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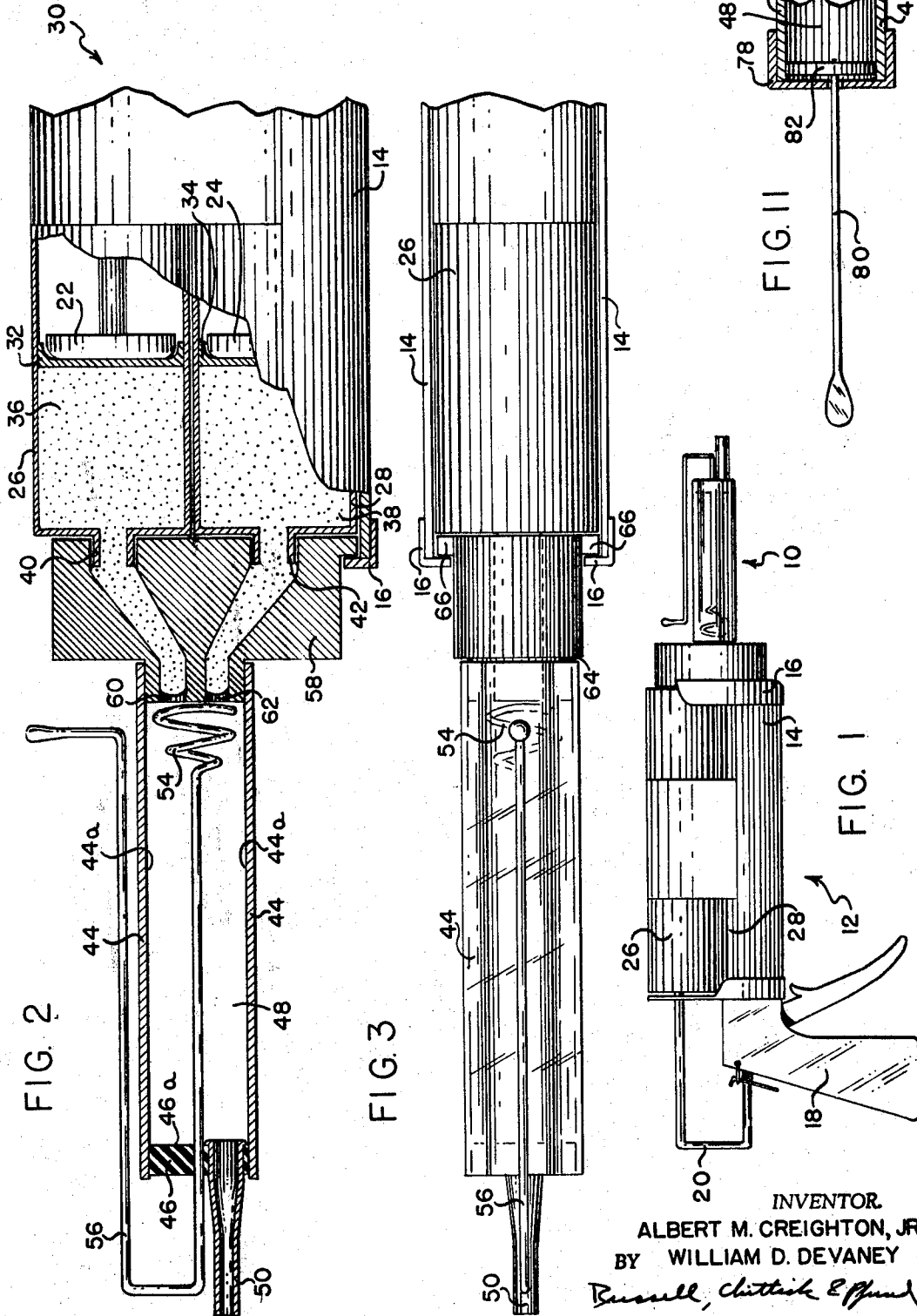
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3,390,814

