bead of viscous liquid adhesive up to a surface wherein a flow of liquid adhesive under pressure is fed through the nozzle while depositing on the surface, and means for selectively cutting off the flow of said liquid while simultaneously reducing the pressure in said nozzle is provided.

It is a yet further object of the invention to provide a method of depositing a bead of hot melt within certain sharply defined limits comprising providing a flow of liquid under pressure to a nozzle, and then at the desired point, stopping the flow of liquid to the nozzle, while simultaneously reducing the pressure within the nozzle.

It is still a further object of this invention to provide a means for depositing a bead of viscous liquid adhesive on a surface with an accurate, abrupt cut off comprising a body including an adhesive inlet; a nozzle secured to said body; a piston operating in said body above said nozzle which communicates said inlet with said nozzle when said piston is in its lowermost position and interrupts said communication when said piston is at an intermediate point between the bottom and the top of the stroke thereof; and means for selectively reciprocating said piston.

Other objects of the invention will become apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features herein-after fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated by the accompanying drawings in which the same numerals refer to corresponding parts and in which:

Figure 1 is a sectional elevation of the nozzle with the piston in the bottommost position;

Figure 2 is a sectional elevation depicting the piston in the uppermost position drawn to the same scale as Figure 1.

The body 10 is provided with a bore 11 which is adapted to receive a connection from a source of liquid plastic adhesive, known as hot melt, under pressure. Such an adaptation is represented by the threads 12. A second bore 13 parallel to the bore 11 is provided in the body 10. The bore 13 has, at its blind extremity, a continuation bore 14. Bore 13 is sealed at its outside opening by any suitable means as for example, by the plug 16 which may be threaded into the threads 17. A third bore 18 is provided in the body 10 intersecting and communicating the bores 11 and 13. Still another bore 19 is provided in the body 10, as shown parallel to the bore 18, in communication with the bore continuation 14. The bore 19 is provided, at its upper end as depicted in Figure 1, with a counter bore 21. The counter bore 21 is preferably of a substantially larger diameter than that of the bore 19. A blind bore 22 extends downwardly from the face 23 of the counter bore 21. The bore 24 communicates the blind bore 22 with the exterior of the body 10. Means for selectively admitting compressed air are adapted to be in communication with the bore 24.

Plug 26 is adapted to be threadably inserted into the bore 18 as at 27 to seal this bore from the outside. The plug 26 is provided with a hollow end 28 and a blind bore 29 extending upwardly, longitudinally thereto. Transverse holes 31 are provided in the plug 26. It is desirable to provide at least 2 perpendicular transverse holes 31, communicating the blind bore 29 with the exterior of the plug 26 to provide adequate flow.

Means for filtering impurities out of the hot melt is desirably inserted between the bores 18 and 13. One very suitable filtering means is the cylindrical screen 32 which is inserted into the bore 18 engaging at the upper end, the hollow plug 28 and, at the lower end, the bottom of the bore 18.

A piston unit 33 is adapted to reciprocate within the bore 19. The piston unit 33 is constructed with a lower portion or first piston 34 adapted to reciprocate within the bore 19 and an upper portion or second piston 36 which is adapted to engage the counter bore 21. A seal is to be provided between the counter bore 21 and the upper piston portion 36. One suitable sealing means is the O-ring 37 which is seated in the annular groove 38 provided in the upper piston portion 36. A top opening longitudinal blind bore 39 is provided in the piston 33.

An annular groove 42 is provided in the bore 19 at the position of the bore continuation 14. A second annular groove 43 is provided near the top of the bore 19 to release leakage through the hole 49 communicating with the outside. Piston 34 is provided with an annular groove 44 and transverse ports 45 which communicate the bore 39 with the annular groove 44 and, thus, the exterior surface of the piston 34. Transverse ports 48 communicate the longitudinal blind bore 39 with the annular groove 46, provided on the periphery of said piston 34 and, thus, with the exterior surface of the piston 34.

A counter bore plug 50 is secured to the end of the counter bore 21 to seal said counter bore and said plug 50 is retained by any suitable means as for example by means of the screws 52. Means for selectively admit-
ting compressed gas is suitably represented by the threaded hole 51 in the plug 50.

A nozzle or dispensing member 53 is rigidly secured to the body 10 and includes a chamber 54 of a larger diameter than the bore 19 disposed to be in line with the bore 19. A nozzle outlet 55 communicates the chamber 54 with the exterior of the nozzle 53.

