

June 11, 1957

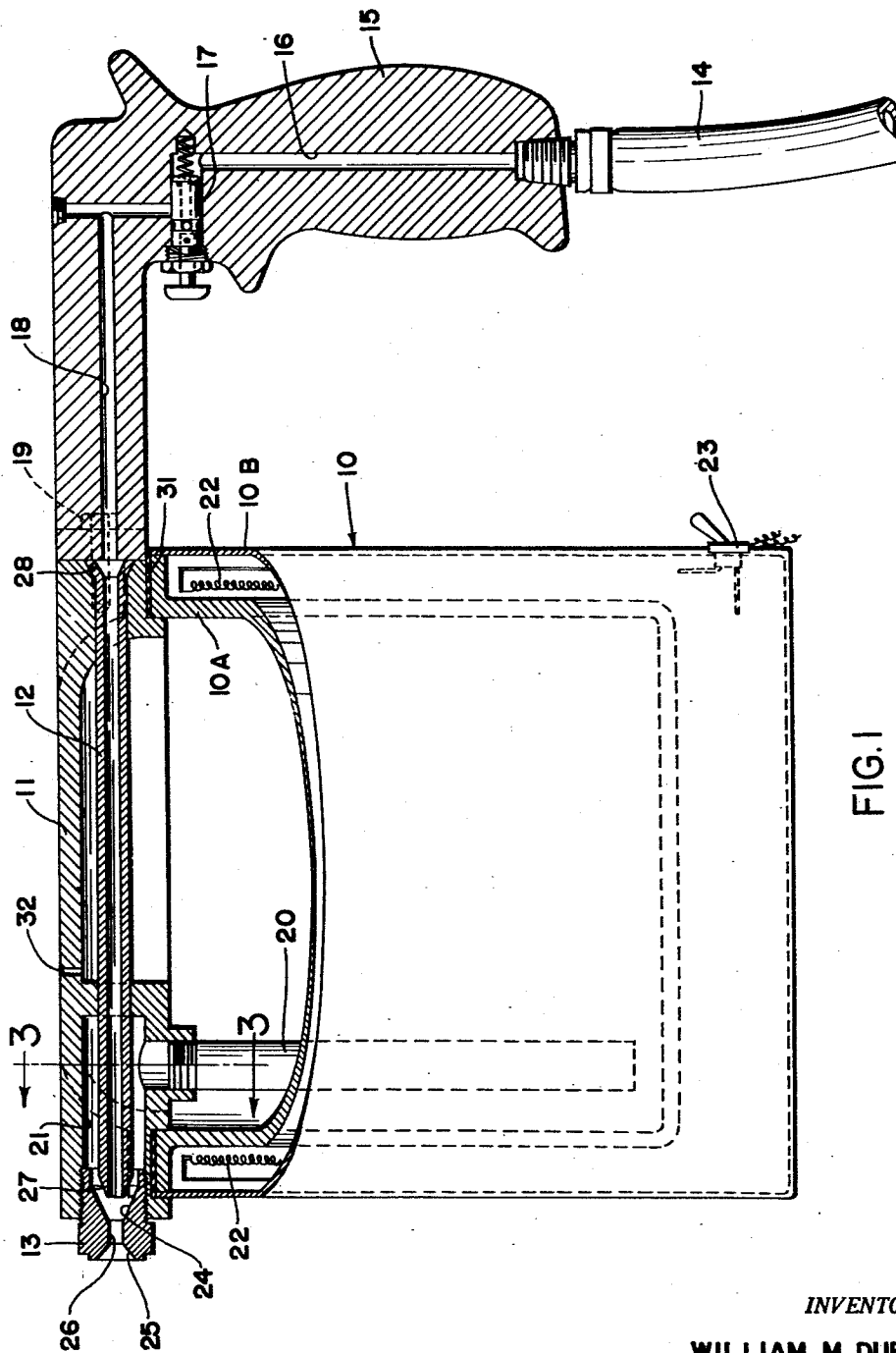
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SPRAY GUN FOR VISCOUS MATERIALS

