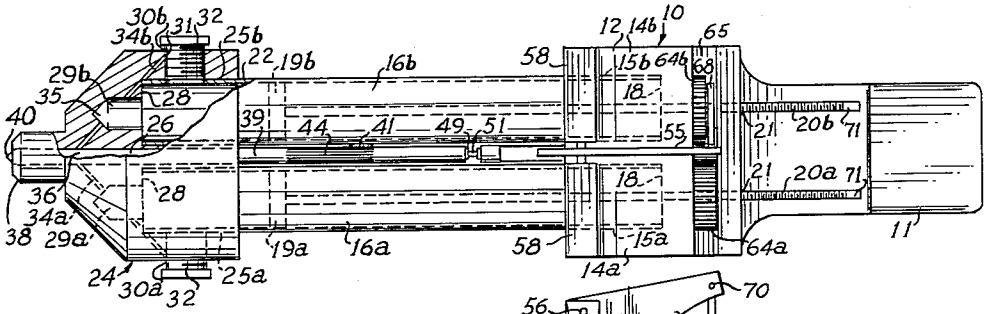
Jan. 14, 1964 C. J. HERMAN ETAL 3,117,696

GUN FOR TWO COMPONENT ADHESIVES

Filed July 12, 1961 2 Sheets-Sheet 1

Fig. 1



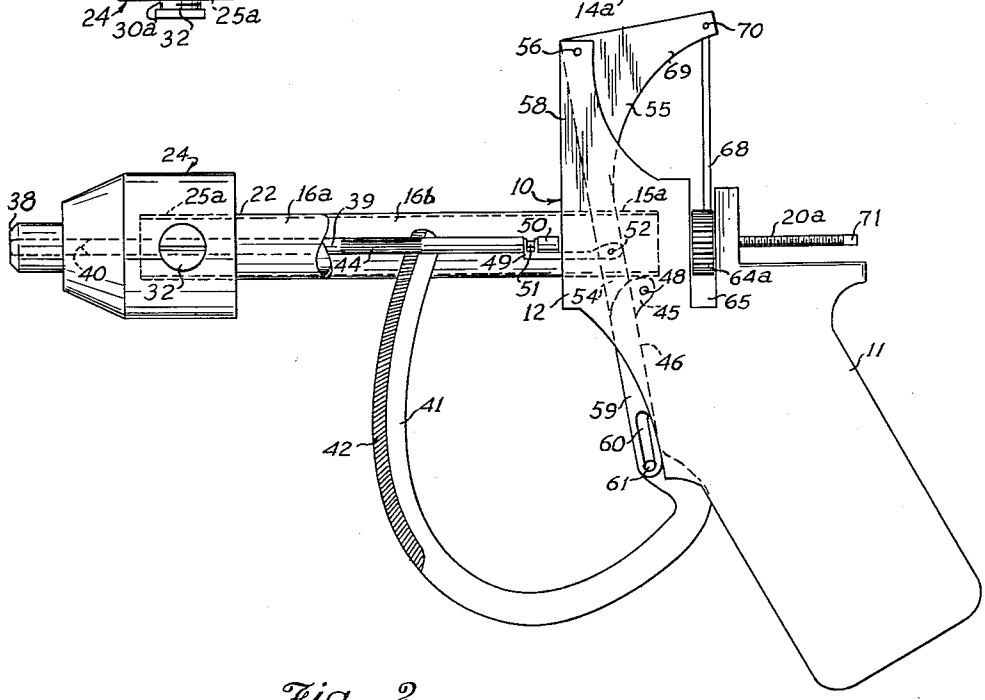


Fig. 2

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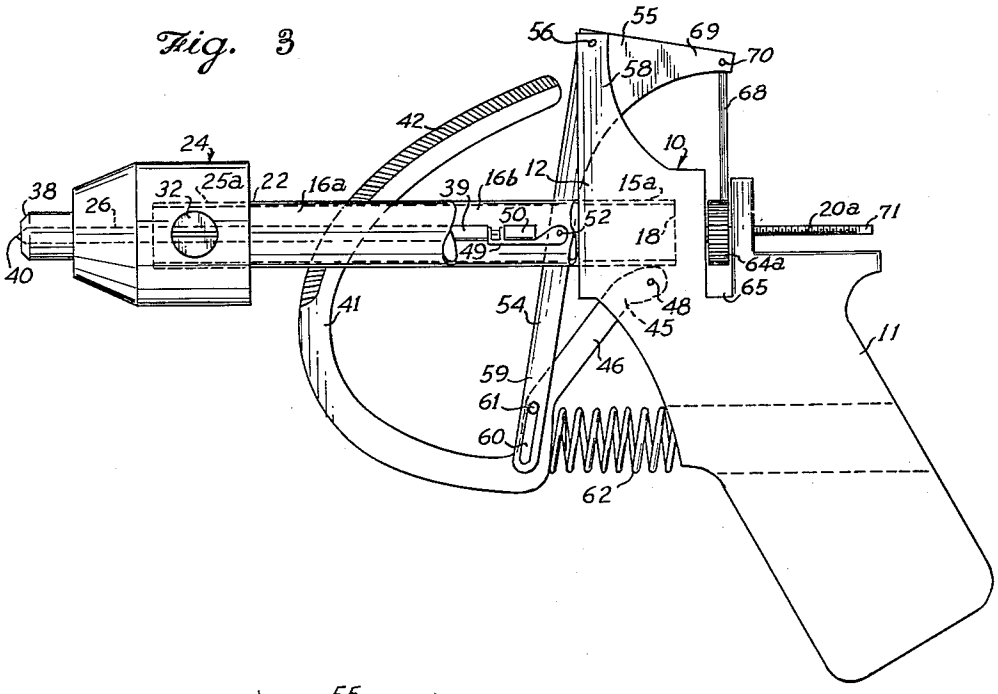
Filed July 12, 1961 2 Sheets-Sheet 2

Fig. 3



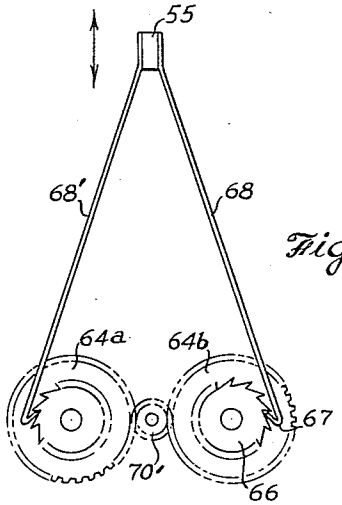


Fig. 4

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GUN FOR TWO COMPONENT ADHESIVES

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7 Claims. (Cl. 222—137)

This invention relates to guns or dispensing devices for two component adhesives wherein two components of an adhesive substance set up comparatively quickly when mixed together and so cannot be stored in a single container, or in use, are said to have a pot-life of the order of hours rather than weeks or months necessary for a reasonable shelf-life.

One example of such adhesives is epoxy resin which is mixed for curing with an amine such as triethylene tetramine. Such a system is well known to the art. Another is the polyurethane system. Often powdered aluminum or silica flour is added to one of the components or mixture to give greater adhesion.

An object of the invention is to provide a device of this kind by which the two components may be mixed substantially at the point of application in proper proportions.

Another object is to provide a device of this kind which is small and light enough in weight to be held in the hand for easy manipulation and yet will contain completely therein some of each component.

Another object is to provide a device of this kind in which there is a mixing chamber of very small size.

Yet another object of the invention is to provide a device of this type in which the danger of clogging is reduced to practical limits.

And still another object of the invention is to provide a dispenser in which comparatively small quantities of each of the two components may be loaded, as for example, from a collapsible tube, so that small quantities of the components may be purchased and used in small amounts.

The attainment of these objects is reached, in a gun-type applicator or dispenser which, briefly described, comprises two storage cylinders for the two separate components of the adhesive having a common dispensing head thereon and provided with an expelling and mixing plunger rod. Means are provided to reciprocate the rod and at the same time meter increments of the components from the cylinders to the head.