**Operation**

It is to be noted, in FIGURE 1, that the bore 11 is in communication with a source of hot melt under pressure. The hot melt passes through the holes 31 into the bore 29. The bore 18 will, thus, be filled with the hot melt which is then strained through the screen 32 to remove particles therein that will not flow through the nozzle. The hot melt passes, then, through the bore 13 and the bore continuation 14 filling the annular groove 42. When the piston unit 33 is in the bottommost position, the annular groove 44 is in communication with the annular groove 42 and receives therefrom the hot melt under pressure. The hot melt fed to the annular groove 44 passes through the transverse ports 47 and thus into the bore 39, and out the ports 49. Hot melt flows from the piston 48 filling the annular groove 46 and that chamber 54, causing hot melt to be extruded through the nozzle outlet 55.

When it is desired to shut off the nozzle, the compressed gas is introduced to the counter bore 21 via bore 22 and hole 44 lifting the piston unit 33 to the position depicted in FIGURE 2. It is noted that the bottom rim 56 engages the bottom of the bore 19 sealing said bore before said piston unit 33 has reached the uppermost position. The hot melt under pressure is thus cut off out of communication with the chamber 54. As the piston unit 33 is further raised there is a decrease of pressure within said chamber. The decrease in pressure within the chamber 54 will tend to pull the hot melt at the nozzle outlet 55 back into the chamber 54 thus resulting in a sharply defined cut off. When the piston unit 33 reaches the position depicted in FIGURE 2, the annular groove 46 is out of communication with the chamber 54, and the annular groove 44 is out of communication with the bore extension 14.

It is apparent that many modifications and variations of this invention as hereinbefore described may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

I claim:

1. A nozzle for depositing hot melt comprising: a body including an inlet therein for receiving hot melt under pressure and a bore in communication with said inlet; a means for removing impurities from said hot melt interposed between said inlet and said bore; a piston having an exterior surface adapted to slide within said bore, a longitudinal passage closed at both ends thereof, and two transverse passages, an upper and a lower each communicating said longitudinal passage with the exterior surface of said piston; a dispensing member secured to said body below said bore and including a chamber of a greater diameter than said bore; a dispensing member secured to said piston for selectively reciprocating said piston; and said piston in said body in such a position that said piston is being in the first position and said transverse piston passage at each position of said transverse piston passage.

2. The nozzle of claim 1 wherein an annular groove is provided in said piston at the position of each transverse piston passage and there is provided a plurality of transverse piston passages at each position of said transverse piston passage.

3. The nozzle of claim 1 wherein the driving means comprises a second piston secured to said piston and said second piston is adapted to slide within a counter bore provided within said body; a source of compressed gas; and means for selectively communicating opposite ends of said counter bore with said source of compressed gas so as to allow said compressed gas to selectively impinge on said second piston.

4. A nozzle for depositing hot melt comprising: a body including an inlet for receiving a viscous liquid under pressure, said body having a bore in communication with said inlet, piston means having an exterior surface adapted to slide within said bore, said piston including a longitudinal passage closed at both ends thereof, and a first transverse passage means and a second transverse passage means each communicating said longitudinal passage with the exterior surface of the piston means, a dispensing member secured to said body in alignment with one end of said bore, said dispensing member having a chamber of a greater diameter than said bore, driving means secured to said piston for selectively reciprocating said piston in said body in said position and a second position, said piston being in the first position when said first transverse passage is in communication with said inlet and said second transverse passage is in communication with said chamber whereby the viscous liquid under pressure flows through said piston and dispensing member to a discharge location, and said piston being in the second position when the first and second passage means are out of communication with said inlet and said chamber respectively.

5. The nozzle of claim 4 including a means for removing impurities from said viscous liquid interposed between said inlet and said bore.

6. The nozzle of claim 4 wherein annular grooves are provided in said piston at the positions of the first and second transverse passages.

7. The nozzle of claim 4 wherein the body has an enlarged counter bore in axial alignment with the bore and said driving means comprises a second piston secured to the piston in the bore, said second piston slidably disposed in said counter bore and secured to said piston, and means for selectively communicating opposite ends of said counter bore with a source of gas under pressure so as to allow said gas to selectively impinge on opposite sides of said second piston.

8. The nozzle of claim 4 wherein said body has an annular groove surrounding said bore in communication with said inlet.

9. The nozzle of claim 8 wherein an annular groove is provided in said piston at the position of the first transverse passage, said annular groove in the piston being in communication with the annular groove in the body when the piston is in the first position.

10. The nozzle of claim 9 wherein an annular groove is provided in said piston at the position of the second transverse passage, said second annular groove being in communication with said chamber when the piston is in the first position.

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