United States Patent

Nordenholt

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[54] **CAULKING GUN**

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[52] **U.S. Cl.** **222/160,** 222/320, 222/327, 222/389

[51] **Int. Cl.** **G01f 11/06**

[58] **Field of Search** 222/162, 320, 326, 327, 381, 222/389, 160; 60/54.5

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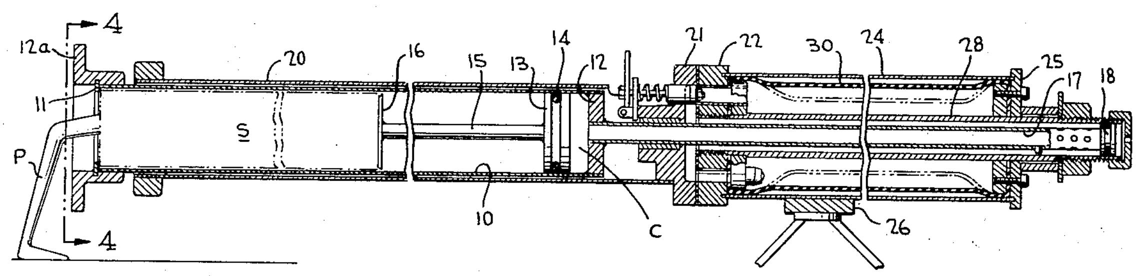
[57] **ABSTRACT**

The sealant applicator hereinafter described in detail has been designed and constructed in such manner that, when operated to apply a ribbon or bead of sealant material to an article, piece of furniture or other work in which a sealed waterproof joint between or in structural members is required, the applied ribbon or bead is uniform in cross section throughout its entire length instead of varying in cross section as do the ribbons of sealant delivered by applicators of the types heretofore employed. To realize this objective a novel mechanism is employed, extrusion of sealant being effected at a rate which is strictly proportional to the linear progress of the spout which delivers the sealant carried in the sealant containing cartridge into the crack or joint to be sealed. Liquid under pressure, automatically metered, is utilized to effect the discharge of sealant.

9 Claims, 6 Drawing Figures



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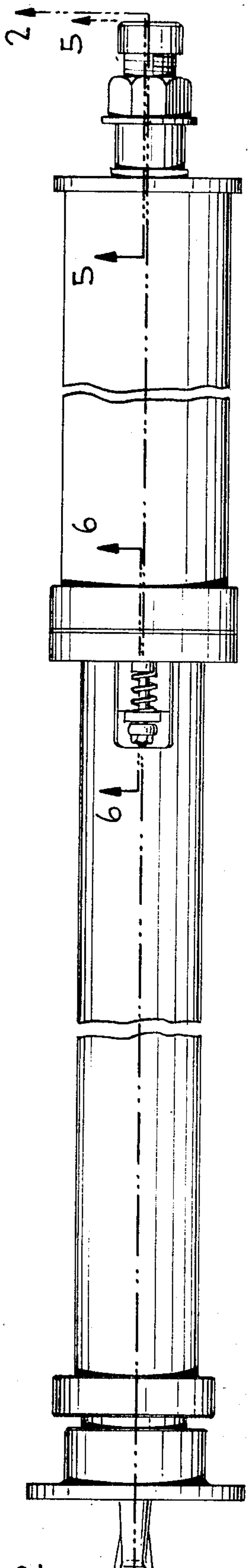