In the accompanying drawing showing, by way of example one of many possible embodiments of the invention,

FIG. 1 is a plan of the dispenser;

FIG. 2 is a side view of the dispenser with parts in one position;

FIG. 3 is a side view of the dispenser with parts in another operational position, and

FIG. 4 is a schematic representation of elements of the metering means.

The applicator comprises a body generally designated 10 having a pistol grip handle 11 and a forward or cylinder-carrying portion 12 generally symmetrical about the vertical mid-plane having left and right spaced socket members 14*a* and 14*b* provided with parallel cylindrical recesses 15*a* and 15*b*.

Axially parallel storage cylinders 16*a* and 16*b* for the two components are mounted fast in the recesses and project forwardly generally as does the barrel of a revolver, and may be substantially closed at their rear as at 18. These cylinders are provided with rather tightly fitting pistons 19*a* and 19*b* having threaded rods 20*a* and 20*b* fast thereon and extending rearwardly through holes 21 in the body 10 and above the handle.

The forward portions 22 of cylinders 16*a* and 16*b* are provided with a symmetrical head 24 with recesses 25*a* and 25*b* having a medial longitudinal bore or small mixing chamber 26 between the recesses 25*a* and 25*b* which have each an annular end wall 28 and a further recess of reduced diameter 29*a* and 29*b* respectively.

The head is provided with laterally opening ports 30*a* and 30*b* internally threaded as at 31 and for communication from the exterior to the interior of the respective storage cylinders ahead of the pistons. Collapsible tubes containing the separate components may be used to load the cylinders through the ports, particularly tubes having necks threaded to fit the port threads 31 so as to reduce the chance of spillage, which ports are sealed as by screw plugs 32.

The recesses 29*a* and 29*b* terminate somewhat conically as at 35 and straight duct bores 34*a* and 34*b* connect the chamber bore 26 as at 36 in the conical zones with the interiors of the cylinders 16*a* and 16*b*. It is to be noted that these duct bores extend onwardly to the ports 30*a* and 30*b* at such an angle that, say, a wire may be inserted into the duct from the port in the event the duct bore becomes clogged. For ease of use, the forward end of the head at the chamber bore 26 is formed somewhat as a nozzle 38.

A plunger rod 39, preferably of nylon plastic or fluorinated plastic material such as "Teflon," both of which have low adhesion to epoxy and urethane resins, is disposed in the chamber bore, projecting rearwardly between the two cylinders, for reciprocation and rotation in the chamber bore. Preferably the head 24 is of steel, stainless steel, or aluminum, and the chamber bore 26 about 0.001 inch larger in diameter than the plunger rod 39. With this clearance and choice of materials just mentioned, there is substantially no danger of fouling in normal use.

The limits of reciprocation by the plunger rod are such that the outer end 40 of the rod projects from the head slightly in extreme forward position and is retracted behind the duct bore junction 36 upon withdrawal.

The plunger rod 39 is rotated by a somewhat ring sector or U-shaped gear member 41 having laterally projecting teeth 42 engaging with teeth 44 on the plunger rod extending thereon for a sufficient distance so that the two sets of teeth may be engaged during the reciprocatory motion of the plunger while the teeth 42 move in a somewhat circular path in a vertical plane.

The gear member is pivoted at one end 45 of an arm 46 thereof to the body 10 between and under recesses 15*a* and 15*b* at 48 and is held sufficiently close to the teeth of the rod by, as shown, the right cylinder 16*b*. The arm 46 occupies the normal trigger position of a revolver and oscillation of the gear member causes the plunger rod to spin back and forth.

Reciprocation of the plunger is accomplished by a longitudinal movement of a bearing 49 carrying the rear end portion 50 of the plunger at a part 51 of reduced diameter. The bearing is pivotally mounted, as at 52, about midway on the lower arm 54 of an inverted L-shaped lever rocker 55 pivoted at 56 on and between upwardly projecting arms 58 on the body 10. The lower portion 59 of the rocker arm 54 is provided with a longitudinal slot 60 receiving a pivot pin 61 fast on the gear member arm 46 below its pivot 48. This combination provides a loose linkage between the arms 46 and 54 permitting the arm 54 to be drawn rearwardly in trigger fashion. The rocker and gear member arms 54 and 46 are biased to forward position by a spring 62 mounted on the handle 11 so that the end 40 of the plunger is normally in projecting position from the nozzle 35.