Filed Feb. 14, 1955

2 Sheets-Sheet 1



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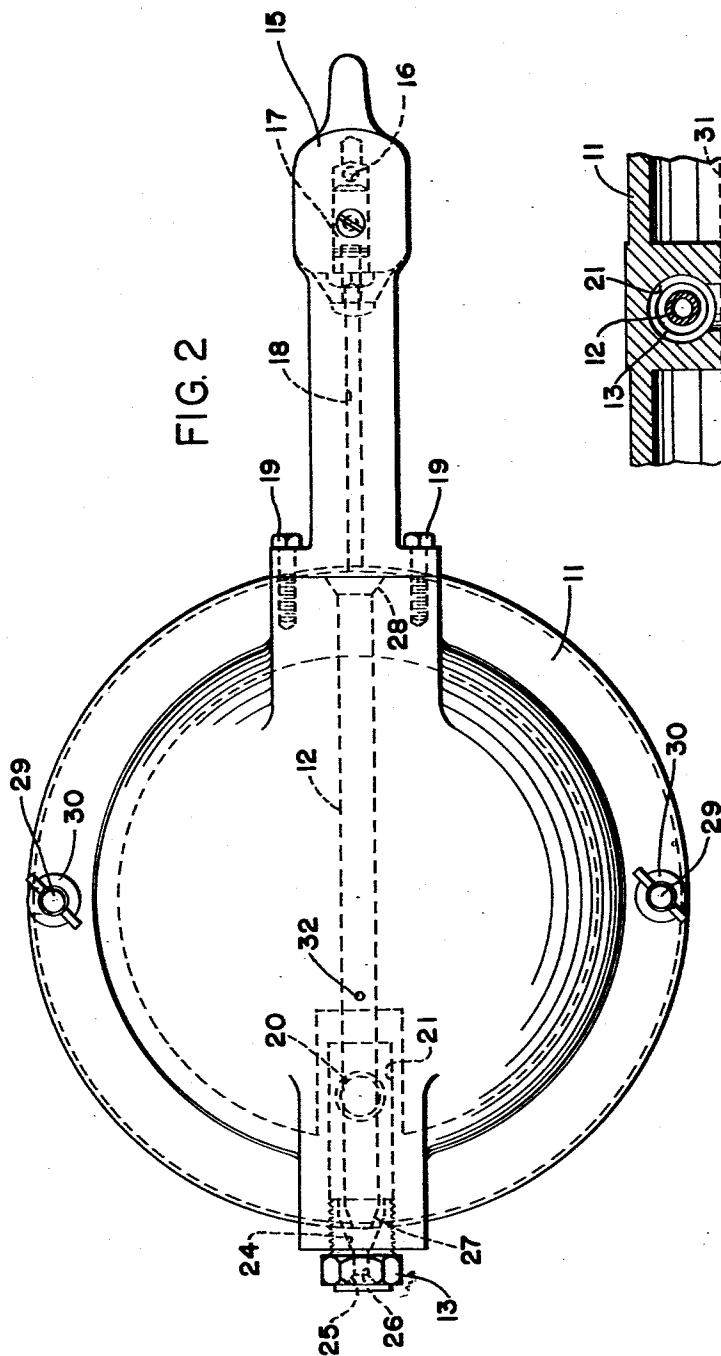
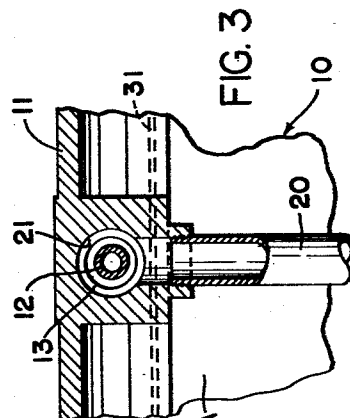
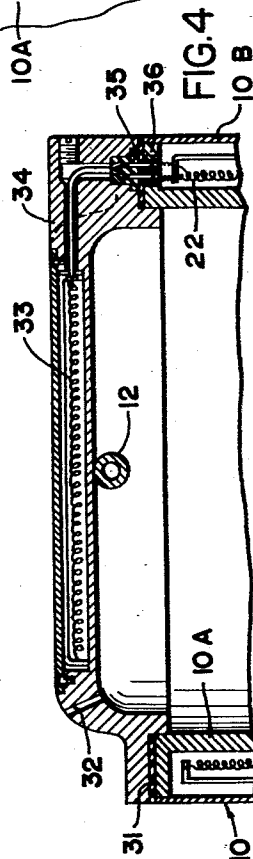
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SPRAY GUN FOR VISCOUS MATERIALS

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2,795,461

SPRAY GUN FOR VISCOUS MATERIALS

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Application February 14, 1955, Serial No. 487,987

2 Claims. (Cl. 299—86)

The present invention relates to a spray gun for use with a source of heated liquid to spray that liquid upon surfaces to be coated and to the method of application. More particularly, it relates to a spray gun associated with a container to permit the spraying of a composition which is liquid only at relatively high temperatures.

A primary object of this invention is to provide a spraying device which is of simple, practical and comparatively light construction and one which will permit the spraying of compositions which are extremely viscous and which must be heated to relatively high temperatures before they are in a condition for application through an atomizing nozzle.

A still further object is to provide a spray gun which may have integrally associated with it a container adapted to bring such compositions or materials to a satisfactory sprayable temperature and to maintain such temperature.

