

[54] **METHOD AND APPARATUS FOR DISPENSING AIR-CURABLE VISCOUS MATERIALS**

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[58] Field of Search **222/148, 320, 504; 141/89, 141/90**

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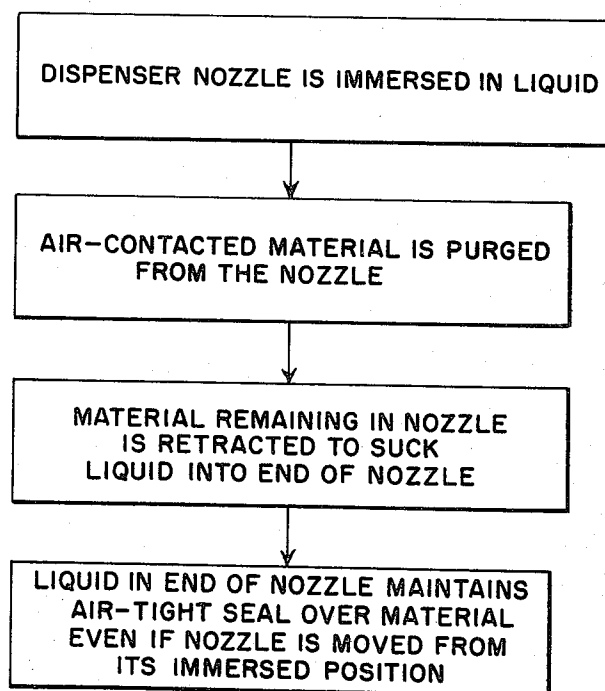
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[57]

ABSTRACT

A method and apparatus are provided for dispensing air-curable materials without allowing them to partially cure and clog portions of the dispensing system. The invention is characterized by the provision of a liquid filled reservoir in combination with a generally conventional dispenser for viscous materials. As is typical, the dispenser includes a dispensing nozzle through which a metered amount of viscous material may be discharged from the dispenser. To prevent the nozzle from being clogged by the formation of bodies of partially or totally cured materials therein, following a dispensing operation of the equipment, the nozzle is partially immersed in the reservoir of liquid so that an air-tight seal is formed around the dispensing end of the nozzle. After such immersion, all air-contacted material in the nozzle is purged from it and a back pressure is applied to the viscous material in the nozzle to withdraw part of it upward into the nozzle and thus cause some of the liquid in the reservoir to be sucked into the nozzle.