MIXING DEVICE

Filed Sept. 24, 1965

2 Sheets-Sheet 1



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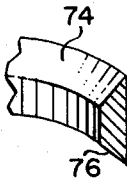
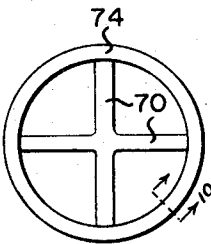
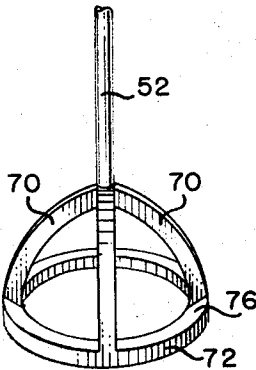
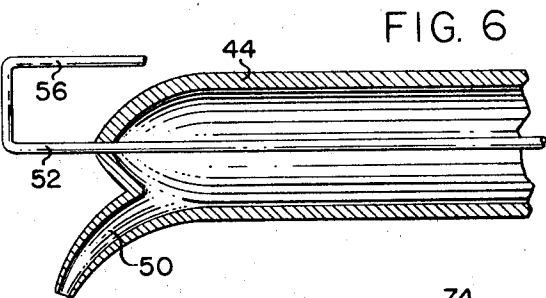
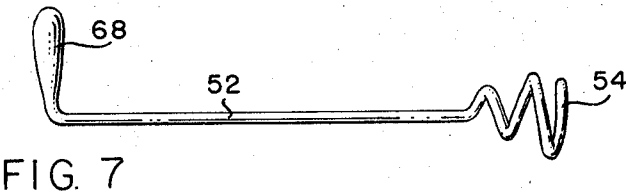
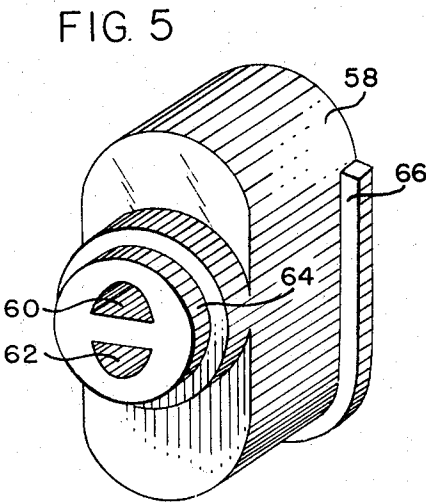
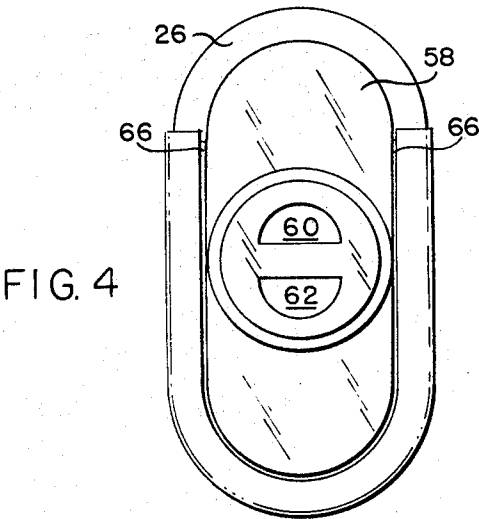


FIG. 10

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3,390,814

MIXING DEVICE

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Continuation-in-part of application Ser. No. 460,970, June 3, 1965. This application Sept. 24, 1965, Ser. No. 489,885

5 Claims. (Cl. 222—137)

ABSTRACT OF THE DISCLOSURE

A mixing device for viscous substances that can be used in conjunction with a gun type dispenser for mixing two or more dispensed viscous substances. The mixing device has a generally cylindrical configuration with an inlet at one end and a dispensing spout at the other end. A manually actuated mixing rod having an integrally formed mixing head is positioned for axial movement within the cylindrical mixing chamber. Reciprocatory motion of the mixing rod and head mixes the viscous substances within the mixing chamber.