FIG. 1

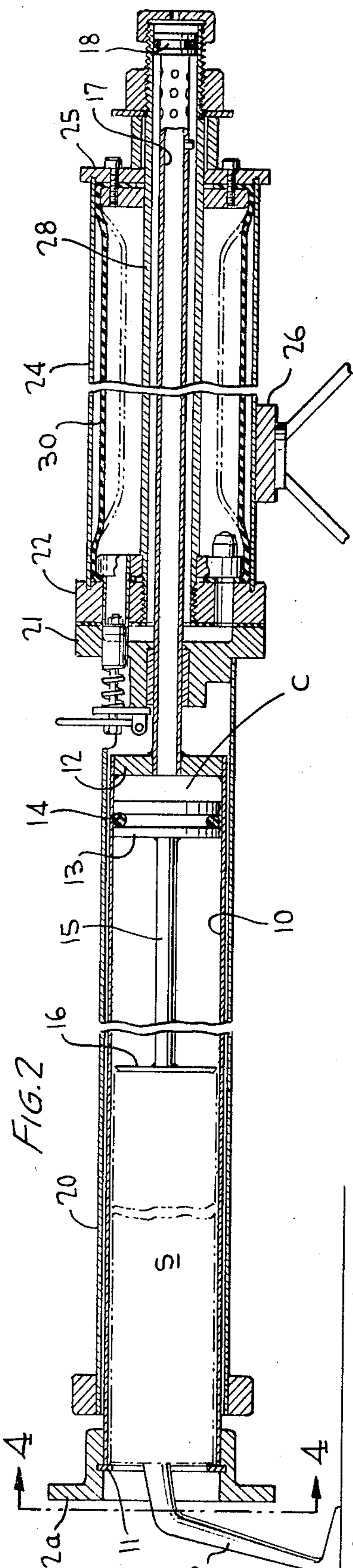

FIG. 2

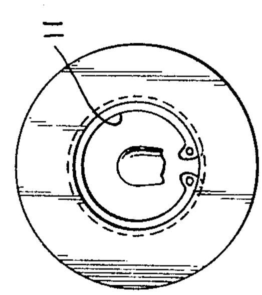

FIG. 4

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FIG. 3

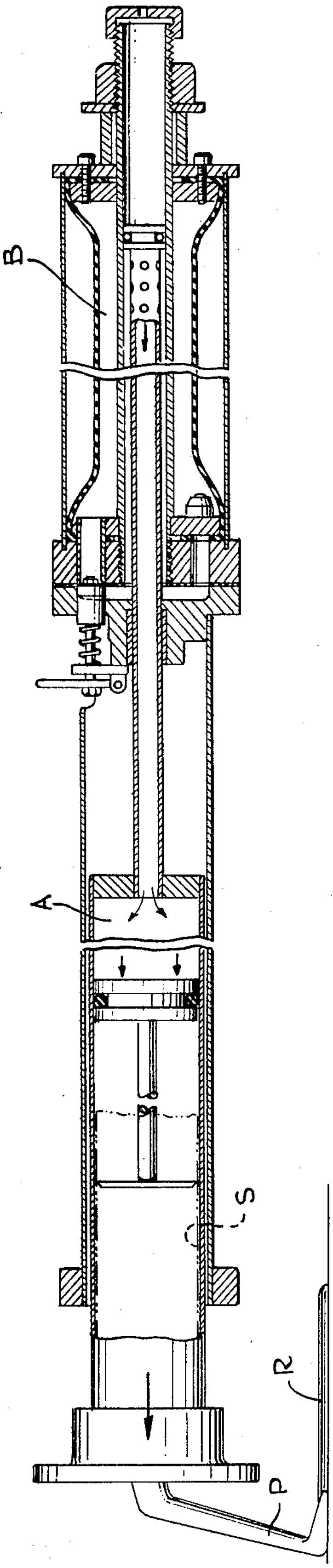


FIG. 5

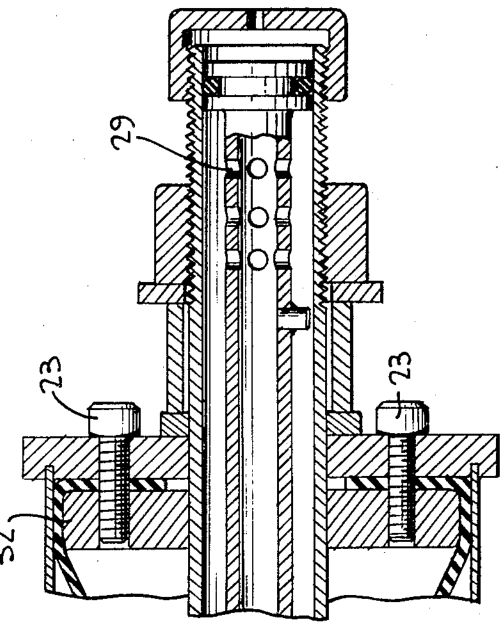
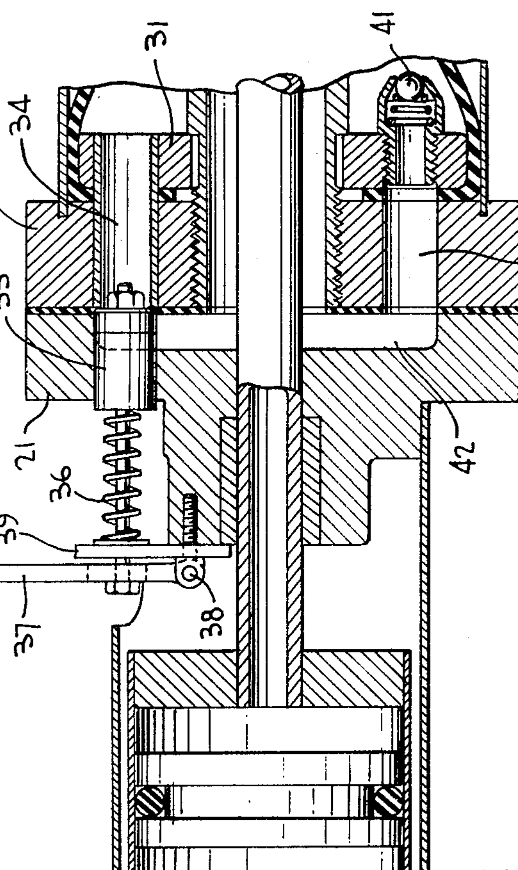


FIG. 6



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CAULKING GUN

The sealant applicator disclosed in the accompanying drawings is primarily designed to be manually operated and to effect the extrusion of sealant material from cartridges of the type now and heretofore commonly used and readily available. The invention, however, may be incorporated in machines of various types in which the work moves relatively to the applicator, or vice versa, and its details may be varied in order to most conveniently accomplish its primary objectives.

That embodiment of the invention which is illustrated by way of example is of such character that it may be easily operated by hand.

FIG. 1 of the drawings illustrates the applicator in top plan view.

FIG. 2 is a vertical longitudinal axial section. FIG. 3 is a partial longitudinal axial section showing certain of the operating parts in positions differing from the positions in which they appear in FIG. 2.

FIG. 4 is an end view of the applicator.

FIGS. 5 and 6 are sectional views taken on lines 5—5 and 6—6, respectively, of FIG. 1, showing details of construction.

The sealant applicator selected for disclosure by way of example comprises two main portions relatively movable along a common axis, such relative movement bringing about the discharge of sealant at a rate which is proportional to the rate at which the discharge spout of the sealant cartridge is advanced with reference to the work piece upon which the sealant is discharged, thus insuring a delivered ribbon of uniform cross section.

A sealant cartridge with displaceable bottom is indicated at S in FIGS. 2 and 3, the delivery spout thereof at P, FIG. 3, and a ribbon of delivered sealant at R, in FIG. 3. The cartridge S is contained within the end of a cylinder **10** of slightly larger diameter by means of a nearly circular clip **11** which is inserted in a circular groove formed in the annular member **12***a* fixed upon the end cylinder **10** and which is grasped by the hand to advance the cylinder and cartridge relatively to the work. Clip **11** is removed when the cartridge has been emptied of its content and a fresh cartridge inserted, the clip being then reinserted and comprising an abutment preventing movement of the cartridge when pressure is applied to its opposite end, that is, to its bottom to force the bottom toward the discharge end in customary manner.

The opposite end of the cylinder **10** is closed, except for a central aperture, by an annular member **12** and, slideably supported and confined within this cylinder is a piston **13** provided with a packing ring **14** to prevent passage of liquid thereby, members **12** and **13** defining between them an expansible and contractable chamber C for fluid, preferably a liquid of non-combustible character. Associated with piston **13** is a work member or push rod **15** to which is secured a disc **16** which is provided to apply pressure evenly over the moveable base of the cartridge to eject its content.