5 Claims, 3 Drawing Figures



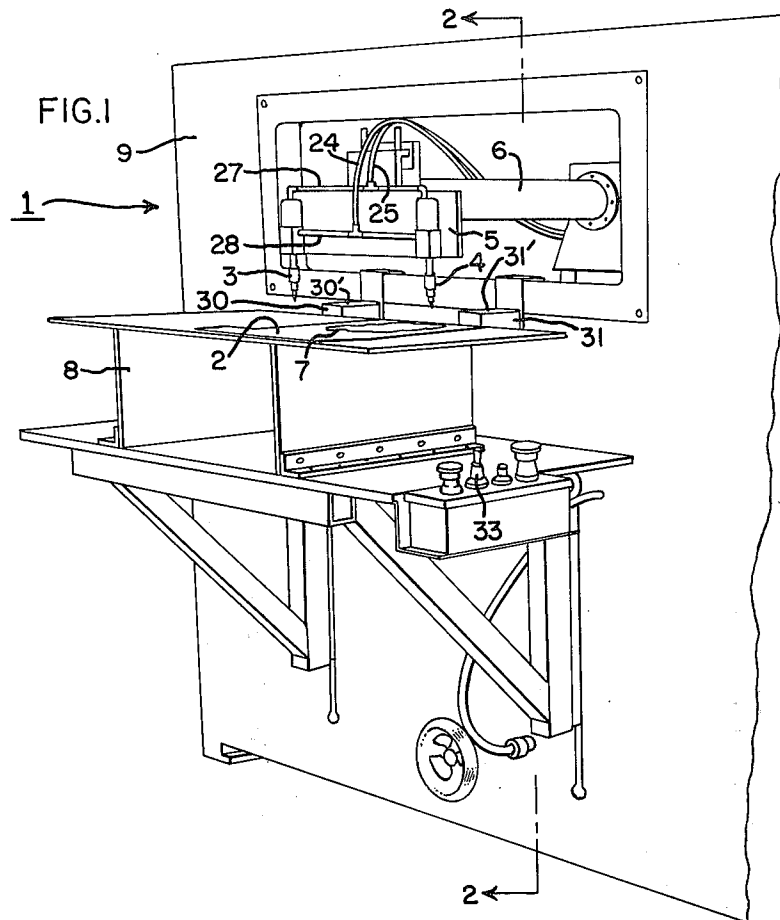
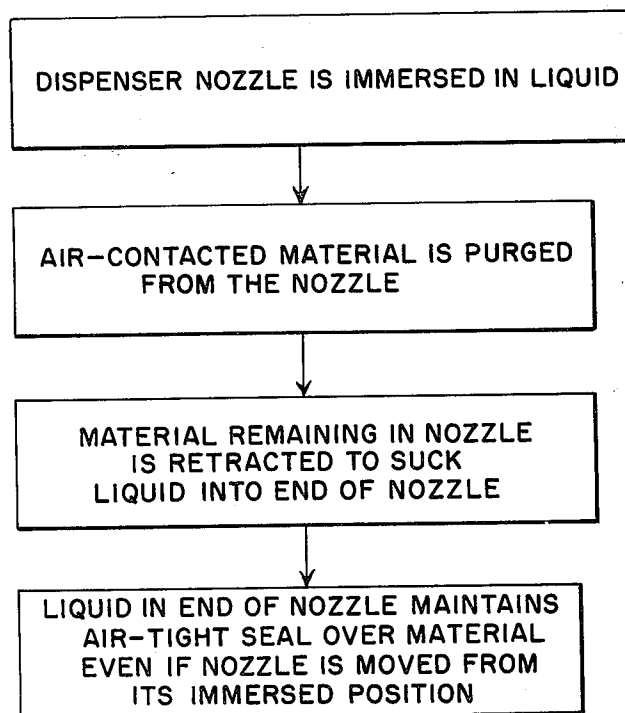


FIG. 3



METHOD AND APPARATUS FOR DISPENSING AIR-CURABLE VISCOUS MATERIALS

BACKGROUND OF THE INVENTION

A well-known problem typically encountered in the dispensing of air-curable materials, such as many commercially available silicone rubbers, is that the materials are likely to completely or partially cure within a dispensing nozzle if the nozzle is left unused for any length of time. For example, if an operator discontinues a dispensing operation and leaves the nozzle exposed to air for more than a few minutes, the material in the nozzle tends to cure and plug the nozzle so that it must be removed and cleaned before the dispensing operation can be resumed. Thus, following any shutdown of extended duration such as is normally taken for labor shift changes or for meals, such a start-up operation is required to place the machine back in operation for continued dispensing duty. Obviously, such start-up operations as removing and cleaning the nozzles or portions of the material supply line are time consuming and expensive so should be avoided, if possible.

Heretofore, no completely satisfactory solution to the undesirable plugging of dispensing nozzles due to curing of dispensable material therein was known to the applicant. Some dispensing systems have been developed in which a jet of gas is used to purge material from a dispensing nozzle following its normal use. Such a purging operation is effective to remove air-contacted material that might otherwise become cured in the nozzle, provided the purging operating is effective to remove all material within the nozzle back to a valve within the dispensing supply line. Even with such a purging arrangement, however, there is a risk that air will leak past any such valve and tend to at least partially cure the material remaining in the supply line. Accordingly, such systems may only complicate the clogging problem by resulting in cured plugs further up the supply line which may be more difficult to remove than those formed within the dispensing nozzle.