Another object is to provide a spraying device adapted to disperse a hot liquid in a manner which will insure suitable and complete coverage of the object to which it is applied, together with a thorough mechanical bonding or penetration of the material onto the surface.

With such objects in mind and such others as will be apparent hereafter, the present invention comprises a novel spray gun and an associated container and the novel combination or relationship of the parts thereof to one another, as shown in the accompanying drawings, is described in the specification and defined by the claims.

In the accompanying drawings the invention is shown embodied in the form which is presently preferred.

Fig. 1 is a side elevation of the gun and container, parts being broken away and in section;

Fig. 2 is a top plan view of the gun;

Fig. 3 is a section taken along the line 3—3 of Fig. 1; and

Fig. 4 shows in cross section a modification of the cover shown in Fig. 1 and is taken at right angles to the central longitudinal axis of the gun.

The spraying device in the form shown includes a double wall container or pot indicated generally at 10, having a cover portion 11. Within the cover and as a part thereof is a horizontal conduit or tube 12 for conveying air under pressure to a nozzle 13. Air may be supplied to the device by means of an air hose 14 attached to a handle 15. Compressed air passing through the conduit or port 16 traverses valve 17 and enters port 18 enroute to the horizontal tube 12. The valve 17 may be activated by a plunger type finger control as shown on the handle of the gun in Fig. 1. The horizontally extending portion of the gun handle 15 may be rigidly secured to the cover 11 by means of bolts 19 or by other suitable means.

Attached to the bottom side of the cover 11 is a vertically extending suction tube or conduit 20 which projects almost to the bottom of the inner wall of the tank as shown by the dotted lines in Fig. 1. Adjacent and inward of the nozzle 13 and at the end of the conduit 12 is a chamber indicated at 21. This chamber surrounds the

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air conduit 12 and is so designed that the heated composition or grease which rises through the suction tube 20 will substantially fill the chamber and, being in contact with the end of the air tube 12, heat this portion so that the composition will not drop in temperature to a degree which would allow it to become so gummy, sticky or semi-solidified as not to be sprayable.

Referring now to the container 10, I prefer to use a double wall type of construction with the inner wall being indicated at 10a and the outer wall at 10b. Electrical heating means, such as coils 22, are secured in the space between the walls for heating the composition within the container and conducting heat to the atomizing head, and the heating means are connected to the electrical switch 23 secured to the outer wall of the container. Suitable insulation serves to maintain the desired and controlled temperature inside container 10.

It should be pointed out that this spraying device has been particularly designed for spraying heavy grease-like material of a cone penetration consistency within the range of 40–275. One such material particularly adapted for gear lubrication of exposed gear parts, the consistency of which determined by needle cone penetration is 40–50, has a melting point of about 275° F. and must be heated to a temperature between about 400–450° F. before it is in a condition suitable for spraying and most effective application. Compositions of this type are sometimes referred to as extreme pressure lubricants.

It will thus be seen that in order to apply a composition of this type it must be heated to a satisfactory applicable temperature without overheating and must be retained within that temperature range in order to be maintained in condition for proper coverage and penetration. It is thus important to have means, such as the disclosed container, for example, which can bring the material to the necessary temperature and hold it there without overheating. It will be obvious, of course, that the composition should be maintained at a temperature well under its flash point. The flash points of various compositions will, of course, differ, but in connection with the material referred to above, which has a flash point of about 600° F., I would prefer never to allow the temperature of the composition to rise to more than 525° F.

In developing my spray device, I have found it essential to establish a relationship between the cross sectional dimension of the nozzle opening 26 and the inside cross sectional dimension of the tube 12 in order to provide a suitable vacuum in the operating head. It will be appreciated that compressed air passing through the tube 12 will be striking the throat or land 26 of the nozzle 13 creating a partial vacuum in the chamber 21. This vacuum or suction draws the preheated material in container 10 through the suction tube 20 and through the preheated chamber 21 to the preheated nozzle 13, where the jet of air atomizes the material and instantaneously forces it through the nozzle 13 as a spray. Heat from the electrically heated container 10 is transmitted through the inner liner 10a to the cover by conduction where it is further conducted to the nozzle 13 to achieve suitable preheating of the chamber 21 and of the nozzle 13. This preheating of the chamber 21 and the nozzle 13 by direct or indirect means to a predetermined or recommended temperature has a direct bearing on the successful operation of this device, particularly during extremely cold weather.

The spray nozzle 13, which I have found to be very effective for many conditions of application, is constructed with a relatively long conical opening 24 and approximately a 40° included angle at the base of the nozzle, and this angle is substantially complementary with the tapered external surface of the end of the air tube 12. It will be apparent that while the air tube

12 and the bore of the nozzle 13 are shown in cylindrical form in the drawings, they may take other shapes, as for example elliptical, depending on the type of spray pattern desired.