This application is a continuation-in-part of our copending application Ser. No. 460,970, filed June 3, 1965, for a Dispensing Apparatus, now Patent No. 3,311,265. The present invention relates to mixing devices in general and more particularly to a mixing device for viscous substances which can be detachably secured to apparatus that dispense such substances.

In our above-mentioned copending application, we disclosed a hand-held and actuated dual piston gun-type dispenser which simultaneously discharged metered quantities of viscous substances, such as, epoxy resins and hardeners, from a disposable, plural chambered cartridge fitted within the dispenser. The dispenser was a conventional caulking gun that had been modified to accept a disposable cartridge assembly comprising two viscous substance filled cylindrical containers which were strapped together in superposed relation so that the containers could be loaded into and removed from the gun as a unit. Each container was provided with a temporarily closed dispensing spout at one end and an axially movable plug positioned within the container at the other end to seal the contents of the container until the cartridge was ready to be used.

When the cartridge was loaded into the modified caulking gun, the container dispensing spouts pointed away from the trigger or handle end of the gun while the two container sealing plugs were located immediately in front of a dual U-shaped piston rod assembly having an annular piston mounted on each end within the cartridge cylinders. A conventional trigger actuated caulking gun drive mechanism was employed to incrementally advance the modified piston rod assembly. Thus, each time the trigger was pulled, both pistons advanced the same distance in their respective cylinders thereby forcing equal amounts of material from each cylinder.

By varying the relative positions of the two dispensing spouts, it was possible to dispense either parallel, spaced streams of the viscous substances stored within the containers or parallel abutting streams of these substances. Assuming that these substances comprised an epoxy resin and hardener, the normal procedure was to eject the resin and hardener onto a disposable palette so that the two materials could be mixed together immediately before their intended use. Although the use of a disposable mixing palette was satisfactory from a purely functional standpoint of providing a means for mixing together the resin and hardener, it was not only inconvenient and messy, but also a time consuming method of obtaining the neces-

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sary resin-hardener mixture. Moreover, it was found that the inherent disadvantages of the palette mixing method severely impaired the usefulness of the gun dispenser as a tool of industry.

It is accordingly a general object of the present invention to provide a mixing device for viscous substances.

It is a specific object of the present invention to provide a mixing device for viscous substances that can be detachably secured to a hand-held and actuated gun-type dispenser for said substances.

It is another object of the present invention to provide a manually operated device which thoroughly mixes together viscous substances in a relatively short period of time and with a minimum expenditure effort.

It is still another object of the present invention to provide a mixing device that is easily cleaned and which requires little or no maintenance other than cleaning.

It is a further object of the invention to provide a mixing device that can be fabricated from readily available materials at a cost that is sufficiently low enough to permit disposal of the mixing device after a single mixing operation.

It is a feature of the present invention that the materials are automatically extruded from the mixing device by the entrance of the unmixed viscous substances.

It is still a further object of the invention to provide a mixing device in which back pressure upon the source of the unmixed substances is substantially eliminated during the mixing operation.

These objects and other objects and features of the present invention will be best understood from the following description of a preferred embodiment of the invention, selected for purposes of illustration, and shown in the accompanying drawings in which:

FIG. 1 is a view in side elevation showing a gun-type dispenser with a mixing device detachably secured thereto;

FIG. 2 is an enlarged view in side elevation showing in greater detail the mixing device and a portion of the gun-type dispenser depicted in FIG. 1;

FIG. 3 is an enlarged plan view showing in greater detail the mixing device and a portion of the gun-type dispenser depicted in FIG. 1;

FIG. 4 is an enlarged view in front elevation showing the gun-type dispenser and dispenser stream converging block with the mixing device removed therefrom;

FIG. 5 is an isometric view of the dispenser stream converging block;

FIG. 6 is a view in cross-section of an alternative embodiment of the mixing device;

FIG. 7 is a view in side elevation of an alternative mixing rod;

FIG. 8 is a plan view of an alternative embodiment of the mixing head;

FIG. 9 is a view in perspective of the alternative mixing head shown in FIG. 8;

FIG. 10 is a view in cross-section taken along line 10—10 of FIG. 8; and,

FIG. 11 is a view in side elevation and partial section showing a sealing cap and plunger detachably secured to the mixing device.