Another known type of dispensing apparatus utilizes a stream or streams of air to wipe a dispensing nozzle clean following a normal dispensing operation. Typically, such air-wiped nozzles are used to prevent leaking or dripping of the nozzle, rather than to prevent plugging of the nozzle by the curing of air-contaminated material therein. It is noted here simply to recognize that it is known that by removing material from the outer end of a valve type nozzle at least the removed material is prevented from curing and forming a plug in the nozzle. Of course, the problem of air leakage past the valve would still be present, as in the directly purged type of nozzle system mentioned above.

OBJECTS OF THE INVENTION

A primary object of the invention is to overcome the above-mentioned shortcomings of prior art dispensing systems.

Another object of the invention is to provide a dispensing apparatus in which means are provided for preventing clogging of a dispensing nozzle in the apparatus when the nozzle is not in use.

A further object of the invention is to provide a liquid reservoir for immersing the dispensing end of a dispenser apparatus nozzle when it is not in use, thereby to seal the end of the nozzle against air so that material

remaining in the nozzle will not be cured by exposure to air.

Yet another object of the invention is to provide a method for dispensing air-curable material, in which method air is sealed from the material within a dispensing nozzle when the nozzle is not in use and any air-contacted material within the nozzle is purged therefrom after the nozzle is sealed.

Still another object of the invention is to provide a method for preventing clogging of a dispensing nozzle of a dispensing apparatus, in which method a dispensing nozzle is immersed in a liquid to provide an air-tight seal around the nozzle when it is not in use. Following such immersion, any air-contacted material remaining in the nozzle is purged therefrom and part of the material remaining in the nozzle is slightly withdrawn into the nozzle to such liquid into the end of the nozzle and provide an air-tight seal around the end of the nozzle even when it is removed from immersion in the liquid.

Additional objects and advantages of the invention will be apparent to those skilled in the art from the description of it that follows herein, taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

In a preferred form of the invention, a dispensing nozzle coupled to a sealed supply of air-curable viscous material is provided in combination with a reservoir filled with a liquid, such as oil. Pressure means are operably connected to the supply of viscous material to selectively force it through the nozzle in a normal dispensing operation. Means are provided for mounting the nozzle for relative movement with respect to the reservoir so that following a normal dispensing operation the dispensing end of the nozzle may be immersed in the liquid in the reservoir, thereby to seal the nozzle and prevent air-curing of the material therein. In practicing the method of the invention, after the dispensing nozzle is immersed in the reservoir of liquid, all air-contacted viscous material in the nozzle is purged from it by energizing the pressure means, and then the pressure means is reversed to withdraw part of the viscous material into the nozzle and thus suck some of the liquid up into the nozzle to form a secondary seal in the nozzle itself. This secondary seal affords an air-tight seal even after the nozzle is removed from immersion in the liquid of the reservoir.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a segmentary perspective view of a dispenser for viscous materials. The dispenser incorporates means for preventing clogging of the dispenser nozzle, pursuant to the teachings of the present invention.

FIG. 2 is a side plan view, partly in cross-section, of a portion of the dispenser shown in FIG. 1, taken along the plane 2—2 illustrated in FIG. 1.

FIG. 3 is a flow chart that illustrates diagrammatically steps of the method of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, it will be seen that there is shown a dispenser 1 for viscous material that may be any one of a number of different types of compositions. As the description of the invention proceeds, it will become apparent that the particular type of viscous material

utilized will not be particularly critical to the operation of the invention except insofar as the invention is designed primarily for use with a viscous material that is air-curable. The preferred embodiment of the invention is described here and is illustrated with respect to a dispenser 1 that may be used for dispensing a material such as air-curable silicone rubber of a commercially available grade that is suitable for forming gaskets in place on a working surface. A steel plate 2 is shown in FIG. 1 to illustrate such a working surface. A pair of movably mounted material dispensing nozzles 3 and 4 are mounted on a header member 5 that is in turn supported on a steel arm 6 that can be moved to drive the nozzles in a variety of controlled patterns. One such pattern is shown by the deposited bead 7 of silicone rubber on work One 2.