Secured within the central aperture formed in annular member **12** is the end of a tube **17** through which liquid may be introduced into the chamber C, and later withdrawn, this tube being coaxial with tube **10** and having secured to its opposite end a piston **18**. The cartridge containing tube **10** is slideably housed within a tube **20** of slightly greater diameter and which comprises portion of a casing which is grasped by one hand of the operator when the device is being used, the operator's other hand grasping the member **12***a*. The remainder of the casing comprises disc-like members **21** and **22** secured together by cap screws or other suitable means and a cylindrical part **24** one end of which is firmly attached to disc **22** and the opposite end of which is closed by an annular member or head **25**. The operator, by grasping either tube **20** or casing **24** with one hand and member **12a** with the other may readily move them axially relatively to each other. In the normal operation of the device the cartridge containing tube **10** will be advanced (as indicated by the arrow in FIG. 3) while the structure which includes tube **20** and casing **24** will be prevented from moving, in certain of its uses being mounted upon a fixed support such as that diagrammatically illustrated at **26** in FIG. 2.

Piston **18**, FIG. 2, secured to the end of tube **17**, has liquid tight sliding engagement with the inner surface of cylinder **28**, one end of which is mounted in a cylindrical aperture formed axially in member **22**. Liquid passages **29** (FIG. 5) formed in tube **17** adjacent piston **18** permit the passage of liquid from the annular space intermediate tubular members **17** and **28** into tube **17**, and vice versa, in the operation of the device. Liquid is stored in a reservoir of annular cross section defined by the outer surface of tubular member **28** and the generally cylindrical member **30** of rubber or other suitable flexible and elastic material the ends of which are inturned and clamped tightly against the inwardly facing surfaces of members **22** and **25**, respectively, by annular clamping members **31** and **32**, respectively, as shown in FIGS. 5 and 6.

The interior of the liquid storage reservoir is in communication with the annular space between tube **17** and cylinder **28** through valve controlled passages formed in members **21**, **22** and **31**, as most clearly shown in FIG. 6. Flow through passage **34** is controlled by a valve **35** normally held in closed position by a spring **36** and moved to open position by pressure applied to the lever **37**, pivotally mounted at **38**, the spring **36**, confined between valve **35** and abutment **39**, being compressed when the lever is pressed in the direction indicated by the arrow in FIG. 6 and restoring the valve to closed position when this pressure is removed. Flow of liquid through passage **40** is controlled, in one direction, by check valve **41**. The annular space between piston **17** and member **28** is in constant communication with cross passage **42** formed in member **21**.

It will be seen that liquid in this space and passages **40** and **42** may not escape into the reservoir when cylinder **10** and attached piston **18** are moved to the left (FIG. 2), valves **35** and **41** preventing such movement. Instead the trapped liquid will flow through ports **29** into tube **17** and be delivered to chamber C to move piston **13** and push rod **15** to the left (FIG 2). The amount of liquid delivered depends upon the length of travel of piston **18** and this piston travels a distance exactly equal to the travel of the cylinder **10** and the sealant cartridge housed in that cylinder. Therefore, the piston **13** and push rod **15** move, on their working strokes, a distance which always bears a constant relationship to the movement of the cartridge along the work, thus assuring that the same amount of sealant will be delivered per unit of travel.

A continuous bead of uniform cross-section will have been deposited during movement of piston **18** longitudinally of cylinder **28** for the full length of that cylinder and, to effect prolongation of the sealant bead the member **12***a*, and the cartridge, are maintained in fixed position while members **20**, **24** and associated parts are moved toward the left (FIG. 3), piston **18** remaining relatively stationary, and thus there is obtained the necessary suction stroke by which the annular space between cylinder **28** and tubular member **17** is again filled with liquid drawn from the reservoir through the check valve **41** and passages **40** and **42**. The cycle of operations is thus completed and when the bead to be deposited is relatively long and narrow, a larger volume of liquid than that indicated by the drawing may be necessary to enable the entire content of a sealant cartridge to be discharged. When the content of a cartridge has been completely discharged, the major portion of the fluid employed to advance piston **13** may be returned to the reservoir by holding open the valve **35** while a new and full cartridge is being inserted in tube **10**, thereby forcing the piston **13** to return to its initial position, thereby pumping the liquid into the reservoir.