Turning now of the drawings and particularly to FIG. 1 thereof, there is shown in side elevation a preferred embodiment of our mixing device identified generally by the reference numeral 10. The mixing device 10 is detachably secured to the forward end of a gun dispenser 12 of the type that is fully illustrated and described in our copending application Ser. No. 460,970, filed June 3, 1965, for a Dispensing Apparatus. For purposes of brevity the complete description of the gun dispenser 12 contained in our copending application will not be repeated, but instead, will be incorporated by reference herein. However, it will be helpful to identify the major components

of the gun dispenser before describing in detail the structure and operation of the mixing device of the present invention.

Referring to FIGS. 1 through 4, the gun dispenser 12 comprises: a modified conventional caulking gun having a semi-cylindrical barrel 14; a U-shaped faceplate 16 mounted on the forward end of barrel 14 (FIGS. 2 and 4); a trigger handle 18 that contains a trigger mechanism (not shown) for actuating a U-shaped piston rod 20 (FIG. 1) that terminates in two annular pistons 22 and 24 (FIG. 2). The U-shaped piston rod 20 and pistons 22 and 24 are positioned within viscous substance filled containers 26 and 28 for reciprocatory movement along the longitudinal axes of the cylindrical containers. Containers 26 and 28 are strapped or glued together to form a cartridge 30 that can be inserted and removed from the dispenser as a single unit. This type of construction greatly simplifies the initial loading of the gun dispenser 12 and subsequent removal of the expended cartridge 30.

It can be seen in FIGS. 2 and 3 that the pistons 22 and 24 are in abutting contact with two sealing plugs 32 and 34 that are fitted within the cylindrical containers 26 and 28 for slidable movement along the longitudinal axes of the containers. Thus, each time the trigger mechanism is actuated, the dual pistons 22 and 24 and the corresponding slidable plugs 32 and 34 are advanced by a predetermined incremental distance along the axes of the containers thereby extruding a portion of the viscous substances 36 and 38 from container dispensing spouts 40 and 42.

Having briefly discussed the major components of the gun dispenser 12, we will now describe in detail the structure and operation of the mixing device 10. As mentioned above, the mixing device 10 is shown in FIGS. 2 and 3 in enlarged view in side and plan elevation, respectively. The mixing device 10, comprises a hollow, cylindrical container 44 that is closed at one end by a press-fitted plug 46. The inner cylinder walls 44a and the inner plug surface 46a together define a mixing chamber 48 for the two viscous substances 36 and 38 that is in fluid communication with a dispensing spout 50 mounted off-center in the sealing plug 46. Positioned within the mixing chamber along the longitudinal axis thereof, is a mixing rod 52 having one end terminating in a mixing head 54 and the other end in a trombone-shaped operating handle 56. The mixing rod 52 is slidably supported by plug 46 for reciprocatory movement along the axis of the mixing chamber 48 during the mixing operation, as will be explained hereinafter.

The open end of the mixing container 44 is detachably secured to a dispenser stream converging block 58 which fluidly connects the two viscous substance filled containers 26 and 28 to the mixing chamber 48. The shape and construction of the fluid coupling block 58 are shown in FIGS. 2, 4, and 5 wherein it can be seen that the coupling block has two converging passageways 60 and 62 that are designed to accept the corresponding dispensing spouts 40 and 42, respectively (FIG. 2). The forward end of the fluid coupling block 58 terminates in an annular shoulder 64 that has a diameter slightly greater than the inside diameter of the cylindrical mixing container 44. This size relationship permits the mixing container 44 to be force fitted on shoulder 64 to provide a secure, but detachable mounting for the mixing device. Other mounting arrangements, such as screw threads or twist locks, can be used to detachably secure the mixing container 44 to the coupling block 58. The coupling block 58 is held in the gun barrel 14 by means of an integrally formed U-shaped shoulder 66 which abuts against the corresponding U-shaped faceplate 16 as shown in FIGURES 3, 4 and 5.