Any suitable means may be used to support the plate 2, but in the preferred embodiment of the invention, a metal table 8 is secured to the steel frame 9 of the dispenser 1 by welding or other suitable means, to form such a support.

A number of well-known conventional means may be used to control the movement of arm 6 and thus dispensing nozzles 3 and 4. In this form of the invention, the movement of arm 6 is controlled by a standard electro-optical sensor and control mechanism 10 (See FIG. 2) that is mounted on a carriage 11 which, in turn, is supported on bars 12 and 12a that are movable across the face of the frame 9 on tracks 13 and 13a. Of course, the wheels 14 and 14a mounted on opposite ends of the bar 12a are restricted in any suitable manner, such as by the lip 13' on track 13, so that they will maintain a completely straight path along the tracks 13 and 13a. Movement of the carriage 11 along bars 12 and 12a and relative to tracks 13 and 13a is controlled by the electro-optical sensor mechanism 10 that is operable to detect and trace a pattern 15 that is mounted in a conventional holder 16 directly above the sensor portion of mechanism 10, as is generally well-known in the art. One suitable commercially available type of sensor (for the mechanism 10) is an "Optronic Tracer Unit" manufactured by Seneca Falls Machine Company of New York. Of course, such movement of the carriage 11 is transmitted to the nozzles 3 and 4 due to the rigid coupling afforded by the arm 6 being welded or otherwise firmly fixed to the carriage 11.

The particular features of the dispenser 1 discussed thus far may be formed of commercially available, conventional components, since they do not incorporate unique features that are essential to the proper operation of the invention. Accordingly, it will be appreciated that although a preferred structure and mode of operation has been described, various other means may be utilized to mount and move the dispensing nozzles 3 and 4 in a variety of desired control patterns. For example, as will be apparent from the following description, the invention may be practiced with dispensing nozzles that are manually held and manipulated, without any need for the type of more sophisticated pattern control mechanism described generally above.

In like manner, it will be understood that a variety of conventional means may be used to supply silicone rubber or other viscous material to the nozzles 3 and 4. However, for the sake of illustrating one suitable form of such apparatus, reference may again be made to FIG. 2 in which there is depicted a replaceable canister or container 17 that is removably mounted on a sup-

porting framework 18 near the bottom of the frame 9. A conventional in-line electric pump 19 is operably connected by conduit 20 in an air-tight manner to an aperture in the base of the canister 17. Normally, some type of plunger such as the graphically illustrated plunger 21 is provided to force the viscous material contained in canister 17 from it into the conduit 20, if the material does not flow by gravity into the conduit.

The output end of pump 19 is operably connected by a conduit 22 to a flexible hose 23 that is coupled in an air-tight manner to the inner end of a pair of smaller flexible hoses 24 and 25 (see FIG. 1) which extend through the rigid arm 6 to feed material from the hose 23 to the nozzles 3 and 4 by way of the tubing 27 and 28 mounted on the header 5.

In order to prevent the pump 19 from transmitting irregular surges of pressure to the nozzles 3 and 4, a pressure accumulator 29 is operably connected in a conventional T-arrangement to the pipe 22 on the high pressure side of the pump 19. In the preferred embodiment of the invention, the accumulator 29 is a standard diaphragm-type that is capable of being charged with a low or high pressure gas that is inert relative to the material being transmitted through the pipe 22. Thus, the pump 19 and the accumulator 29, in combination with the standard valve means normally present in the respective heads of nozzles 3 and 4 constitute a pressure means that is operable to regulate the discharge of material from the nozzles 3 and 4 in a manner pursuant to the method of the present invention. Of course, it should be understood that other conventional pressure means may be used in alternative forms of the invention to obtain this desired objective.

Pursuant to the present invention, a pair of open-topped liquid reservoirs 30 and 31 are rigidly mounted on the frame 9 at positions accessible to the nozzles 3 and 4. The reservoirs 30 and 31 are at least partially filled with bodies of liquid 30' and 31' which are relatively inert with respect to the silicone rubber or other materials that are to be dispensed from the nozzles. In the preferred embodiment of the invention, the bodies of liquid 30' and 31' comprise commercially available oil of a suitable machine grade.