Feed to the mixing chamber bore 26 through ducts 34*a* and 34*b* is obtained by metered forward movement

of the pistons 19*a* and 19*b* in predetermined increments. To this end, gears 64*a* and 64*b* having threaded central holes are threaded on the respective piston rods 20*a* and 20*b* and disposed in a transverse slot 65 in the body 10 to be turned in increments. This turning is carried out by ratchet wheel means 66, well known to the art, on at least one of the gears, and actuated by a vertically reciprocatory resilient strip 68 having a hook 67 to engage the wheel and pivoted to the upper arm 69 of the rocker, as at 70, where it overhangs rearwardly the slot 65. A friction washer may be provided between the ratchet wheel and the wall to the slot if necessary.

In order to avoid the need for left handed threads on a gear and piston rod set and to use only one ratchet, though these avoidances are not necessary, an intermediate gear 70' may be provided. Indeed it may be desirable to have an additional strip 68' having a hook to engage a ratchet wheel on the gear 64*a*. This makes the system of FIG. 4 double acting, and by the omission of the gear 70' and varying the effective range of the movement of the strips 68 and 68' the rates of travel of the pistons can be varied.

In use, collapsible tubes containing the components are first screwed into ports 30*a* and 30*b* with the metering pistons in forward position. The pistons are then forcibly turned, as by a crank (not shown) fitted on the squared ends 71 of the piston rods, to retract the pistons in the cylinders, the threaded gears being held against turning if necessary. This, attended by, if necessary, a squeezing on the tubes, charges the cylinders 16*a* and 16*b* with the separate components and the tubes are then removed and ports closed with their plugs.

Upon drawing on the trigger-like gear member arm 54, the plunger is retracted in the chamber bore 26, uncovering the ducts at 36. Meanwhile, the rocking of the L-shaped rocker 55 lifts the ratchet strip 68 causing the wheel 66 and gears 64*a* and 64*b* to turn about the piston rods and advance the pistons and force an increment of each component into the chamber bore.

Upon release of the "trigger" the plunger advances in the chamber bore with a spinning action, the pointed end 40 of the plunger affording greater surface for contact with the admitted components so that the two components are mixed in the chamber bore as they become expelled therefrom.

If the ratchet system is double acting, pressure builds up in the cylinders during forward motion of the plunger past the duct 34. Generally this is not desirable but in the case of thin components, the additional pressure with the plunger in forward position sometimes tends to make them stick to the rear portion of the plunger and foul up. On the other hand, with thicker components, it is desirable to have pressure building up during the forward stroke of the plunger so that flow of the components into the chamber bore is more rapid when the duct passages become uncovered. The action of either of the ratchet strips 68 or 68' may be eliminated by merely holding the appropriate strip away from its wheel.

By having the plunger biased to forward position the amount of mixed adhesive left in the chamber bore is kept to a minimum. This advantage is enhanced by having the pistons act only during retraction of the plunger by employing appropriate ratcheting.

The invention claimed is:

1. In an applicator for a two-component adhesive, a pistol grip body; two storage containers for the components mounted on the body; a dispensing head in fixed relationship to the body and provided with a mixing chamber bore and with two ducts from the bore in communication with the interior of the respective containers; a rod rotatable and reciprocatory with respect to the head and in the bore and provided with gear teeth to the rear of the head; a generally U-shaped gear sector pivotally mounted at one end thereof and on the body and having laterally projecting teeth engageable with said gear teeth on the rod and a lever as a trigger-like finger piece pivotally carried on the gear sector and pivotally mounted on the body for turning the gear sector and rod when the lever pivots on the body; means for converting pivotal movement of the lever to reciprocatory movement of the rod, and means for feeding the components from the containers into the bore by pivotal movement of said lever.