The operation of the mixing device 10 and the gun dispenser 12 can best be understood by referring to the side elevational view of FIG. 2. Assuming that the mixing container 44 has been secured to the coupling block shoulder 64, the trigger mechanism 18 is actuated there-

by forcing the viscous substances 36 and 38 through the coupling block passageways 60 and 62 and into the mixing chamber 48. This action is continued until the entire mixing chamber is filled with the two viscous substances 36 and 38. At this time the operator grasps handle 56 and moves the handle back and forth so that the mixing rod 52 and mixing head 54 are moved in a corresponding manner through the viscous substances. After the viscous substances 36 and 38 have been thoroughly mixed by the reciprocatory action of the mixing head 54, the trigger mechanism 18 is again actuated forcing fresh, unmixed viscous substances into the mixing chamber 48. The entry of the unmixed material forces the mixed viscous substances out of the mixing chamber 48 and into the dispensing spout 50. Further actuation of the trigger mechanism then forces some of the mixed material out of the dispensing spout. Since the extrusion of the mixed substances from the dispensing spout 50 is controlled by the actuation of the trigger mechanism 18, the operator can carefully meter the application of the mixed substances to a work surface. As the mixed material is extruded from the dispensing spout, new unmixed material enters the mixing chamber 48. When substantially the entire mixing chamber 48 has been filled with the unmixed viscous substances 36 and 38, the mixing action is repeated by moving the operating handle 56 in a back and forth direction.

The mixing-chamber filling-mixing-extrusion cycle can be repeated as many times as necessary during a single work period. Depending upon a number of variables including the cure time of the viscous substances, the mixing container 44 should be removed from the gun dispenser, if a substantial time period is expected between mixing operations. Once the container 44 has been removed from the dispenser, it can be cleansed with a suitable solvent. However, since the mixing container 44 and associated components can be fabricated from relatively inexpensive materials, it is contemplated that the mixing device 10 would be thrown away after a single series of mixing operations.

The mixing container 44 is preferably constructed from a polyethylene plastic that is relatively transparent so that the operator can see when the unmixed viscous substances 36 and 38 have substantially filled the interior of the mixing container 44. Of course, other materials can be used to construct the mixing container 44. However, we find that a thermoplastic, such as polyethylene, is preferable in many respects. For example, if the viscous substances 36 and 38 comprise an epoxy resin and hardener, the cured epoxy will not stick to the inner walls of a polyethylene container. In addition, one of the primary advantages of using a moldable plastic is that the mixing container 44 and sealing plug 46 can be formed as an integral unit as shown in FIG. 6.

FIGURE 6 also illustrates an alternative arrangement for the integral dispensing spout 50. In this embodiment the axis of the dispensing spout is not parallel with the container, but instead, intersects the container axis so that the spout points downwardly from the mixing container. This configuration is advantageous in certain situations where the dispensing spout and mixing rod arrangement shown in FIG. 2 might interfere with the workpiece.

Other arrangements can be employed for the operating handle 56 as shown in FIG. 7 wherein the handle comprises an enlarged portion 68 of the mixing rod 52 that has been bent at right angles to the rod. It will be appreciated that the coaxial position of the mixing rod 52 and the arrangement of the handles 56 and 68 permit the mixing device 10 to be operated by either a right handed or left handed person. Besides being easy to operate, the mixing rod and handle designs shown in FIGURES 2 and 7 also facilitate cleaning of the mixing head 54 because the mixing rod 52 is long enough to allow the mixing head to protrude beyond the open end of the container

44 once the container has been removed from the gun dispenser.

One of the features of the present invention is that the configuration of the mixing rod and mixing head affords a maximum amount of mixing per mixing stroke, yet the total volume of the rod and head is small enough to avoid any back pressure during the mixing operation that might force a portion of the mixed substances back into passageways 69 and 62. In the embodiment of the mixing head shown in FIGURES 1, 2, 3 and 7, the integrally formed, concentric, expanding, conically shaped spiral provides an extremely good "folding" action during the mixing stroke, with relatively little volume.