In addition to the electro-optical control means afforded by mechanism 10 that is capable of controlling the movement of the nozzles 3 and 4 in various pre-selected patterns, a suitable conventional electric drive means 32 is housed in the carriage 11 and is partially controlled by a suitable electric switch 33 mounted on an arm of the table 8 and connected to the drive means 32 in standard fashion. The drive means 32 is operatively coupled to move the nozzles 3 and 4 to and from a position in which the respective venting ends of the nozzles are immersed in the bodies of the liquid in reservoirs 30 and 31 to a position where the nozzles are in a desired position relative to the pre-selected pattern 7 on the working surface 2. Thus, following a normal dispensing operation in which one of the nozzles is moved around the pre-selected pattern 7 under the control of the electro-optical sensing and control means 10, an operator may actuate switch 33 to cause drive means 32 to move the nozzles 3 and 4 in a horizontal plane generally parallel to the plane of the dispensed pattern 7 to a position over the respective reservoirs 30 and 31. Then, the drive means 32 is operable to move the nozzles 3 and 4 in a generally vertical direction to immerse their respective dispensing ends in

the bodies of liquid 30' and 31'. It will be understood that this immersion serves to form air-tight seals around the dispensing ends of the nozzles. Subsequently, pursuant to the next step of the preferred form of the method of the invention, all air-contacted or possibly contaminated material remaining in the nozzles 3 and 4 is purged therefrom by selective actuation of the pressure means that is used to effect a normal dispensing operation of material from the nozzles. Next, the pressure means is operated to cause a withdrawal or retraction of part of the material in nozzles 3 and 4 so that some oil is sucked upwardly into the nozzles to assure an air-tight seal over the remaining material in the nozzles even after they are withdrawn from their immersed positions in the bodies of liquid 30' and 31'.

It will be seen from the foregoing description of the structure and method of the invention that a means is provided whereby air-curable material, such as silicone rubber, may be dispensed from the dispenser 1 without risk of clogging the dispensing nozzles 3 and 4 due to contamination of the material in the nozzles during intervals when they are not being utilized in a dispensing operation. For example, when an operator of the dispenser 1 leaves the machine for several minutes to perform some other duty, or perhaps for a longer period such as that normally taken for meals or over-night shutdown of the apparatus, dispensing nozzles 3 and 4 are protected from clogging by being sealed and purged in the manner described above. When it is desired to re-start or continue the dispensing operation, it is only necessary to actuate the switch 33 to cause the drive means 32 to remove the nozzles 3 and 4 from the reservoirs 30 and 31 and position them over the pattern area where control of the operation of the nozzles can be assumed by the electro-optical mechanism 10. The small amount of oil sucked into the ends of the nozzles can simply be discharged onto the working surface 2 at the initiation of a normal dispensing pattern, since it will not impair the quality of a formed-in-place gasket that is to be formed by operation of the dispensing means. It has been discovered that it is not necessary to remove or manually clean the nozzles 3 and 4 prior to commencing such a dispensing operation following an extended shutdown period of several days duration.

It is believed that the operation of the invention is clear from the foregoing description, but to briefly summarize the unique features of the method of the invention, reference may be made to FIG. 3 of the drawings which illustrates a flow chart for the fundamental steps of one preferred sequence of the method. As indicated in FIG. 3, following a normal dispensing operation of the silicone rubber or other air-curable viscous material from either one or both of the dispensing nozzles 3 and 4, the dispensing nozzles are moved to a position where they are immersed in the bodies of liquid 30' and 31'. In the next step of the method, all air-contacted or potentially contaminated material is purged from the nozzles directly into the liquid of the reservoirs. In the next step of the method of the invention, which is optional and need not be included in every application of the invention, part of the material remaining in the nozzles is retracted slightly to cause it to suck the liquid from the reservoirs 30 and 31 into the dispensing ends of the nozzles. Finally, in the last step of the method which is also an optional step that need not be practiced in every application of the method of the invention, the nozzles may be raised from their im-

mersed position in the liquid and still be sealed by the liquid that has been sucked into their respective dispensing ends. Accordingly, air will be prevented from coming in contact with the air-curable material remaining in the nozzles and conduits of the dispensing system, so that the dispenser 1 may be maintained in this optimum condition for an indefinite period of time without causing the nozzles to be clogged by setting or curing of the dispensable material.