2. In an applicator for a two-component adhesive, a pistol-grip body; a pair of storage cylinders for the components mounted on the body and having pistons with rods therein; a head having a mixing and dispensing chamber and mounted on the cylinders, ducts being provided in the head for communication between the chamber and cylinders for admission of the components into the chamber; a rod rotatably and slidably disposed in the chamber for mixing the components entering the chamber from the cylinders; said body being provided with upstanding supports at the upper portion thereof; an L-shaped lever member pivotally mounted for rocking at the corner portion thereof between the supports, one arm of the lever member projecting downwardly as a trigger-like finger piece and the other arm projecting rearwardly the body being provided with an upwardly open transverse slot to the rear of the supports and under said other arm; a ratchet wheel substantially threaded on one of the piston rods and in the slot and a ratchet member engageable with the wheel for turning same and pivoted to said other arm; and means for converting rocking movement of the lever member to rotary motion of the rod; and means on the finger piece for reciprocating the rod in the chamber.

3. A dispenser for a two-component adhesive comprising two parallel storage cylinders for the components of the adhesive and a pistol-grip body carrying same; a head on the cylinders and having a mixing chamber bore open forward to the exterior and in communication with the interior of the cylinders via ducts opening on opposite sides of the bore; a reciprocatory and rotatable plunger rod in the bore and projecting rearwardly therefrom; the plunger rod being movable forward of the ducts; pistons having rods fast thereon in the cylinders for forcing the respective components into the chamber bore; wheels threaded on the respective piston rods, the body being provided with a transverse upwardly open slot receiving the wheels and preventing rearward motion of the wheels; means for transmitting turning motion of one wheel to another, the pistons being tight enough in their respective cylinders so that rotation of the threaded wheels produces axial movement of the piston rods and pistons; a U-shaped gear member having an end portion thereof pivoted on the body for oscillatory movement of the gear member and having laterally projecting teeth; gear means on the plunger rod and engaging said teeth during oscillation of the gear member; an L-shaped rocker pivotally mounted on the body above and forward said wheels and having an arm depending as a trigger-like finger piece and the other having ratchet means associated with one of the wheels for turning same by rocking of the rocker, the finger piece being loosely pivoted to the gear member so that rocking of the rocker will oscillate the gear member, and a double thrust bearing on the plunger rods pivoted on the rocker so that rocking same will reciprocate the plunger member.

4. An applicator for a two-component adhesive comprising a pistol-grip body; a pair of storage cylinders for the components on the body side by side and having a common head provided with a bore shaped mixing chamber and with conduit bores in comunication with the chamber and the interior of the respective cylinders; a plunger rod in the chamber and extending rearwardly from the head and between the cylinders, a part of the rear end portion of the rod having a portion of reduced diameter; laterally spaced arms fast on the body and projecting upwardly therefrom near the rear ends of the cylinders; rocker member between the arms and cylin-

ders and pivotally mounted on the arms, the rocker member having a pending trigger-like lower portion; a bearing pivotally mounted on said lower portion for forward and rearward movement with the lower portion and receiving the portion of the rod of reduced diameter for reciprocating the rod, the latter being rotatable in the bearing; the rod being provided with pinion teeth between the bearing and the head; a generally U-shaped sector gear pivoted at one end thereof to the body and having lateral teeth on the other end portion to engage the pinion teeth; pin-and-slot means for pivoting the lower end portion of the rocker member to the sector gear remote from said one end for constraining the sector gear to turn when the lower end portion is pulled in trigger fashion; bias means for urging the lower end portion forward, and feeding means for forcing the components from the cylinders into the chamber when lower end is pulled, whereby repeated pulling of said lower end portion in trigger fashion will rotate and reciprocate the rod to mix the components and expel the mixture from the head.

5. An applicator as claimed in claim 4, said feeding

means including pistons in the respective cylinders, and ratcheted means for advancing the pistons when the lower end portion of the rocker member is pulled.

6. An applicator as claimed in claim 4, the chamber having a diameter about 0.001 inch greater than that of the plunger rod and the latter being of nylon plastic to minimize fouling and freezing of the rod in the chamber by the adhesive.

7. An applicator as claimed in claim 4, the rod being long enough and the bias means having sufficient acting range for the rod to normally project from the extreme forward end of the head to reduce the chance of sufficient mixed adhesive being left in the bore of the chamber to set up.

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