Extending outwardly from the surface 24 of the nozzle is a throat or land 26 which terminates at a frusto-conical opening 25 which will preferably have an opening of approximately 90° included angle, and this shape and angle may also be varied for suitable control of the spray pattern desired.

I have found that, in order to provide a piston of air along the inside diameter of the nozzle, the air must come from the mouth of an air inlet tube 12 whose inside diameter must be smaller than the minimum diameter of the nozzle, as at 26, and I prefer that the diameter of the air inlet tube be within 70 to 90% of the diameter of the nozzle throat 26. It will be apparent that with a proper flow of air under pressure, which may range under different conditions of application or availability from 10 p. s. i. to as much as 200 p. s. i., although I would prefer to use pressure normally in the range of 60 to 80 p. s. i., sufficient vacuum will be created to draw the heated composition material through the suction tube 20, chamber 21, past the end portion of the nozzle to the beginning of the tapered surface 24 and thence through the land 26 and out in atomized or sprayed form.

The end of the air tube 12, as is mentioned hereinabove, is flared as at 27 into a conical form substantially complementary to the angle of the conical surface 24 of the nozzle. This arrangement permits the surface 24 of the nozzle to be brought into sealing contact with the surface 27 of the air tube by means of adjusting the nozzle 13 in the cover. This adjustment controls the amount of material passing through the nozzle 13 from a complete shut-off to the quantity desired for a particular application. The cover 11 may be secured to the container 10 by means of bolts 29 and wing nuts 30, or other suitable fastening. A gasket 31 may be used to form a tight seal between the container and the cover. A vent hole 32 is provided in the cover to equalize atmospheric pressure inside the container and to allow for the expansion of air or gases in the chamber during the heating process.

In the modification shown in Fig. 4, I have placed an electrical heating unit 33 in the cover, now designated as 34, to provide additional heating in this area of the container adjacent to the air tube 12. Under certain circumstances, as for example, during particularly cold weather, I have found it expeditious to heat the cover so that the nozzle 13 and the chamber 21 are brought to a suitable temperature and maintained there to prevent solidification of the lubricant composition in this area. Such heat should only be necessary when conducted heat from the electrically heated container is insufficient to accomplish adequate heating of the nozzle 13 and the chamber 21. This heating element 33 may be connected to the heating element 22 in the container itself by means of a plug 35 and jack 36. Under certain circumstances, I have also found it desirable to heat the entire cover and to achieve a temperature in the cover region which will be related to the temperature achieved by the composition in the container. In the cover area or head I have found that, for a lubricant such as that described hereinabove in which it is necessary to achieve about 425° F. in the container, it is preferable to maintain a temperature in the vicinity of 300 to 325° F. in the chamber 21 and in the nozzle 13 in order to achieve suitable spraying conditions.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. For example, it will be appreciated that

the material in the container can be brought to and maintained at a proper temperature by heating means other than those directly associated in the walls of the container and that for certain applications the container and the spray gun need not be integrally associated so long as suitable spraying temperatures are available and maintained in the vicinity of the nozzle 13 and the chamber 21.

It will also be understood that certain other related compounds having an unworked needle cone penetration consistency in the 50-110 range may be effectively applied through my invention when brought to at least the melting point temperature and preferably well above, such as to the preheating range referred to hereinbefore. My invention is also effective with lubricating greases such as those having a grease cone penetration consistency from 85-285 when the material is properly preheated.

The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

I claim:

1. A device for spraying viscous material which must be maintained at an elevated temperature prior to spraying comprising a handle portion and a barrel portion, said barrel portion having an inner liner member adapted to hold the material to be sprayed, an outer container member spaced from said inner member and rigidly secured and sealed at its upper end to the upper end of said inner liner member with said inner member having a flanged rim portion secured to the top of said outer member, and an electrical heating element disposed between said members, said barrel member also having a detachable cover adapted to sit in sealing contact upon the rim of said container and liner members and having a bore therethrough and being formed with a chamber at its forward end, said cover portion having a converging-diverging venturi type nozzle rotatably mounted therein at the forward end thereof and being axially adjustable therewith, an air tube disposed within the bore of said cover and having its forward end terminate in said chamber, a siphon tube communicating with said cover member and connecting into a source of liquid within the inner liner and means for conveying heat through the liner member to the said nozzle and cover chamber through said rim portion, and thermostatic means disposed in said outer container member for controlling the heating element to maintain the spray material within the liner at suitable temperature.

2. A device for spraying viscous material as described in claim 1, wherein the invention is further defined by having the diameter of the air tube proportioned so that it is smaller than the diameter of the throat of the nozzle and being within the range of 70 to 90% of the diameter of the nozzle.

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