It will be apparent that the applicator may be employed to deliver sealant in ribbons of varying but uniform cross section by relatively moving its two major elements in different ways. Thus, if the sealant nozzle P is held against movement and the reservoir continuing portion is moved in a direction away from the nozzle the sealant will be discharged at one point to form a heap, which is sometimes desired. Ribbons of uniform cross section but of different dimensions may be deposited by simultaneously advancing the nozzle and moving the metering pump section simultaneously in the opposite direction, thus influencing the rate of delivery of the sealant and determining the cross section of the bead or ribbon. Thus the applicator may be employed to accomplish widely different tasks, as will be apparent.

In the embodiment of the invention selected for disclosure by way of example the cartridge containing cylinder **10** may be rotated within the outer cylinder **20** so that the delivery spout may be angularly adjusted about the longitudinal axis of the applicator in the deposition of sealant upon work pieces which are not horizontally disposed. If desired, however, in adapting the applicator to the deposition of sealant along a fixed line, such rotation of the tube **10** within the tubular member **20** may be prevented by providing the inner tube **10** with an outwardly projecting pin which is received within a longitudinally extending slot formed in the outer tube **20**, or by some other means which performs the same function.

I claim:

1. An applicator for effecting the discharge of sealant from a sealant cartridge comprising, in combination, a holder for a cartridge of sealant, an expansible and contractable liquid tight chamber positioned to apply pressure, when expanding, to a cartridge confined in said holder to expel the content thereof, a reservoir for a liquid, and manually operable means for alternatively and in successive operations with drawing liquid from said reservoir and forcing it into said chamber to expand the same and effect discharge of sealant from said cartridge, said chamber and reservoir being relatively movable and comprising a pump responsive to and actuated by relative movement of chamber and reservoir.

2. The combination set forth in claim **1**, one member of said pump being connected to said expansible and contractable chamber to effect the discharge of liquid into said chamber in proportion to the relative travel of said chamber and reservoir.

3. A device of the class described comprising in combination a guide for a work member, a work member mounted on said guide for forward and return movements along a fixed path, an expansible and contractible liquid tight chamber in operative relationship to said work member to actuate said member in one direction when the chamber expands, a reservoir for liquid, a support for said reservoir, said support and said guide being relatively movable along a predetermined path, and means activated upon relative movement of guide and support for withdrawing liquid from said reservoir and introducing it into said chamber, the amount of liquid thus introduced being in proportion to the extent of relative movement of guide and support.

4. The combination set forth in claim **3** in which said last mentioned means includes a pump, one member of which is attached to said chamber and the second member is attached to the reservoir.

5. The combination set forth in claim **3** in which said guide is tubular in form and one wall of said expansible and contractable liquid chamber has liquid tight engagement with, and is slidable in, said tubular guide.

6. The combination set forth in claim **3** in which said guide is a cylindrical tube and a second tube encloses the guide tube, said tube being relatively moveable longitudinally, the work member disposed within and movable longitudinally of said guide tube, and said expansible and contractable liquid tight chamber is disposed within and attached to said guide tube and in operative contact with said work member.

7. A device of the class described comprising, in combination, two coaxial tubular members relatively movable along their common axis, an expansible and contractable liquid chamber within the inner tubular member, one portion of said chamber being secured to said inner tubular member, means for securing a sealant containing cartridge within said inner tubular member, and means responsive to relative movement of said tubular members for introducing liquid under pressure into said chamber, the volume introduced bearing a fixed relationship to the extend of relative movement of said tubular members along their common axis.

8. The combination set forth in claim **7** in which said last mentioned means includes a liquid pump one element of which is connected to the fixed portion of said chamber.

9. The combination set forth in claim **8** in which a liquid reservoir is connected to said outer cylinder and moveable therewith and a liquid pump for transferring liquid from said reservoir to said chamber includes a piston movable with said inner tubular member and a cylinder movable with said outer cylinder.

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