Those skilled in the art will recognize that various modifications and improvements of the structure and method disclosed herein may be made based upon the teachings outlined above, without departing from the true spirit and scope of the invention. Accordingly, I intend to define within the scope of the appended claims the true limits of the invention.

I claim:

1. A dispenser comprising a dispensing nozzle, a conduit operably connected to said nozzle to supply air-curable material to it, pressure means operably connected to force said material through the conduit means and out of the nozzle, in combination with a liquid reservoir at least partially filled with a liquid, said nozzle and reservoir being mounted for relative movement so the nozzle can be immersed in said liquid, whereby the liquid is caused to form an air seal around the dispensing end of said nozzle when the nozzle is immersed in the liquid, and drive means for causing said relative movement following a dispensing operation of the nozzle, thereby to prevent the nozzle from being clogged by air-curing of the material supplied to it through said conduit means, said drive means being operable to move said nozzle in a horizontal plane to form a variety of pre-selected patterns to enable the material dispensed from the nozzle to be deposited on a surface beneath the nozzle in said patterns and to position the nozzle over the reservoir, and said drive means being further operable to move the nozzle in a generally vertical direction to and from a position in which said dispensing end is immersed in said liquid, said pressure means being selectively operable to discharge material from said nozzle after the end thereof is immersed in said liquid thereby to purge from the nozzle all of the material in it that has been exposed to air.

2. A dispenser comprising a dispensing nozzle, a conduit operably connected to said nozzle to supply air-curable material to it, pressure means operably connected to force said material through the conduit means and out of the nozzle, in combination with a liquid reservoir at least partially filled with a liquid, said nozzle and reservoir being mounted for relative movement so the nozzle can be immersed in said liquid, whereby the liquid is caused to form an air seal around the dispensing end of said nozzle when the nozzle is immersed in the liquid, and means for causing said relative movement following a dispensing operation of the nozzle, thereby to prevent the nozzle from being clogged by air-curing of the material supplied to it through said conduit means, said pressure means being selectively operable to discharge material from said nozzle after the end thereof is immersed in said liquid thereby to purge from the nozzle all of the material in it that has been exposed to air, said pressure means being further selectively operable to retract some of said material within the nozzle after the air-contacted material has been purged from the nozzle, whereby liquid is drawn into the discharge end of the nozzle to

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maintain an air tight seal over the material even after the nozzle is removed from the reservoir.

3. An invention as defined in claim 1 wherein said liquid is oil.

4. A method of protecting an apparatus for dispensing air-curable material from being clogged by curing of the material within the apparatus, comprising the steps of:

- a. providing a dispensing nozzle having a sealed supply of air-curable material connected to it,
- b. providing pressure means for selectively forcing the material from the nozzle,
- c. providing a reservoir at least partially filled with a liquid,
- d. providing means for immersing the nozzle in said liquid when the nozzle is not being used to dispense material,

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e. operating the pressure means to purge some of said material from the nozzle after it is immersed in the liquid thereby to purge air-contacted material from the nozzle, and

f. manipulating the nozzle to immerse it in said liquid following use of the nozzle to dispense a portion of said material therefrom.

5. A method as defined in claim 4 including the step of:

f. operating the pressure means to withdraw part of the material into said nozzle after the purging step, thereby to cause some of said liquid to be pulled into the nozzle to form an air-tight seal over the material in the nozzle, even after the nozzle is removed from immersion in the liquid.

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