It should be understood that the present invention is not limited to this particular mixing head configuration. An alternative embodiment of the mixing head is shown in FIGURES 8, 9 and 10 wherein the mixing rod 52 terminates in a plurality of radially extending fins 70 that are secured together by an annular member 72. The leading and trailing edges 74 and 76, respectively, of the annular member are tapered inwardly toward the mixing rod 52 as shown in the cross-sectional view of FIG. 10. This configuration provides a scraping or cleaning action along the inside of the mixing container 44 each time the mixing rod is moved back and forth.

Although the mixing device of our invention has been described above in connection with a gun-type dispenser, its use is not limited to this application. For example, epoxy resins and hardeners are often packaged in separate tubes that are sold as a single "blister" pack unit. The mixing device 10 can also be used to mix these components. After resin and hardener are squeezed from the two tubes into the mixing chamber 48, a press-fitted sealing cap 78 is placed over the open end of the mixing container 44 as shown in FIG. 11. The sealing cap is provided with a slidably mounted plunger 80 having an annular piston 82 which fits within container 44. The epoxy resin and hardener can then be mixed by moving the operating handle 56 or 68 back and forth. After the substances are thoroughly mixed, the plunger 80 is pushed in thereby forcing the mixed materials out of the dispensing spout 50.

It will be apparent that the cap 78 and plunger 80 can be used in conjunction with the gun dispenser 12. Thus, after the last charge of unmixed substances has been forced into the mixing chamber by the action of trigger mechanism 18, the mixing container 44 can be removed from the gun and the end opposite the spout 50 covered with the sealing cap 78. After mixing, the plunger 80 is pushed in and the mixed material is extruded from the dispensing spout as described above. By using this procedure, it is possible to avoid wasting the last charge of the viscous substances.

Having described in detail the mixing device of our invention, it will now be apparent to those skilled in the art that numerous modifications can be made without departing from the scope of the appended claims.

What we claim and desire to secure by Letters Patent of the United States is:

1. The combination comprising: a gun-type dispenser having a plural chambered, viscous substance filled cartridge removably mounted therein, and means for simultaneously discharging said chambers; a mixing device comprising: a cylindrical container open at one end and closed at the other end, said closed end having a dispensing spout fluidly connected to the interior of said

container, a mixing rod having a mixing head at one end thereof positioned within said container for reciprocatory axial movement therein, said rod movably extending through the closed end of said container and terminating in gripping means for manual reciprocation of said rod and mixing head; and, means for fluidly connecting the open end of said mixing container to said cartridge chambers.

2. The combination comprising: a gun-type dispenser having a plural chambered, viscous substance filled cartridge removably mounted therein and means for simultaneously discharging said chambers; a mixing device comprising: a cylindrical container open at one end and closed at the other end, said closed end having a dispensing spout fluidly connected to the interior of said container, a mixing rod having a mixing head at one end thereof positioned within said container for reciprocatory axial movement therein, said rod movably extending through the closed end of said container and terminating in gripping means for manual reciprocation of said rod and mixing head; and, means for temporarily connecting the open end of said mixing container in fluid communication with said viscous substance filled cartridge chambers.

3. The combination of claim 2 further characterized by said mixing rod being coaxial with said cylindrical container.

4. The combination of claim 3 further characterized by said dispensing spout being noncoaxial with said cylindrical container.

5. A mixing device for viscous substances comprising: a cylindrical container open at one end and closed at the other end, said closed end having an off-center dispensing spout fluidly connected to the interior of said container; a mixing rod having an integral mixing head at one end thereof positioned within said container for reciprocatory axial movement therein, said mixing head comprising a plurality of radially extending fins joined together at their extremities by an annular scraper having inwardly tapering leading and trailing edges and a diameter slightly less than the inside diameter of said cylindrical container, said mixing rod movably extending through the closed end of said container and terminating in gripping means for manual reciprocation of said rod and mixing head; and, means for temporarily closing the open end of said container during the mixing operation.

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